RETHINKING THE EQUITY RISK PREMIUM

Edited by

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Rethinking the Equity Risk Premium

RESEARCH FOUNDATION OF CFA INSTITUTE

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Rethinking the Equity Risk Premium: An Overview and Some New Ideas

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Many investors regard the past decade as an unusual one for market returns. This view is no doubt based on their having experienced a sea change in equity market behavior, including much-lower-than-average returns, much higher volatility, two of the biggest bubbles (and their subsequent bursting) in stock market history, and rising correlations—cross-asset, cross-country, cross-sector, and intra-sector. Any longtime investment market participant will have encountered more extreme trends and events in the past 10 years than during any other 10-year period in the past seven decades.

One of the key features of this turbulent period is renewed uncertainty about what may be the most important measure in all of finance—namely, the equity risk premium, or the expected return for equities in excess of a risk-free rate:

$$ERP = E(re) - E(rf).$$

The equity risk premium, or ERP, plays a critical role for any investor in that it affects savings and spending behavior as well as the all-important allocation decision between riskless and risky assets. In that sense, it is an equilibrium concept that looks beyond any given period's specific circumstances to develop a fundamental, long-term estimate of return trends.

It should be noted that the equity risk premium, as the term is used here, is not identical to the historical excess return. For example, for the 10 years beginning in the middle of 2001, annualized geometric mean U.S. equity returns significantly trailed U.S. TIPS (Treasury Inflation-Protected Securities)—roughly 3 percent versus 6 percent. So, one measure of the historical excess return is −3 percent.[1] In this volume, Robert Arnott shows that, using rolling 20-year returns, the historical excess return has ranged from +20 percent to −10 percent,

[1]Please note that, by convention, the return is often expressed as a "percentage" rather than "percentage points."

a range that is not very helpful in forming a historical average. But these numbers do not say much about the equity risk premium, which is a forward-looking expectations-driven estimate of stock returns. In other words, what premium do we *expect* stocks to provide over a risk-free rate? This forward-looking premium is critical to fundamental activities in investing, especially strategic and tactical asset allocation but also in portfolio management, hedging, investment product development, and the formation of saving and spending plans.

The problem posed by recent history for all these activities is whether we can be confident in our understanding of equity risk. After several decades during which realized equity returns followed a welcome positive pattern, the past decade has seen a marked downturn in equities. This downturn has prompted some investors to suggest that we must permanently adjust our future expectations for equity returns versus other broad asset classes. Others argue that the same evidence suggests equities are poised for outstanding future excess returns. Which is it?

To investigate the ERP in more depth, we could evaluate forecasts, trends, and expected variations in forward-looking measures: P/Es, dividend payouts, debt, macroeconomic growth and inflation, investment horizon, demographic change, and other variables. We have at our disposal, arguably, more analytical techniques and sources of information than ever before that bear on asset class expectations and behavior, but we have less certainty than ever about the ERP.

This volume is the result of an effort to sort through and present some of the best recent thinking on the ERP in a way that practitioners may find useful in developing their own approach to the subject. It assembles leading practitioners and academics who have confronted the question of what the ERP might be going forward and, more importantly, what factors are the most important drivers of the premium.

Initial ERP Project

The present project arose out of an interest on the part of the Research Foundation of CFA Institute to revisit, in light of what has happened in asset markets, a similar but not identical effort that it sponsored in late 2001. This earlier effort emerged as the "dot-com" bubble burst and investors confronted, for the first time in many years, the possibility of an extended period of lower equity returns. The 2001 forum gathered a wide range of experts to discuss the theoretical foundations of the ERP, historical results, then-current estimates of the size of the premium, and implications for asset management (Association for Investment Management and Research 2002). It featured lively discussions of the definition of the ERP, rational expectations versus behavioral explanations for its existence, specific factors and models that explain its size and stability (or lack thereof), the possibility of structural change–driven effects on the premium, and ways in which institutions and individuals incorporate views on the ERP into asset allocation.

Rather than a firm consensus, a strong sense of diversity arose from this earlier forum regarding views on the ERP and possible explanations for differences among those views. For example, **Exhibit 1** shows, as of 2001, a selected set of estimates of the ERP ranging from 0 to 7 percent, with an average of a little less than 4 percent.

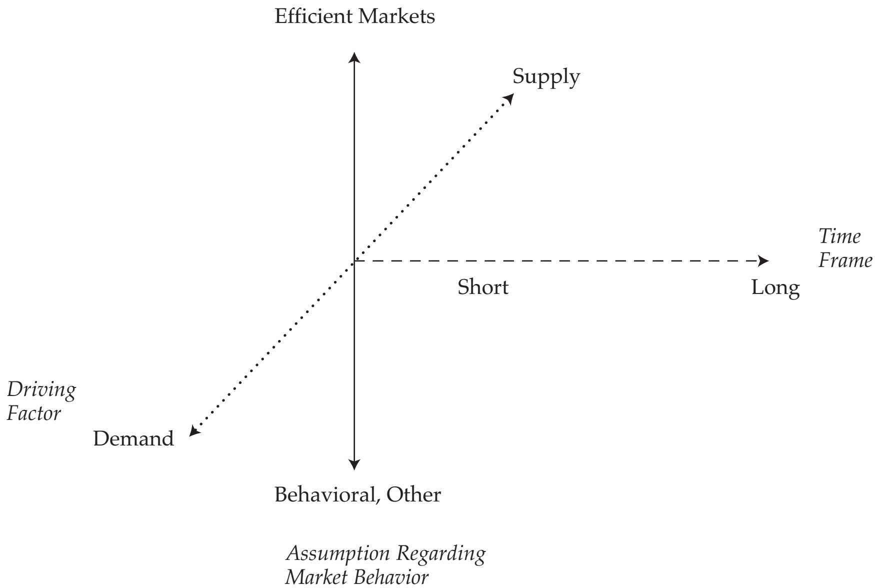
Exhibit 1. Estimates as of 2001 of the ERP

Source	ERP Estimate (%)
Arnott and Bernstein (2002)	0.0
Campbell and Shiller (2001)	0.0
McGrattan and Prescott (2001)	0.0
Ross, Goetzmann, and Brown (1995)	Low
Reichenstein (2001)	1.3
Campbell (2001)	1.5–2.5
Philips (2003)	1.0–3.0
Siegel (2002)	2.0
Bansal and Lundblad (2002)	2.5
Shoven (2001)	3.0
Siegel (1994)	3.0–4.0
Asness (2000)	4.0
Graham and Harvey (2001)	4.0
Ibbotson and Chen (2003)	4.0
Goyal and Welch (2002)	3–5
Fama and French (2002)	4.3
Cornell (1999)	5.0
Ibbotson and Sinquefield (1976)	5.0
Welch (2000)	6.0–7.0
Average	3.7
Range	0.0–7.0

Note: ERP estimates are the expected long-term geometric return of equities in excess of the real risk-free rate.

Figure 1 summarizes, in schematic form, some of the key dimensions that can help explain these estimates. On one dimension, differences in ERP estimates can be caused by the weight given to short-term versus long-term investment horizons, including an emphasis on mean reversion or cyclicality. (A related dimension, not shown here, for different regimes or macro environments could

Figure 1. Three-Dimensional Array of Views on the ERP



also be added—for example, whether prevailing interest rates are high or low.) ERP estimates can also vary according to whether supply or demand considerations are the dominant influence. Some investigators focus on the demand for a return that will compensate investors for the extra risk of equities, whereas others look at the supply of cash flows that companies can inject into the market.

Perhaps most fundamentally, the forum exposed different views on investor behavior, specifically whether markets exhibit rational expectations or suffer from behavioral distortions, such as myopic loss aversion (which can be nonlinear or noncontinuous). One area of general agreement was that, to their detriment, few institutions or individuals explicitly address these issues and even fail to consider the size of the equity premium itself in forming policy portfolios and determining asset allocation.

10th Anniversary Project

The current project started with leading academics and practitioners gathering for a daylong discussion on what new developments, if any, have occurred in thinking about the ERP as well as in estimating the size of the ERP that we can expect in the future. Following that discussion, participants were asked to set down their current thoughts in essay form. The result, contained in this volume, is a rich set of papers that illuminate the issues and speak to the conceptual and empirical sources of the various perspectives. What is interesting about the more recent effort is not only some commonality with respect to the emphasis on supply-driven considerations but also—quite naturally in light of recent history and theory—a great deal of variation among the authors on the stability and term structure of the ERP as well as on whether variations in the ERP, no matter what their source, matter much.

The opening paper by Roger Ibbotson lays out several ways of estimating the ERP, including supply, demand, historical extrapolation, and combinations thereof. Investors are not the only agents who are affected by the excess return on equities over bonds; corporations should consider the ERP as the most important ingredient in understanding their cost of capital, and equity analysts need to use the ERP as part of the discount rate when estimating the present value of a company's future cash flows. Moreover, although it may be the largest market premium, the ERP is not the only one. Other premiums are associated with investment horizon, company size, value, momentum, default risk, and inflation risk. Of particular interest is the liquidity premium, described by Ibbotson as the phenomenon in which unpopular stocks (those that do not trade much) can display significant excess returns compared with stocks traded more often. Most important, investors often fail to differentiate a short-term tactical view of the ERP from the more fundamental long-term supply-driven equilibrium equity premium, suggesting that short-term signals may not always provide accurate information about the "true" long-term ERP.

Focusing on the cyclical nature of returns and fundamental indicators, Clifford Asness notes that there is no evidence that high P/Es are an accurate forecast of high future earnings growth rates. Rather, the evidence runs in the opposite direction. Using his own estimates of earnings growth and drawing on the Shiller P/E, which is the current price divided by trailing 10-year average real earnings, Asness offers a future equity return estimate in the range of 4 percent. Because it is hard to agree on a benchmark for the risk-free rate, he does not make a specific forecast of the ERP.

Looking historically and adopting a broad geographical perspective, Elroy Dimson, Paul Marsh, and Mike Staunton report on their most recent update of realized excess equity returns, relative to both bills and bonds, in 19 different countries from 1900 to the start of 2011. Although they found considerable variation across countries, the realized excess return was substantial everywhere. For their world index, annualized geometric mean real returns were 5.5 percent, the excess return relative to Treasury bills was 4.5 percent, and the excess return relative to long-term government bonds was 3.8 percent. Based on a supply model of the ERP, with the addition of the change in the real exchange rate, they estimate that the forward-looking equity premium is lower, around 3–3.5 percent, largely because of lower expected dividend growth compared with the historical average. In addition, they suggest that mean reversion in the stock market may not be as strong a force as others would argue. And even if mean reversion is a force, it may not provide much comfort to an investor who still does not know what the average stock market return will be in the future, nor what the equity premium is today or what the other parameters of the return process are.

The paper by Richard Grinold, Kenneth Kroner, and Laurence Siegel develops and estimates a supply model of the ERP. It decomposes equity returns into three major components: income, earnings growth, and repricing:

$$R \underbrace{\frac{D}{P} - \Delta S}_{\text{Income}} + \underbrace{i + g}_{\text{Earnings growth}} + \underbrace{\Delta \text{PE}}_{\text{Repricing}},$$

where D/P is the dividend yield, ΔS is share repurchases net of (that is, minus) new issuance, i is inflation, g is real earnings growth (not earnings per share), and the last term is the change in the P/E multiple. To illustrate, if the current 10-year bond yield is 2 percent and the ERP is 4 percent, then income, earnings growth, and repricing components must sum to 6 percent. Looking forward, the authors estimate future income to be about 2 percent, composed of dividend yield of about 1.8 percent and net share repurchases at 0.2 percent (repurchases of 2.2 percent and dilution or new issues at 2 percent). Earnings growth is expected to be a little more than 5 percent, with 2.4 percent coming from inflation and a little less than 3 percent coming from real earnings growth (which they equate to real GDP growth). Finally, although repricing contributed significantly to equity returns in the 20th century, there is little reason to believe that it will continue to do so. If we put these figures together, equity returns are expected to be about 7.2 percent. If the long-term nominal bond yield is about 3 percent, then the ERP is in the range of 4 percent.

Robert Arnott supports a view of the ERP as cyclical, smaller, and more dynamic than the prevailing theory of a more stable and robust premium would suggest. He counters a series of "myths" by showing that bonds have outperformed stocks over a significant period, the realized excess return has often been lower than the forward-looking ERP, net stock buybacks are lower than is often assumed, lower earnings yields are empirically associated with lower subsequent stock returns and premiums, real earnings and stock prices grow with per capita GDP rather than total GDP, and dividend yields are lower now than ever before. When taking this more sobering evidence into account, he finds that the probability of future stock returns matching the 7 percent real historical average is slight. Arnott's estimate of the future ERP ranges from negative to slightly positive.

Antti Ilmanen directly addresses the issue of the stability of the ERP over time by considering what the premium might look like for the next decade and well beyond, including periods with regime and term structure variations. After helpfully reviewing a wide variety of approaches to the ERP, he makes three major points. First, term structure effects are more obvious on the bond side of the premium, where short-dated TIPS yields are currently negative but longer-dated TIPS are higher, implying a 2.7 percent forward TIPS yield for the decade starting in 2021. Second, abnormally high (or low) starting valuations for equity markets and related mean-reversion potential have strong implications for expected stock market returns for the next few years. However, if we consider prospective equity returns *after* the next decade, we have no clue what the starting valuation levels will be in 2021. Thus, if we assume below-average equity market returns for the next decade because of an expected normalization of the currently high Shiller P/E, our best forecast for real equity market returns beyond 2021 should be closer to our "unconditional" long-term return forecasts. That is, these forward forecasts should largely ignore starting valuations (or at least allow future higher starting yields in 2021 than in 2011). And third, many indicators besides valuation measures can be used to predict stock market returns. Regressions and other econometric techniques can be used to forecast returns over any investment horizon (admittedly having fewer independent data points in longer horizon regressions). It is thus possible to estimate a full term structure of expected returns.

Using a variation on the supply-driven approach, Peng Chen looks at whether bonds might outperform stocks over the long run as they have over the past decade. Although the bulk of bond returns comes from their yield or income, the recent outperformance of bonds is based on the decline in yield (price increase). Currently, long-term bond yields are so low (estimated at the time of writing to be less than 3 percent) that they are unlikely to decline much further, so expected capital gains from bonds are low to negative. In contrast, stock returns depend on earnings growth and the change in the ratio of price to earnings as well as their yield. If expected earnings growth and yields remain at roughly historical averages (5 percent and 2 percent, respectively), then P/Es have to decline to 5 to produce overall future stock returns less than the 4 percent expected bond yield—an outcome that seems highly unlikely.

Looking at the information contained in the P/E that might bear on the ERP, Andrew Ang and Xiaoyan Zhang conclude that the ERP is relatively stable over time. They decompose companies' future earnings into those associated with a perpetual, no-growth component and a component associated with future growth opportunities. In effect, movements in P/E reflect changes in discount rates, which contain the ERP, as well as growth opportunities, which involve the cash flow and earnings-generating capacity of company investments. Therefore, P/Es can be high (low) because growth opportunities are favorable and/or because expected returns are low. Using more than 50 years of data from the S&P 500 Index, Ang and Zhang show that macro variables—especially risk-free rates, earnings growth, and payout ratios—are important in explaining variations in P/E. Most important, although discount rates (which contain the ERP) are variable, they are also mean reverting; thus, changes in growth opportunities, rather than in the total discount rate, explain 95 percent of the variation in P/E.

Adopting a historical emphasis, as several of the other authors have, Jeremy Siegel looks back even further to emphasize continuities in the numbers that underlie the historical excess return and estimates of the ERP. He shows that the underperformance of real equity returns in the past 10 years relative to the historical average (6–7 percent) was just about offset by the outperformance of the previous 10 years. In addition, the average historical P/Es and earnings yields have changed very little in the past decade, further supporting the notion of stability in the forward-looking ERP. Siegel closes by observing, consistent with finance theory, that the dividend payout ratio has declined along with dividend yield but that it was offset by the growth of future earnings and dividends.

Rajnish Mehra looks back in a different way, asking whether the result of his original groundbreaking work, which predicted a very low ERP, is still warranted. Taking a long-term view that combines supply and demand considerations, he argues that higher estimates of the ERP typically depend on three basic assumptions that need rethinking because they lead to overestimations of aggregate risk. First, the risk-free rate of return should be matched to the duration of liabilities, which suggests using higher inflation-linked bond or mortgage returns rather than the more commonly used T-bill rate. Second, most estimates ignore the idea that households borrow considerably more than they lend, thus inflating the ERP. Third, younger investors have a higher demand for equities than middle-aged and older investors, but younger investors find it harder than older investors to borrow. These life-cycle and borrowing constraints artificially raise the ERP and the bond yield. Taken together, these corrections greatly reduce forward ERP estimates. One consequence of this analysis is that as the Baby Boomers retire and raise the demand for bonds, it is possible that the ERP will be higher in the future.

In sum, the papers collected in this volume share a general emphasis on supply factors and models for the historical excess return as well as the forward-looking equity risk premium. After 10 years of low and highly volatile equity returns, there is little consensus about the stability of the ERP over changing regimes and time horizons. Interestingly, the group appears to be in agreement more on the actual size of the ERP over the next few years (most agree that it is in the 4 percent range) than on its stability.

Another Perspective: Regimes and Circumstantial Drivers

Rather than try to resolve what may be unresolvable differences in perspective on the ERP, and given the understandable challenges of evidence, inference, and prediction in this area, it may be useful to adopt a different approach—one that acknowledges and reflects the inherent multiplicity and diversity among (1) interest rate and market regimes and (2) investor perspectives.

The ERP is typically discussed as an expected return increment needed to compensate a universal or typical investor for accepting equity risk. This simple, and thus attractive, definition tempts us to think of a single investor deciding, on the margin, whether to move from a "riskless" fixed-income base into equities. The higher the ERP, the more the investor can expect to gain from a move from fixed income to equities and the higher the expected allocation to stocks. The lower the risk premium, the lower the expected gain and the lower the allocation to equities.

One implication of this single-premium concept is the assumption that it is possible to forecast a single "headline" ERP. This assumption is built into most discussions of the risk premium and most applications. Of course, these discussions and applications must take into account variables that affect the headline number. **Exhibit 2** is a far-from-exhaustive list of these "objective" drivers, including the selection of the risk-free asset base, the type of equities under consideration, real interest rate regimes, inflation expectations, other macro trends, earnings expectations, variations in the premium over time, and other considerations that can affect the forecast of a risk premium.

Each of these important variables can drive differences in calculations of the ERP. These variables have received considerable attention from analysts as well as from academics in search of the actual risk premium, including many of the contributors to this volume. Some of the differences in perspectives may be better understood by noting that the dynamics among macroeconomic and valuation factors, and their effects on the ERP, may be nonlinear. This nonlinearity can be seen in an admittedly simplistic form in **Exhibit 3**, in which the analysis is tied to interest rate regimes, which are nonlinearly associated with equity valuations. In other words, one can observe a sweet spot in P/Es and other valuations associated with moderate real long-term interest rates (2–3 percent), with a drop in valuations for lower and higher interest rate regimes. The relationships among some of the factors listed here display loosely connected tendencies rather than strong tight unities (e.g., inflation).

Exhibit 2. Objective Drivers of ERP Differences

Risk-Free Asset	Equity Class	Real Interest Rate Trend	Inflation Expectations	Other Macro Assumptions	Earnings Expectations	Dividend Trend	ERP Variations
Treasury bills	U.S. equities	High	High	Macroeconomy	High	Rising	Volatility
Treasury notes	Global equities	Medium	Medium	Demographics	Medium	Falling	Volatility of volatility
Inflation-linked bonds	Large cap	Low	Low	Globalization	Low		
	Other:						
	Size						
	Value						
	Geography						
	Sector						

Exhibit 3. Real Interest Rate Regimes and the ERP

Factor	Low Rates 0–1%	Sweet Spot 2–3%	High Rates 6%+
Equity risk premium	High (6%)	Low (4% or less)	High (5%)
Probability of occurrence	Low	High	Low
Financial/economic environment	Dismal	Balanced	Overheated
Inflation expectations	Low (1–2%)	Low/medium (2–3%)	High (4%+)
Discount rate/cost of capital	Medium (7%)	Medium (7%)	High (11%)
Real growth rate	Very low (2.5%)	Good (4%)	Too high (7%)
Regime persistence	Hopefully brief	Sustainable	Almost surely brief
Sustainability of current earnings	Fair (0.4)	Fair (0.4)	Good (0.7)
New investment profitability	Good when available (6%)	Good (6%)	Squeezed (2%)
“Franchise” value (FV)	Low (4.8)	High (11.4)	Low (3.2)
“Ongoing” or “tangible” value (TV)	Fair (5.7)	Fair (5.7)	Fair (6.4)
Theoretical P/E (FV + TV)	Low (10.5)	Peak (17.1)	Low (9.6)

Notes: Specific functional values have no empirical validity. They are illustrative of relative values that might be associated with P/E and other valuation components corresponding to the three growth regimes.

Source: Based on Leibowitz and Bova (2007).

The main point is the relationship between the ERP and other economic and valuation factors. Note that although the middle, or medium, interest rate regime is the sweet spot for the economy and the equity market, the ERP could remain low in these circumstances. Whether we focus on supply or demand forces, excess return expectations may be low compared with those in more uncertain times when economies are troubled or overheated. So, some of the differences in views of the ERP could be attributed to specific regime forecasts or to whether regimes play a strong or weak role in determining the ERP.

One implication of looking at these sorts of objective determinants is that they are all, at least in theory, reducible. In other words, let’s imagine it is possible to gather investors together to obtain a general agreement on selection of the risk-free asset, equity index, earnings and inflation expectations, and even the pattern by which the ERP varies over time or the list of forces that cause such variation. Although agreement on these matters might not be easy to obtain, discussions would focus on issues that are subject to measurement, analysis, and objective inference. With such a general agreement, some or maybe even a great portion of the differences among investors in their ERP estimates would be reduced. But not completely.

The differences in investors' ERP estimates would not, in the end, be eliminated. These differences are not fully reducible even with agreement on measurement and benchmarks. What remains are irreducible differences based on investors' varying conditions or circumstances. Each investor might have a unique combination of circumstances that differentiates her from all other investors, not in terms of her views on how to calculate the ERP but in terms of the circumstances in which she finds herself as an investor. In turn, those unique circumstances can then affect what we might call a "personal" or "institutional" ERP, one that is specific to an individual or institution. As shown in **Exhibit 4**, these circumstances could include investment horizon, need for liquidity, rebalancing requirement, sensitivity to changing market valuations, the capacity to evaluate those changing valuations, risk tolerance, and buyer or seller orientation.

All these circumstantial drivers of investor perceptions can affect the size of the equity premium that an investor might expect or experience at any point in time. Furthermore, this expected ERP is different from a "required" ERP in that it reflects what the investor actually experiences based on his or her individual circumstances (as opposed to an ERP that is required for the investor to act). For example, investment horizon can range from nearly perpetual (some foundations and endowments) to nearly immediate (an individual investor's current living expenses). A short-term investor might not experience the same ERP as a long-term investor, either in terms of expected return or expected volatility of that return. Similarly, liquidity needs can affect the return an investor can expect; sometimes there may be a positive or negative illiquidity premium built into the ERP. And rebalancing requirements can influence return, especially if we are aware that a large set of investors must rebalance in the same direction at the same time. In turn, the ERP may vary depending on whether one is a buyer or seller (such as during late 2008 in the equity markets, when bid–ask spreads or the differential returns required by buyers and sellers froze some markets and nearly destroyed others).

Take, for example, some combinations of these dimensions as illustrated in Exhibit 4. Many long-term investors are relatively premium insensitive in that they are interested in holding rather than buying or selling. Others, such as the LSB (long-horizon valuation-sensitive buyer), may be looking to add to positions if the price (premium) is right, although the LSS (long-horizon valuation-sensitive seller) is looking to lighten holdings based on receiving an adequate premium.[2] In contrast, a liquidity-sensitive investor (e.g., hedge funds in mid-2007 and late 2008), denoted by LLS, may need to sell at nearly any

[2] See the notes to Exhibit 4 for a full explanation of the acronyms used in this discussion.

Exhibit 4. Circumstantial Drivers of Investors' Perceptions of the ERP

Investor Type	Investment Horizon	Liquidity Bias	Rebalancing Requirement	Valuation Sensitivity	Ability to Evaluate Market	Risk Tolerance	Trade Orientation	Example
Long horizon								
LSB	Long			Sensitive	High		Buyer	Discretionary buyer looking for low premium
LSS	Long			Sensitive	Low		Seller	Discretionary seller looking for extra premium
LLB	Long	Liquidity bias					Buyer	Buyer at nearly any price
LLS	Long	Liquidity bias					Seller	Seller at nearly any price
LRB or LRS	Long		Rebalance				Buyer	Must rebalance when market moves
LCB or LCS	Long				High	Constant		Constant risk tolerance but evaluates and acts on changing market opportunities
LVB or LVS	Long				High	Variable		Risk tolerance depends on market conditions or changing personal circumstances
LRB or LRS	Long					Range bound		Constant risk tolerance, except in extreme market move
Short horizon								
SSB or SSS	Short			Sensitive				Daily, weekly, monthly, quarterly performance evaluation
SLB or SLS	Short	Liquidity bias						Must remain liquid

Notes: First letter: L = long horizon, S = short horizon. Second letter: S = valuation sensitive, L = liquidity bias, C = constant risk tolerance, V = variable risk tolerance, R = has rebalancing requirement. Third letter: B = buyer, S = seller.

price in order to raise cash. Other investors, such as pension funds, may need to put cash to work quickly as contributions come in the door (LLB). Still others may need to rebalance systematically as the market pushes their allocations away from a policy portfolio (LRB or LRS), and therefore, they may be relatively premium insensitive. Of course, the same individual or institution may exhibit more than one of these behaviors depending on the circumstances. The point is that these circumstances can influence the size and character of the ERP investors experience or require.

Shorter-term investors may be a smaller part of the overall equity market but may receive an outsize portion of media attention. If we put aside share repurchases and new issues, as well as the supply of equity substitutes, the term structure of the ERP and its volatility may be such that both variables have very different values over the short and long term. A high short-term volatility may look much more acceptable to a long-term investor because of his ability to ride it out. Similarly, a high short-term premium can coexist with a dreary long-term premium.

So, long-term and short-term investors might share a sensitivity to valuation metrics but in very different ways. Long-term valuation-sensitive investors (LSB and LSS) might respond to a sufficiently high long-term ERP (that is, the ERP in excess of the long-term fixed-income yield) by selling bonds to buy stocks in the belief that such an action will compensate them for long-term nominal as well as real risk. In contrast, short-term valuation-sensitive investors (SSB and SSS) may be more inclined to judge the ERP either on an absolute stand-alone basis or relative to returns from various fixed-income durations given expectations regarding yield curve movements. In these cases, price volatility looms large as a risk factor, so short-term investors need a much greater premium inducement to get them to prefer equities to bonds over their short horizon.

One should also consider not just the effects of circumstantial ERP on investor behavior but also the effects of investor behavior on the ERP. As buyers and sellers meet in the marketplace, the transaction size, urgency, other asset holdings, and other circumstances could dampen or exacerbate equity premium movements. Rebalancers and especially liquidity-sensitive sellers may be relatively insensitive to price and premium and thus have a moderating effect on ERP variations. Both valuation-sensitive and valuation-insensitive investors could affect the equity premium. Valuation-sensitive investors are looking for a desired or required price or premium, so their actions will tend to move the market in that direction. The impact of actions by valuation-insensitive investors may be unpredictable because they purchase or sell shares at times that could inadvertently push the equity premium up or down.

Some transactions, however, might have little effect on the marginal ERP. In general, the marginal ERP value is likely to be determined by one type of buyer interacting with one type of seller. Although we often think of both the marginal buyer and seller as savvy and valuation sensitive, an equally savvy investor on one side may not be able to exercise valuation sensitivity. For example, a long-term liquidity-sensitive buyer (LLB) might be content buying at a price set by a short-term valuation-sensitive seller (SSS) who thinks that equities are currently overpriced. The sum of all such forces would theoretically combine into a pair of supply and demand curves, which could be smooth, lumpy, kinked, and certainly multidimensional (e.g., with term structure characteristics and regime dependency). Thus, we can see how the interplay of these multiple circumstantial forces can lead to a risk premium that is far more multifaceted and complex than is typically envisioned in the standard discount models, even when we take into account structural and cyclical changes in the more objective factors cited in Exhibit 2.

Overlaid on all these issues may be behavioral effects, such as systematic investor misperceptions and behavioral anomalies, that affect buying and selling behavior (the behavioral versus efficient markets dimension in Figure 1). But these forces are in addition to the objective and circumstantial forces just described, and they may be more invariant. Finally, our investor categories are not all mutually exclusive, and depending on circumstances, investors may shift from one type to another.

Conclusion

The past 10 years have shown that the ERP, far from being a settled matter, continues to challenge analysts. The research and observations in this volume have a number of implications for investment practice and theory. First, investors and analysts should take care to be explicit about their estimates of the ERP. We still too often use different definitions of, assumptions about, and approaches to the ERP, or leave it altogether implicit in our analyses of asset markets and valuations. Further clarity may help reduce the number of occasions when we are talking past each other. Second, we should be clear about what model we are using when we offer a forecast or explanation of the ERP. We have seen that variations in our estimates can be the result of different approaches to objective, circumstantial, and behavioral factors. Third, differing circumstances among investors lead to true, irreducible differences in the ERP that each investor may face at any given time. This final consideration underscores how the interplay of these multiple circumstantial forces can lead to a risk premium that is far more multifaceted and complex than typically envisioned in the standard discount models, even when we take into account structural and cyclical changes in the more objective factors. The papers contained in this volume richly illustrate this interplay.

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The Equity Risk Premium

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The equity risk premium (ERP) is a concept that seems to mean different things to different people. Some people treat it as the equilibrium long-run return, whereas others treat it as their own personal estimate of the long-run return. Some discuss it as a future return, whereas others discuss it as a realized return. Some compare equity returns with long-term bond returns or yields, whereas others compare equity returns with short-term bond returns or yields. There are various ways to estimate the ERP, whether we are talking about equilibrium or personal estimates and whether we are making forecasts or measuring past realizations. In this paper, I will clarify the terminology, compare the various ways of estimating and measuring the equity risk premium, and discuss some of the other premiums that exist in both equity and other capital markets.

What is the equity risk premium? I consider it a long-run equilibrium concept that gives an estimate of the future excess return of the stock market over and above the bond market. There are several advantages to thinking of the ERP as an equilibrium concept. It provides the *market's* estimate of the excess return on stocks relative to bonds. It is neutral in the sense that it does not take advantage of any particular investor's expertise but, rather, tries to determine what the market thinks. In this way, it can be used as a benchmark for more active or dynamic forecasts of the stock market. It can also be used for long-term planning purposes in setting a long-term asset allocation or in estimating the returns that a portfolio can provide to meet various future obligations.

I have already established that from an investor's perspective, the ERP is the expected return that investors can earn on stocks in excess of bonds. From a corporation's perspective, however, the ERP is part of the cost of equity capital. When looking at a company's entire weighted average cost of capital, the ERP is usually the most important ingredient. From a valuation perspective, the ERP is used as part of the discount rate when estimating the present value of a set of future cash flows. The expected return of equity is used in all three of these contexts, and they are all equivalent to each other after taking into account certain market imperfections, such as taxes and transaction costs.

Methods of Estimating the Equity Risk Premium

How should we estimate the equity risk premium in equilibrium over the long run? There are four primary ways. The first is to look at the historical ERPs that we get from comparing past stock returns with past bond returns. These realizations give us an idea as to the magnitude of payoffs that investors have received for taking on the extra risk of being in the stock market rather than the various bond markets. A second way is to use a consensus estimate of the opinions of all the participants in the marketplace. Because these market participants are setting the price, they must also be the investors who are buying or selling stocks to reflect their long-term outlook. A third method is to look at the demand side of the equation. In this case, we are trying to determine how much extra return an investor would demand for taking on the extra risk of buying stocks rather than bonds. The last way is to look at the supply side of the equation. Here we consider what the economy and corporations supply to the market in the form of earnings or cash flow.

Historical. Let us start with the historical perspective. **Table 1** lists the returns over the period 1926 through 2010 for the following Ibbotson indices: Large Company Stocks, Small Company Stocks, Long-Term Corporate Bonds, Long-Term Government Bonds, Intermediate-Term Government Bonds, U.S. Treasury Bills, and Inflation. The geometric mean annualized return from Large Company Stocks was 9.9 percent, and the arithmetic mean return was 11.9 percent. The Long-Term Government Bond geometric mean return was 5.5 percent, and the arithmetic mean return was 5.9 percent. The U.S. Treasury Bill geometric mean return was 3.6 percent, and the arithmetic mean return was 3.7 percent. The table demonstrates that there can be many

Table 1. Ibbotson Index Series: Summary Statistics of Annual Total Return, 1926–2010

Series	Geometric Mean	Arithmetic Mean	Standard Deviation
Large Company Stocks	9.9%	11.9%	20.4%
Small Company Stocks	12.1	16.7	32.6
Long-Term Corporate Bonds	5.9	6.2	8.3
Long-Term Government Bonds	5.5	5.9	9.5
Intermediate-Term Government Bonds	5.4	5.5	5.7
U.S. Treasury Bills	3.6	3.7	3.1
Inflation	3.0	3.1	4.2

Source: Ibbotson® SBBI®, *2011 Classic Yearbook: Market Results for Stocks, Bonds, Bills, and Inflation, 1926–2010* (Chicago: Morningstar, 2011).

ERPs even when using a single historical data period. At the high extreme, the arithmetic mean ERP of Large Company Stocks compared with U.S. Treasury Bills was 8.2 percent (11.9 percent − 3.7 percent). At the low extreme, the geometric mean ERP of Large Company Stocks compared with Long-Term Government Bonds was 4.4 percent (9.9 percent − 5.5 percent). Thus, researchers and investors often have confusing conversations with each other. Even when they might agree on the *same* historical time interval and dataset, the ERP historical measure can be anywhere in the range of 4.4–8.2 percent, depending on which definition of ERP is used.

Investors typically use the Large Company Stock geometric mean return minus the Long-Term Government Bond return as their characterization of the historical ERP, which for 1926–2010 is 4.4 percent. In corporate finance and in valuation discounting, arithmetic means are more often used. Even if a characterization of the ERP is agreed upon, however, a debate over what historical period is most representative of the future long-run return can occur. Some might want to use even longer historical periods to reduce the estimation error, which falls in proportion to the square root of time. Some might want to use shorter and more recent periods, which better reflect the current and future environment. Those who think the historical method should be used still have plenty to debate about. The historical method, however, has the great advantage that it measures what really happened. It reveals how much stocks have actually outperformed bonds over whatever interval is under investigation.

Consensus. The consensus method might appear to be a very good approach; when using this method, one attempts to obtain the estimates from the market participants themselves (i.e., the very investors who are setting the market prices). But there are a number of problems with this approach. Most of these investors have no clear opinion about the long-run outlook. Many of them have only very short-term horizons. Individual investors often exhibit extreme optimism or pessimism and make procyclical forecasts, and so following a boom, they can have ERP estimates that exceed 20 percent or 30 percent. Following a recession or a decline in stock market prices, their estimates of the ERP might even be negative. Academics and institutional investors may be more thoughtful, but any survey of their opinions would have to be very carefully designed. I have seen surveys, however, that do not seem to even clarify whether the questionnaire refers to arithmetic mean returns or geometric mean returns. Many surveys also do not make clear whether the ERP to which they refer is the excess return of stocks over government bonds or Treasury bills or some other type of bond. This lack of clarity makes the surveys very difficult to interpret. The most extensive surveys have been done by Pablo Fernández (see, for example, Fernández, Aguirreamalloa, and Corres 2011).

Demand. The demand approach to estimating the ERP stems from the idea that investors demand an extra return for investing in stocks rather than bonds. In the capital asset pricing model (CAPM), the ERP is the central feature. The CAPM is derived from utility curves that characterize the risk–return trade-off. In the CAPM, all assets are held in the market portfolio, and the expected return of the market portfolio is sufficient to satisfy the investors' demand for stocks relative to their risk. Attempts to measure the ERP using the demand approach focus on analyzing utility functions. Mehra and Prescott (1985) first attempted to come up with reasonable measures of the ERP in this way. The ERP was very low and did not reasonably match any of the historical data. This mismatch came to be known as the "equity premium puzzle." Subsequently, many researchers have attempted to resolve the puzzle using behavioral finance, different types of utility curves, different distributional assumptions about stock returns, and risk aversion measures that are conditional on the state of the economy. In the end, the puzzle can be resolved in many ways, but the demand approach is not likely to provide a good estimate of the equity risk premium.

Supply. The supply approach attempts to estimate what the economy or the companies in the economy can supply to the market in the form of cash flows. This approach can be applied to the economy, using per capita or total GDP growth, net capital investment, and output provided to both capital and labor. It can also be applied at the corporate level, using company cash flows, earnings, dividends, payout ratios, stock share repurchases, and cash flow receipts from mergers and acquisitions. My co-authors and I used this approach in Diermeier, Ibbotson, and Siegel (1984) and in Ibbotson and Chen (2003), as did several of the authors in *The Equity Risk Premium: Essays and Explorations* (Goetzmann and Ibbotson 2006). The supply approach is a promising alternative for estimating the ERP.

Many Different Risk Premiums

Table 1 shows that the equity risk premium is not the only premium in the market. The following are some of the potential premiums:

- Long-horizon ERP (stocks – long-term government bonds)
- Short-horizon ERP (stocks – U.S. Treasury bills)
- Small-stock premium (large stocks – small stocks)
- Default premium (long-term corporate bonds – long-term government bonds)
- Horizon premium (long-term government bonds – U.S. Treasury bills)
- Real interest rate (U.S. Treasury bills – inflation)

The equity risk premium is the largest of these premiums, but all are important. We can forecast stock and bond returns of various types by restacking the various premiums. This approach is known as the "build-up method" and was first proposed in Ibbotson and Siegel (1988). **Exhibit 1** provides an example of the build-up method.

Exhibit 1. Components of Assets' Expected Returns

Stocks	Bonds	Cash	Real Estate	Small Stocks	Foreign Stocks	Foreign Bonds
				Small-stock premium	Foreign stock premium	
Equity risk premium				Equity risk premium	Equity risk premium	Foreign bond premium
Bond horizon premium	Bond horizon premium			Bond horizon premium	Bond horizon premium	Bond horizon premium
Real riskless rate	Real riskless rate	Real riskless rate	Real return on real estate	Real riskless rate	Real riskless rate	Real riskless rate
Inflation	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation

Source: Ibbotson and Siegel (1988).

As Exhibit 1 shows, a small-stock return can be estimated from the following components: expected inflation, the expected real rate of interest, the bond horizon premium, the long-horizon ERP, and the small-stock premium. A corporate bond return can be estimated from the expected inflation rate, the expected real rate of interest, the horizon risk bond horizon premium, and the default risk premium. Often the first three terms (inflation, interest rate, and bond horizon premium) are combined into the long-term yield of a riskless bond because this yield is typically observed directly in the marketplace.

One reason that the ERP is so important is that it is often the largest number in the stack. The ERP is also the most important source of estimation error because it is not directly observable in the future. Instead, we have a historical record of past realizations and various other forecast methods. In this framework, the expected stock return is the sum of two components: the long-term riskless rate, which is the yield on bonds and is directly observable, and the long-horizon ERP, which can only be estimated.

Other Premiums in the Market

The stock market is frequently characterized by investment styles. I have discussed the small-stock premium, and investing in small- versus large-capitalization stocks is considered an investment style. Fama and French (1993), among others, proposed the other prevalent style in the marketplace. They showed that value stocks outperform growth stocks over long periods of time. They defined value stocks as those of companies that have high book-to-market ratios. Others define value stocks as having high earnings-to-price ratios (or low price-to-earnings ratios). The premiums of value over growth stocks and small over large stocks are often characterized as risk premiums because they are long term in nature, have a positive payoff, and can be earned through passive rather than active management.

Another premium in the market that has been empirically observed is the momentum premium (see, for example, Jegadeesh and Titman 1993). Stocks that did well in the previous year tend to do well in the next year, whereas stocks that did poorly in the previous year tend to do poorly again. The momentum premium is not typically characterized as an investment style because momentum investing usually involves some form of active management to realize the excess returns. There is some evidence that momentum premiums are becoming more erratic and less predictable, perhaps because momentum is becoming so well known in the market. With so many investors taking advantage of the momentum premium, it may tend to disappear over time.

The liquidity premium is perhaps as important as any of the risk premiums. Ibbotson, Diermeier, and Siegel (1984) proposed that the three security characteristics that investors most wish to avoid and, therefore, need to be most compensated for in the long run are (1) risk, (2) lack of liquidity, and (3) taxation. This observation forms part of the demand approach to expected returns because investors demand a premium to take on risk, to give up liquidity, or to invest in a security that is heavily taxed. The liquidity premium is very well known and has been applied primarily in bond and alternative asset markets. Because a bond yield is observable, a less liquid bond can easily be seen to have a higher yield than a more liquid bond that is otherwise similar. This spread is the liquidity premium, and it can be used as another stack in the build-up method described previously. Real estate and private equity are examples of alternative investments for which investors would demand a higher return in order to compensate for the fact that they cannot easily liquidate their positions. These liquidity premiums are not observable, but it is generally accepted that a substantial portion of the return that investors receive from these types of investments must be a reward for taking on this lack of liquidity.

Ibbotson, Chen, and Hu (2011) proposed a new equity investment style based on the concept of the liquidity premium. We restricted the investment universe to publicly traded stocks and found that cross-sectional differences in liquidity have a large impact on returns, even though almost every one of these stocks trades every day. Thus, the liquidity premium is important not only across asset classes but also in the continuum of liquidity within an asset class. In the case of stocks, there is a substantial difference between the returns of the most popular stocks, which are the most heavily traded, and the returns of the least popular stocks. These premiums are larger than small-stock premiums and are comparable in magnitude to value premiums. When compared with size, value, and momentum, liquidity premiums have a different but at least as powerful effect. **Table 2** provides a comparison of liquidity and size premiums.

Table 2. U.S. Equity Annual Return Quartiles, 1972–2010

	Liquidity			
Size	1 (lowest)	2	3	4 (highest)
1 (smallest)	18.17%	17.46%	13.51%	6.16%
2	16.87	15.15	11.68	6.52
3	15.15	14.36	12.87	9.56
4 (largest)	12.49	11.48	11.55	9.87

Source: Ibbotson, Chen, and Hu (2011).

Dynamic and Tactical ERP Forecasts

Most forecasts of the equity risk premium are not equilibrium forecasts. They are not attempts at estimating an ERP that can be used for long-term investment-planning purposes, the equity cost of capital in corporate finance, or the discount rate used in valuation. Rather, they are attempts to outperform the market by applying special expertise in determining whether the stock market is over- or undervalued today. Forecasts of high returns for the stock market are accompanied by recommendations to buy stocks instead of bonds, whereas low-return forecasts are accompanied by recommendations to reduce stock investments.

Of course, knowing when to buy stocks and when to sell them is very difficult, particularly at the macro level. At the individual stock level, thousands of stocks might be over- or underpriced. But at the market level, any mispricing must be systematic. For the stock market to be overpriced in aggregate, most of the individual stocks have to be overpriced, which means that the investors in aggregate must be systematically overconfident because the market price reflects their collective judgment. Most stock market forecasts implicitly say that the market is wrong in some way. The forecasters believe that their particular judgment is superior to the judgment of the marketplace.

In many cases, whether the forecaster is making an equilibrium forecast or a beat-the-market forecast is not very clear. The four approaches to the equity risk premium discussed in this paper are not always clearly classified as to whether they are being applied in an equilibrium context or for the purpose of beating the market. The historical approach is based on return realizations, but one can argue over whether they are representative of the future or are too high or low. The consensus approach is subject to incorrect measurement to such an extent that it may be difficult to apply in either context. The demand approach is usually more theoretical and is mostly useful in determining the broad direction—so that one can say that the ERP is a positive number and in equilibrium stocks should always be expected to outperform bonds in the long run. The supply approach has the most flexibility; investors can attempt to use it in an equilibrium context, or they can apply their special expertise in an attempt to outperform the market. For example, one might say that an aging population argues for lower returns in the future or that the increasing speed of technological change argues for higher returns in the future. Each expert places relative importance on a particular factor, which causes the experts to end up with a wide diversity of opinions.

Summary

I have defined what the equity risk premium is and how it can be used in equilibrium and beat-the-market contexts. The terminology is confusing to many investors and financial writers: They tend to mix up a future concept with a past realization, they assign a number to the ERP without clarifying which measurement of the ERP is being used, and they rarely clarify whether they are talking about the ERP in an equilibrium or a beat-the-market context.

I have also discussed various other premiums in the market. These premiums represent the differential returns of the many different asset classes and investment styles in the market. To make sound investment decisions, it is important to have good estimates of these premiums.

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Reflections After the 2011 Equity Risk Premium Colloquium

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In 2001, and again in 2011, I participated in a forum about the equity risk premium. Presented here are some informal thoughts about the equity premium that I composed after the second forum. These thoughts are an eclectic collection inspired by, but not limited to, what we discussed together.

Sequels Are Rarely as Good as Originals

The 2011 forum reprised the earlier gathering with many of the same presenters from 2001. When we met in 2001, it was not long after the peak of the technology bubble (I call it a bubble, although that label is still in some dispute). At that time, equity prices were still well above historical norms, although they were lower than in March 2000. In 2011, many of us would say that equity prices are still high versus historical prices, but the divergence is nowhere near as dramatic as in 2001.

We Still Do Not All Agree about Long-Term Predictability

It is clear from the 2011 forum that a division remains among the participants that was clearly present in 2001. Some believe in long-term predictability; others do not. Thus, when equity prices are high versus fundamentals (I am assuming that we agree on how to measure this comparison), some believe conditional long-term expected real equity returns are low, and vice versa.

I am in this camp, but I have to admit the relationship is not as obvious as it may seem. Point estimates—the actual observed history—show that long-term (say, 10-year) historical rolling returns are indeed negatively related to starting prices. And the market's performance since the first forum, when high prices indeed led to very low realized equity returns, might make it seem that the case is closed.

It is incredibly hard, however, to say anything with precision and confidence about the relationship between long-term return and price because not that much independent data are available and in-sample regressions often contain biases. As was mentioned in the forum, it really comes down to what an investment manager believes about long-term returns beforehand. If a manager believes that expected returns are constant, then when prices are high, expected growth will be higher than normal (making expected returns come out the same despite the higher prices). The data in fact point in the other direction, but only weakly after accounting for all the problems. In other words, the data barely help to resolve this debate.

It has to be one way or the other; it is a mathematical identity. High prices forecast either low expected returns or high expected growth. For me, despite its low statistical power, the point estimate is still a reasonable guess. Rather than looking for a definitive relationship between high prices and subsequent low returns, I find it more useful to focus on the absolute lack of evidence that high prices forecast high future growth. The relationship is equivalent, but it is how I like to frame the problem.

This point estimate is only a small part of why I believe in predictability. It is more important to me that return predictability agrees with my intuition and prior experience, largely formed from other time-series and cross-sectional experiments. A vast body of literature shows that when prices of anything are high versus fundamentals, expected returns are low, and vice versa. For instance, in the cross-section, when a given set of stocks has high prices versus fundamentals (such as book value, earnings, or cash flow), the expected returns on these stocks are low relative to other (cheaper) stocks. This finding is nearly ubiquitous. Thus, although I find the point estimate for the equity risk premium (ERP) versus the price relationship comforting, I find it far more compelling in the context of the literature. I think the way finance works is that when prices are high, as measured against any reasonable form of fundamentals, expected returns are lower than normal, and vice versa. Admittedly, that is hard to prove, especially if the focus is only on ERP data, and clearly some are still not convinced.

I posed the following question to the 2011 group, particularly to those who were skeptical about the possibility of long-term predictability: When prices are at true extremes (e.g., the high in March 2000 or the other direction, the low in the early 1980s), would forecasters project any difference in forward-looking expected real returns? If the answer is yes, the issue then is a variation in the degree of our beliefs, not a difference in dogma. (I never quite got an answer!)

Some Still Believe Silly Ideas, but They Also Have Learned Important Truths

Ten years after the technology bubble, some unsubstantiated beliefs remain. The so-called Fed model, which is the idea that high stock prices are reasonable when nominal interest rates are low, is still very common (although no one at the forum advanced this view). My own research and others' have shown this proposition to be a form of money illusion with no power to predict (even noisily) long-term stock returns. But the Fed model still yields a far more bullish forecast than focusing just on equity prices (unadjusted for nominal interest rates), as it has for a long time. Its bullishness probably accounts for its continued popularity, particularly among strategists on Wall Street.

The Shiller P/E (the current price of the S&P 500 Index divided by the previous 10-year average real earnings) has become the *lingua franca* of those that discuss the ERP and how it relates to current equity prices. This choice is not because the Shiller P/E is perfect—no measure is—but simply because it is reasonable and historically consistent. It also helps to have a common standard. Recently, the Shiller P/E has been back in the news because some broker research has called it into question. The attacks are mostly ridiculous; they are based on bullish researchers using Wall Street's long-term preferred "operating" earnings, which are earnings before negative events are deducted, or throwing out historical periods that the researchers do not want in the data. If the price of the S&P 500 is compared only with other times when the price was high, then of course it will look lower.

One argument the critics advance, with some possible merit in my view, is that the most recent financial crisis was so severe that the past 10 years of earnings are too low to be a reasonable proxy for trend. Even that effect, however, is tiny and ultimately unconvincing.[1]

Finally, reflecting the controversy about predictability discussed earlier, those who have issues with the Shiller P/E assume that today's low dividend payouts are sensible because earnings will grow more in the future. Rob Arnott and I (Arnott and Asness 2003) established empirically that this notion is not only wrong but also backward for the past 140 years. Some notions die hard, and notions that are more bullish tend to die harder. Both the Fed model and the current critique of the Shiller P/E lean in the direction of liking stocks.

More optimistically, investment managers seem to have learned some important lessons since 2001. Again, many still argue about long-term mean reversion and predictability, but many also believe, as I do, that after long-term strong returns (if mirrored in higher valuations at the end), expected future returns will be lower.

[1]This argument at least is in the right direction. For instance, if instead of looking at average 10-year earnings, investors looked at median 10-year earnings (thus giving no weight to the magnitude of the crisis), the resulting Shiller P/E would be very high versus history but slightly less high compared with the conventional approach of taking the average. In my view, this minor adjustment, which still shows an overvalued stock market, is not what the bulls are looking for, but it is a reasonable adjustment to make.

In contrast, in 2001, reflecting the thinking of the technology bubble, many in the investment world seemed to believe that high past returns meant *higher* long-term future returns. This belief can creep into prices in various ways, but perhaps the simplest occurs when an investor uses a past average of realized returns to forecast the future. I cannot say this view is gone, but many investors, perhaps most, now seem to understand that it never made sense.

After a time of strong long-term returns, future long-term returns will be lower. Reasonable people may believe that future long-term returns will be unaffected. No rational investor will expect long-term returns to be higher than normal; there are far fewer of such irrational investors today than in 2001.

My Forecast and Some Thoughts on Dispersion

Even those who believe in long-term predictability should acknowledge that it is a noisy process. The standard deviation of average annual returns over 10 years around a forecast that moves with the Shiller P/E is about 4–5 percent. It is a bit tighter when the Shiller P/E is very high or low. This tightness could mean greater predictability at those times, but it could also be a bias from investors not seeing the true extremes possible in the distribution. Nonetheless, 4–5 percent is a lot for standard deviation, and it is big relative to the dispersion among all the forecasters at the forum. Bullish and bearish forecasters at the forum mostly did not differ from each other by more than one time-series standard deviation of 10-year returns. Thus, it will be very hard for anyone to claim a convincing victory!

The financial world, however, still demands a specific forecast, so I will oblige. Guesswork is always involved in making such a forecast, but the thought process around the guesswork can be interesting. I will forecast only the real (consumer price index–adjusted) return on the S&P 500, not the risk premium versus bonds. At the 2001 forum, we failed in deciding what benchmark to use in forecasting the equity risk premium, thus confusing the issue somewhat. In my view, our discussion was not meant to reflect differing bond forecasts; forecasting the real return on the S&P 500 is more to the point.

To do so, I like to start with the Shiller P/E, which was roughly 23.5 in early April 2011. I then reduce that number by 10 percent to get a measure of the current P/E using trend earnings (because earnings grow over time, the unmodified Shiller P/E is a lagging indicator of valuation). Doing so drops the Shiller P/E to about 21.5, which makes the earnings yield about 4.7 percent. To get a sustainable dividend yield, I cut the earnings yield figure in half to about 2.3 percent. Reducing the earnings yield reflects a historically reasonable payout ratio of about 50 percent, not the current payout ratio, which is lower. I am sneaking in some optimism by ignoring my own work with Arnott that shows growth is slower when payouts are low, as they are today. Next, I add about 1.5 percent for expected real growth in earnings. Using the Gordon growth model (Dividend/Price + Growth), the result is a long-term forecast real equity return of 3.8 percent.

Finally, I round to 4 percent (not to round is arrogantly overprecise!); that is my 10-year forecast, but with some more caveats. This rate assumes a steady state in the markets. That is, it assumes that the best forecast of the future Shiller P/E is the current Shiller P/E. A more pessimistic vision of the future would assume some regression to the long-run mean Shiller P/E, which is about 15. A very pessimistic vision of the future would assume a regression through the long-term mean, as some argue happens eventually after all bubbles. Aside from about three days in early 2009, and then only trivially, valuations have not been below historical means since well before 2000. But I am not that pessimistic.

I agree with others who have argued that valuations in the past were too low, partly because the returns that investors study are far more attainable today with diversified index funds. I think those at the forum in 2001 were just beginning to appreciate this argument, and it is one of the most important considerations when examining the historical ERP. Too often, investors take for granted that they can mimic the market's ERP by buying diversified index funds at very low fees. During much of the historical period, however, this option did not exist. Thus, investors today should require a lower total return, and pay a higher P/E, because they retain more of the return at lower risk. So, my forecast does not incorporate any mean reversion of P/Es. I will stick with a real 4 percent.

Although the journey to arrive at my forecast is messy, and as much art as science, I think the thought process is useful for investment managers.

References

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Equity Premiums around the World

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We update our global estimates of the historical equity risk premium that were first presented in *The Millennium Book: A Century of Investment Returns* (Dimson, Marsh, and Staunton 2000) and in *Triumph of the Optimists: 101 Years of Global Investment Returns* (Dimson, Marsh, and Staunton 2002). More detailed analysis is published in our annual volumes, the *Credit Suisse Global Investment Returns Yearbook* and the *Credit Suisse Global Investment Returns Sourcebook* (Dimson, Marsh, and Staunton 2011a and 2011b).

We provide estimates for 19 countries, including two North American markets (the United States and Canada), eight markets from what is now the euro currency area (Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, and Spain), five other European markets (Denmark, Norway, Sweden, Switzerland, and the United Kingdom), three Asia-Pacific markets (Japan, Australia, and New Zealand), and one African market (South Africa).

The Dimson–Marsh–Staunton (DMS) database, which is distributed by Morningstar, also includes six U.S. dollar–denominated regional indices (Dimson, Marsh, and Staunton 2011c). The indices are a 19-country World equity index, an 18-country World ex-U.S. equity index, a 13-country European equity index, and three corresponding government bond indices for the World, World ex-U.S., and Europe. For the equity indices, each country is weighted by market capitalization (or by GDP for the years before capitalizations were available). The bond indices are GDP weighted throughout.

Our dataset includes equities, long government bonds, bills, inflation, exchange rates, and GDP. More details about the data, the sources, and the index construction methods are presented in Dimson, Marsh, and Staunton (2008, 2011b).

Long-Run Global Returns

Investment returns can be extremely volatile. The 2000s were a period of disappointment for most equity investors, and few would extrapolate future returns from this recent experience. Including the 1990s adds a period of stock market exuberance that is also not indicative of expectations. To understand risk and return, long periods of history need to be examined. That is why we ensure that all our return series embrace 111 years of financial market history, from the start of 1900 to the end of 2010.

Panel A in **Figure 1** shows the cumulative total returns in nominal terms for U.S. equities, bonds, bills, and inflation for 1900–2010. Equities performed best, with an initial investment of $1 growing to $21,766 by year-end 2010. Long bonds and bills had lower returns, although they beat inflation. Their respective levels at the end of 2010 were $191 and $74, with the inflation index ending at $26. The legend shows the annualized returns were 9.4 percent for equities, 4.8 percent for bonds, and 3.9 percent for bills; inflation was 3.0 percent per year.

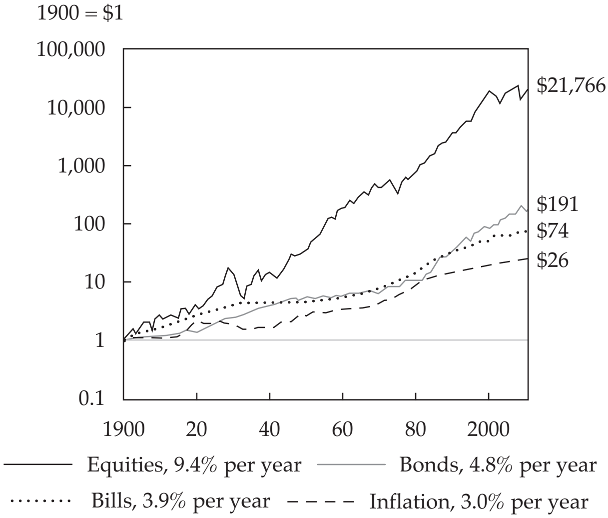
Because U.S. prices rose 26-fold over this period, it is helpful to compare returns in real terms. Panel B of Figure 1 shows the real returns on U.S. equities, bonds, and bills. Over the 111 years, an initial investment of $1 in equities, with dividends reinvested, would have grown in purchasing power by 851 times. The corresponding multiples for bonds and bills are 7.5 and 2.9 times the initial investment, respectively. As the legend shows, these terminal wealth figures correspond to annualized real returns of 6.3 percent for equities, 1.8 percent for bonds, and 1.0 percent for bills.

The United States is by far the world's best-documented capital market. Prior to the assembly of the DMS database, long-run evidence was invariably taken from U.S. markets and typically treated as being applicable universally. Few economies, if any, can rival the long-term growth of the United States, which makes it dangerous to generalize from U.S. historical returns. That is why we have put effort into documenting global investment returns.

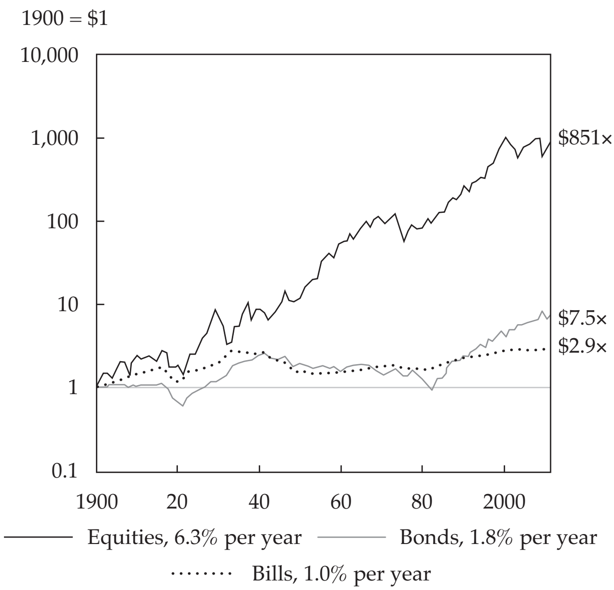
Figure 2 shows annualized real equity, bond, and bill returns for 19 countries as well as the World, the World ex-U.S., and Europe indices. The countries and regions are ranked in ascending order of equity market performance. The real equity return was positive in every location, typically 3–6 percent per year. Equities were the best-performing asset class within every market. Furthermore, bonds performed better than bills in all the countries. This pattern of equities outperforming bonds, and of bonds outperforming bills, is precisely what we would expect because equities are riskier than bonds, whereas bonds are riskier than cash.

Figure 1. Cumulative Returns on U.S. Equities, Bonds, Bills, and Inflation, 1900–2010

A. Nominal Terms

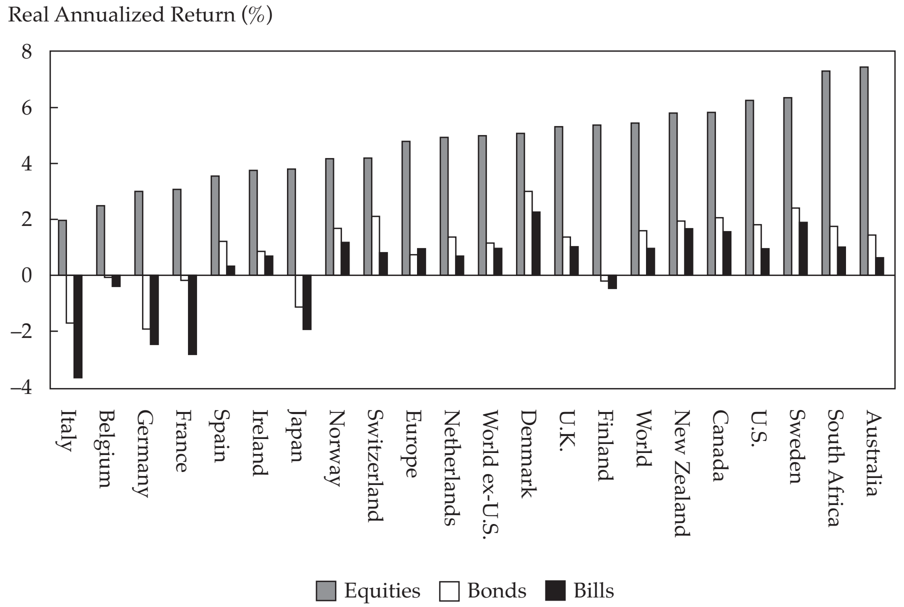


B. Real Terms



Source: Based on Dimson, Marsh, and Staunton (2002) and as updated in Dimson, Marsh, and Staunton (2011b).

Figure 2. Real Annualized Returns on Equities vs. Bonds and Bills Internationally, 1900–2010



Source: Based on Dimson, Marsh, and Staunton (2002) and as updated in Dimson, Marsh, and Staunton (2011b).

Figure 2 also shows that although most countries' bonds had a positive real return, six countries experienced negative returns. With the exception of Finland, the latter were also among the worst equity performers. Mostly, their poor performance dates back to the first half of the 20th century, when these countries suffered most from the ravages of war and civil strife as well as periods of high inflation or hyperinflation associated with the wars and their aftermath.

The chart confirms that the United States performed well, ranking fourth for equity performance (real 6.3 percent per year) and sixth for bonds (real 1.8 percent per year). This result confirms the conjectures that U.S. returns would be high because the U.S. economy has been such an obvious success story and that it is unwise for investors to base their future projections solely on U.S. evidence. Figure 2 helps set this debate in context, however, by showing that although U.S. stocks did well, the United States was not the top performer nor were its returns especially high relative to the world averages. The real return on U.S. equities of 6.3 percent is more than a percentage point higher than the real U.S. dollar–denominated return of 5.0 percent on the World ex-U.S. index. A common factor among the best-performing equity markets over the past 111 years is that they tended to be rich in resources and/or to be New World countries.

Table 1 provides statistics on real equity returns from 1900 to 2010. The geometric mean shows the 111-year annualized returns achieved by investors, and these are the figures that are plotted in Figure 2. The arithmetic mean shows the average of the 111 annual returns for each country or region. The arithmetic mean of a sequence of different returns is always larger than the geometric mean, and the more volatile the sequence of returns, the greater the gap between the arithmetic and geometric means. This fact is evident in the fifth column of Table 1, which shows the standard deviation of each equity market's annual returns.

The U.S. equity standard deviation of 20.3 percent places it at the lower end of the risk spectrum, ranking sixth after Canada (17.2 percent), Australia (18.2 percent), New Zealand (19.7 percent), Switzerland (19.8 percent), and the United Kingdom (20.0 percent). The World index has a standard deviation of just 17.7 percent, showing the risk reduction obtained from international diversification. The most volatile markets during this period are Germany (32.2 percent), Finland (30.3 percent), Japan (29.8 percent), and Italy (29.0 percent), which are the countries that were most affected by the world wars and inflation; Finland's case also reflects its heavy concentration in a single stock (Nokia) during recent periods. Additionally, Table 1 shows that, as one would expect, the countries with the highest standard deviations experienced the greatest range of returns—that is, the lowest minimum returns and the highest maximum returns.

Bear markets underline the risk of equities. Even in a less volatile market, such as the United States, losses can be huge. Table 1 shows that the worst calendar year for U.S. equities was 1931, with a real return of −38 percent. However, from peak to trough, U.S. equities fell by 79 percent in real terms during the 1929–31 Wall Street crash. The worst period for U.K. equities was the 1973–74 bear market, with stocks falling 71 percent in real terms and by 57 percent in a single year. More recently, 2008 had the dubious distinction of being the worst year on record for eight countries, the World index, the World ex-U.S., and Europe. The table shows that in several other countries, even more extreme returns have occurred, on both the downside and the upside.

Common-Currency Returns

So far, we have reported the real returns to a domestic equity investor based on local purchasing power in that investor's home country. For example, during 1900–2010, the annualized real return to a U.S. investor buying U.S. equities was 6.27 percent, whereas for a British investor buying U.K. equities, it was 5.33 percent. When considering cross-border investment, however, it is also

Table 1. Real (Inflation-Adjusted) Equity Returns around the World, 1900–2010

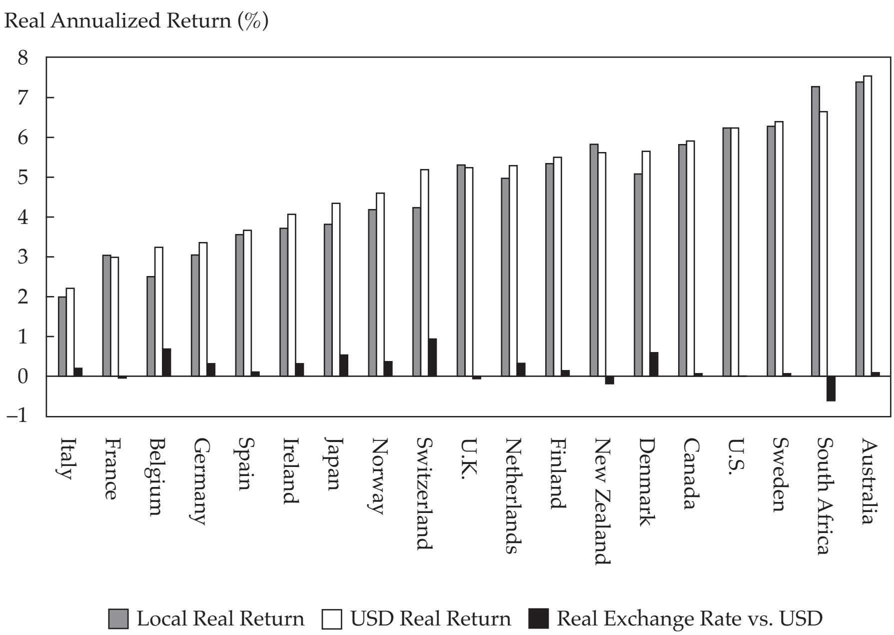
Country/Region	Geometric Mean (%)	Arithmetic Mean (%)	Standard Error (%)	Standard Deviation (%)	Minimum Return (%)	Year of Minimum	Maximum Return (%)	Year of Maximum
Australia	7.4	9.1	1.7	18.2	–42.5	2008	51.5	1983
Belgium	2.5	5.1	2.2	23.6	–57.1	2008	109.5	1940
Canada	5.9	7.3	1.6	17.2	–33.8	2008	55.2	1933
Denmark	5.1	6.9	2.0	20.9	–49.2	2008	107.8	1983
Finland	5.4	9.3	2.9	30.3	–60.8	1918	161.7	1999
France	3.1	5.7	2.2	23.5	–42.7	2008	66.1	1954
Germany	3.1	8.1	3.1	32.2	–90.8	1948	154.6	1949
Ireland	3.8	6.4	2.2	23.2	–65.4	2008	68.4	1977
Italy	2.0	6.1	2.8	29.0	–72.9	1945	120.7	1946
Japan	3.8	8.5	2.8	29.8	–85.5	1946	121.1	1952
Netherlands	5.0	7.1	2.1	21.8	–50.4	2008	101.6	1940
New Zealand	5.8	7.6	1.9	19.7	–54.7	1987	105.3	1983
Norway	4.2	7.2	2.6	27.4	–53.6	2008	166.9	1979
South Africa	7.3	9.5	2.1	22.6	–52.2	1920	102.9	1933
Spain	3.6	5.8	2.1	22.3	–43.3	1977	99.4	1986
Sweden	6.3	8.7	2.2	22.9	–43.6	1918	89.8	1905
Switzerland	4.2	6.1	1.9	19.8	–37.8	1974	59.4	1922
United Kingdom	5.3	7.2	1.9	20.0	–57.1	1974	96.7	1975
United States	6.3	8.3	1.9	20.3	–37.6	1931	56.3	1933
Europe	4.8	6.9	2.0	21.5	–46.6	2008	76.0	1933
World ex-U.S.	5.0	7.0	1.9	20.4	–43.3	2008	79.3	1933
World	5.5	7.0	1.7	17.7	–40.4	2008	69.9	1933

Source: Based on Dimson, Marsh, and Staunton (2002) and as updated in Dimson, Marsh, and Staunton (2011b).

necessary to account for exchange rate movements—for example, a U.S. investor buying U.K. equities or a U.K. investor buying U.S. equities. Each investor now has two exposures, one to foreign equities and the other to foreign currency, and each return needs to be converted into each investor's reference currency.

Rather than just comparing domestic returns, we translate all countries' local returns into a common currency. **Figure 3** shows the results of translating from the local currency to U.S. dollars. These dollar returns are expressed as real returns, adjusted for U.S. inflation. The gray bars show the annualized real domestic currency returns from 1900 to 2010, as presented earlier. The white bars are the common-currency returns, in real U.S. dollars, from the perspective of a U.S. investor. The black bars are the difference between the annualized real local-currency return and the annualized real dollar return. The black bars equate to the annualized inflation-adjusted exchange rate movement over the same period. The gap between the two return measures is less than 1 percent per annum for every country, indicating that purchasing power parity (PPP) held reasonably closely over the very long run (see Taylor 2002).

Figure 3. Real Annualized Equity Returns in Local Currency and U.S. Dollars, 1900–2010



Source: Based on Dimson, Marsh, and Staunton (2002) and as updated in Dimson, Marsh, and Staunton (2011b).

In Figure 3, countries are ranked in ascending order based on the white bars, which show the annualized real dollar returns to a U.S. investor. Because PPP tends to hold, equity markets have a similar ranking whether they are ranked by domestic real returns or by their real dollar returns. Note that although the magnitude of the returns varies according to the choice of common currency, the rankings of the countries are the same regardless of which reference currency is used.

Worldwide Premium

Investment in equities has proven rewarding over the long run, but as we noted in Table 1, it has been accompanied by significant variability of returns. Investors do not like volatility—at least on the downside—and will be prepared to invest in riskier assets only if there is some compensation for this risk (for more on this subject, see Dimson, Marsh, and Staunton 2004). The reward for equity risk that investors have achieved in the past can be measured by comparing the return on equities with the return from risk-free investments, such as Treasury bills. The difference between equity and bill returns is known as the "equity risk premium." For long-term government bonds, the difference between bond and bill returns is referred to as the "maturity premium." Although our focus in this article is on the equity risk premium, we provide up-to-date evidence on the maturity premium in Dimson, Marsh, and Staunton (2011b).

We measure the historical equity risk premium by taking the geometric difference between the equity return and the risk-free return. The formula is

(1 + Equity rate of return) / (1 + Risk-free return) – 1.

For example, if we were evaluating stocks with a one-year return of 21 percent relative to T-bills yielding 10 percent, the realized equity risk premium would be 10 percent because (1 + 21/100) / (1 + 10/100) is equal to 1 + 10/100 and deducting 1 gives a premium of 10/100, which is 10 percent. This measure of the risk premium is based on a ratio, and it thus has no numeraire. It is hence unaffected by whether returns are computed in dollars or pounds or euros or by whether returns are expressed in nominal or real terms.

Our preferred benchmark for the risk-free return is Treasury bills (i.e., very short-term, default-free, fixed-income government securities, or going back in history, the closest available equivalent in the years before T-bills became available). Many people, however, also measure the equity premium relative to long bonds, so we report both measures, even though bonds are clearly far from risk free in real terms. Detailed statistics on the equity risk premium relative to bills and bonds are given in **Table 2** and **Table 3**.

Table 2. Worldwide Equity Risk Premiums Relative to Bills, 1900–2010

Country/Region	Geometric Mean (%)	Arithmetic Mean (%)	Standard Error (%)	Standard Deviation (%)	Minimum Return (%)	Year of Minimum	Maximum Return (%)	Year of Maximum
Australia	6.7	8.3	1.7	17.6	−44.4	2008	49.2	1983
Belgium	2.9	5.5	2.3	24.7	−58.1	2008	130.4	1940
Canada	4.2	5.6	1.6	17.2	−34.7	2008	49.1	1933
Denmark	2.8	4.6	1.9	20.5	−50.6	2008	95.3	1983
Finland	5.9	9.5	2.9	30.2	−53.6	2008	159.2	1999
France	6.0	8.7	2.3	24.5	−44.8	2008	85.7	1941
Germany[a]	5.9	9.8	3.0	31.8	−45.3	2008	131.4	1949
Ireland	3.0	5.3	2.0	21.5	−66.7	2008	72.0	1977
Italy	5.8	9.8	3.0	32.0	−49.1	2008	150.3	1946
Japan	5.9	9.0	2.6	27.7	−48.3	1920	108.6	1952
Netherlands	4.2	6.5	2.2	22.8	−51.9	2008	126.7	1940
New Zealand	4.1	5.7	1.7	18.3	−58.3	1987	97.3	1983
Norway	3.0	5.9	2.5	26.5	−55.1	2008	157.1	1979
South Africa	6.2	8.3	2.1	22.1	−33.9	1920	106.2	1933
Spain	3.2	5.4	2.1	21.9	−39.9	2008	98.1	1986
Sweden	4.3	6.6	2.1	22.1	−41.3	2008	84.6	1905
Switzerland	3.4	5.1	1.8	18.9	−37.0	1974	54.8	1985
United Kingdom	4.3	6.0	1.9	19.9	−54.6	1974	121.8	1975
United States	5.3	7.2	1.9	19.8	−44.1	1931	56.6	1933
Europe	3.8	5.8	2.0	21.0	−47.4	2008	76.3	1933
World ex-U.S.	4.0	5.9	1.9	19.9	−44.2	2008	79.6	1933
World	4.5	5.9	1.6	17.1	−41.3	2008	70.3	1933

[a]All statistics for Germany are based on 109 years, excluding the hyperinflationary years of 1922–1923.

Source: Based on Dimson, Marsh, and Staunton (2002) and as updated in Dimson, Marsh, and Staunton (2011b).

Table 3. Worldwide Equity Risk Premiums Relative to Bonds, 1900–2010

Country/Region	Geometric Mean (%)	Arithmetic Mean (%)	Standard Error (%)	Standard Deviation (%)	Minimum Return (%)	Year of Minimum	Maximum Return (%)	Year of Maximum
Australia	5.9	7.8	1.9	19.8	–52.9	2008	66.3	1980
Belgium	2.6	4.9	2.0	21.4	–60.3	2008	84.4	1940
Canada	3.7	5.3	1.7	18.2	–40.7	2008	48.6	1950
Denmark	2.0	3.4	1.6	17.2	–54.3	2008	74.9	1972
Finland	5.6	9.2	2.9	30.3	–56.3	2008	173.1	1999
France	3.2	5.6	2.2	22.9	–50.3	2008	84.3	1946
Germany[a]	5.4	8.8	2.7	28.4	–50.8	2008	116.6	1949
Ireland	2.9	4.9	1.9	19.8	–66.6	2008	83.2	1972
Italy	3.7	7.2	2.8	29.6	–49.4	2008	152.2	1946
Japan	5.0	9.1	3.1	32.8	–45.2	2008	193.0	1948
Netherlands	3.5	5.8	2.1	22.2	–55.6	2008	107.6	1940
New Zealand	3.8	5.4	1.7	18.1	–59.7	1987	72.7	1983
Norway	2.5	5.5	2.7	28.0	–57.8	2008	192.1	1979
South Africa	5.5	7.2	1.9	19.6	–34.3	2008	70.9	1979
Spain	2.3	4.3	2.0	20.8	–42.7	2008	69.1	1986
Sweden	3.8	6.1	2.1	22.3	–48.1	2008	87.5	1905
Switzerland	2.1	3.6	1.7	17.6	–40.6	2008	52.2	1985
United Kingdom	3.9	5.2	1.6	17.0	–38.4	2008	80.8	1975
United States	4.4	6.4	1.9	20.5	–50.1	2008	57.2	1933
Europe	3.9	5.2	1.6	16.6	–47.6	2008	67.9	1923
World ex-U.S.	3.8	5.0	1.5	15.5	–47.1	2008	51.7	1923
World	3.8	5.0	1.5	15.5	–47.9	2008	38.3	1954

[a]All statistics for Germany are based on 109 years, excluding the hyperinflationary years of 1922–1923.

Source: Based on Dimson, Marsh, and Staunton (2002) and as updated in Dimson, Marsh, and Staunton (2011b).

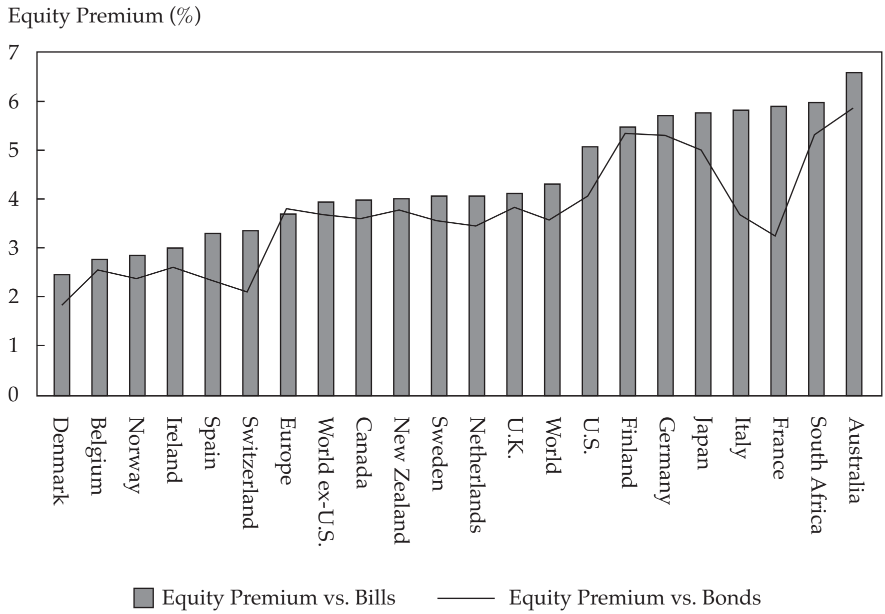
The estimates in Table 2 and Table 3 are lower than frequently quoted historical averages, such as the Ibbotson Yearbook (2011) figures for the United States and the earlier Barclays Capital (1999) studies for the United Kingdom. The differences arise from a bias (subsequently corrected) in the construction of the U.K. index used in Barclays' studies and, for both countries, our use of a long time frame (1900–2010) that incorporates the earlier part of the 20th century as well as the opening years of the 21st century, utilizing data described in Dimson, Marsh, and Staunton (2008). Our global focus also results in lower risk premiums than previously assumed. Prior views have been heavily influenced by the experience of the United States, whereas the view expressed here reflects an average of 19 countries, of which the United States is only one and in which the U.S. risk premium is somewhat higher than average.

The annualized equity premiums for the 19 countries and the World indices are summarized in **Figure 4**, in which countries are ranked according to the equity premium measured relative to bills, displayed as bars. The line plot presents each country's corresponding risk premium, measured relative to bonds. Over the entire 111 years, the annualized (geometric) equity risk premium, relative to bills, is 5.3 percent for the United States and 4.3 percent for the United Kingdom. Averaged across all 19 countries, the risk premium relative to bills is 4.6 percent, whereas the risk premium on the World equity index is 4.5 percent. Relative to long-term government bonds, the story is similar. The annualized U.S. equity risk premium relative to bonds is 4.4 percent and the corresponding figure for the United Kingdom is 3.9 percent. Across all 19 markets, the risk premium relative to bonds averages 3.8 percent; for the World index, it is also 3.8 percent.

Survivorship Bias

For the World index, our estimate of the annualized historical equity premium relative to bills is 4.5 percent. This estimate is based on the 19 countries in the DMS database, all of which survived from 1900 to 2011. These 19 countries accounted for an estimated 89 percent of the world equity market in 1900. The remaining 11 percent came from markets that existed in 1900 but for which we have been unable to obtain data. Some of these omitted markets failed to survive, and in cases like Russia in 1917 and China in 1949, investors lost all of their money. To quantify the maximum possible impact of omitted markets on the magnitude of the historical equity risk premium, we make an extreme assumption. We assume that all omitted markets became valueless and that this outcome occurred for every omitted country in a single disastrous year, rather than building up gradually. We then ask what risk premium investors would have earned if in 1900, they had purchased a holding in the entire World

Figure 4. Worldwide Annualized Equity Risk Premium Relative to Bills and Bonds, 1900–2010



Note: Statistics for Germany are based on 109 years, excluding the hyperinflationary years of 1922–1923.
Source: Based on Dimson, Marsh, and Staunton (2002) and as updated in Dimson, Marsh, and Staunton (2011b).

market, including countries omitted from the DMS database, and held this portfolio for 111 years. At the start of the period, their portfolio would have comprised an 89 percent holding in the DMS World index and an 11 percent holding in countries that we have assumed were all destined to become valueless.

Given these extreme assumptions, we demonstrate (see Dimson, Marsh, and Staunton 2008) that survivorship bias could, at most, give rise to an overstatement of the geometric mean risk premium on the World equity index by about one-tenth of a percentage point. If omitted markets did not all become valueless—and we know that very many did not—the magnitude of survivorship bias would be smaller still. Although debate continues about the precise impact of the bias because some, but not all, of these equity markets experienced a total loss of value, the net impact on the worldwide geometric mean equity premium is no more than 0.1 percent. The effect on the arithmetic mean is similar. The intuition involves the disappearance of 11 percent of the value of the market over 111 years, which represents a loss of value averaging 0.1 percent per year. We conclude that survivorship bias in world stock market returns is negligible.

Decomposing the Equity Risk Premium

Many people argue that the historical equity premium is a reasonable guide to what to expect in the future. Their reasoning is that over the long run, investors should expect good luck to balance out bad luck. If this view is correct, then the average premium investors receive should be close to the premium they required and "priced in" before the event. But even over a period as long as 111 years, this expectation may fail to be the case. It is possible that investors have enjoyed more than their share of good luck, making the past too good to last. If so, the historical premium would reflect "the triumph of the optimists" and would overstate expectations.

As an alternative approach, we seek to infer what investors may have been expecting, on average, in the past. To understand investors' expectations, we separate the historical equity premium into elements that correspond to investor expectations and elements of non-repeatable good or bad luck. In our article "The Worldwide Equity Premium: A Smaller Puzzle" (Dimson, Marsh, and Staunton 2008), we show that the equity premium can be decomposed into five components: the annualized mean dividend yield, plus the annualized growth rate of real dividends, plus the annualized expansion over time of the price/dividend ratio, plus the annualized change in the real exchange rate, minus the real risk-free rate.

Of these components, the dividend yield has been the dominant factor historically. At first sight, this may seem surprising because on a daily basis, investors' interest tends to focus mainly on the capital gains element of returns, such as stock price fluctuations and market movements. Indeed, over a single year, equities are so volatile that most of an investor's performance is attributable to capital gains or losses. Dividend income adds a relatively modest amount to each year's gain or loss. But although year-to-year performance is driven by capital appreciation, long-run returns are heavily influenced by reinvested dividends.

The difference in terminal wealth that results from reinvested dividend income is very large. As Figure 1 shows, the total real return from investing $1 in U.S. equities at the start of 1900—and reinvesting all dividend income—is an annualized 6.3 percent, such that by the start of 2011, the initial investment would have grown in purchasing power by 851 times. If dividends had not been reinvested, the initial $1 investment would have grown in purchasing power by just 8.5 times, equivalent to a real capital gain of 1.9 percent per year over the 111 years. A portfolio of U.S. equities with dividends reinvested would have grown to 100 times the value it would have attained if dividends had been spent. The longer the investment horizon, the more important dividend income becomes. For the seriously long-term investor, the value of a portfolio corresponds closely to the present value of dividends.

Components of the Equity Premium

To quantify the components of the equity premium, we examine the decomposition for all 19 countries and the World index over 1900–2010. The results are presented in **Table 4**, and we examine each component in turn. The second column of the table shows the annualized dividend yield for each market, reinforcing the point that the dividend yield has been the dominant factor historically. Across all 19 countries, the mean yield was 4.5 percent, although it was as large as 5.8 percent (South Africa) and as low as 3.5 percent (Switzerland). The annualized dividend yield for the United States (4.2 percent)

Table 4. Decomposition of the Historical Equity Risk Premium, 1900–2010

Country/Region	Geometric Mean Dividend Yield	*plus* Real Dividend Growth Rate	*plus* Expansion in the P/D Ratio	*plus* Change in Real Exchange Rate	*minus* U.S. Real Interest Rate	*equals* Equity Premium for U.S. Investors
Australia	5.76	1.10	0.48	0.10	0.96	6.53
Belgium	3.72	–1.48	0.36	0.70	0.96	2.28
Canada	4.39	0.84	0.56	0.09	0.96	4.94
Denmark	4.58	–1.13	1.64	0.57	0.96	4.69
Finland	4.76	0.49	0.09	0.15	0.96	4.53
France	3.81	–0.90	0.18	–0.04	0.96	2.05
Germany	3.66	–1.16	0.58	0.31	0.96	2.40
Ireland	4.57	–0.94	0.16	0.31	0.96	3.09
Italy	4.06	–1.52	–0.47	0.20	0.96	1.24
Japan	5.22	–2.39	1.08	0.54	0.96	3.39
Netherlands	4.94	–0.51	0.55	0.35	0.96	4.34
New Zealand	5.38	1.26	–0.84	–0.21	0.96	4.60
Norway	4.00	–0.13	0.33	0.38	0.96	3.62
South Africa	5.82	0.95	0.46	–0.61	0.96	5.65
Spain	4.18	–0.60	0.01	0.12	0.96	2.71
Sweden	4.02	1.77	0.43	0.09	0.96	5.41
Switzerland	3.48	0.46	0.28	0.94	0.96	4.22
United Kingdom	4.63	0.46	0.20	–0.06	0.96	4.27
United States	4.24	1.37	0.56	0.00	0.96	5.26
Average	4.49	–0.11	0.35	0.21	0.96	3.96
Standard dev.	0.69	1.18	0.51	0.35	0.00	1.39
World (USD)	4.11	0.83	0.48	0.00	0.96	4.49

Notes: Premiums are relative to bills. Summations and subtractions are geometric.

Source: Based on Dimson, Marsh, and Staunton (2008) and as updated in Dimson, Marsh, and Staunton (2011b).

was close to the cross-sectional average. For the World index, the annualized dividend yield was 4.1 percent, which is 3.1 percent higher than the real risk-free return from Treasury bills (see the penultimate column).

The real dividend growth rates in the third column of Table 4 reveal that in most markets, real dividend growth was lower than it was in the United States. In more than half of the countries, real dividends declined, and only four countries enjoyed real dividend growth of more than 1 percent per year. The equal-weighted average rate of real dividend growth across the 19 countries was slightly negative, although the World index's real dividend growth rate was 0.83 percent, bolstered by its heavy U.S. weighting. Dividends, and probably earnings, barely outpaced inflation. Over sufficiently long intervals, higher equity returns are generally associated with higher profits, which, in turn, generate larger dividends; comparing real equity returns (Table 1) with real dividend growth rates (Table 4) reveals a strong correlation (0.82) between the two.

The fourth column shows the expansion in the price-to-dividend ratio (P/D). Superior stock market performance and the magnitude of the historical equity risk premium are sometimes attributed to the expansion of valuation ratios, but the importance of this can be overstated. Table 4 shows that over the last 111 years, the P/D rose (dividend yields have fallen) in all but two countries, whereas the P/D of the World index grew by 0.48 percent per year. There are two possible explanations for this long-term decline in dividend yields: It may represent a repricing of equities (a downward shift in the capitalization rate or an upward shift in growth expectations), or the average payout ratio may have declined. In *Triumph of the Optimists* (Dimson, Marsh, and Staunton 2002), we note that equities enjoyed a rerating over this period but that in some countries, especially the United States, there were well-known changes in the cash distribution policies of corporations that made it necessary to take into account the impact of repurchases as well as cash dividends. The long-term multiple expansion of 0.48 percent per year is modest, however, given the improved opportunities for stock market diversification that took place over this period.

The fifth column shows the long-term change in the real (inflation-adjusted) exchange rate. As noted earlier, to examine the equity premium from the perspective of a global investor located in a specific home country, such as the United States, the real, local-currency returns need to be converted to real, common-currency returns. The annualized change in the 19 countries' real exchange rates averages only 0.21 percent per year, so this effect is small. As noted earlier, every country's real exchange rate change was within the range of ±1 percent.

The penultimate column is the historical real U.S. risk-free interest rate, and the final column computes the historical annualized equity premium for all the markets from the perspective of a U.S. investor. The realized equity premium relative to bills was, on average, 4.0 percent, with a cross-sectional standard deviation of 1.4 percent. For the U.S. dollar–denominated World index, the realized equity premium relative to bills was 4.5 percent (see the final entry in the bottom row of Table 4).

Investor Expectations

Over the long term, purchasing power parity has been a good indicator of long-run exchange rate changes (for more information, see Taylor 2002 and Dimson, Marsh, and Staunton 2011b, p. 19). The contribution to equity returns of real exchange rate changes is, therefore, an unanticipated windfall. It implies an upward bias of 0.21 percent in the cross-sectional average of the country equity premiums (there is no bias for the World index because it is denominated in the reference currency). Furthermore, as noted by Grinold, Kroner, and Siegel in their paper in this book, valuation ratios cannot be expected to expand indefinitely. Consequently, the contribution to equity returns of repricing is also likely to have been unanticipated; it implies an upward bias of 0.35 percent in the cross-sectional average of the country equity premiums and of 0.48 percent for the World index. Together, these two adjustments cause the equity premium to decline from 4.0 percent to 3.4 percent for the average country and from 4.5 percent to 4.0 percent for the World index.

In the sample of 19 countries, the average country had a long-term real dividend growth rate of slightly less than zero. In the World index, dividends outpaced inflation by an annual 0.8 percent, bolstered by the heavy weighting of the United States, where real dividends grew by 1.4 percent. But the 111-year annualized growth rate conceals a game of two halves. The 20th century opened with much promise, and only a pessimist would have believed that the next half-century would involve widespread civil and international wars, the Wall Street crash, the Great Depression, episodes of hyperinflation, the spread of communism, and the start of the Cold War. During 1900–1949, the annualized real return on the World equity index was 3.4 percent. By 1950, only a rampant optimist would have dreamed that during the following half-century, the annualized real return would be 9 percent. Yet, the second half of the 20th century was a period when many events turned out better than expected: There was no third world war, the Cuban missile crisis was defused, the Berlin Wall fell, the Cold War ended, productivity and efficiency accelerated, technology progressed, economic development spread from a few industrial countries to most of the world, and governance became stockholder driven.

The 9 percent annualized real return on world equities during 1950–1999 almost certainly exceeded expectations and more than compensated for the poor first half of the 20th century.

The question now is, What real dividend growth can be projected for the future? Pessimists may favor a figure of much less than the 0.8 percent historical average on the grounds that the "good luck" after 1950 more than outweighed the "bad luck" before 1950. Optimists may foresee indefinite real growth of 2 percent or more. Ilmanen (2011, p. 58) argues for a forward-looking approach. The yield on the World index as of year-end 2010 was 2.5 percent, well below the long-run historical average. If we assume future real dividend growth of 2 percent from this lower starting point, then the prospective premium on the World index declines to 3–3.5 percent, depending on the assumption made about the expected future real risk-free rate. The corresponding arithmetic mean risk premium would be around 4.5–5 percent, as we explained in Dimson, Marsh, and Staunton (2008). Our estimate of the expected long-run equity risk premium is less than the historical premium and much less than the premium in the second half of the 20th century. Many investment books still cite figures as high as 7 percent for the geometric mean and 9 percent for the arithmetic mean, but investors who rely on such numbers are likely to be disappointed.

Time-Varying Risk Premiums

The equity premium should be higher at times when the equity market is riskier and/or when investors are more risk averse. Yet, when markets are very volatile, extensive empirical evidence indicates that volatility tends to revert quite rapidly to the mean (for more information, see Dimson, Marsh, and Staunton 2011b, p. 34). We can, therefore, expect the period of extreme volatility to be short-lived, elevating the expected equity premium only over the relatively short run. But the premium may also vary with changes in investors' risk aversion. The latter will naturally vary among individuals and institutions and will be linked to life cycles as well as wealth levels.

The links between wealth levels and risk aversion suggest that there will be periods when risk aversion will be more or less than its long-run average. Particularly after sharp market declines, investors in aggregate will be poorer and more risk averse. At such times, markets are also typically more volatile and highly leveraged. Investors will thus demand a higher risk premium, which will drive markets even lower. Stocks are then priced to give a higher future expected return. So on average, achieved returns should be higher after market declines. The reverse logic applies following bull markets; when investors are richer, then risk aversion and, hence, the equity premium are expected to be lower.

Therefore, equity markets might be expected to exhibit mean reversion, with higher returns typically following market declines and lower returns, on average, following market rises. If there is appreciable mean reversion, then a market-timing strategy based on, for example, buying stocks after large price drops (or when market dividend yields are high or price-to-earnings ratios are low) and selling stocks after significant market rises should generate higher absolute returns. This rational economic explanation for mean reversion is based on time-varying equity premiums and discount rates. The more widely held view among investment practitioners, however, is that equity markets exhibit mean reversion for behavioral reasons—namely, that markets overreact. It is believed that in down markets, fear and over-pessimism drive prices too low, whereas in up markets, irrational exuberance and over-optimism cause markets to rise too high. In both cases, there will eventually be a correction so that equity markets mean revert.

A key difference between the rational economic view and the behavioral view is that if the former is correct, investors simply expect to earn a fair reward at all times for the risks involved. Thus, although market-timing strategies might seem to increase returns *ex post*, these higher *ex post* returns may simply reflect a realization of the higher *ex ante* returns required to compensate investors for additional risk. Put another way, the good news is that short-term expected returns are likely to be higher after market declines. The bad news is that volatility and risk aversion are correspondingly higher, and larger returns are needed to compensate for this increase. Loading up on equities at these risky times may take courage, but if subsequent returns prove to be higher, this outcome is a reward for risk, not for timing skill.

The problem with both the rational economic and behavioral views is that the evidence for mean reversion is weak. Mean reversion would imply that the equity premium is to some extent predictable, that risk over the long run is less than short-run volatility suggests, and that investors with a long horizon should favor equities compared with short-horizon investors. Yet, despite extensive research, this debate is far from settled. In a special issue of the *Review of Financial Studies*, leading scholars expressed opposing views, with Cochrane (2008) and Campbell and Thompson (2008) arguing for predictability, whereas Welch and Goyal (2008, p. 1455) find that "these models would not have helped an investor with access only to available information to profitably time the market." Cochrane's (2011) recent Presidential Address demonstrates the persistence of this controversy.

As we pointed out in our article (Dimson, Marsh, and Staunton 2004), and as articulated more formally by Pástor and Stambaugh (Forthcoming), mean reversion (if it exists) does not make equities safer in the long run. The reason is that there are three additional components of long-term risk that pull in the opposite direction. For example, an investor does not know what the average stock market return is going to be in the future, nor what the equity premium is today, nor what the other parameters of the return process are. These issues leave the investor with substantial estimation risk, and all three components of uncertainty get bigger as the investment horizon lengthens. As a result, Pástor and Stambaugh conclude that on a forward-looking basis, stocks are more risky over the long run. Diris (2011) elaborates on this view and points out that although stocks can be safer over long investment horizons, provided markets are fairly stable, they are riskier when held for the long term over periods that suffer from financial crises or other turmoil.

In summary, although some experts say that knowledge of current and recent market conditions can improve market timing, others conclude that investors cannot do better than to forecast that the future equity premium will resemble the (long-term) past. Moreover, although a lot of money could be earned if investors managed to invest at the bottom of the market, sadly the bottom can be identified only in hindsight. There are, of course, good reasons to expect the equity premium to vary over time. Market volatility clearly fluctuates, and investors' risk aversion also varies over time. But although sharply lower (or higher) stock prices may have an impact on immediate returns, the effect on long-term performance will be diluted. Moreover, volatility does not usually stay at abnormally high levels for long, and investor sentiment is also mean reverting. For practical purposes, therefore, and consistent with our discussion here, we conclude that when forecasting the long-run equity premium, it is hard to improve on evidence that reflects the longest worldwide history that is available at the time the forecast is being made.

Conclusion

Our approach is based on analyzing a comprehensive database of annual asset class returns from the beginning of 1900 to the end of 2010 and estimating realized returns and equity premiums for 19 national markets and three regions. Our estimates, including those for the United States and the United Kingdom, are lower than some frequently quoted historical averages. Yet, we find that the equity premium is positive and substantial in all markets and that survivorship bias has had only a very small effect on the estimate of the premium for the World index.

The historical equity premiums, presented here as annualized (i.e., geometric mean) estimates, are equal to investors' *ex ante* expectations plus the effect of luck. The worldwide historical premium was larger than investors are likely to have anticipated because of such factors as unforeseen exchange rate gains and unanticipated expansion in valuation multiples. In addition, past returns were also enhanced during the second half of the 20th century by business conditions that improved in many dimensions. We infer that investors expect a long-run equity premium (relative to bills) of around 3–3.5 percent on a geometric mean basis and, by implication, an arithmetic mean premium for the World index of approximately 4.5–5 percent. From a long-term historical and global perspective, the equity premium is smaller than was once thought. The equity premium survives as a puzzle, however, and we have no doubt that it will continue to intrigue finance scholars in the foreseeable future.

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A Supply Model of the Equity Premium

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The equity risk premium (ERP) is almost certainly the most important variable in finance. It tells you how much you need to save, how much you can spend, and how to allocate your assets between equities and bonds. Yet, recognized experts cannot agree on the ERP's value within an order of magnitude or even agree whether it is negative or positive. At a 2001 symposium, the predecessor of the one documented in this book, Robert Arnott and Ronald Ryan set forth an ERP estimate of −0.9 percent and Roger Ibbotson and Peng Chen proposed +6 percent.[1] The estimates in this book are much more tightly clustered, but considerable disagreement remains about how to estimate the premium as well as its size.

Grinold and Kroner (2002) proposed a model of the ERP that linked equity returns to gross domestic product (GDP) growth.[2] The key insight, which draws on earlier work by a number of authors, was that aggregate corporate profits cannot grow indefinitely much faster—or much slower—than GDP. (And as Herbert Stein was fond of reminding us, any economic trend that cannot continue forever will not.) If profits grow faster than GDP, they eventually take over the economy, leaving nothing for labor, government, natural resource owners, or other claimants. If profits grow more slowly than

[1]See Arnott and Ryan (2001); Ibbotson and Chen (2003). The Ibbotson and Chen estimate of 6 percent is an arithmetic mean expectation; their geometric mean expectation was 4 percent.

[2]A second printing of this article, from March 2004, is available online at www.cfapubs.org/userimages/ContentEditor/1141674677679/equity_risk_premium.pdf.

GDP, they eventually disappear and businesses will have no profit motive to continue operating. Thus, in the very long run, the ratio of profits to GDP is roughly constant.

The title of this paper, a shortened and updated version of Grinold and Kroner (2002), refers to the "supply model" of Diermeier, Ibbotson, and Siegel (1984), who differentiated between the demand for capital market returns (what investors need to compensate them for risk) and the supply of returns (what the macroeconomy makes available). The original supply model likewise made use of a link between profits and GDP. Grinold and Kroner (2002) was titled "The Equity Risk Premium: Analyzing the Long-Run Prospects for the Stock Market," but the similarity with the title of this book forced us to rename the current paper. Although our method is designed to produce an ERP estimate that reflects both supply and demand, the link to macroeconomic performance gives it a supply-side flavor.[3]

When we revisited the estimates from Grinold and Kroner (2002), we found that not all the components could be updated with equal accuracy, so the ERP estimate provided here is subject to some important caveats regarding data adequacy. The method that we recommend, however, remains largely unchanged from Grinold and Kroner (2002).

The Equity Risk Premium Model

We define the equity risk premium as the expected total return differential between the S&P 500 Index and a 10-year par U.S. government bond over the next 10 years. Our forecast of the return to the 10-year government bond over the next 10 years is simply the yield on that bond. Therefore, the ERP becomes

$$E\left(R_S - R_B\right) = \text{Expected S\&P 500 return} - \text{10-year bond yield}. \tag{1}$$

A purer and more "modern" approach is to conduct the whole analysis in real terms and to use the yield on a 10-year par Treasury Inflation-Protected Securities (TIPS) bond or, alternatively, a 10-year TIPS strip as the relevant bond yield. The authors of some of the other papers in this book do just that. We estimate the ERP over 10-year nominal bonds, however, because that is what Grinold and Kroner (2002) did. The numerical difference between the results of the two methods, real and nominal, is not large.

Forecasting the return on the S&P 500 over the next 10 years is more difficult and, therefore, gets most of the attention in this paper. The framework we use is to decompose equity returns into several understandable pieces and then examine each piece separately.

[3] A more detailed history of the estimation of the ERP can be found in the foreword (by Laurence B. Siegel) in Kaplan (2011).

The return to equities over a single period can always be broken down as

$$R_S = \text{Income return} + \text{Nominal earnings growth} + \text{Repricing}. \tag{2}$$

The income return is the percentage of market value that is distributed to shareholders as cash. If dividends are the only source of income, then the income return is equivalent to the dividend yield. Today, share repurchase programs (buybacks) are another common means of distributing cash to shareholders. Cash takeovers (by one company of another) should also be counted in the income return of an index that includes the stock of the acquired company.

The next two terms in Equation 2 represent the capital gain. Capital gains come from a combination of earnings growth and P/E expansion or contraction, which we call "repricing."

For expository purposes, we decompose the components further and use more precise notation. The return over a single period is

$$R = \underbrace{\frac{D}{P} - \Delta S}_{\text{Income}} + \underbrace{i + g}_{\text{Earnings growth}} + \underbrace{\Delta PE}_{\text{Repricing}}. \tag{3}$$

The first term, D/P, is simply the dividend yield. The second term, $-\Delta S$, is the percentage change in the number of shares outstanding. The percentage change in the number of shares outstanding equals the "repurchase yield" (which theoretically also includes cash takeovers) minus new shares issued (dilution); it has a negative sign because a decrease in the number of shares outstanding adds to return and an increase subtracts from return.[4] Together, the terms D/P and $-\Delta S$ measure the fraction of market capitalization that the companies in an index, in aggregate, return to shareholders in cash. Therefore, we refer to the sum of these two terms as the "income return."

The remaining terms, $i + g + \Delta PE$, make up the capital gain. The term i represents the inflation rate. The term g is the real earnings (not earnings per share) growth rate over the period of measurement. The final term, ΔPE, is the percentage change in the P/E multiple over the period. We refer to this last piece as the "repricing" part of the return.

[4] Share buybacks may be viewed as either a component of income return or a component of capital gain. An owner of a single share who holds on to the share through the share buyback program experiences the buyback as a component of capital gain because the same earnings are divided among fewer shares, which causes EPS to rise although earnings (not per share) have not changed. If the stock's P/E and all other factors are held equal, then the stock price rises. An index fund investor, however, experiences the share buyback as cash income because the index fund manager—who tenders some of the shares to the issuer to keep the stock's (now decreased) weight in the fund proportionate to its weight in the index—receives cash, which is then distributed to, or held by, fund shareholders like any other cash (tax considerations aside). We choose to view share buybacks as a component of income return.

It is important to realize that this decomposition of returns is essentially an identity, not an assumption, *so any view on the equity risk premium can be mapped into these components*. To illustrate, if the current 10-year bond yield is 3 percent, anyone who believes that the ERP is currently 4 percent must believe that the income return, nominal earnings growth, and repricing sum to 7 percent.

Historical Returns

Let us briefly consider what risk premium markets have provided historically. Over the last 85 years (1926–2010), the U.S. stock market and the intermediate-term U.S. Treasury bond market have delivered compound annual nominal returns of 9.9 percent and 5.4 percent, respectively.[5] Thus, the realized premium that stocks delivered over bonds was 4.5 percent.[6] The historical return decomposition in **Table 1** can be used to better understand this 9.9 percent annual equity return.

The income return (through dividends only, not share buybacks) on the S&P 500 was 4.1 percent annualized over this 85-year period. In this decomposition, we adjusted earnings growth for increases in the number of shares to arrive at *earnings per share (EPS) growth*. EPS grew at a rate of about 4.9 percent per year (1.9 percent real growth and 3.0 percent inflation) over the period.

Table 1. Decomposition of Total Returns on the S&P 500,[a] 1926–2010

Income return	4.10%
Real EPS growth	1.91
Inflation	2.99
P/E repricing	0.58
Within-year reinvestment return[b]	0.28
Total return	9.87%

[a]S&P 90 from January 1926 to February 1957; S&P 500 from March 1957 to 2010.
[b]Reinvestment of dividends paid during the year in the capital gain index (which consists of real EPS growth plus inflation plus P/E repricing).
Source: Morningstar/Ibbotson (used by permission).

[5]See the data for large-company stocks (i.e., the S&P 90 from January 1926 through February 1957 and the S&P 500 thereafter) in Table 2.1 in Ibbotson SBBI (2011, p. 32). Returns are before fees, transaction costs, taxes, and other costs.

[6]This amount is the arithmetic difference of geometric means. The geometric difference of geometric means, or the compound annual rate at which stocks outperformed bonds, is given by (1 + 0.099)/(1 + 0.054) − 1 = 4.27 percent.

The remainder of the total return on equities was due to repricing. The P/E of the market, measured as the end-of-year price divided by trailing 12-month earnings, grew from 11.3 at year-end 1925 to 18.5 at year-end 2010.[7] This repricing works out to an additional return, or P/E expansion, of 0.58 percent per year. A common view is that this P/E expansion was understandable and reasonable in light of the technological and financial innovations over this long period. For example, accounting standards became more transparent (recent "fraud stocks" notwithstanding). Such innovations as the index fund made it easier for investors to diversify security-specific risk and to save on costs. Mutual fund complexes provided easier access to institutional-quality active management. Finally, many market observers perceive the business cycle to have been under better control in recent decades than it was in the 1920s and 1930s, which made expected earnings smoother; the recent near depression and quick recovery, at least in corporate profits and the stock market, support this view somewhat. All these factors have made equity investing less risky and contributed to the repricing over this 85-year period.

But the presence of these factors in the past does not mean that we should build continued upward repricing into our forecasts. We consider this issue later in this paper.

Chart 1 of Grinold and Kroner (2002) further dissects the return decomposition into annual return contributions. Their graph demonstrates that the noisiest component of returns is clearly P/E repricing, followed by real earnings growth. Inflation and income returns are relatively stable through time. This observation implies that our real earnings growth and repricing forecasts are likely to be the least accurate and our inflation and income return forecasts are likely to be more accurate.

Mehra and Prescott (1985), and many others, argued that the equity premium of 4.5 percent was a multiple of the amount that should have been necessary to entice investors to hold on to the risky cash flows offered by equities instead of the certain cash flows offered by bonds. This contention spawned a huge literature on the "equity risk premium puzzle."[8] We have always been perplexed by a debate that suggests that investors were wrong while a specific macroeconomic theory is right, but Rajnish Mehra sheds additional light on this question elsewhere in this book.

[7]Because earnings were growing very quickly at the end of 2010, the more familiar P/E calculated as the current price divided by 12-month *forward* (forecast) earnings was lower than the P/E shown here.

[8]For surveys of this literature, see Kocherlakota (1996); Mehra (2003).

Looking to the Future

Next, we will examine each term in Equation 3 to determine which data are needed to forecast these terms over the moderately long run (10 years). Later in the paper, we will combine the elements to estimate, or forecast, the total return on the S&P 500 over that time frame. Finally, we will subtract the 10-year Treasury bond yield to arrive at the expected equity risk premium.

Income Return. The income return is the percentage of market capitalization that is distributed to shareholders in cash. Currently, companies have two principal means of distributing cash to shareholders: dividend payments and share repurchases. A third method, buying other companies for cash, "works" at the index level because index investors hold the acquired company and the acquiring company if the index is broad enough.

Until the mid-1980s, dividends were essentially the only means of distributing earnings. Since then, repurchases have skyrocketed in popularity, in part because they are a more tax-efficient means of distributing earnings and in part because companies with cash to distribute may not want to induce investors to expect a distribution every quarter (and cutting dividends is painful and often causes the stock price to decline). In addition, dividend-paying companies may suffer from a stigma of not being "growth" companies.

In fact, according to Grullon and Michaely (2000), the nominal growth rate of repurchases between 1980 and 1998 was 28.3 percent. Numerous other studies have shown that share repurchases have surpassed dividends as the preferred means of distributing earnings.[9] According to Fama and French (2001), only about one-fifth of publicly traded (nonfinancial and nonutility) companies paid any dividends at the time of their study, compared with about two-thirds as recently as 1978. So the "repurchase yield" now exceeds the dividend yield.

Currently (as of 18 March 2011), the dividend yield is 1.78 percent.[10] Like a bond yield, the current (not historical average) dividend yield is likely the best estimate of the income return over the near to intermediate future, so we use 1.78 percent as our estimate of D/P in Equation 3.

To estimate the repurchase yield, we used historical data over the longest period for which data were available from Standard & Poor's, the 12 years from 1998 through 2009. We calculated the annual repurchase yield as the sum of a given year's share repurchases divided by the end-of-year capitalization of the market. **Table 2** shows these data. The average of the 12 annual repurchase yields is 2.2 percent, which we use in our ERP estimate.

[9] See, for example, Fama and French (2001); Grullon and Michaely (2000); Fenn and Liang (2000).
[10] We obtained this number at www.multpl.com/s-p-500-dividend-yield on 18 March 2011.

Table 2. Repurchase Return of the S&P 500, 1998–2009

Year	Year-End Market Capitalization ($ billions)	Share Repurchases during Year ($ billions)	Share Repurchase Return (%)
1998	9,942.37	125	1.26
1999	12,314.99	142	1.15
2000	11,714.55	151	1.29
2001	10,463.39	132.21	1.26
2002	8,107.41	127.25	1.57
2003	10,285.83	131.05	1.27
2004	11,288.60	197.48	1.75
2005	11,254.54	349.22	3.10
2006	12,728.86	431.83	3.39
2007	12,867.85	589.12	4.58
2008	7,851.81	339.61	4.33
2009	9,927.56	137.60	1.39
Average			2.20

Source: Standard & Poor's.

It is possible to make the case for a much higher repurchase yield forecast by giving greater weight to more recent information (which is basically what we did with the dividend yield). According to Standard & Poor's (2008), "Over the past fourteen quarters, since the buyback boom began during the fourth quarter of 2004, S&P 500 issues have spent approximately $1.55 trillion on stock buybacks compared to . . . $783 billion on dividends." Although buybacks collapsed in 2009, they rebounded in 2010 and 2011. If the two-to-one ratio of buybacks to dividend payments observed by Standard & Poor's over 2004–2008 persists in the future, the repurchase yield will be as high as 3.5–3.6 percent. Aiming for a "fair and balanced" estimate, we use the lower number, 2.2 percent, which we obtained by weighting all 12 years of historical share repurchase data equally.[11]

We have not included cash buyouts in our estimate of the repurchase yield. From the perspective of an investor who holds an index containing companies A, B, C, and so forth, a cash buyout or takeover—a payment by company A to

[11]The use of this lower number is neutral, not conservative in the sense of numerically minimizing the ERP estimate. The reason is that there are offsetting biases. Our buyback estimate of 2.2 percent is too high because we do not subtract the historical contribution of buybacks to the dilution estimate (discussed later). And it is too low because very recent buyback rates have been much higher than 2.2 percent, not to mention the fact that we fully ignore the cash takeover yield.

an investor holding shares of company B in exchange for a tender of those shares—is no different from a share buyback, which is a payment by company A to an investor holding shares of A in exchange for a tender of *those* shares. Thus, the "cash buyout yield" needs to be added to the repurchase yield when summing all the pieces of $-\Delta S$. However, we do not have data for cash buyouts. If we did, they would increase our forecast of the equity risk premium (because cash buyouts must be a positive number and no other component of the ERP would change).

■ *Effect of Dilution on Income Return.* Dilution is the effect of new issuance of shares by existing companies and takes place through secondary offerings and the exercise of stock options. Dilution may be regarded as reflecting capital that needs to be injected from the labor market (or from elsewhere) into the stock market so investors can participate fully in the real economic growth described in the next section. Formally, dilution (expressed as an annual rate or a decrement to the total expected equity return) is the difference between the growth rate of dividends and the growth rate of dividends per share. If the payout ratio is assumed to be constant, dilution is also equal to the difference between the earnings growth rate and the EPS growth rate.

Grinold and Kroner (2002) estimated dilution from secondary offerings using historical data and dealt with stock options separately. Here, because we do not have the data to properly update the dilution estimates in Grinold and Kroner (2002), we use a shortcut: We directly adopt the 2 percent per year dilution estimate from Bernstein and Arnott (2003).

Bernstein and Arnott (2003) studied U.S. stocks from 1871 to 2000 and stocks from other countries over shorter periods. Instead of measuring the difference between the growth rate of earnings and that of EPS, they used a proxy: They measured the difference between the growth rate of total market capitalization and the capital appreciation return (price return) on existing shares. Dilution thus measured is net of share buybacks and cash buyouts (which are forms of negative dilution because giving cash back to shareholders is the opposite of raising capital by selling shares). The 2 percent dilution estimate for U.S. stocks is supported by evidence from other countries.[12]

[12]For a fuller discussion of dilution and an excellent description of the Bernstein and Arnott (2003) method, see Cornell (2010), who wrote, "Bernstein and Arnott (2003) suggested an ingenious procedure for estimating the combined impact of both effects [the need of existing corporations to issue new shares and the effect of start-ups] on the rate of growth of earnings to which current investors have a claim. They noted that total dilution on a marketwide basis can be measured by the ratio of the proportionate increase in market capitalization to the value-weighted proportionate increase in stock price. More precisely, net dilution for each period is given by the equation Net dilution = $(1 + c)/(1 + k) - 1$, where c is the percentage capitalization increase and k is the percentage increase in the value-weighted price index. Note that this dilution measure holds exactly only for the aggregate market portfolio" (p. 60).

We should subtract from the 2 percent dilution estimate that part of historical dilution that was due to buybacks and cash takeovers (but *not* the part of dilution that was due to stock option issuance because these cash flows went to employees, not shareholders). We do not have the data to perform these adjustments, however, so we do not attempt them. We simply use the 2 percent estimate. (Note that the number of buybacks was tiny until the mid-1980s—that is, over approximately the first 115 years of the 130-year sample—so historical buybacks probably had a minimal impact on the average rate of dilution for the entire period.)

■ *Numerical Estimate of Income Return.* The income return forecast consists of the expected dividend yield, D/P, minus the expected rate of change in the number of shares outstanding, ΔS. The expected dividend yield is 1.78 percent. The number of new shares is expected to decline at a –0.2 percent annual rate, consisting of 2 percent dilution minus a 2.2 percent repurchase yield. After adding up all the pieces, the income return forecast is 1.98 percent.

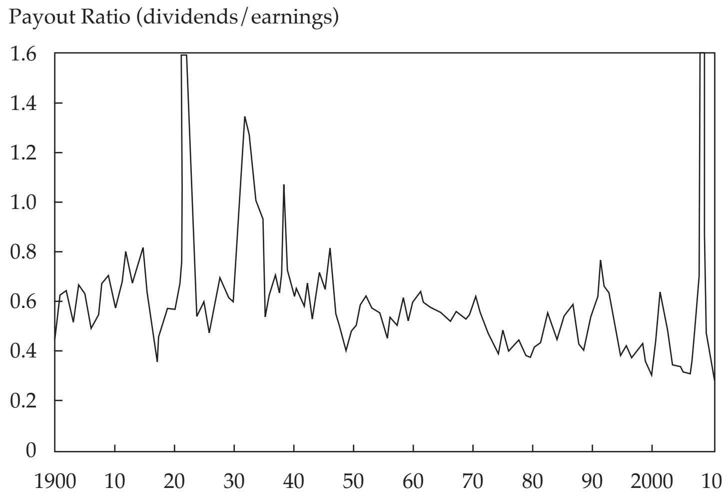
Expected Real Earnings Growth. We expect real dividend growth, real earnings growth, and real GDP growth—all expressed in aggregate, not in per share or per capita, terms—to be equal to each other.

We expect dividend and earnings growth to be equal because we assume a constant payout ratio. Although the payout ratio has fluctuated widely in the past, it has trended downward over time, presumably because of tax and corporate liquidity considerations. But the decline has effectively stopped. **Figure 1** shows the dividend payout ratio for the U.S. stock market for 1900–2010; this curious series looks as though it has been bouncing between a declining lower bound (which has now leveled off near 30 percent) and an almost unlimited upper bound. The highest values of the payout ratio occurred when there was an earnings collapse (as in 2008–2009), but companies are loath to cut dividends more than they have to.[13] The lower bound reflects payout policy during normally prosperous times.

The current lower bound of about 30 percent would be a reasonable forecast of the payout ratio, but we do not need an explicit forecast because we have already assumed that it will be constant over the 10-year term of our ERP estimate. It is helpful to have empirical support for our assumption of a constant payout ratio, however, and the recent relative stability of the lower bound in Figure 1 provides this support.

[13]The all-time high level of the payout ratio, 397 percent, occurred in March 2009, when annualized monthly dividends per "share" of the S&P 500 were $27.25 and annualized monthly earnings per "share" were $6.86.

Figure 1. Payout Ratio of the U.S. Equity Market, 1900–2010



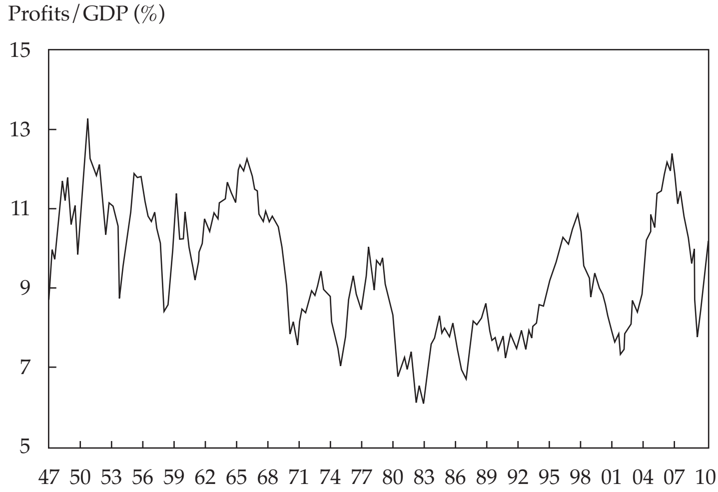
Source: Raw data are from Robert Shiller (www.econ.yale.edu/~shiller/data/ie_data.xls, as of 4 November 2011); calculations are by the authors.

We expect real earnings growth to equal real GDP growth for the macro-consistency reason stated earlier: Any other result would, in the very long run, lead to an absurdity—corporate profits either taking over national income entirely or disappearing. **Figure 2** shows the (trendless) fluctuations in the corporate profit share of GDP since 1947.

These observations leave us with the puzzle of forecasting real GDP growth. Grinold and Kroner (2002) engaged in a fairly typical macroeconomic analysis that involved productivity growth, labor force growth, and the expected difference between S&P 500 earnings and overall corporate profits. They did not use historical averages or trends directly as forecasts; rather, they argued that the data plus other factors justified the conclusion that real GDP would most likely grow at 3 percent over the relevant forecast period and that real S&P 500 earnings would grow at 3.5 percent.

Real economic growth, by definition, equals real productivity growth plus labor force growth. Although we can update the historical productivity and labor force growth numbers, doing so would not produce an especially useful forecast any more than it did for Grinold and Kroner (2002), who distanced themselves somewhat from the productivity and labor force growth approach. The reason is that extrapolating recent trends in these components of economic growth can produce unrealistically high or low expectations, and using

Figure 2. Quarterly U.S. Corporate Profits as a Percentage of GDP, 1947–2010



Note: Profits are pre-tax.
Source: Haver Analytics, citing U.S. National Income and Product Accounts data.

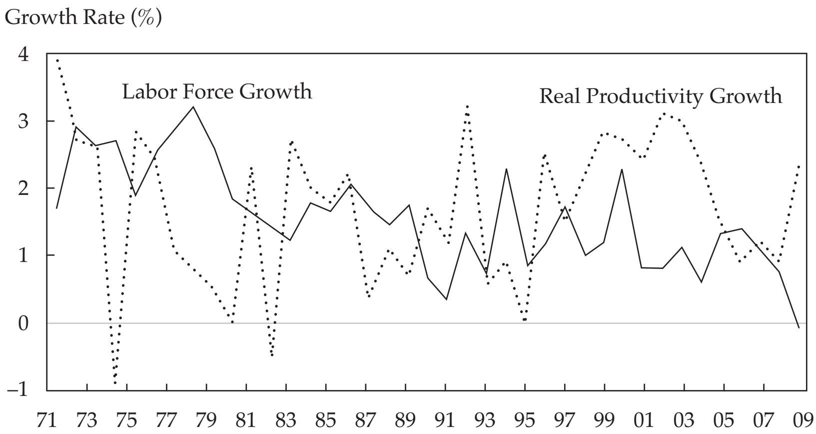
historical averages provides no insight into possible future changes in the components, which are important. Nevertheless, updates of these components are provided for informational purposes in **Figure 3**.

We can, however, use a different decomposition of real economic growth, which is also definitional: Expected GDP growth equals expected *per capita* GDP growth plus expected population growth. We believe that population growth is easier to forecast than labor force growth because the latter is partly endogenous (e.g., people work longer if they need the money because of a weak economy).[14]

Figure 4 shows that since 1789, real per capita U.S. GDP has grown at a fairly constant 1.8 percent compound annual rate. Cornell (2010) arrived at a global estimate from the high-growth postwar period (1960–2006) that is higher, but not dramatically so: 2.42 percent for mature economies and 2.79 percent for emerging economies. A cautious forecast is that the 1.8 percent growth rate will continue. If this forecast entails substantial risk, it is to the upside because an investment in the S&P 500 is not a pure bet on the U.S. economy; many, if not most, of the companies in the index are global companies that sell to markets that are growing more rapidly than the U.S. market.

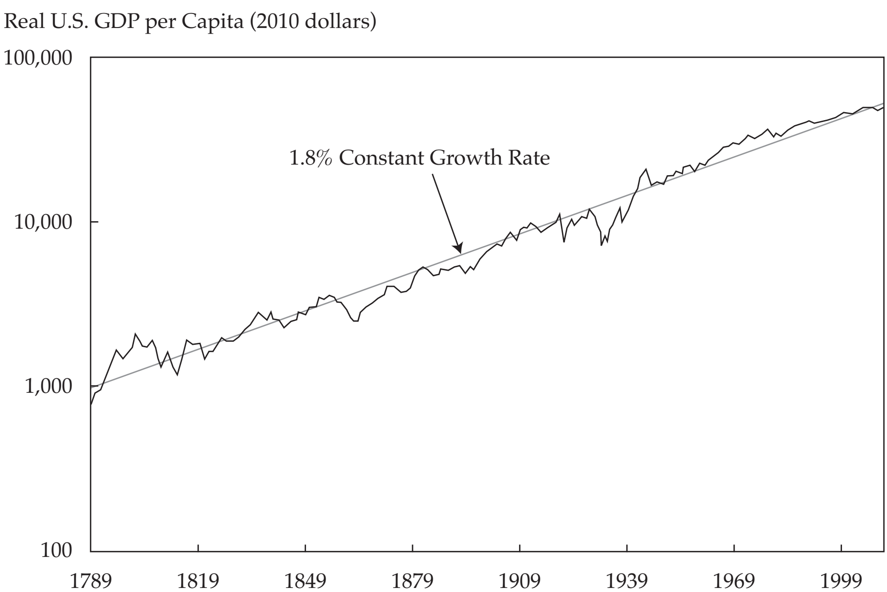
[14]Population growth is also partly endogenous (because the decisions of how many children to have, whether to emigrate, and so forth, may depend on economic performance). These effects, however, operate with long lags and tend to move the population growth rate slowly.

Figure 3. U.S. Real Productivity and Labor Force Growth Rates, 1971–2009



Source: Organisation for Economic Co-Operation and Development, OECD StatExtracts (http://stats.oecd.org/Index.aspx, as of 14 November 2011: total labour force, U.S., and labour productivity annual growth rate, U.S.).

Figure 4. Real U.S. GDP per Capita, 1789–2008



Source: Data are from Robert D. Arnott.

We add to the 1.8 percent real per capita GDP growth estimate the Economist Intelligence Unit 10-year U.S. population growth estimate of 0.85 percent,[15] which gives a total real GDP growth forecast of 2.65 percent. This number is slightly below current consensus estimates.

This simplified method presents some difficulty because if the rate of dilution is 2 percent at all population growth rates, then population growth has a one-for-one effect on the estimate of the expected return on equities and, therefore, on the ERP. This suggests an easy beat-the-market strategy: Invest only in countries with the fastest population growth. This strategy has not worked well in the past, and even if it did over some sample period, easy beat-the-market strategies are usually illusory. Thus, the dilution estimate should probably be higher for countries with high population growth rates or for a country during periods of above-normal population growth. Although the logic of using a link to real GDP growth to forecast the stock market has great intuitive appeal, putting it into practice with any precision will take more work and more thought regarding dilution.[16]

Expected Inflation. Because we are deriving the ERP relative to Treasury bonds, we do not need our own inflation forecast as much as we need an estimate of the inflation rate that is priced into the 10-year Treasury bond market. Historical inflation rates have no bearing on this number, so we do not present them. Fortunately, the yield spread between 10-year nominal Treasury bonds and 10-year TIPS is a direct, although volatile, measure of the inflation rate that is expected by bondholders. (The spread also includes an inflation risk premium, present in nominal bond yields but not in TIPS yields, for which we need to adjust.)

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[15]This number was obtained at http://7marketspot.com/archives/2276 on 2 May 2011 under the heading "USA economy: Ten-year growth outlook" in the column "2011–20." If we instead used real productivity growth plus labor force growth to estimate real GDP growth, we would get a slightly higher number for real productivity growth and a slightly lower number for labor force growth, which would provide a very similar overall real GDP forecast.

[16]Our simplified method has some other characteristics worth noting. It does not specifically account for the wedge between population growth and labor force growth if the proportion of retirees (or children) in the population is expected to change. A growing unproductive retiree population should be considered bearish. Many would-be retirees, however, are not financially prepared for retirement and, willingly or not, will work longer than they originally anticipated, which contributes to GDP. In addition, in an advanced technological society, an aging population distribution within the workforce is not all bad! We are accustomed to thinking of young workers as productive and older workers as unproductive, but this is the case only in a fairly primitive economy where the primary job description is something like "lift this and put it over there." In a technological society, young workers are unproductive—often startlingly so, earning only the minimum wage—and older workers produce most of the added value and make the lion's share of the money. Nevertheless, young workers' productivity grows quickly and older workers' productivity grows slowly or shrinks, so the impact of an aging workforce on *rates of change* in productivity may be less salutary than the impact on the *level* of productivity.

On 22 April 2011, the breakeven inflation rate (the yield spread described above) was 2.60 percent.[17] This rate is high by recent standards—it was as low as 1.5 percent in September 2010—but it is typical of the longer history of the series. Recent concerns about very high and rapidly growing levels of public indebtedness (of the U.S. government, of local governments in the United States, and of non-U.S. governments) have contributed to the increase in inflation expectations. We subtract 0.2 percent for the inflation risk premium to arrive at a 2.4 percent compound annual inflation forecast over the next 10 years.[18]

Expected Repricing. Grinold and Kroner (2002, p. 15, Chart 8) conducted an analysis of the market's P/E that led them to include a nonzero (–0.75 percent per year) value for the repricing term, ΔPE, in Equation 3. At the time the analysis was conducted (November 2001), the market's conventional trailing P/E (price divided by one-year trailing earnings) was a lofty 29.7 and the "Shiller P/E" (price divided by 10-year trailing real earnings) was 30.0, which prompted the authors to conclude that the P/E was likely to decline.[19] (The Shiller P/E is designed to smooth out fluctuations caused by yearly changes in earnings.) And decline it did.

Today, the situation is different. **Figure 5** shows the conventional P/E and the Shiller P/E of the U.S. market. Today's conventional P/E of 18.5 is only modestly higher than the very long-run (1900–2010) average P/E of 15.7, and it is lower than the more recent long-run (1970–2010) average P/E of 18.9. The Shiller P/E tells a slightly less favorable story: The current value is 22.4, compared with an average of 16.3 over 1900–2010 and 19.2 over 1970–2010.[20] Because it averages 10 years of trailing earnings, however, the current Shiller P/E includes an earnings collapse in 2008–2009 that is almost literally unprecedented; even the Great Depression did not see as sharp a contraction in S&P composite index earnings, although overall corporate profits in 1932 were negative. (Huge losses in a few large companies, such as those that occurred in 2008–2009, go a long way toward erasing the profits of other companies when summed across an index.) Only the depression of 1920–1921 is comparable.

Thus, we see no justification for using a nonzero value for the repricing term in Equation 3. The market's current level is already reflected in the (low) dividend yield. To include a repricing term even though the dividend yield already incorporates the market's valuation is, theoretically, not double-counting because the influence of the dividend yield is amortized over an infinite horizon,

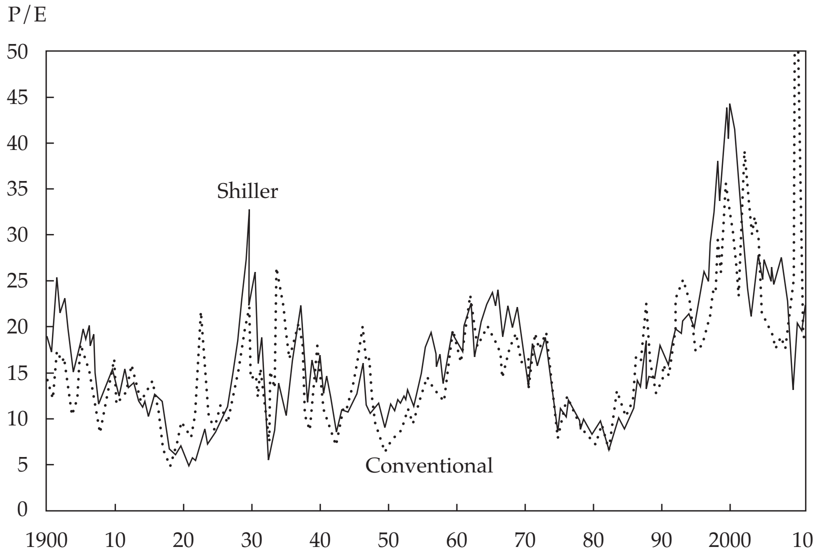
[17] See www.bloomberg.com/apps/quote?ticker=USGGBE10:IND.

[18] This estimate of the inflation risk premium comes from Hördahl (2008, p. 31, Graph 2).

[19] Shiller (2000) describes the Shiller P/E.

[20] In this section, "current" values are as of December 2010.

Figure 5. Conventional and Shiller P/Es for the U.S. Equity Market, 1900–2010



Note: The October 2009 conventional P/E equals 86.

Source: Spreadsheet available at Robert Shiller's website (www.econ.yale.edu/~shiller/data/ie_data.xls).

whereas our forecast is for only the next 10 years. Thus, if we believe that the market is mispriced in such a way that it will be fully corrected within 10 years, a nonzero repricing term is warranted. Although Grinold and Kroner (2002) argued that the market P/E was too high at that time and would decline at an expected rate of 0.75 percent per year over the forecast horizon, we think the market is currently not too high (or too low), and our repricing forecast is zero.

Bringing It All Together

In this section, we estimate the expected total nominal return on equities, as expressed in Equation 3, using the inputs we derived in the foregoing sections. We then subtract the 10-year nominal Treasury bond yield to arrive at our estimate of the ERP over the next 10 years.

Income return ($D/P - \Delta S$) = 1.78 percent dividend yield
– (–0.2 percent repurchase yield net of dilution)
= 1.98 percent.

Capital gain ($i + g + \Delta PE$) = 2.4 percent inflation
+ 1.8 percent real per capita GDP growth
+ 0.85 percent population growth
= 5.05 percent.

Total expected equity return = 1.98 percent + 5.05 percent
= 7.03 percent (rounded to 7 percent)
– 3.40 percent 10-year Treasury bond on 22 April 2011[21]
= 3.6 percent expected ERP over 10-year Treasuries.

Arithmetic vs. Geometric Mean Forecasts

Our forecasts thus far have been geometric means (r_G). To estimate the equivalent arithmetic mean return expectation (r_A) for use as an optimizer input, we rely on the following approximation:

$$1+r_G \approx (1+r_A)-\frac{\sigma^2}{2}. \tag{4}$$

We use standard deviations drawn from 1970 to 2010 because we do not necessarily expect bond returns to be as placid as they have been recently. Thus, for the purpose of estimating standard deviations, we include this long period because it includes the bond bear market of 1970–1980 and the dramatic subsequent recovery.[22] We obtain the following:

Expected arithmetic mean equity total return = 8.59 percent.

Expected arithmetic mean 10-year Treasury bond total return = 3.96 percent.

Difference (expected arithmetic mean ERP) = 4.63 percent.

A limitation of this study is that we use U.S., not global, macroeconomic data in our estimate of the expected return on the S&P 500. The S&P 500 is a global index, in that it contains many companies that earn most, or a substantial share, of their profits outside the United States. Perhaps global economic growth rates are more relevant to the expected return on the S&P 500 than U.S. growth rates. Future research should examine this possibility.

Assessing the Previous Grinold and Kroner Forecast

Grinold and Kroner (2002) identified three camps of ERP forecasters: "risk premium is dead," "rational exuberance," and "risk is rewarded." They called the first two views "extreme" and wished to be counted among the moderate "risk is rewarded" camp, in keeping with the belief that markets are generally efficient and that prices, therefore, do not stray far from genuine values for very long.

[21]This number was obtained from Yahoo! Finance on 22 April 2011.

[22]Stocks = 17.68 percent; bonds = 9.73 percent (these data are from Aswath Damodaran's website, http://pages.stern.nyu.edu/~adamodar, as of 3 June 2011).

Grinold and Kroner's (2002) forecast, evaluated over 2002–2011, was too high. The main problem was the volatile repricing term. They seriously underestimated the speed with which the unusually high P/Es that then prevailed would revert toward their historical mean. In this paper, we forecast a repricing of zero, consistent with our view that the market is finally, after two bear markets and two recoveries, roughly fairly priced. Because the repricing term is noisy, we know that our current forecast is more likely to be too high or too low than just right when evaluated over the next 10 years. We believe, however, that we have identified the middle of the range of likely outcomes. Although black swans, fat tails, and tsunamis are the talk of the day, such large unexpected events tend to fade in importance as they are averaged in with less dramatic events over extended periods and the underlying long-term trends reveal themselves once more.[23] We expect moderate growth in the stock market.

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Equity Risk Premium Myths

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For the capital markets to "work," stocks should produce higher returns than bonds. Otherwise, stockholders would not be paid for the additional risk they take for being lower down in the capital structure. This relationship should be particularly true when stocks are compared with government bonds that (ostensibly) cannot default. It comes as no surprise, therefore, that stockholders have enjoyed outsized returns from their investments. When investors collectively expect an outsized return, as they should relative to bonds or cash, we call this expectation the "equity risk premium."

Many of the controversies surrounding the equity risk premium (ERP) are rooted in semantics: The same term is used for multiple purposes. The ERP may be based on the difference between two backward-looking rates of return—which is *not* a risk premium because it reflects past returns rather than return expectations—or on forward-looking return expectations. It may be based on single-year arithmetic return differences or compounded multiyear geometric return differences. It may be based on comparisons with cash or with bonds or with U.S. Treasury Inflation-Protected Securities (TIPS).

In any dialogue on the topic, these semantic differences mean that we may, unfortunately, be talking past one another. A 1 percent ERP (calculated as an expected multiyear geometric return difference between stocks and bonds) can be consistent with a 7 percent ERP (calculated as an expected single-year arithmetic return difference between stocks and cash at a time when the yield curve is steep, as it is at this writing), and both can be wholly consistent with a 6.5 percent observed historical excess return (the arithmetic average single-year difference between stock and cash returns over the past 60 years, which many observers erroneously label the "equity risk premium").[1]

So, perhaps this discussion should begin with definitions—the distinction between excess returns and the ERP. Because cash yields are inherently short term and hugely variable whereas forward-looking stock market returns are inherently long term and rather more stable (the sum of the yield and long-term expected growth in income is not likely to move more than 1–2 percentage points in a single year), I prefer to compare expected stock market returns with the return expectations for forward-looking government bonds or TIPS.

[1]By convention, I express the equity risk premium as a "percentage" rather than the more accurate "percentage points" or in basis points.

Backward-looking excess returns are hugely variable. Over rolling 20-year spans, the gap between stock and bond market returns—the excess return for stocks—ranges from +20.7 percent to −10.1 percent per year. Wow! Most of us would consider 20 years to be a long time span. Yet, few observers would consider a 20 percent annual risk premium to be reasonable; none would consider a −10 percent risk premium reasonable.

These historical excess returns also exhibit large negative serial correlation with subsequent excess returns. Over the past 210 years, the correlation between consecutive 10-year stock market excess returns over 10-year government bonds has been a whopping −38 percent. When stocks beat bonds by a wide margin in one decade, they reversed with reasonable reliability over the next decade. This correlation is both statistically significant and economically meaningful.

Forecasting the future ERP by extrapolating past excess returns is, therefore, fraught with peril. Yet, extrapolating the past is so tempting that much of the finance community sets return expectations in exactly this fashion. No wonder our industry got it so wrong at the peak of the technology bubble in 2000: The average corporate pension fund was using an all-time-high 9.5 percent "pension return assumption" for conventional balanced 60 percent equity/40 percent bond portfolios at a time when bond yields were 6 percent and the stock market offered an all-time-low 1.1 percent dividend yield! There may also be a Machiavellian aspect to this "expectation," in that some pension plan sponsors may have known the forecasts were too high but used them anyway to avoid having to increase contributions to their pension plans.

Except when I specifically indicate to the contrary, I use the term "excess returns" to refer to realized differences between stock market returns and long-term government bond returns and the term "the ERP" to refer to expected (forward-looking) long-term differences between stock returns and long bond market expected returns (geometric or compounded annual rates). Occasionally, I use cash or long-term TIPS rather than long-term government bonds, but when I do, I acknowledge that I am doing so.

Myths

Over the years, a number of myths related to the ERP have emerged. One of the most widely "cited" myths is that the ERP is 5 percent. Before discussing the natural limits for the risk premium, I will explore an array of these ERP myths and reflect on why we so eagerly embrace myths rather than test them to objectively gauge their legitimacy.

Take, for example, the myth that the ERP is a static 5 percent. According to Ibbotson Associates (now Morningstar) data, equity investors earned a real return of 8 percent and stocks outpaced bonds by more than 5 percent from

1926 until the early 2000s.[2] More recently, these figures have sagged to 6.5 percent and 4.5 percent, respectively. Intuition suggests that investors should not require such outsized returns in order to bear equity market risk. If we examine the historical record, neither the 8 percent real return nor the 5 percent risk premium for stocks relative to government bonds has ever been a realistic *expectation*, except at major market bottoms or at times of crisis, such as wartime.

Should investors have expected these returns in the past, and why shouldn't they continue to do so? We can break this question into two parts. First, can we derive an objective estimate of what investors had good reasons to expect in the past? Second, should we expect less in the future than we have earned in the past, and if so, why?

The answers to these questions lie in the difference between the observed excess return and the prospective risk premium. When we distinguish between past excess returns and future expected risk premiums, the idea that future risk premiums should be different from past excess returns is entirely reasonable.

Most of the ERP myths take on the character of a classic urban legend—so seductively plausible that they linger despite overwhelming evidence to the contrary. Note that most of these myths can be used to rationalize a higher, not a lower, ERP. No one seems to construct a myth or a fable to explain why we should expect lower returns!

The myths I examine include the following:

- *The risk premium is 5 percent and changes little, except perhaps in proportion to a stock's beta*. Nothing in finance theory requires any such assumption, but the notion of a large risk premium has been used to justify some truly heroic growth assumptions when yields or payout ratios have been low.
- *The ERP is static over time, across markets, and across companies*. Higher or lower yields, yield spreads, valuation multiples, and so forth have no bearing on the ERP. The proponents of this myth argue that constantly changing yields, spreads, and valuation multiples reflect changing investor expectations for future growth—in a fashion that offsets the yield, spread, or valuation changes—leaving the ERP unaltered. Nothing in neoclassical finance theory, however, suggests that the ERP must be static. Moreover, behavioral finance observers would emphatically contradict the notion of a static ERP because risk, risk expectations, and risk tolerance are all nonstatic.
- *The "ERP Puzzle": Stocks beat bonds by more than they should*. If we adhere to the view that the excess return for stocks should be measured in 10ths of a percent (10s of basis points), as most utility functions suggest for the long-term investor, this observation is true. But the ERP Puzzle seems to

[2]This section is excerpted and amended from Arnott and Bernstein (2002).

be posed as though 5 percent is the excess return that needs to be explained. Such a high excess return has not been earned in "normal" markets. In the absence of gains in valuation multiples, an excess return of 2–3 percent is more normal, and even that margin seems to be more consistent with high yields than with the low yields we observe today.

- *Stocks will beat bonds for anyone willing to think long term, which is typically taken to mean 20–30 years or longer*. This myth lingers in spite of a 41-year span (early 1968 to early 2009) in which the returns of ordinary long U.S. T-bonds eclipsed the S&P 500 Index return. Non-U.S. examples counter to this myth also abound.
- *When yields and payout ratios are low, stock buybacks can replace the dividend in a tax-advantaged fashion*. However, true buybacks—that is, buybacks that truly reduce shares outstanding rather than merely recapture shares issued in a context of management stock option redemption—are much more the exception than the rule.
- *Stock market earnings grow with GDP*. If this myth were true, the expected return on stocks would match yield plus expected GDP growth. Unfortunately, this enduring myth ignores the fact that the share of corporate profits in GDP growth consists of the growth in existing enterprises *plus* the creation of new enterprises. The "new enterprises" portion is often the larger component of real GDP growth. Therefore, the ERP is much smaller than adherents to this misconception expect.
- *Dividends do not really matter*. This myth is twofold. First, it involves the belief that *lower yields are entirely consistent with continued high return and a high ERP*. In an efficient market, investors will accept a lower yield whenever they are confident that future real growth in earnings will make up the difference. But overwhelming global evidence suggests a strong positive link between the dividend yield and both the subsequent real return for stocks and the subsequent excess return of stocks over bonds.

  The second part of this myth is that *lower payout ratios lead to faster earnings growth*. The Modigliani and Miller indifference theorem is often used to justify this view. But M&M is a theory based on a large array of simplifying assumptions and, therefore, an approximation of reality.

Both of these instances show that, in reality, dividends *do* matter.

The 5 Percent Risk Premium

Ibbotson Associates—whose annual data compendium covers U.S. stocks, T-bonds, and T-bills since January 1926—shows the S&P 500 compounding through February 2011 at an annual rate of 9.8 percent, versus 5.5 percent for long-term government bonds, which is an excess return of 4.3 percent. This return compounds exponentially with time. Albert Einstein whimsically declared that compound interest is "the most powerful force in the universe." Disregarding inflation, taxes, transaction costs, and fees, a $1,000 U.S. stock investment in 1926 would have ballooned to $3 million by February 2011, versus $94,000 for an investment in long-term bonds—a 32-fold difference.

In the 1980s and 1990s, stocks—bolstered by soaring valuation multiples—compounded at, respectively, 17.6 percent and 18.2 percent per year. As a result, "Stocks for the Long Run" became the mantra for long-term investing, as well as the title of a best-selling book by Siegel (2007). This view is now embedded into the psyche of an entire generation of professional and casual investors, who ignore the fact that much of that outsized return in the 1980s and 1990s was a consequence of soaring valuation multiples and tumbling yields. Because most investors anchor their decisions on personal experience, we have a population that largely assumes that this long-term 5 percent excess return of stocks over bonds is their birthright. This view constitutes the "cult of equities."

Let's Talk Really Long Term. For those willing to do the homework, very long-term stock and bond data exist for the United States. The picture of the difference between stocks and bonds if we start at 1802 is not quite as rosy as it is from 1926 to 2010; therefore, this view does not receive as much attention from the relentlessly optimistic stock sellers of Wall Street. From 1802 to 2010, U.S. stocks generated a 7.9 percent annual return, versus 5.1 percent for long-term government bonds. So, the realized excess return was cut to 2.8 percent—a one-third reduction—by including an additional 125 years of capital market history.

Of course, many observers declare 19th century data irrelevant. A lot has changed. The survival of the United States as we know it was in doubt during the first part of the century (the War of 1812), and in the middle stages, we waged a debilitating civil war. Government bonds were thus not riskless. And by modern standards, the United States was an emerging market. Citizens lived shorter lives than now, and the economy was notably short on global trade and long on subsistence agriculture. Furthermore, three major wars and four depressions—two roughly comparable to the Great Depression—occurred between 1800 and 1870, a span during which the data on market returns are notably meager.

One could as easily make the case, however, that the 20th century is not representative either. The 20th century brought great and unexpected fortune to the United States and its equity markets. The country was not invaded and occupied by a foreign power, and it did not suffer a government overthrow. For contrast, consider the return on capital for Russian investors after the Bolshevik Revolution—a 100 percent loss. Benjamin Graham cautioned on the difference between the loss *on* capital (a drop in price, from which the investor can recover) and a loss *of* capital (100 percent loss, from which the investor cannot recover). Russia's stock market was not alone in devastating losses of capital in the 20th century; 2 additional markets of the top 15 in 1900, Egypt and China, suffered a 100 percent loss of capital; Argentina, Germany (twice), and Japan (once) came close.

Markets tend to be unkind to those who ignore history, and the severity of the penalty is highly correlated with our reliance on viewing a span of history that is too short. The long history of the markets should not be ignored even when we are dealing with the shorter time horizons of most investment programs. Even for such "perpetual" institutions as university endowments, the relevant horizon is only 10–30 years. As Bernstein (1997) commented about 80–100 years of data, ". . . this kind of long run will exceed the life expectancies of most people mature enough to be invited to join such boards of trustees" (p. 22).

Nonetheless, the relevant investment span should be long enough that equity investors will be rewarded for bearing risk, right? Not always! As displayed in **Table 1**, trailing returns for stocks have not come close to the excess returns over bonds that we have all come to expect, even after stocks worldwide doubled from the lows reached during the global financial crisis that began in early March 2009. They have not come close in the United States, in the rest of the developed world, and most assuredly not in the emerging markets.

Where is the wealth creation implied by the long-term Ibbotson data? Stock market investors took the risk. They rode out every bubble, every crash, every spectacular bankruptcy and bear market during a 30-year stretch that finished with a 100 percent gain in two years. How much was their cumulative excess return for the blood, sweat, and tears spilled with all this volatility? Through 2010—a splendid span for bonds as yields tumbled for 30 years while

Table 1. Annualized Returns for Stocks over the "Long Run," for 10, 20, and 30 Years Ended 2010: Where Is the Reward?

	10-Year Return	20-Year Return	30-Year Return
S&P 500	1.41%	9.14%	10.71%
Ibbotson U.S. long-term government bonds	6.64	8.44	10.18
U.S. equity risk premium	–5.23	0.70	0.53
MSCI Europe/Australasia/Far East Index (net)	3.50	5.85	
JPM Government Bond Index: Global ex U.S. TR USD[a]	7.64	7.07	
International equity risk premium	–4.14	–1.22	

[a]TR stands for "total return."

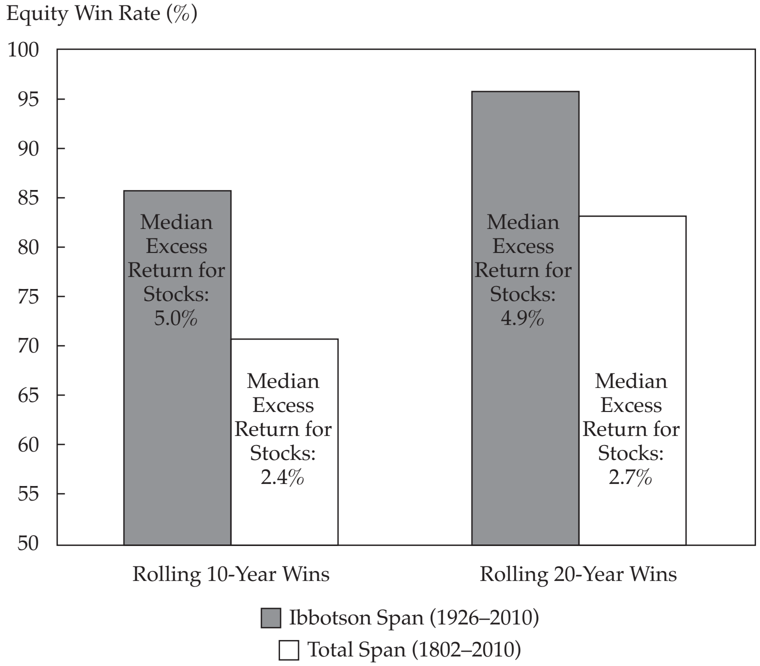
Source: Based on data from Morningstar EnCorr.

stock market yields followed a less relentless downward course—the cumulative excess return was only 0.66 percent per year. Indeed, investors who incurred the ups and downs over the past 10 years have lost money compared with what they could have earned from long-term government bonds. They have paid for the privilege of incurring stomach-churning risk. Not only did T-bond investors sleep better and more over the past 10 years than stock investors, but they also ate better.

Although recent years have been far from normal, a 30-year stock market excess return of approximately zero is a slap in the face for the legions of "stocks at any price" long-term investors. Yet, it is not the first extended drought. From 1803 to 1857, U.S. equities struggled; the stock investor would have received a third of the ending wealth of the bond investor. For the 1803 investor in U.S. stocks, the shortfall against the bond investor was only recovered in 1871. These early U.S. stock market return data are of dubious quality, but the better U.K. data show a similar trajectory. Most observers would be shocked to learn a 68-year stretch of stock market underperformance occurred in either country. After a 72-year run from 1857 through 1929, when stocks outperformed handily in both the United States and the United Kingdom, another dry spell ensued. From 1929 through 1949, U.S. stocks failed to match bonds. It is the only long-term shortfall in the Ibbotson time sample until the 40-year period ending in March 2009. Perhaps the spectacular 1950–99 aftermath of the extraordinary period of history comprising the Great Depression and World War II lulled recent investors into a false sense of security regarding extended equity performance.

The Odds. Fortunately for the capital markets and equity investors, an examination of history shows that stocks have a high tendency to outperform government bonds over 10- and 20-year periods. **Figure 1** illustrates rolling 10- and 20-year "win rates" for equities versus government bonds for Ibbotson data and data for the whole 1802–2010 period. The Ibbotson time frame confirms investor behavior in the 30 years since Ibbotson and Sinquefield published their groundbreaking study (1977). For the vast majority of periods—92 percent for 10 years and almost 98 percent for 20 years—equities outperformed bonds. The solid consistency goes hand-in-hand with a large average excess return; stocks beat long government bonds by 4.6 percent per year over this span. But the longer-term data are much less convincing than the Ibbotson data. Equities outperformed in 70 percent of the 10-year periods and 84 percent of the 20-year spans, which is wholly consistent with the smaller 2.7 percent risk premium earned by stocks over long bonds during this much longer two-century span. Similar data for other countries indicate that the advantage of equities is even less reliable there than in the United States.

Figure 1. Percentage of Time U.S. Stocks Have Outperformed Long-Term U.S. Government Bonds over Monthly Rolling Periods



Odds are still with the equity investor. Odds of 70 percent or 80 percent are pretty good. In professional basketball, those odds would be average to above-average free throw percentages. But the relatively small probability of failure masks the magnitude of a miss. Just as a single missed free throw can cost a basketball championship, so too can an equity "miss" lead to drastic consequences, as the past 10 years have shown. Superior equity returns are not guaranteed, so why does our industry act as if they are? More importantly, why do investors take all that risk for a skinny equity premium?

We at Research Affiliates do not expect bonds to beat stocks over the next 10 or 20 years. I offer this brief history lesson to illuminate the fact that the much vaunted 4–5 percent risk premium for holding stocks is unreliable and a dangerous assumption to rely on for future plans. In our view, a more reasonable assumption would be 2–3 percent, which reflects history excluding the rise in valuation multiples of the past 30 years. A consideration of today's low starting yields, the prospective challenges from our addiction to debt-financed consumption, and headwinds from demographics would put the ERP closer to 1 percent.

To act as if the past 200 years were fully representative of the future would be foolish. For one thing, the United States was an emerging market for much of that period, with only a handful of industries and an unstable currency. In the past century, we dodged challenges and difficulties that laid waste to the plans of investors in many countries. Taleb (2007) has pointed out that black swans—unwelcome outliers that spring up well beyond the bounds of normalcy—are a recurring phenomenon; the abnormal is, indeed, normal. U.S. stock market history is but a single sample of a large and unknowable population of potential outcomes.

Peter Bernstein relentlessly reminded us that there are things we can never know, that prosperity and investing success are inherently "risky" and can disappear in a flash. Uncertainty is always with us; the old adage puts it succinctly: If you want God to laugh, tell him your plans. Concentrating the majority of one's investment portfolio in one investment category on the basis of an unknowable and fickle long-term equity premium is a dangerous game of "probability chicken."

The Unchanging ERP

An enduring myth is the notion that the ERP should be static across time and across assets. Why, however, should British Petroleum, struggling to recover from the largest oil spill in history, command the same risk premium as Apple, enjoying acclaim for a product line that serves the appetites of the consumer market with remarkable prescience? BP seems to be riskier than Apple. Should it not command a higher risk premium (and, therefore, a lower price)? Why should the broad stock market command the same risk premium when it is gripped by fear of the apocalypse in the financial services community (as in early 2009) as when optimism is being fueled by a booming economy and a startling surge in technological innovation (as in early 2000)? The year 2009 felt riskier than 2000. So, should stocks have broadly commanded a higher risk premium (and, therefore, a lower price) in 2009 than in 2000? Intuitively, the ERP should obviously vary both across time and across assets.

Many in academia like the simplicity of a fixed risk premium. Simplicity is a good thing, but recall that Einstein was fond of saying, "Make everything as simple as possible, but not simpler." A fixed risk premium is a hypothesis, not a fact; indeed, it is one of the least defensible hypotheses in the finance world today. There is no reason to assume a static risk premium. Nothing in neoclassical finance theory requires a static risk premium, and behavioral finance essentially insists on a risk premium that varies over time and across assets. Indeed, recent developments in neoclassical finance theory have focused on time-varying and cross-sectional differences in risk premiums.[3]

A question that emerges from these recent developments in neoclassical finance is: What's the difference between an inefficient market and a market in which the risk premium varies both cross-sectionally and across time? Would it not be easier to simply dispense with the efficient market hypothesis and recognize that price equals an invisible fair value plus or minus a mean-reverting error? Siegel (2006) and Hirshleifer, Glazer, and Hirshleifer (2005) have both likened the debate about this question to the slow acceptance of Copernican cosmology in preference to the bizarre epicycles that were needed to defend Aristotle for more than 1,500 years. Without Copernicus, people could explain the movement of the planets with considerable precision, but because the basic pre-Copernican theory was wrong, no one could figure out why. With Copernicus, Newton was able to answer "why."

The notion that fair value equals price deprives fair value of any independent meaning. Moreover, this notion deprives the academic, empirical, and practitioner communities of a rich opportunity to consider the mathematics and the practical implications of a world in which price and value differ.

The ERP Puzzle: Less Puzzling Than We Might Think

Academia has been abuzz for most of three decades about the ERP Puzzle: Stocks have delivered premium returns relative to bonds or cash that are outsized relative to the return premium that would, in theory, suffice to justify the incremental risk. Although much of macroeconomics points toward a *rational* ERP (for stocks relative to bonds) measured in 10ths of a percent, observed excess returns over long spans have often been 5 percent or more. Until recently.

An observed excess return of 5 percent is not the same thing as an *ex ante* expectation for a 5 percent ERP. For example, if stock market valuation multiples soar, adding a large unexpected increment to returns, excess returns can soundly exceed the *ex ante* ERP. But the opposite can happen just as readily. Indeed, the opposite was the nature of the past decade: Stock market yields nearly doubled as bond yields tumbled, fueling both the bleak stock market returns and the robust real returns for bonds. Yet, despite stocks delivering 700 bps less than long-term

[3]The capital asset pricing model allowed for cross-sectional differences in expected returns, but these returns were driven solely by beta. Many extra dimensions seem to be necessary to fit the data; Fama and French (1992, 1993) explored the joint influence of size and valuation, but a myriad of other dimensions have appeared in recent years. Campbell and Shiller (1988) opened the door in the 1980s for time-varying stock market returns; this approach was subsequently extended by Fama and French (1988). Theoretical explanations were explored by Campbell and Cochrane (1999). Finally, Cochrane's (2011) presidential address to the American Finance Association focuses specifically on the whole issue of time-varying and cross-sectional variation in risk premiums.

T-bonds, no reframing of the ERP Puzzle has occurred; there has been no questioning of why the recent risk premium is far *lower* than finance theory would suggest. Evidently, for many observers a history supported by soaring valuation multiples (and plunging dividend yields) is fair game for bolstering the forward-looking ERP, while a plunge in valuation multiples (and a huge jump in dividend yields) should be ignored in setting that same forward-looking ERP.

If the historical norm for the *expectational* ERP has been roughly half as large as the observed excess return from that rather special span of 1926–2000, the ERP Puzzle remains unsolved, but it is a bit less puzzling. If 100 people are polled on their appetite for equity market risk (I have done this informally many times), almost everyone will be found to eagerly embrace equity market risk if they truly believe that they will earn a 5 percent excess return over bonds, on a long-term compounded basis. That appetite diminishes with a shrinking ERP. The breakeven point, where half of the 100 people will choose *not* to hold an equity-centric portfolio, tends to center on roughly a 2 percent gap or a little more. That percentage point difference is the same ERP that Bernstein and I identified as the historical "normal" ERP in our 2002 article. Hardly anyone will want an equity-centric portfolio if they truly believe that they will garner only 1 percentage point more than long bonds or TIPS.

In our polling experiments, I venture to state that we would find almost no "votes" for accepting equity risk for the few 10ths of a percent incremental return for stocks that finance theory would justify. No one wants 15 percent annual volatility (compounding to about 50 percent total volatility over a 10-year span) if the expected annual return for all the risk is only about 0.5 percent more than the return for bonds.[4]

If market inefficiencies are firmly rooted in behavioral finance, it is easier to close a 2 percent gap than a 4 percent or 5 percent gap. The ERP Puzzle is considerably less puzzling.

Stocks for the Long Run? Yes, but How Long?

For most people, "slender" is an attractive goal.[5] For investors, however, a slender return or a slender risk premium is not at all attractive. For those seeking investments that are priced to offer material benefits to compensate for risk—a solid risk premium—bigger is better.

Few serious observers of the capital markets would argue that the future risk premium for stocks relative to bonds can rival the lofty excess return that stocks have delivered in the past. In the 85 years covered by the Ibbotson data, stocks delivered a real return of 6.6 percent, against 2.1 percent for bonds.

[4]By "total volatility," I mean 10-year (not annualized) lognormal volatility.

[5]This section is excerpted and amended from Arnott (2004).

Terrific! But a big part of this return is attributable to the past increase in the value that the market attaches to each dollar of earnings or dividends. Most observers would think subtracting expansion in the valuation multiple would be reasonable when framing future return expectations.

Using the growth of $100 over time, **Figure 2** breaks the total return on equities into its constituent parts.[6] Panel A does so for the 209 years from 1802 to 2010, and Panel B does so for the 85-year span covered by the Ibbotson data.

For the 209-year time span, the total return is 7.9 percent and the breakdown is as follows:

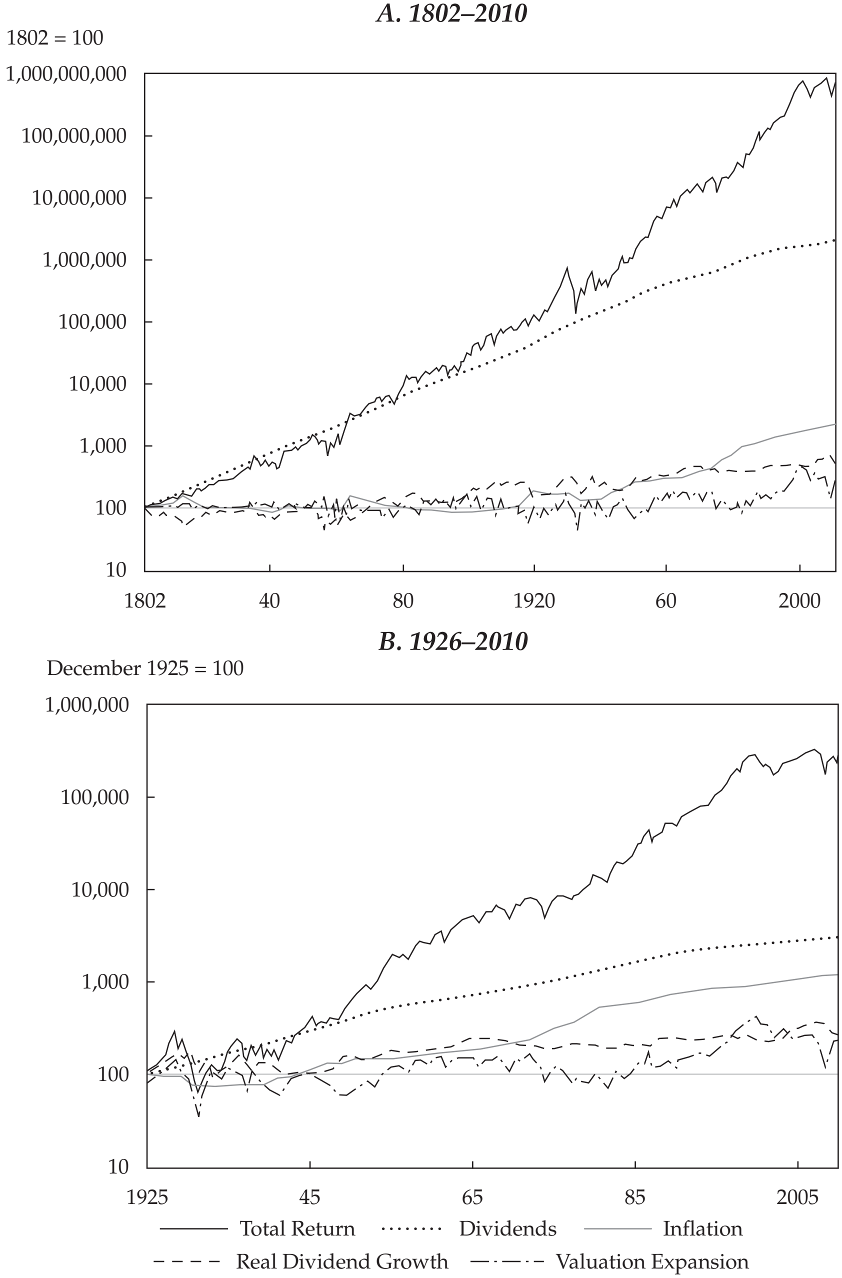
- *4.9 percent from dividends*. Suppose an investor received only the dividend yield, with no price appreciation, no growth in dividends, and no inflation contributing to price and dividend growth. Then, the investor's $100 would be worth $2.1 million in 2010. Pretty good.
- *1.5 percent from inflation*. Suppose an investor participated only in the part of the capital gain that came from inflation—no income, no growth in income, and no rising valuation multiples. This investor's $100 would have grown to $2,200 by 2010: The cost of living has risen 22-fold, according to U.S. Consumer Price Index statistics. Of course, the $2,200 would buy only what $100 would have bought in 1802 (by definition of "inflation").
- *0.8 percent from real growth in dividends*. Suppose an investor gave away his or her income, experienced no inflation, and did not participate in rising valuation levels but did participate in the real growth in the dividends from stocks. This investor would now have $552—after many more than 200 years. That amount is far less than most people would have expected.
- *0.5 percent from rising valuation multiples (hence, falling yields)*. Suppose an investor received no income, saw no growth, and suffered no inflation but did have assets rise with the rise in equity valuation levels. This investor would have had $100 grow to $265 because dividend yields fell to 35 percent of their 1802 levels [or, viewed in terms of valuation multiples, price-to-dividend ratios (P/Ds) rose to nearly three times the 1802 levels]. P/Es saw a similar increase.
- *0.2 percent from compounding of the multiple sources of return*.

The total return from equities for 1926–2010 is 9.9 percent, and the breakdown is similar to that in Panel A:

- *4.1 percent from dividends*.
- *3.0 percent from inflation*.

[6]Figure 2 updates Arnott (2003).

Figure 2. Attribution of Stock Market Returns (lognormal scale)



Source: Based on data from CRSP, Morningstar (Ibbotson), Robert Shiller, and William Schwert.

- *1.3 percent from real growth in dividends.*
- *1.1 percent from rising valuation levels.*
- *0.4 percent from compounding.*

For the full 209-year span starting in 1802, the 7.9 percent total return for stocks compares with 5.1 percent for long-term government bonds, giving us a 209-year excess return of 2.7 percent (net of compounding). Over the 85-year Ibbotson span, the long-term bond return is 5.2 percent and stock market excess return is 4.4 percent (again, net of compounding). If we take out the historical rise in valuation level—0.5 percent and 1.1 percent, respectively—these excess returns shrink to 2.2 percent for the longer period and 3.3 percent for the 85-year span.

Details of the impact of a "new normal" (in which GDP growth is impeded by the triple threat of deficits, debt, and demographics) on the ERP are beyond the scope of this paper. I would like to observe, however, that as people live longer and work longer, they have more time to accumulate wealth in anticipation of retirement. This phenomenon should lead investors to accept lower forward-looking stock and bond market returns and a lower risk premium for stocks. This phenomenon may be the cause of Japan's low current yield for both stocks and bonds and the steady erosion in these yields in the United States. It may also help explain investors' tolerance of low sovereign yields—even in the face of steadily escalating debt burdens and escalating fears of eventual defaults. Apparently, the risk premium should be lower than the historical 2–3 percent excess return, and a lower risk premium is wholly consonant with lower long-term return expectations for both stocks and bonds.

Let's explore the consequences of a slender risk premium. If stocks always offered a 5 percent risk premium relative to bonds, then no long-term investor would diversify away from stocks. The arithmetic is compelling. If stocks normally delivered better returns than bonds by 5 percent per year compounded over time, the long-term investor would have almost a 95 percent chance of winning with stocks by the end of a 20-year span. The cult of equities and the notion of stocks for the long run are predicated on such a lofty risk premium. If the risk premium is smaller, then the arithmetic quickly becomes drastically less interesting: If the risk premium falls by half, the time required to have high confidence of winning with stocks quadruples. The arithmetic is simple but powerful.[7]

Consider a disaster scenario for an investor—the 5th percentile outcome. **Figure 3** shows the 5th percentile relative wealth outcome for various risk premiums over time. In Panel A, if the difference in returns between stocks and

[7]I am indebted to André Perold for pointing out that if the risk premium falls by half, the time required to have high confidence of winning with stocks quadruples.

bonds is 5 percent and has a volatility of 15 percent, then the 5th percentile outcome is a 19 percent shortfall of stocks relative to bonds after one year.[8] That is, the investor would have a 5 percent chance of stocks underperforming bonds by 19 percent or more in a year. But over two years, the 5th percentile outcome is *not* another loss of 19 percent after the initial loss of 19 percent. Because risk expands with the square root of time, the 5th percentile outcome over two years is 34 percent below the mean. But the mean return has now grown another 5 percent, to a 10 percent gain. Thus, the 5th percentile outcome is a loss of only 24 percent over the two years, barely 5 percent worse than the one-year case.

In fact, if stocks can reasonably be expected to deliver 5 percent more than bonds, the "worst-reasonable" (or 5th percentile) outcome is that the equity investor is underwater relative to bonds by 26 percent after five years and never falls any lower. After five years, the picture becomes brighter. And, after 25 years, the investor has a better than 95 percent chance of winning with stocks, relative to bonds. In a nutshell, this kind of analysis is the basis for recommending stocks for the long run.

Unfortunately, some time periods, including the past decade, delivered far worse outcomes than a mere 26 percent peak-to-trough relative performance drawdown. If long-term bonds yield 4 percent, an investor needs to get a long-term return of 9 percent from stocks to get a 5 percent risk premium. If stocks are yielding 2 percent and if stocks have to return 9 percent, then stocks must deliver long-term earnings and dividend growth of 7 percent above the dividend yield. Such performance is a lot to ask. Annual per share earnings growth in the 20th century (no slacker for growth as centuries go) averaged slightly more than 4 percent, of which fully 3 percent was inflation.

Suppose earnings growth is only 4 percent, or 3 percent, or 2 percent. These growth rates, added to a 2 percent dividend yield, will correspond to a (respective) 6 percent, 5 percent, and 4 percent total return and, therefore, a (respective) 2 percent, 1 percent, and zero risk premium. After 25 years, the 5th percentile bleak outcome has the equity investor, respectively, 50 percent, 60 percent, and 70 percent behind the bond investor and still headed south. This bad news is the 5th percentile outcome, but it is well within the realm of possibility.

With smaller risk premiums, the shortfalls can be larger and it takes longer to recover. For example, Panel B shows that the worst-reasonable outcome for a 2 percent risk premium reaches about a 50 percent shortfall, and the equity investor finally has 95 percent confidence that stocks will beat bonds in 150

[8]The 5th percentile is 1.6 standard deviations below the mean. The standard deviation of 15 percent times 1.6 results in a 5 percent chance of having stocks perform 24 percent below this 5 percent mean outperformance, for a shortfall of 19 percent relative to bonds.

years. This point is also about the time that the worst-reasonable outcome with a 1 percent risk premium hits its low point, at 77 percent less wealth than the bond investor has. At this risk premium, the equity investor is still way behind bonds after 200 years in the 5 percent outcome.

In short, stocks work for the long run if the risk premium is large. But the "normal" risk premium over the past two centuries has been shown to be about 2.4 percent (Arnott and Bernstein 2002) and, if the same technology is used as in the 2002 paper, would be about 1.4 percent today. If the long-term average of 2.4 percent is right, then 100-year investors can expect their stocks to beat their bonds with 95 percent confidence. If the current risk premium is lower than 2.4 percent, the investor will need a longer horizon to have this much confidence in the superiority of the stock holdings.

Naturally, if the investor is willing to settle for a 60 percent likelihood of success, the span needed to wait for success is considerably shorter. But the myth is that a reasonable span for patient investors is all that is needed for stocks to assuredly outpace bonds. This myth is simply untrue unless stocks are priced to deliver a large risk premium relative to bonds.

The Myth of Buybacks

The bull market of the 1990s was built largely on a foundation of two immense misconceptions.[9] Investors were told the following:

1. With the coming of the technology revolution and a "new paradigm" of low payout ratios and internal reinvestment, earnings will grow faster than ever before. Real growth of 5 percent will be easy to achieve.[10]
2. When earnings are not distributed as dividends and not reinvested into stellar growth opportunities, they are distributed back to shareholders in the form of stock buybacks, which are a vastly preferable way of distributing company resources to the shareholders from a tax perspective.[11]

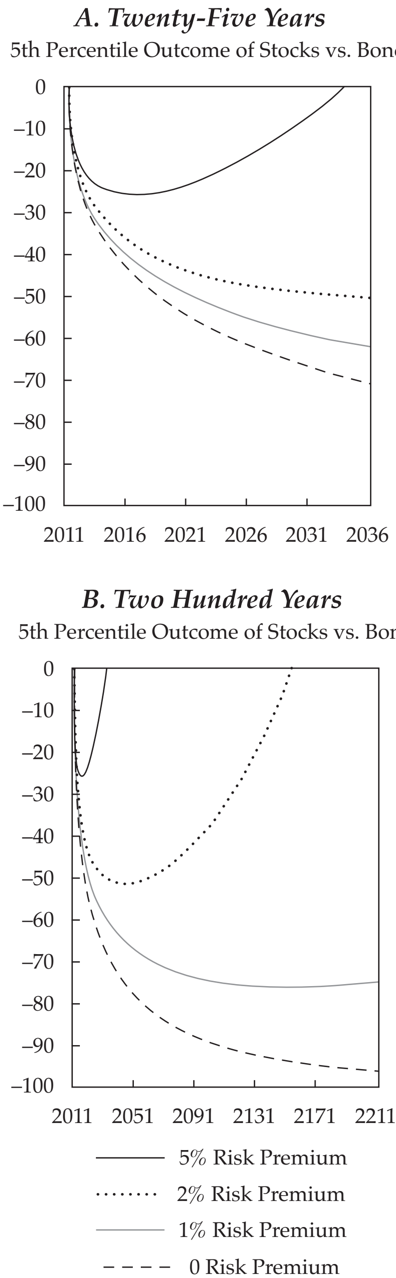
The vast majority of the institutional investing community has believed these untruths and has acted accordingly. Whether these myths are lies or merely errors, they are serious and demand scrutiny. Let's examine reinvestment first.

[9]This section is excerpted and amended from Bernstein and Arnott (2003).

[10]Like the myth of Santa Claus, this story is highly agreeable but is supported by neither observable current evidence nor history. Asness and I debunked this idea in a 2003 article (Arnott and Asness 2003). The work of Miller and Modigliani (1961) is often used as theoretical justification for this claim, although their capital equivalence theorem makes a typical array of simplifying assumptions (market efficiency, no taxes, free trading, etc.) not found in the real world. Furthermore, their work applies cross-sectionally.

[11]Bernstein and I demonstrated that stock repurchases rarely exceed new share issuance. The norm appears to be a "Two Percent Dilution" (Bernstein and Arnott 2003).

Figure 3. The Arithmetic of Long-Term Returns in the United States: 5th Percentile Relative Wealth Outcomes vs. Equity Risk Premiums

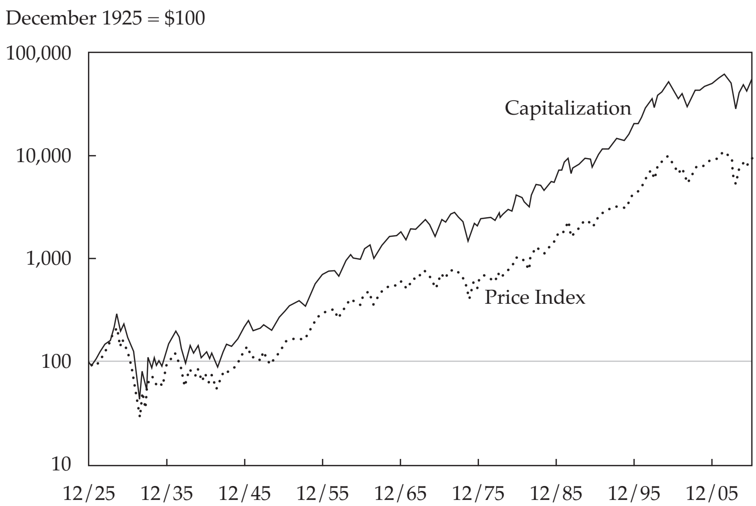


I would not dispute the attractions of stock buybacks. They are a tax-advantaged way to provide a return on shareholder capital, particularly when compared with dividends, which are taxed twice. Buybacks have enormous appeal. Contrary to popular belief, however, apart from brief spans in the 1980s and the latest decade, they have not occurred to any meaningful degree in the past 85 years.

I suggest a simple measure of net new issuance—namely, the ratio of the proportionate increase in market capitalization to the proportionate increase in price. For example, if over a given period the market cap increased by a factor of 10 and the cap-weighted price index increased by a factor of 5, then 100 percent net share issuance has taken place in the interim.

This relationship has the advantage of factoring out valuation changes and splits because they are embedded in both the numerator and denominator. Furthermore, it holds only for universal market indices, such as the CRSP Cap-Based Portfolio indices 1–10, because less inclusive indices can vary the above ratio simply by adding or dropping securities. **Figure 4** shows the growth of $100.00 in total market cap and in the price of the CRSP 1–10. Note that even the CRSP data can involve adding securities: CRSP added the American Stock Exchange in 1962 and NASDAQ stocks in 1972.

Figure 4. Growth of U.S. Stock Prices and Capitalization, 1926–2010
(lognormal scale)



Source: Based on CRSP data.

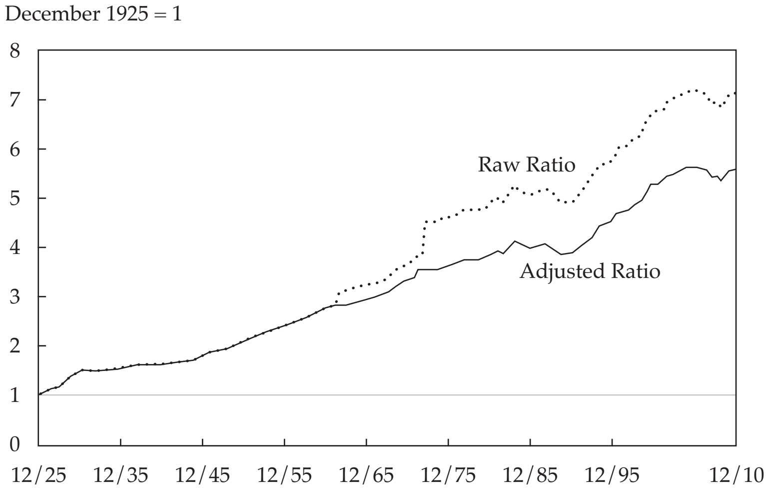
An initial public offering (IPO) or a secondary equity offering (SEO) dilutes investors in the broad index. A buyback that reduces a company's outstanding float increases existing shareholders' ownership of the company. A buyback that merely offsets management stock option redemption—a common so-called buyback—is a wash; it does not change the float, so it is not a true buyback.

Note in Figure 4 how market cap slowly and gradually pulls away from market price. The gap does not look large in this figure, but by the end of 2010, the U.S. market cap index had grown 567-fold whereas the price index had grown only 101-fold. The reason for this discrepancy is simple: 82 percent of today's stock market consists of businesses that did not exist in 1925. For every share of stock extant in 1926, there are now 5.65 shares. These data imply net new share issuance at an annualized rate of slightly more than 2 percent per year.

To give a better idea of how this phenomenon has proceeded over the past 85 years, **Figure 5** shows a plot of a dilution index, defined as the ratio of capitalization growth to price index growth. (The adjustment for the stock additions of 1962 and 1972 is evident in Figure 5, where the dilution ratio was held constant for the two months during which the shifts took place.) Figure 5 traces the growth in the ratio of (1) the total capitalization of the CRSP 1–10 to (2) the market value–weighted price appreciation of these same stocks. The fact that this line rises nearly monotonically shows clearly that new share issuance almost always sharply exceeds stock buybacks. The notable exceptions are in the late 1980s, when buybacks outstripped new share issuance, and in the mid-2000s, when a flurry of demand from shareholders for buybacks occurred. That stock buybacks were an important force in the 1990s is simply a myth. The *belief* that stock buybacks were happening at an unprecedented pace may have been an important force, however, in the bull market of the 1990s.

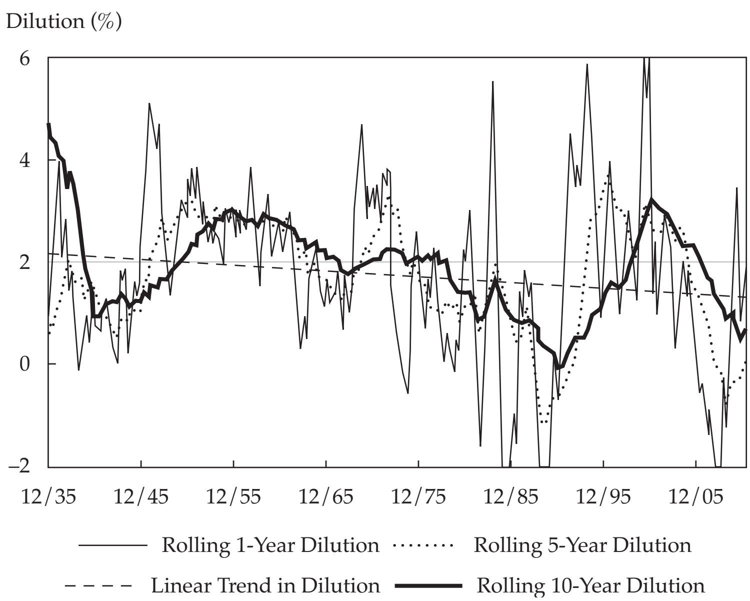
Figure 6 shows the rolling 1-, 5-, and 10-year growth in the aggregate supply of equity capital; hence, dilution of an index affects investors' ownership of the market portfolio. Keep in mind that every 1 percent rise in equity capital is a 1 percent rise in market capitalization in which existing shareholders did not (and could not) participate. Except for the 1980s, the supply growth was essentially never negative even on a 1-year basis. How the myth of stock buybacks gained traction after the 1980s is clear; it was such a pervasive pattern in those years that even the 10-year average rate of dilution briefly dipped negative. But then, during the late 1990s, stock buybacks were outstripped by new-share issuance at a pace that was exceeded only in the IPO binge of 1926–1930. This surge in the supply of new stock is evident whether we are looking at net new-share issuance on a 1-, 5-, or 10-year basis. A recent, 2005–2007, spate of buybacks brought back the illusion that stock buybacks are a normal means by which management rewards shareholders in a tax-advantaged fashion.

Figure 5. CRSP U.S. Market Capitalization/Price, 1926–2010



Source: Based on CRSP data.

Figure 6. Annualized Rate of Shareholder Dilution in the United States, 1935–2010



Source: Based on CRSP data.

Those who argue that stock buybacks will allow future earnings growth to exceed GDP growth can draw scant support from history. Could buybacks be large enough to be an important complement to dividends as a means of rewarding shareholders? Of course. Enormous earnings growth, far faster than real economic growth, did occur from 1990 to 2000. But much of this earnings growth was dissipated through shareholder dilution in the form of IPOs and SEOs.

Expected stock returns would be highly agreeable if dividend growth, and thus price growth, proceeded at the same rate as aggregate economic growth, or better. Unfortunately, this growth does not occur: Comparing the Dimson, Marsh, and Staunton (2002) 20th century dividend growth series with aggregate U.S. GDP growth, we find that even in nations that were not savaged by the century's tragedies, dividends grew, on average, 2.3 percent more slowly than the GDP. Similarly, by measuring the gap between the growth of market capitalization and share prices in the CRSP database, we find that between 1926 and the present, a 2.3 percent net annual dilution occurred in the outstanding number of shares in the United States.

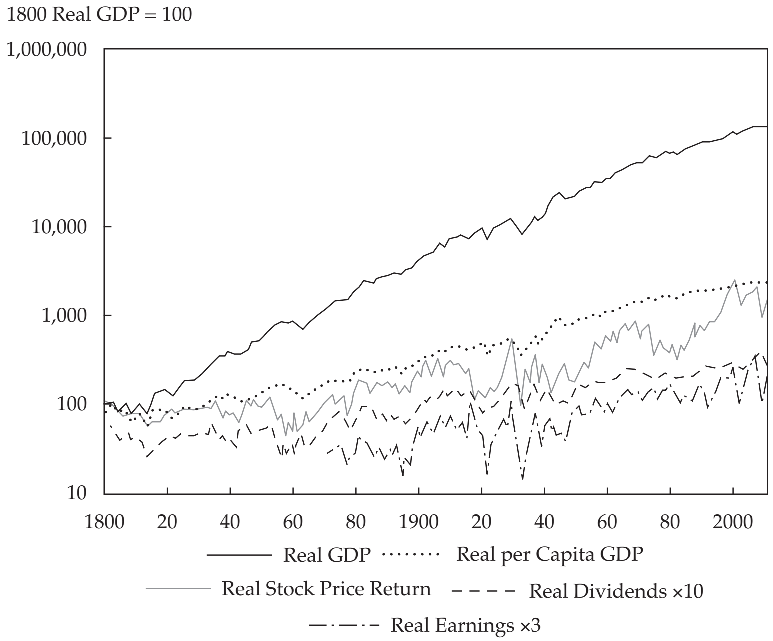
Thus, two independent analytical methods point to the same conclusion: In stable nations, net annual creation of new shares is roughly 2 percent, which is the "2 percent dilution" that separates long-term economic growth from long-term per share dividend, earnings, and share price growth.

The Mythical Link of GDP Growth and Earnings Growth

Over the past two centuries, common stocks have provided a sizable excess return to U.S. investors: For the 200 years from 1802 through 2001, the returns for stocks, bonds, and bills were, respectively, 7.9 percent, 5.2 percent, and 4.2 percent. In the simplest terms, the reason is obvious: A bill or a bond is simply a promise to pay interest and principal, and as such, its upside is sharply limited. Shares of common stock, however, are a claim on the future dividend stream of the nation's businesses. The ever increasing fruits of innovation-driven economic growth accrue only to the shareholder, not the bondholder.

Viewed over the decades, this powerful economic engine produces remarkably even growth. **Figure 7** plots the real GDP of the United States since 1800. The economy, as measured by real GDP, has grown 1,300-fold since 1800, averaging about 3.5 percent per year. The long-term uniformity of economic growth is both a blessing and a curse. It is reassuring to know that real U.S. GDP has doubled every 20-odd years, partly on the basis of a rapidly growing population. But the data are also a dire warning to those predicting rapid acceleration of economic growth from the computer and internet revolutions. Such

Figure 7. Growth in U.S. Real GDP, Real per Capita GDP, Real Stock Price Return, Real Earnings, and Real Dividends (lognormal scale)



Source: Based on data from CRSP, Morningstar (Ibbotson), Robert Shiller, and William Schwert.

extrapolations of technology-driven increased growth are painfully oblivious to the broad sweep of scientific and financial history in which innovation and change are constant; they are neither new to the current generation nor unique. The technological advances of the 1990s register barely a blip on the long-term history shown in Figure 7; the travails of the past decade are far more noticeable.

The impact of recent advances in computer science pales in comparison with the technological explosion that occurred between 1820 and 1855. This earlier era contained the deepest and most far reaching technology-driven changes in everyday existence in human history. These changes profoundly affected the lives of those from the top to the bottom of society in ways that can scarcely be imagined today.

At a stroke, the speed of transportation increased tenfold and communications became almost instantaneous. Until 1820, people, goods, and information could not move faster than the speed of a horse. Within a generation, journeys achieved an order-of-magnitude less time, expense, danger, and discomfort because of steam, canals, and the railroad; important information that had previously required the same long journeys—taking weeks or months—could be transmitted instantaneously by telegraph.

Put another way, the average inhabitant of 1815 would have found the world of 40 years later incomprehensible, whereas a person transported from 1971 to 2011 would be duly impressed by our technological advances but would have little trouble understanding the intervening changes in everyday life (and would be shocked that we have not revisited the moon in 40 years!). From 1815 to 1855, the U.S. economy grew eightfold, whereas in the past 40 years, it has grown barely 150 percent.[12]

The relatively uniform increase in GDP is matched by a similar uniformity in the growth of corporate profits. A direct relationship has existed between aggregate corporate profits and GDP since 1871, the earliest market earnings data that anyone has assembled for U.S. stocks. Therefore, shouldn't stock prices have grown at the same rate? The problem is that per share earnings and dividends keep up with GDP only if no new shares are created. Unfortunately, entrepreneurial capitalism has a dilution effect; it creates new enterprises and new stock in existing enterprises so that *per share* earnings and dividends grow considerably more slowly than the economy, as Figure 7 shows.

In fact, as Figure 7 shows, since 1871, real stock prices have grown at 1.8 percent per year, versus 3.4 percent for real GDP. Furthermore, the true degree of "slippage" is much higher because one-third of the rise in real stock prices after 1871 was the result of a substantial upward revaluation (increase in the P/E or P/D). The highly illiquid industrial stocks of the post–Civil War period rarely sold at much more than 10 times earnings and often sold for multiples of only 3 to 4 times earnings. Those stocks gave way to the instantly and cheaply tradable common shares, priced many times more dearly, that we see today.

Note also in Figure 7 that real per share prices, earnings, and dividends grew at a pace similar to that of per capita GDP (with some slippage associated with the "entrepreneurial" stock rewards to management). Indeed, since 1871, these growth rates have been 1.8 percent for real per share prices, 1.4 percent for earnings, 1.1 percent for dividends, and 1.9 percent for GDP. Why should these rates be so tightly linked? Per capita GDP is a measure of productivity (with slight differences for changes in the workforce, hours worked, and so forth). And aggregate GDP per capita must grow in reasonably close alignment with productivity growth. Productivity growth is also the key driver for per capita income growth and for per share earnings and dividends. Accordingly,

[12]Of course, much of the growth in earlier GDP was driven by population growth, especially in the 1815–55 span. Still, per capita real GDP doubled in 1815–1855 but rose only by slightly more than 60 percent in the past 40 years.

any difference in the growth rates of GDP and the other three measures will mean that capital is deriving outsized benefits from productivity growth relative to labor (and vice versa). If share prices, earnings, and dividends grow faster than productivity, return on labor migrates to return on capital; if slower by a margin larger than the value of stock awards to management, then the economy is migrating from rewarding capital to rewarding labor. Either way, such a change in the orientation of the economy cannot continue indefinitely. The migration of returns to capital is corrected by a labor backlash; the migration of returns to labor by a flight of capital.

This observation has sobering implications at a time when corporate profits are near an all-time record high share of GDP and wages are near an all-time low share, as was the case in 2007 and again in 2011. Any student of market history will see that mean reversion is a powerful force in the interplay between these measures.

Is the United States unique? In their book *Triumph of the Optimists,* Dimson, Marsh, and Staunton (2002) tracked stock, bond, and cash returns over the previous century in 16 countries. I compared dividend growth, price growth, and total return with data on GDP growth and per capita GDP growth for the 16 countries covered by Dimson et al. (2002) in the 20th century. The GDP data come from Maddison's (2001) world GDP survey for 1900–1998 and the International Finance Corporation for 1998–2000. For the average country, there is a startling gap of 3.3 percent between dividend growth and the growth rate of aggregate GDP. For per capita GDP growth, there is still a 2.4 percent annual shortfall between dividend growth and per capita GDP growth. In the 2010 update of the Dimson et al. study, the results changed little.

The 20th century was not without turmoil. In our 2003 study, Bernstein and I divided 16 nations (see Bernstein and Arnott 2003) into two categories according to the degree of devastation visited upon them by the era's calamities. One group included countries that suffered substantial destruction of their productive physical capital at least once during the century; the other group did not. The nine nations in the first group were devastated in one or both of the world wars or by civil war. The remaining seven suffered relatively little direct damage.

For the nations that were devastated during the world wars or revolutions, the good news is that their economies repaired the devastations by the end of the 20th century. They enjoyed overall GDP growth and per capita GDP growth that rivaled the growth of the less scarred nations. The bad news is that the same cannot be said for per share equity performance. A slippage of 4.1 percentage points occurred between the annual growth rates of their economies and per share corporate payouts.

In the fortunate group—those untroubled by war, political instability, and government confiscation of wealth—we nevertheless found, on average, dividend growth 2.3 percentage points less than GDP growth and 1.1 percentage points less than per capita GDP growth. These results are similar to the 2.7 percent and 1.4 percent figures observed in the United States during the 20th century.

Why Does the Finance Industry Think Dividends Don't Matter?

Two misconceptions about the ERP that I stated in the opening are linked to the prevailing view that dividends aren't especially important. Respected academics have suggested the following:

1. If dividend yields are below historical norms, the market is clearly expecting faster future growth. (With this circular logic, we might as well buy at any valuation multiple because our buying creates still higher multiples and the resulting lower yields will imply even faster future growth.)
2. If payout ratios are below historical norms, the retained earnings will be reinvested in projects that will lead to faster future growth. (M&M are thus invoked. If that shortcut is sound, why not encourage management to retain all of the earnings? After all, the massive technological investments between 1998 and 2001, which were funded out of retained earnings, certainly must have led to a major step-up in subsequent earnings growth rates.)

A careful examination of the data provides no support for this intertemporal interpretation of M&M. Miller and Modigliani (1961) developed a brilliant thesis proving that dividend policy and structural debt/equity decisions do not matter so long as investors are rational, markets are efficient, there are no taxes, management operates in the best interests of the shareholders, bankruptcy costs are ignored, and so forth. These arguments seem to be tacitly based on the notion that because our "best" finance models (those that most accurately explain and predict phenomena) rely on certain assumptions, the assumptions must also be right. Even the best finance theories and models, however, rely on assumptions that are deliberate simplifications of the real world. Accordingly, even M&M's assumptions must be considered approximations of the real world.[13]

[13]Paul Samuelson said much the same: "Only the smallest fraction of economic writings, theoretical and applied, has been concerned with the derivation of *operationally meaningful* theorems. In part at least, this has been the result of the bad preconception that economic laws deduced from *a priori* assumptions possessed rigor and validity independently of any empirical human behavior. But only a very few economists have gone so far as this. The majority would have been glad to enunciate meaningful theorems if any had occurred to them." (Samuelson 1947, p. 3) [Italics in the original.]

When we approach the models, we can rely on common sense. Because the models are based on certain assumptions, we can examine the validity of those assumptions before we accept the dictates of the models as "truth."

Bond yields are accepted as the dominant factor in setting bond return expectations, but dividend yields (and, often, even earnings yields) are seen as secondary to growth in setting equity return expectations. Yet, overwhelming global evidence suggests a strong positive link between the dividend yield and both the subsequent real return for stocks and the subsequent excess return of stocks over bonds. It is a myth that in an efficient market investors will accept a lower yield whenever they are confident that future real growth in earnings will make up the difference. It is a myth that in an efficient market investors will not care about payout ratios because retained earnings make up for the deferred income in the form of more rapid growth; that is, lower dividends now mean higher ones later. These enduring myths lead to complacency about the ERP.

Conclusion: Why These Enduring Myths?

Why do we so readily accept forecasts based on extrapolating the past? If bond yields fall from 8 percent to 4 percent, and the bonds thereby deliver a 12 percent annualized return (including capital gains), should we assume 12 percent as a future bond return? Of course not! The capital gains that pushed the 8 percent yield up to a 12 percent return are nonrecurring. Should we "conservatively" assume a bit less than the historical 12 percent return—say, 10 percent—in recognition that yields are down? Of course not; the yield is 4 percent! So, the expected return is also 4 percent. Yet, much of our industry, with an assist from assorted academic luminaries, is wedded to forecasting equity returns by extrapolating past returns.

Returns are, for the most part, a function of simple arithmetic. For almost any investment, the total return consists of yield, growth, and multiple expansion or yield change. For bonds, the growth is simple: Fixed income implies zero growth. For high-yield or emerging market debt, growth is negative because of the occasional defaults. For stocks, based on a long history, growth tends to be around 1 percentage point above inflation.

The 7 percent real stock market returns of the past 78 years consist of roughly 4.3 percent from dividend yield, slightly more than 1 percent from real dividend growth, and 1.5 percent from multiple expansions. We cannot expect 7 percent in the future because we cannot rely on expansion of the multiple. Most observers would, at a minimum, subtract multiple expansions from future return expectations. Now, the return is down to about 5.5 percent. The current dividend yield, however, is only 1.6 percent, not 4.3 percent, which takes the real return down to around 2.5 percent to 3 percent. And that is without any "mean reversion" toward historical valuation levels. Much of our industry seems to prefer forecasting the future by extrapolating the past, however, because doing so produces a higher number.

Why is a low (even negative) risk premium considered shocking? Nothing assures a positive risk premium. Only finance theory (with numerous assumptions) suggests that this situation is not possible. But finance theory also posits that rational investors shun lotteries and casinos. Outside of finance theory, a temporary negative risk premium should be possible.

Should equity provide a positive risk premium relative to bonds? Of course. Is it written into contract law for any assets we buy? Of course not. In the long run, the market must adjust to provide a positive expected risk premium. But the adjustment to a positive rationally expected risk premium may be painful. A 5 percent risk premium is often taken as fact, but it is only a hypothesis and, many times, an ill-reasoned one.

Even the most aggressive, intellectually honest forecasts of long-term earnings or dividend growth assume GDP growth as an upper bound. Growth in the portion of GDP represented by corporate profits comes from the growth of existing enterprises and the creation of new enterprises. Stock market investments allow investors to participate in the former but not the latter. Because more than half of real GDP growth comes from entrepreneurial capitalism, real earnings and dividends should collectively grow a bit under half the rate of economic growth.

Nevertheless, consensus long-term earnings growth estimates routinely exceed sustainable GDP growth. The current consensus growth rate for earnings on the S&P 500, according to the Zacks Investment Research survey, is 10 percent, which, if we assume a consensus inflation expectation of 2–3 percent, corresponds to 7–8 percent real growth. Real earnings growth of 8 percent is six times the real earnings growth of the past century, however, and three times the consensus long-term GDP growth rate. This growth is not possible.

GDP growth, less the economic dilution associated with entrepreneurial capitalism, basically defines sustainable growth in per share earnings and dividends. Accordingly, it is hard to imagine that stocks offer a positive risk premium when they are yielding far less than TIPS. Yet, in December 1999 and January 2000, stock market yields were a scant 1.1 percent whereas the TIPS yield was 4.4 percent. Earnings and dividends on stocks would have needed to grow at 3.3 percent per year (triple the real growth rate of the prior century) for stocks to merely match the total return of TIPS. I believe a negative risk premium (at least for the broad stock market averages relative to TIPS) existed at the beginning of 2000.

Many market observers would agree that the cult of equities and reliance on a 5 percent ERP were the most damaging errors in the institutional sponsor community in the past quarter century. Shouldn't our industry, as a matter of course, question aggressive, unsustainable growth forecasts before acting on them?

Why do we accept rising return expectations in a rising market? In 1982, at a time when stock yields were 5 percent and both earnings yields and bond yields were in the low teens, the average pension return assumption was barely 6 percent. In 2000, the average pension return assumption had risen to approximately 9.5 percent, even though stock dividend yields and bond yields were down by, respectively, 4 percentage points and 8 percentage points. When markets fell in 2007–2009, we began to see pension return assumptions drifting downward again!

Siegel (2007) recognized that this mean reversion reduces the risk of equities for the long-term investor. A puzzle that he does not acknowledge is that, following the largest equity revaluation in history in 1982–2000, mean reversion might exact consequences in the form of reduction of future returns.

Too often, analysts rely on finance theory as a shortcut to easy answers. We point to M&M to reassure ourselves that 70 percent or even 100 percent earnings retention is fine because the retained earnings are surely being used to fund innovations that will lead to unprecedented future growth. We point to the capital asset pricing model (CAPM) to compute expected rates of return and to assess the alphas of our strategies. But none of these remarkable models and theories fully capture reality. Behavioral finance, the principal rival to the models of neoclassical finance theory, helps us understand how human frailties can create the very market behaviors that classical finance theory seeks to explain away, but behavioral finance does not help us decide how to profitably invest.

Our industry, in both the academic and the practitioner communities, is too complacent. Too many people say, "Assuming this, then we can decide that." Too few are willing to question their basic assumptions. As fiduciaries, we owe it to our clients to be less accepting of dogma and more willing to explore the implications of errors in the root assumptions of finance theory. These basic assumptions often fail when they are tested. Failing assumptions are not bad; indeed, that is where the profit opportunities can be found.

If finance theory assumes that markets are efficient and behavioral finance suggests that markets are not efficient, do we discard the less convenient theory? Isn't it better to recognize elements of truth in seemingly incompatible theories? Economics is not physics. Classical finance and behavioral finance *can* both be partially correct. If we recognize this possibility, we gain a rich understanding of the markets in which we seek our clients' profits and our livelihood.

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Time Variation in the Equity Risk Premium

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The equity risk premium (ERP) refers to the (expected; sometimes, realized) return of a broad equity index in excess of some fixed-income alternative. In the past decade, a dramatic shift has occurred in what is considered to be the best source of information about the future ERP: Is it historical average returns or forward-looking valuation indicators?

- Academics and practitioners alike used to think that the ERP is constant over time, in which case the future premium would best be estimated from the long-run average of the realized excess return. If the historical realized outperformance of stocks over bonds was 6 percent, for example, 6 percent would also be the best forecast for the future. Such a rearview-mirror perspective makes the ERP seem especially high at the end of each long bull market, just when market valuation ratios are abnormally high.
- The recent roller-coaster experiences in markets, as well as theoretical and empirical lessons, have converted many observers to the belief that expected returns and premiums vary over time. If so, then past average returns are a highly misleading indicator of future returns. Forward-looking valuation indicators are better and may provide useful timing signals. Low dividend yields or low earnings yields (or their inverse, high price-to-earnings ratios) are now seen as a sign of low prospective stock market returns in just the same way that low bond yields and narrow yield spreads are interpreted as a forecast of low returns in fixed-income markets. This forward-looking logic would have guided investors well during the low equity market yields of 2000 and high market yields of early 2009.

This shift in opinion can also be described as a change in the perceived information in market yields (valuation ratios). Does a low dividend yield in the equity market predict low future returns (reflecting low required risk premiums or investor irrationality) or high future cash flow growth (reflecting growth optimism)? The answer must be one or the other—or some combination of the two. Empirical research has shown that low dividend yields tend to precede subpar market returns rather than above-average growth. In January 2011 in Denver, John Cochrane of the University of Chicago, in the American

Finance Association's presidential address (see Cochrane 2011), argued that a 100 percent reversal had occurred in academic thinking on this question in the past 20–30 years. Cochrane explained the following:

- The ERP is no longer thought to be constant *over time*. All time variation in market valuation ratios was once thought to reflect changing growth expectations (with an unchanging *ex ante* required risk premium), but now all such variation is thought to reflect changing required returns.
- All expected return variation *across stocks* was thought to reflect stocks' differing betas. Now, the beta is thought to explain none of the cross-sectional variation in expected returns.

Not all academics agree. Some harbor doubts about return predictability and argue that the evidence against a constant risk premium is limited. For example, variation in the ERP could be sample specific or reflect subtle econometric problems in predictability regressions.[1] And those who agree that expected returns vary over time have a follow-up debate over whether this time variation reflects rational drivers (such as wealth-dependent risk aversion), varying amounts of risk in the market, or investor irrationality.

Practitioner thinking has experienced similar shifts. Many investors have become open to the idea of market timing since the decade of boom-to-bust cycles, when forward-looking valuation indicators turned out to give decent forecasts. Yet, even if a time-varying ERP reflects a general tendency for investor risk aversion to rise in bad times, the typical investor should not necessarily become a contrarian market timer. As many investors found out in 2008, their risk appetites fell at least as fast as their wealth, so they did not feel inclined to jump at the bargains (low market valuations, high expected returns). Investors with a longer horizon or relatively stable risk preferences may well be the more natural buyers when such contrarian opportunities arise. Even for them, however, exploiting high expected returns is not easy because no one knows when the market will hit bottom—until after the fact.

Before we turn to forward-looking market analysis, consider the historical equity market performance over the past 111 years shown in **Table 1**. The geometric average excess return of stocks over long-term government bonds has been more than 4 percent in the United States but a bit lower in the rest of the world. (The excess returns would be higher if stocks were compared with short-dated U.S. T-bills or if arithmetic averages were used.) Equities have outperformed bonds in all of the markets Dimson, Marsh, and Staunton (2011) studied. The 20th century may have been especially favorable, however, for stocks versus bonds; the return gap for the 19th century was less than 1 percent in the United States.

[1]Typical is the debate between Welch and Goyal (2008) and Campbell and Thompson (2008).

Table 1. Compound Annual (Geometric) Equity Returns and ERPs, 1900–2010

Market	Real Equity Return	ERP over Long-Term U.S. Government Bonds
United States	6.3%	4.4%
World ex-U.S. (in $)	5.0	3.8
World (in $)	5.5	3.8
Range among 19 markets	2.0–7.4%	2.0–5.9%

Source: Dimson, Marsh, and Staunton (2011).

My favorite valuation ratio for the equity market is the inverse of the "Shiller P/E10," which Yale Professor Robert Shiller conveniently updates each month on his website.[2] Because one-year earnings may be too volatile and cyclical for accurate comparisons, Shiller compares today's market prices with smoothed (10-year averages of real) earnings. **Figure 1** compares this ratio, which I'll henceforth call the "real E10/P" or just "E10/P," with the real long-term Treasury yield from January 1900 to February 2011.[3] The solid line correctly predicted high prospective returns for equities in the early 1920s, the 1930s, the 1980s, and more recently in late 2008–2009. Similarly, it captured the low prospective returns in 1929 and 2000, both in stand-alone equity investments and relative to bonds.

Framework to Anchor the Debates

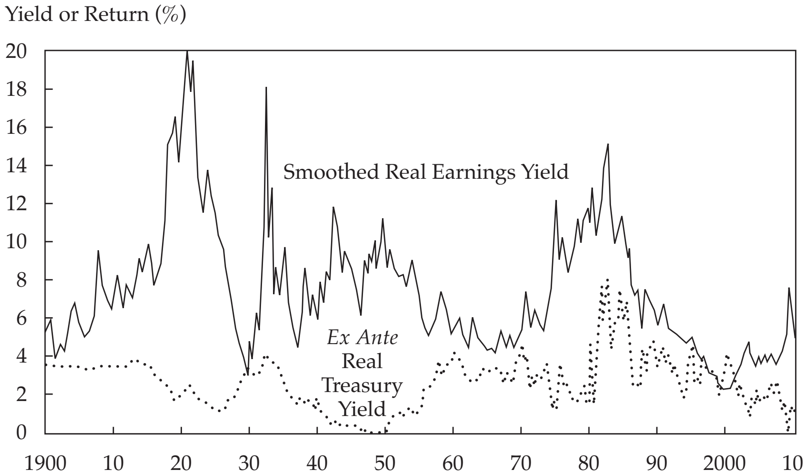
The gap between the two lines in Figure 1 is roughly the forward-looking ERP. Yet, strictly speaking, the Shiller earnings yield equals the *ex ante* real return for equities only under fairly stringent conditions. The dividend discount model (DDM) provides a cleaner conceptual framework than the Shiller earnings yield for assessing the difference between the long-term expected returns of stocks and bonds. Analysts will, of course, debate the inputs of the model and the resulting ERP estimates, but this framework at least gives the debaters a common language.

In the basic version of the DDM, cash flows to equity investors (which can be considered, narrowly, to be dividends) are assumed to grow at a constant annual rate G. A feasible long-run return on equities is then the sum of the cash flow yield (here, dividend yield, or D/P) and the trend of cash flow growth rate,

[2]The P/E10 is the price or index value of the S&P 500 Index divided by the average of the last 10 years of earnings. Shiller's website is www.econ.yale.edu/~shiller/data.htm.

[3]In the real long-term Treasury yield, the nominal Treasury yield is deflated by the consensus forecast inflation for the next decade (for the period before survey forecasts became available in the 1970s, statistical estimates were used). For details, see Ilmanen (2011).

Figure 1. Smoothed Real Earnings Yields of U.S. Equities and *Ex Ante* Real Yields on 10-Year Treasuries, 1900–2011



Sources: Bloomberg; Shiller website (www.econ.yale.edu/~shiller/data.htm); U.S. Federal Reserve; *Blue Chip Economic Indicators*; *Consensus Economics.*

G. The required return on equities, or the discount rate, can be viewed as the sum of the riskless long-term Treasury yield, *Y*, and the required equity-over-bond risk premium, the ERP. Intuitively, markets are in equilibrium when the equity market return that investors require, $Y + ERP$, equals the return that markets are able to provide, $D/P + G$. These expressions can be reshuffled to state the *ex ante* ERP in terms of three building blocks:

$$ERP = D/P + G - Y.$$

The DDM can be expressed in nominal terms (with G_{nom} and Y_{nom}) or in real terms (with G_{real} and Y_{real}) if both expected cash flow growth and the bond yield for expected inflation are adjusted. The model can also be expressed as an earnings discount model if a constant dividend payout rate is assumed. With a constant payout rate, the growth rates of dividends and earnings are equal.

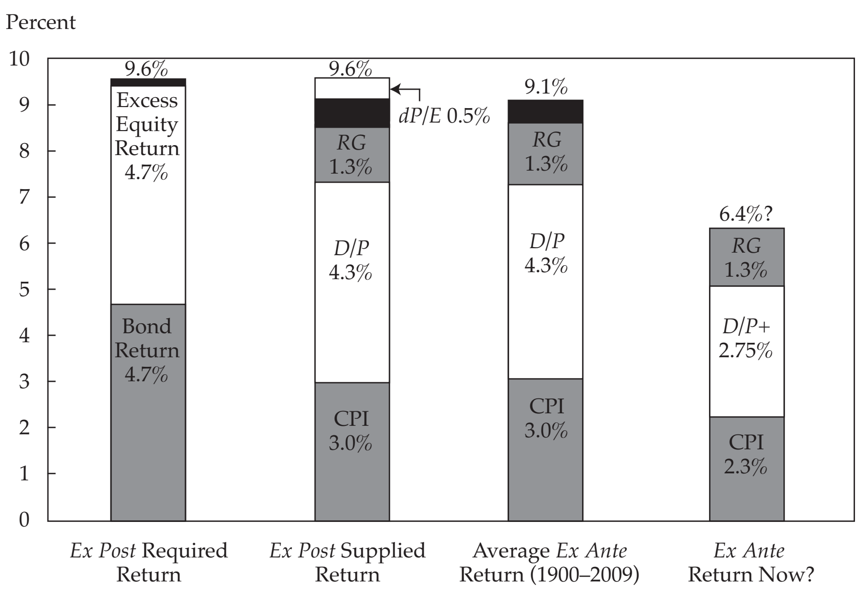
The DDM framework can be easily extended to include a variety of short-term and long-term growth rates, but the use of the DDM to analyze time-varying ERPs can only be informal because it is a steady-state model that assumes constant expected returns and valuation ratios. In a dynamic variant of the DDM, one that allows time-varying expected returns, D/P is a combination of the market's expectations of future (required) stock returns and dividend growth (see Campbell and Shiller 1988).

The DDM framework is simple and flexible, but what inputs to use in calculating the ERP is a topic of wide disagreement. Even the observable inputs—dividend yield and bond yield—are ambiguous because broader payout yields (including, for example, share buybacks) may be appropriate for equities and the maturity and nature (nominal versus real) of the Treasury yield may be debated. The main source of contention, however, is the assumed trend of the growth rate of profits, or earnings per share (EPS), *G*.

Nevertheless, this framework can be used to analyze the building blocks of realized and prospective equity market returns (see Ibbotson and Chen 2003). **Figure 2** decomposes the realized 110-year (1900–2009) compound annual U.S. stock market return of 9.6 percent into its elemental parts with separate decompositions for the "demand" and "supply" of returns. The nomenclature follows Diermeier, Ibbotson, and Siegel (1984). The total return is split into either

- the sum of returns demanded by the investor (the first column in Figure 2), on the assumption that sample averages capture required returns well: 4.7 percent nominal T-bond return + 4.7 percent *ex post* ERP + small interaction terms, represented by the black bands or

Figure 2. Decomposed Historical Equity Market Returns, 1900–2009



Note: RG = real earnings growth, *dP/E* = repricing gains, and CPI is the U.S. Consumer Price Index.
Sources: Arnott and Bernstein (2002); Bloomberg; Shiller website (www.econ.yale.edu/~shiller/data.htm).

- the sum of returns supplied by the economy (the second column in Figure 2): 3.0 percent average inflation + 4.3 percent average dividend yield + 1.3 percent average real EPS growth rate + 0.5 percent repricing effect (which represents the annualized impact of the expansion of the P/E by 75 percent—from 12.5 to 21.9—during the sample period) + small interaction terms.

The third column shows the result when, following Ibbotson and Chen, I deemed the 0.5 percent repricing gain to be an unexpected windfall and subtracted it from the supplied returns.[4] This column suggests, then, that investors required an *ex ante* nominal equity market return of 9.1 percent between 1900 and 2009, on average. If expected returns vary over time and current values differ from the average levels over the sample, this analysis can be misleading for assessing current expected returns. The current inflation rate and equity and bond yields are clearly below historical averages. Using a 2.3 percent rate of CPI growth (the consensus forecast for long-term inflation) and a 2.0 percent *D/P* produces a forward-looking measure predicting only 5.6 percent nominal equity returns. Admittedly, the *D/P* value could be higher if a broader carry measure that included net share buybacks were used, so for the last column in Figure 2, I added 0.75 percent to the estimate (and called it "*D/P*+"). Return forecasts more bullish than the 6.4 percent nominal return in the fourth column would have to rely on growth optimism (beyond the historical 1.3 percent rate of real EPS growth, to be discussed later) or further P/E expansion in the future (my analysis assumes none). More bearish forecasts consider my buyback adjustment excessive and/or my growth or valuation forecasts overly optimistic.

Figure 2 is based on data at the end of 2009. Conveniently, market changes over the subsequent 15 months have been modest. Equity markets have rallied somewhat, with dividend yields dropping from 2 percent to 1.8 percent (and the Shiller E10/P falling from 5 percent to 4.3 percent), whereas Treasury yields and consensus inflation forecasts are virtually unchanged.

So, when asked what I expect the realized outperformance of U.S. equities over Treasuries to be for the decade from the first quarter (Q1) of 2011 to Q1:2021, I pretty much stay with the same numbers. In **Exhibit 1**, I predict 4 percent real (compound annual) return for the equity market and 1 percent real return for Treasuries—close to the current 10-year yield of Treasury Inflation-Protected Securities (TIPS)—thus, a 3 percent ERP. Because inflation terms wash out across stocks and bonds, I do not need to forecast inflation, which is currently an especially hard call. I would assign a ±0.25 percent band around each component estimate.

[4]To be a stickler, I'll note that the yield and growth estimates are consistent only if the payout ratio is constant over time. I could use the real dividend growth rate (averaging 1.2 percent) and the repricing effect based on dividend yield changes (which has a slightly higher annualized impact, 0.7 percent) instead of earnings data, and I would obtain, broadly, the same results.

Exhibit 1. Components of the ERP

Component	Estimate for Next Decade
Equity cash flow yield	2.7% (*D/P* + addition for net buybacks)
+ Real cash flow growth	1.3 (historical average EPS growth)
+ Valuation change	0 (assume unchanged valuations)
− Real Treasury yield	−1
ERP	3%

For the global markets, my ERP forecast is similar. In most countries, I can see somewhat better growth prospects than in the United States, but these prospects are offset by higher real yields. Japan is the one exception; growth prospects are worse there than in the United States.

Debates about the Values of the Main Components

As I have stressed, these building blocks give us a useful framework for debating the values of key components of future ERPs. What are these debates?

Equity Market Yield. Dividend yield is the classic proxy for equity market yield. Having ranged between 3 percent and 6 percent for 40 years, the *D/P* of the S&P 500 Index fell below 3 percent in 1993 for the first time ever and then fell below 2 percent in 1997, remaining there for the next decade. The decline in the *D/P* in the 1980s and 1990s partly reflects a structural change: Many companies replaced dividends with repurchases (i.e., stock buybacks), which were more tax efficient and more flexible and which had a more positive impact on share price (and thereby executive compensation) than did dividends. One reason share buybacks increased is the 1982 change in U.S. SEC rules that provide a safe harbor from price manipulation charges for companies conducting share buybacks.

The obvious improvement in the measurement of the equity market yield would be to include share buybacks. The buyback yield never exceeded 1 percent before 1985 but did in most years thereafter. Even though the buyback yield has in some years exceeded the dividend yield, the buyback yield arguably should not get as high a weight as the dividend yield in any long-run yield measure because it is not as persistent. It is much easier for a corporation to reduce repurchase activities than to cut dividends.

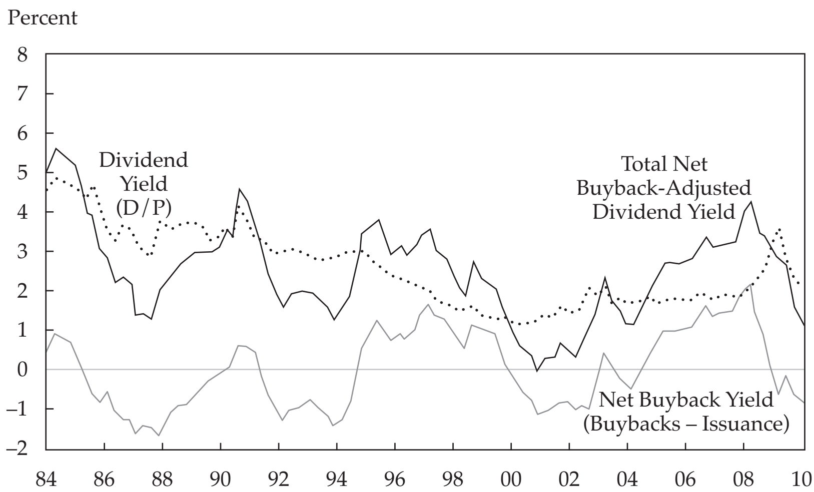
Only adding share buybacks (i.e., not subtracting share issuance), as is sometimes done, would overstate the effective yield. Companies may repurchase shares or pay dividends when they have excess cash, whereas they issue "seasoned" equity when they need more capital from investors.

Cash-financed merger and acquisition deals are another component of cash flows to the investor that could be included in a broad yield measure. The literature on this issue is diverse, however, and hardly conclusive. In computing the net buyback-adjusted yield, net payout yield, and change in Treasury stock, somewhat different data are used to adjust dividend yields, but the intent of all of them is the same: to estimate total cash flow from the company to the investor (see Allen and Michaely 2003; Boudoukh, Michaely, Richardson, and Roberts 2007; Fama and French 2001).

Figure 3 plots one estimate of broader cash flow yield, the dividend yield, and the buyback yield over a quarter century. This broad yield estimate has not been systematically higher than the dividend yield; buybacks and issuance have roughly canceled out over time. Other estimates imply higher cash flow yields, especially since the mid-1990s, so I stay with the 0.75 percent addition over *D/P*. Some may deem this adjustment too high; others, too low. More empirical research is clearly needed.

Equity Cash Flow Growth. Some studies use growth estimates based on analyst expectations for earnings growth or on P/Es, for which they use analyst forecasts of next-year operating earnings. Both approaches embed analyst overoptimism and result in upwardly biased estimates of the ERP.

Figure 3. Equity Market Yield Measures, 1984–2009



Sources: Haver Analytics; Nomura.

A more conservative approach is to use the trend of the rate of growth in real GDP or corporate profits.[5] Even this approach turns out to be overoptimistic. Although many practitioners think that the GDP growth rate is a *floor* for earnings and dividend growth, the rate has historically been a *ceiling* that has been broken only during benign decades. Arnott and Bernstein (2002), Bernstein and Arnott (2003), and Cornell (2010) showed that growth rates of per share earnings and dividends have, over long histories, lagged the pace of GDP growth and sometimes even per capita GDP growth. As **Table 2** shows, between 1950 and 2009, growth rates of earnings and dividends per share almost matched the 1.9 percent real growth rate of GDP per capita but clearly lagged real GDP growth (3.1 percent).

Table 2. Average Real Long-Term Growth Rates (Geometric Means), 1900–2009

Period	Real GDP	Real GDP per Capita	Real EPS	Real Dividends per Share
1900–1949	3.2%	1.8%	1.0%	1.0%
1950–2009	3.1	1.9	1.5	1.3

Sources: Arnott and Bernstein (2002); Haver Analytics.

Taking even longer histories does not help. The first half of the 20th century looked even worse for earnings and dividend growth. When I looked at shorter histories, I saw a prettier picture for a while. Between 1988 and 2007, U.S. real EPS growth averaged 3.7 percent a year—clearly larger than the real GDP growth rate (2.4 percent). This period was an exceptionally benign one, however, for capital markets; for example, the share of GDP represented by corporate profits rose from 8 percent to 11 percent. After 2008, the trailing 20-year real EPS growth rate was negative; after the 2009 recovery, it was still only 1.3 percent.

Studying the global evidence also does not help to raise the growth estimate. Dimson, Marsh, and Staunton (2002) showed that between 1900 and 2000, growth in real dividends per share lagged growth in real GDP per capita in 15 of the 16 countries they examined. Across countries, real dividend growth averaged nearly zero and lagged growth in real GDP per capita by 2.4 percentage points. U.S. dividend growth was somewhat better but still lagged growth in real GDP per capita by 1.4 percentage points.

[5] Some analysts use the trend in the growth of nominal earnings (say, 7 percent). By doing so, they conveniently forget that such nominal growth occurred over a period when inflation averaged 4 percent, whereas the current expected inflation is closer to 2 percent.

MSCI Barra (2010) has contrasted (real) EPS growth and GDP growth between 1969 and 2009 in 16 countries. The researchers found that, averaged across all the countries, annual GDP growth was 2.4 percent—compared with 0.1 percent EPS growth. (Comparable figures in the United States are 2.8 percent and 1.3 percent.) The gap in growth rates between GDP and EPS was positive (0.5–5.0 percent) in all the countries studied except Sweden.

Why? These patterns seem puzzling. In the long run, GDP and profits should have similar trends in growth rates; otherwise, the corporate sector would eventually dominate the economy. (Admittedly, this argument is only relevant over extremely long periods.) An important distinction must be made, however, between aggregate earnings growth and EPS growth. Aggregate earnings growth has matched GDP growth quite closely during the post–World War II era; EPS growth has not.

Investors in existing listed stocks capture only part of aggregate profit growth because a portion of this growth is financed with newly issued equity. Arnott and Bernstein (2002) stressed that new entrepreneurs and labor (including top management) capture a large share of economic growth at the expense of shareholders in existing companies. Stock market indices (made up of listed stocks) miss the most dynamic growth in the economy, which comes from unlisted start-up ventures, other small businesses, and sole proprietorships—all of which count toward total business profits.

Total corporate profit growth is, therefore, effectively diluted by net equity issuance. Cornell (2010) showed that the annual dilution rate (mainly through new business creation but also through net issuance by existing companies) between 1926 and 2008 was 2 percent and reasonably stable over time. Subtracting the 2 percent dilution effect from 3 percent real aggregate earnings growth makes 1 percent real EPS growth a realistic long-run prospect. Some evidence indicates, however, that the dilution effect has flattened during the past decade, perhaps reflecting the increasing use of buybacks.

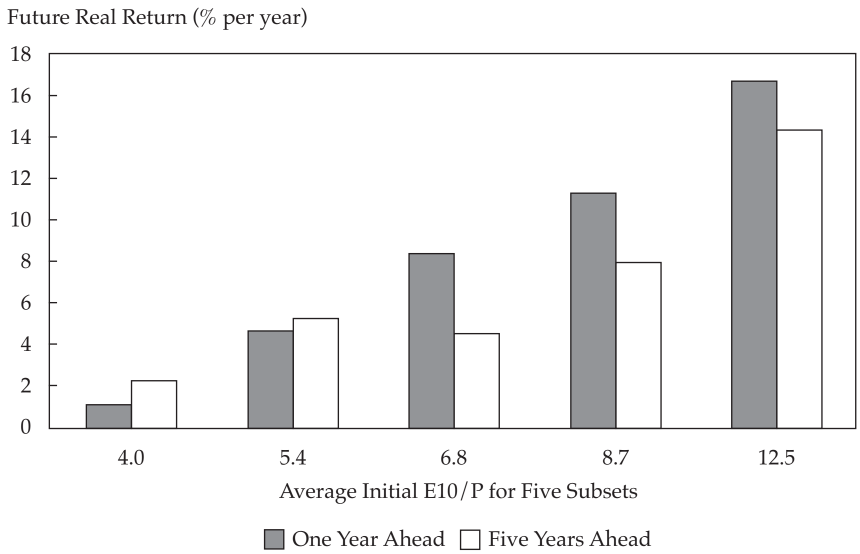
Although several studies confirm these patterns, the crucial distinction between aggregate earnings growth and EPS earnings growth is not widely appreciated, and many ERP estimates rely on at least a 3 percent real trend in EPS growth. As Upton Sinclair said, "It is difficult to get a man to understand something, when his salary depends upon his not understanding it." Still, it is true that over a single decade, real EPS growth may deviate significantly from its long-run trend, so this building block can be subject to very vigorous debates.

Valuation Change. I have assumed here unchanged market valuations over the coming decade. It is often a good base assumption in normal circumstances.

One can argue, however, that current equity markets are expensive in an absolute sense. The Shiller P/E10 is near 23, more than 40 percent above its long-run average. The smoothed real earnings yield is only 4.3 percent (100/23), not far from the average of the bottom quintile over a 110-year history. **Figure 4** shows that real stock market returns have typically been modest in years following low starting yields (and high following high starting yields). Generally, Figure 4 indicates that this valuation ratio has the useful ability to predict future market returns.[6]

Other market valuation indicators suggest that equity markets are fairly valued. And in comparison with even more expensive Treasuries, the equity market may appear to be cheap.

Figure 4. Average Level of E10/P and Subsequent Returns by Periods, 1900–2009



Notes: The graph was created by sorting each month into one of five buckets based on the level of real E10/P at the beginning of the month and then computing the average level for E10/P (*x*-axis labels) and subsequent one-year and five-year real stock market returns (*y*-axis values) in five subsets of the sample history. Real return is the S&P 500 return.

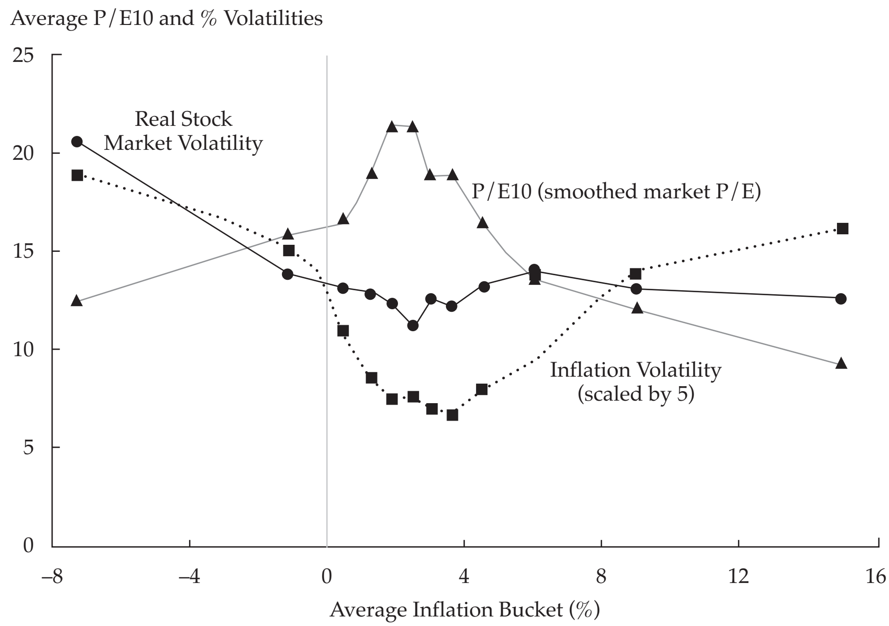
Sources: Shiller website (www.econ.yale.edu/~shiller/data.htm); Haver Analytics.

[6]The predictive ability is somewhat overstated because the sorting of months into quintiles uses in-sample information. Investors know only with hindsight that 4 percent earnings yields would be among the lowest and 12 percent yields among the highest during the full sample. The mean-reversion effect is, therefore, overstated.

In addition to market valuations, many other determinants of the outlook for growth and valuation can be considered. Bearish observers focus on debt problems, deleveraging, and unfavorable demographics. Bullish observers note that technological progress has tended to surprise on the upside and that widening knowledge and access to information may benefit from increasing returns to scale, unlike traditional capital, which tends to exhibit decreasing returns to scale.

I highlight one bearish consideration. High inflation tends to hurt equity markets, but so does deflation. Steady and low, but positive, inflation appears to be the optimal environment for real growth and risky-asset valuations. **Figure 5** shows a sombrero-shaped relationship between equity market valuation levels (P/E10) and inflation levels over the past 110 years. The sweet spot of peak valuations occurs with inflation in the 1–4 percent range. One mechanism behind this nonlinear relationship is that economic uncertainty—here measured by inflation volatility and equity market volatility—tends to be higher amid deflation and high inflation. Thus, inflation may not directly influence

Figure 5. U.S. Equity Market Valuations and Inflation, 1900–2009



Note: The graph was created by sorting each month into 1 of 12 subsets on the basis of the level of inflation during the month and then computing the average level for inflation (x-axis), the P/E10 valuation ratio, and the two volatility series (y-axis) in the 12 subsets of the sample history.

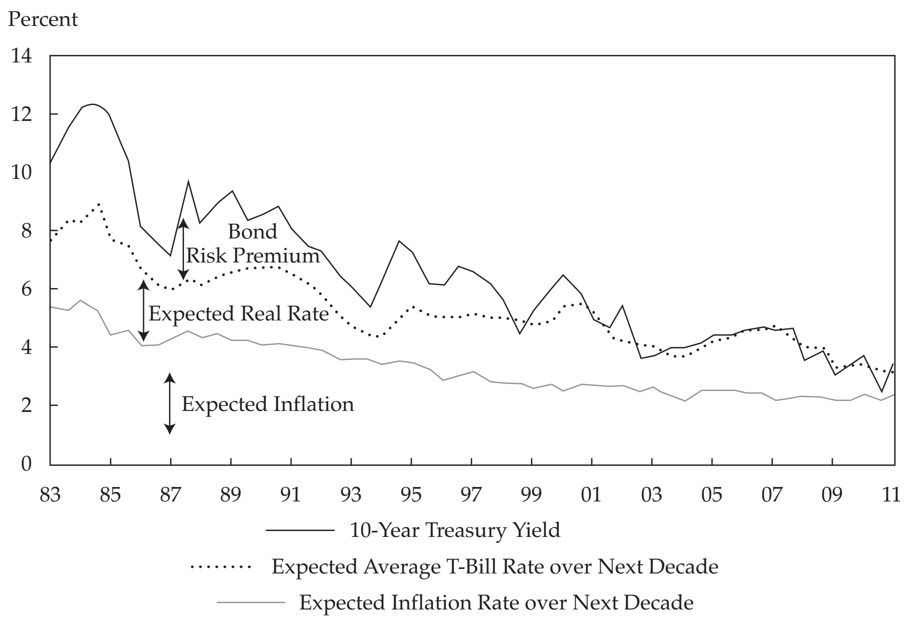
Sources: Haver Analytics; Shiller website (www.econ.yale.edu/~shiller/data.htm); author's calculations.

equity market valuations, but it affects the market through its impact on economic growth and uncertainty. Whatever the reason, the pattern is bad news for market valuations because two decades have been at the sweet spot, so the likelihood of both deflation and high inflation for the coming decade has substantially increased.

Treasury Yield. This component is subtracted. Bonds appear at least as expensive as stocks when measured by historical yardsticks, especially in comparison with the past 30 or 60 years of experience. Moreover, the debt and demographic problems make many expert observers worry about inflation reaching levels not seen since the 1980s.

A perhaps surprising phenomenon is that current bond yields do not contain much of a risk premium. **Figure 6** clarifies this statement by decomposing the 10-year Treasury yield into three components: expected average inflation, expected average real T-bill rates, and the required bond risk premium over bills. The decomposition is based on consensus forecasts of next-decade average inflation and average T-bill rates. The current 10-year yield of 3.4

Figure 6. Decomposition of the 10-Year Treasury Yield Based on Survey Data, 1983–2011



Note: Each year measurement is as of March and October.

Sources: Bloomberg; *Blue Chip Economic Indicators.*

percent is close to the average expected T-bill rate, implying a bond risk premium of nearly zero. Simply put, the yield curve is exceptionally steep, but all this steepness seems to reflect the market's expectation of short rates rising sharply from the abnormal near-zero level. The expected real yield on the nominal 10-year bond is slightly more than 1 percent, well below the past 30-year average of 3 percent. The 10-year TIPS has a yield slightly under 1 percent, but this yield is an average reflecting negative real yields at the front end and clearly higher real yields further out.

The reasons for Treasuries' continued richness include still-modest inflation; the exceptional safe-haven role of Treasuries in recessions, deflations, and financial crises (which has been extremely valuable in the past decade but may not work as well in the next decade); and various exceptional sources of demand (large asset purchases by the Fed, reserve accumulation by other central banks, and purchases by pension funds seeking close asset/liability matching).

I simply assume a 1 percent real bond return for the next decade, which is broadly in line with the current market pricing of both nominal and inflation-linked Treasuries. These yields are known today.

An alternative way of computing the ERP involves comparing stock returns with the returns of constant-maturity bonds (or of long-term bond indices) over time. If such a method is used, the results thus depend on future yield changes. Unexpectedly bond-bearish outcomes would probably also hurt equity market valuations. They might leave the realized excess return of stocks and bonds broadly unchanged, but with both asset classes earning real returns lower than the now expected, respectively, 4 percent and 1 percent.

Concluding Thoughts

In this paper, I focus on the prospects of the equity risk premium over the next decade. However, it is worthwhile to think about the *term structure* of such premiums. A world of time-varying expected returns contains more than one premium number. The short-run and long-run premiums can differ significantly. How would the forecast beyond 2021 differ from the prediction for the next decade?

- The term structure effects are more obvious on the bond side of the premium. Short-dated TIPS yields are currently negative (consistent with short-dated nominal Treasuries yielding nearly zero while headline inflation is nearly 2 percent and rising). At the same time, the 10-year TIPS yield is 0.9 percent and the 20–30 year TIPS yields are approaching 2 percent. Together, these yields imply a 2.7 percent forward TIPS yield for the decade starting in 2021.

- Abnormally high (or low) starting valuations for equity markets and related mean-reversion potential have strong implications for expected stock market returns for the next few years. When considering prospective equity returns *after* the next decade, however, it is impossible to know what the starting valuation levels will be in 2021. Thus, if one assumes below-average equity market returns for the next decade because of an expected normalization of the currently high Shiller P/E10, the best forecast for real equity market returns beyond 2021 should be close to the "unconditional" long-term return forecasts. That is, these "forward forecasts" should largely ignore starting valuations (or at least allow future higher starting yields in 2021 than in 2011).
- Many indicators in addition to valuation measures can be used to predict stock market returns. Regressions and other econometric techniques can be used to forecast returns over any investment horizon (admittedly, they have fewer independent data points in long-horizon regressions). Thus, we can estimate a full term structure of expected returns. (Such forecasts are always model specific, but such a situation is no worse than the situation with informal and judgmental forecasts.)

The following empirical fact is worth emphasizing: Although beta risk has been well rewarded across asset classes (in the sense of the capital asset pricing model, in which the stock market, with a beta near 1, has outperformed the bond market, with a beta near 0, by 3–4 percent over long time periods), the same is not true *within* stock markets. High-beta and high-volatility assets in most stock markets have hardly outperformed their low-volatility peers in the long run; often, the reverse has occurred. Such risk without reward has increasingly attracted investor attention.

This paper focuses on the equity risk premium, but I want to finish with this exhortation: LOOK MORE BROADLY! A key theme in my recent book (Ilmanen 2011) is that relying exclusively or primarily on the ERP as the source of long-run returns causes portfolios to be inadequately diversified. Investors should broaden their horizons beyond asset class perspectives to consider various dynamic strategies (value, carry, trend, volatility, illiquidity) as well as underlying risk factors. The result for investors will be smarter portfolios than they currently have and better long-run performance.

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Will Bonds Outperform Stocks over the Long Run? Not Likely

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Given the poor performance of stocks in the past decade, ample discussion has concerned the relative performance of stocks and bonds. Some even argue that investors should allocate assets entirely to bonds, not only because bonds are the safer investment but also because they believe bonds will outperform stocks over the long run. In other words, if bonds can deliver higher returns than stocks with less risk, why bother with stocks?

The impressive performance of the stock market in the 1980s and 1990s and the resulting rise in investor expectations spurred numerous articles that called attention to the historical market return and cautioned investors about overly optimistic expectations. Many studies forecasted equity returns that would be much lower when compared with the historical average. A few even predicted that stocks would not outperform bonds in the future. Later, after the bear markets of 2000–2002 and 2007–2009, the reverse happened. Investors tended to have very pessimistic expectations for stock returns. A study of the historical returns is, therefore, useful for bringing sense to either situation, whether overly optimistic or overly pessimistic expectations.

Table 1 shows the performance of the S&P 500 Index, the Barclays Capital (BarCap; formerly, Lehman Brothers) U.S. Aggregate Bond Index, the Ibbotson U.S. Intermediate-Term Government Bond Index, and the Ibbotson U.S. Long-Term Government Bond Index over various time periods. Average annual stock returns have been poor relative to bonds not just for the past 10 years; stock returns look mediocre for the past 20, 30, and even 40 years relative to bond returns. According to returns over the past 40 years, the argument that bonds might outperform stocks in the long run appears to be valid. But one should view these data with skepticism. Note that over the 20-, 30-, and 40-year periods, stocks actually performed quite well. In fact, stocks have outperformed their long-run average return since 1926. Only during the past 10 years have stocks significantly underperformed both the long-term average and bonds. We should also note that bonds over the past 40 years, in particular relative to stocks over the past 10, have done extremely well. Bonds have significantly outperformed their long-term averages since 1926.

Table 1. Compound Annualized Total Returns Ending December 2010

Span and Start Date	S&P 500	BarCap U.S. Aggregate	Ibbotson U.S. Intermediate-Term Government	Ibbotson U.S. Long-Term Government
1 Year: Jan 2010	15.06%	6.54%	7.12%	10.14%
5 Years: Jan 2006	2.29	5.80	6.06	5.58
10 Years: Jan 2001	1.41	5.84	5.64	6.64
20 Years: Jan 1991	9.14	6.89	6.56	8.44
30 Years: Jan 1981	10.71	8.92	8.51	10.18
40 Years: Jan 1971	10.14	8.32[a]	7.81	8.57
Jan 1926–Dec 2010	9.87	—	5.35	5.48

[a]The BarCap U.S. Aggregate goes back only to January 1976.

Over the very long term, however, it is no longer a contest. **Figure 1** shows the hypothetical value of $1 invested at the beginning of 1926 for the major capital market asset classes. Over this 85-year period, stocks easily beat bonds.

Consider these various long-term histories of U.S. stocks' compounded total returns:

January 1825–December 1925[1]	7.3%
January 1926–December 2010	9.9%
January 1825–December 2010	8.5%

The returns on the stock market have been consistently high for almost two centuries. The returns over the past 40 years are roughly comparable to the returns from the more distant past. Long-term history provides two major insights:

1. Stocks have outperformed bonds.
2. Stock returns are far more volatile than bond returns and are thus riskier. Given the additional amount of risk, it is not surprising that stocks do not outperform bonds in every period—even over extended periods of time.

Stocks vs. Bonds in the Future

How likely are stocks to outperform bonds in the future? As a first attempt to figure out the future, let's look in more detail at what happened during the past 40 years. We can decompose the stock and bond returns into several components:

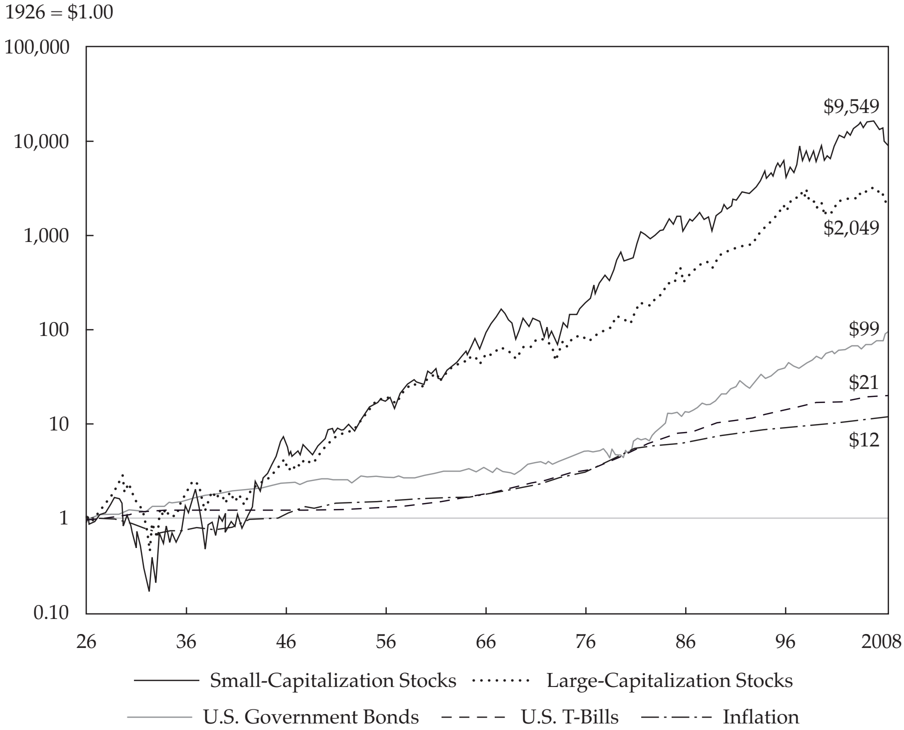
Bond return = Current yield + Capital gain;

Stock return = Current yield + Earnings growth + P/E change.

Despite the substantial decline in yields over the past 40 years, and thus substantial capital gains on bonds, **Figure 2** shows that the bulk of returns on

[1]Stock returns for 1825–1925 are from Goetzmann, Ibbotson, and Peng (2001). For 1926–2010, returns are from Ibbotson Associates (2011).

Figure 1. Stocks, Bonds, Bills, and Inflation, 1926–2008
(lognormal)

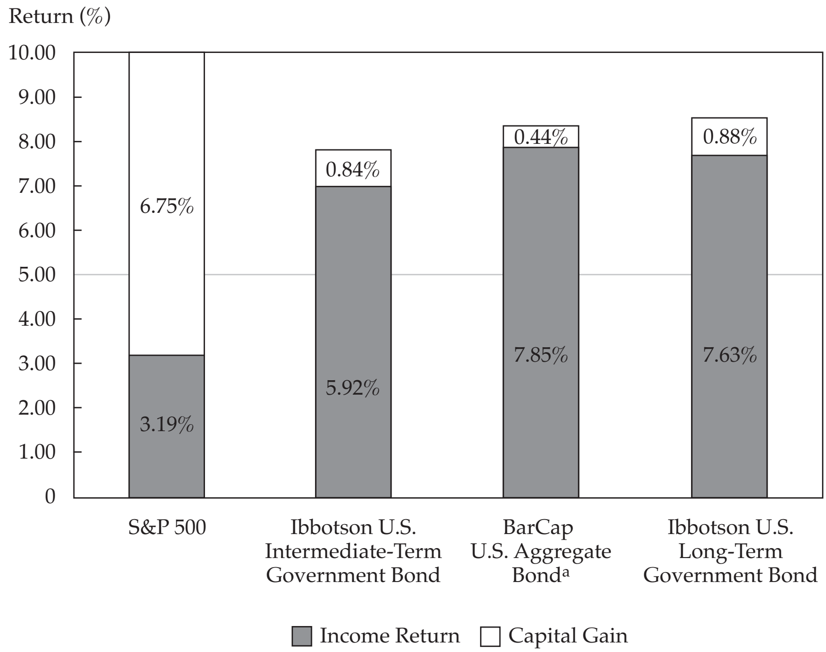


Note: Results assume reinvestment of income and no transaction costs or taxes.

the bond indices over the past 40 years came from the income return portion, or yield. On average, the bond income return from coupon payments was more than 7 percent. Capital gains caused by the yield decline made up the additional return. In contrast, over the past 40 years, stock returns consisted of 3.2 percent from dividend yield and 6.8 percent from capital gains. Next, let's look at what these components would look like going forward.

Today, bond yields are much lower than those shown in Figure 2. **Table 2** compares current bond yield information with yields at the beginning of 1971. As of the end of 2010, the Ibbotson long-term government bond yield was 4.14 percent and the Ibbotson intermediate-term government bond yield was only 1.70 percent. For bonds to continue to enjoy the same amount of capital gains over the next 40 years, their yields, especially the yield on intermediate-term government bonds, would probably have to move into negative territory. Such

Figure 2. Decomposition of Historical Returns, January 1971–December 2010



[a]BarCap U.S. Aggregate goes back only to January 1976.

a development would be impossible because it implies that investors would be willing to pay for the privilege of lending their money to a borrower. Over the past 40 years, bond investors have enjoyed abundant returns because of a high-yield environment at the beginning of the period followed by a steady decline in yields. Going forward, these conditions are not likely to repeat; we are currently experiencing a much lower-yield environment with a higher likelihood of yield increases than decreases.

Table 2. Bond Yields

Bond Index	January 1971	December 2010	Change
Ibbotson U.S. Long-Term Government	6.12%	4.14%	–1.98
BarCap U.S. Aggregate[a]	7.92	2.97	–4.95
Ibbotson U.S. Intermediate-Term Government	5.70	1.70	–4.00

Note: Change is in percentage points.

[a]The BarCap U.S. Aggregate goes back only to January 1976, so average yield was calculated as starting from that date.

Given the current low-yield environment, it would be almost impossible for bonds to generate the same amount of capital gains as they did in the past. In fact, a reasonable estimate might be that no more capital gains will be available in the near future because yields are at least as likely to rise as to fall.[2] If no future fall in yields were to occur, all of the return would have to come from the coupon return. That means the total return for bond investments would likely be 3–4 percent.

For stocks, the current dividend yield from January to December 2010 for the S&P 500 was 2.03 percent, which is a good baseline forecast of the future dividend yield levels. If stocks produce more than 2 percent in capital gains per year on average, adding the 2.03 percent dividend yield would result in a total stock return of 4 percent. Thus, just from simply looking at the decomposition of the past returns and making some simple forward-looking assumptions, one should expect that stocks will likely beat bonds going forward.

Let's elaborate some more on stocks' capital gains portion. Stocks' capital gain or price increase can be decomposed into nominal earnings growth and change in the P/E (see Ibbotson and Chen 2003). Historically, U.S. long-term nominal earnings growth has been roughly 4.65 percent, which is comparable to U.S. long-term nominal GDP growth. If we assumed that the market valuation level (the P/E of the S&P 500) would stay at the same level today over the next 40 years, then we would have an equity return of around 7 percent by adding the current dividend yield and nominal earnings growth. This means that the stock return will be in the 7 percent neighborhood, and the bond return will be around 3–4 percent. Even if we forecasted a decline in the valuation level, the 10-year average P/E would need to fall from its current level of about 20 to below 5 to result in average equity returns around 3 percent over the next 40 years. The lowest level of the P/E on the S&P 500 since 1926 was recorded at 7.1 in 1948; it has never gotten to a level less than 5, even through the Great Depression during the 1920s and 1930s and the 2008–09 global financial crisis. Again, this shows that it is unlikely that stocks will underperform bonds over the next 40 years.

Forecasting Expected Returns

The previous section showed a simple return decomposition and included some observations on future stock and bond returns. The following section will use the building block method to derive the expected returns on bonds and the supply-side equity risk premium model to derive expected returns on stocks.

[2] Some would even argue that bond yields are likely to increase over time, thus producing capital losses for bonds.

Building Block Method. The building block method was first introduced in Ibbotson and Sinquefield (1976). This approach uses current market yields as its foundation and adds estimated risk premiums to build expected return forecasts. This approach separates the expected return of each asset class into the three components shown in **Exhibit 1**.

Exhibit 1. Building Block Approach to Generating Expected Returns

Component	Description
Real risk-free rate	Return that can be earned without incurring any default or inflation risk
Expected inflation	Additional reward demanded to compensate investors for future price increases
Risk premium	Additional reward demanded for accepting uncertainty associated with a given asset class

When choosing a risk-free rate, Ibbotson Associates uses U.S. Treasury yield-curve rates with a maturity to match the investment period. **Table 3** outlines the risk-free rates that are applied to various time horizons. In this paper, because we are mostly interested in the long-term expected returns, we use the long-term (20-year) risk-free rate.

Table 3. Risk-Free Rates for Various Time Horizons

Time Horizon	Years to Maturity	Yield
Short term	5	2.01%
Intermediate term	10	3.30
Long term	20	4.13

Note: All data are from the U.S. Treasury Department website as reported for 31 December 2010.

Some risk premiums can be derived by subtracting the historical average return of one asset class from another or by subtracting the risk-free rate from the return of an asset class. In this way, past data are incorporated into the forecast of future returns; the assumptions are that the financial market is relatively efficient over time and that the realized return differential is a good measure of what investors are expecting to be compensated for in order to take on the various risk levels among different asset classes. Various premiums are added to the current risk-free rate to forecast the expected return unique to each asset class.

Historical returns are calculated over annual periods and may, depending on the nature of the benchmark, use income or total returns. In general, total returns are used for equity forecasts, whereas income returns are used for fixed-income forecasts. Total return is composed of capital appreciation and income (interest payments or dividends). For fixed-income asset classes, the realization of capital gains and losses is assumed to sum to zero over the time horizon of the investment. (In other words, coupon-paying bonds are assumed to be bought at par and are expected to mature at par.) The assumption is that the current market yield is the best forecast of *expected* returns on bonds (i.e., when investors buy bonds, they are expecting neither capital gain nor capital loss).

Expected Return for Bonds. For bond asset classes, Ibbotson Associates identifies three risk premiums that can impact the returns—a horizon premium, a default premium, and a mortgage prepayment premium, as shown in **Table 4.** The horizon premium measures the excess yield that investors in long-term fixed income expect to receive in exchange for accepting additional uncertainty and potential loss of liquidity. Ibbotson Associates estimates the horizon premium as the difference (in the income return) between two government bonds. The first government bond (which is called the "government bond proxy") has the same maturity as the asset class being modeled; the second government bond is the risk-free rate.

Table 4. Detailed Methodology on Expected Return Estimations, 31 December 2010

				Fixed Income		
Benchmark	Expected Return, Geometric	Long-Term Risk-Free Rate	Equity Risk Premium	Horizon Premium	Corporate Default Premium	Mortgage Prepayment Premium
Stocks (S&P 500)	7.61%	4.13%	3.34%			
BarCap U.S. Aggregate	4.45	4.13	—	−0.34%	0.26%	0.40%
Ibbotson U.S. Long-Term Government	4.13	4.13	—	—	—	—
Ibbotson U.S. Intermediate-Term Government	3.61	4.13	—	−0.52	—	—
T-bills	2.49	4.13	—	−1.64	—	—

The corporate default premium measures the historical reward received for holding corporate bonds rather than government bonds of the same maturity. The corporate default premium is equal to the difference between a pure corporate benchmark and a government bond of the same maturity. This difference is multiplied by the corporate exposure in the particular bond asset class.

The mortgage prepayment premium depends on early delivery of mortgage payments that may subsequently change the cash flow and total return received by an investor. The premium is calculated as the difference between the arithmetic mean income return of an index of pure mortgage-backed securities and the arithmetic mean income return of a government bond proxy with the same maturity as the mortgage-backed index. This difference is then multiplied by the percentage of mortgage exposure found in the asset class benchmark:

The specific fixed-income-premium calculations are as follows:

Horizon premium	=	Ibbotson government bond proxy[a] income return	−	Ibbotson government bond proxy[b] income return		
Corporate default premium	=	Corporate bond index income return	−	Ibbotson government bond proxy[a] income return	×	Percent corporate bond exposure
Mortgage prepayment premium	=	Mortgage bond index income return	−	Ibbotson government bond proxy[a] income return	×	Percent mortgage bond exposure

[a]Same maturity (average or current) as the asset class benchmark.
[b]Same maturity as the time horizon (i.e., 20 years).

The resulting estimated expected returns for various bond asset classes are shown in Table 4.

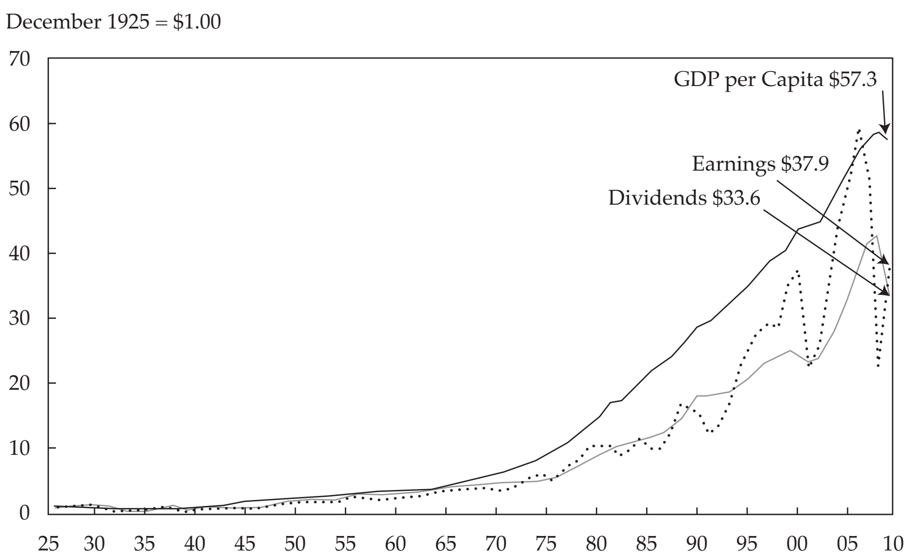
Long-Term Expected Return for Stocks and Equity Risk Premium. The expected return of stocks over bonds has been estimated by a number of authors using various approaches. Such studies can be categorized into four groups based on the approaches they have taken. The first group of studies derives the ERP from historical returns between stocks and bonds. By taking the long-term bond returns (5.48 percent) from the stock returns (9.87 percent) from Table 1, we arrive at a historical compounded equity risk premium estimate of 4.16 percent. The second group uses supply-side models to measure the expected ERP. These models incorporate fundamental information, such as earnings, dividends, and overall productivity. A third group adopts demand-side models that derive the expected return of equities through the payoff demanded by equity investors for bearing additional risk. The fourth group relies on the opinions of financial professionals through broad surveys.

Ibbotson Associates establishes an equity risk premium by following the supply-side approach outlined in Ibbotson and Chen (2003). Their work combined the first and second approaches to arrive at a forecast of the ERP. By proposing a new supply-side methodology, the Ibbotson–Chen study challenges current arguments that future returns on stocks over bonds will be negative or close to zero. The results affirm the relationship between the stock market and the overall economy. They also provide implications for investors creating a policy for allocating assets between stocks and bonds. The following section will briefly explain the methodology presented in Ibbotson and Chen (2003). For detailed explanations, please refer to the original article.

■ *Supply model.* Long-term expected equity returns can be forecasted by using supply-side models. The supply of stock market returns is generated by the productivity of corporations in the real economy. Investors should not expect a much higher or lower return than that produced by the companies in the real economy. Thus, over the long run, equity returns should be close to the long-run supply estimate.

Earnings, dividends, and capital gains are supplied by corporate profitability. **Figure 3** illustrates that earnings and dividends have historically grown in tandem with the overall economy (GDP per capita), adjusting for inflation. So, if one assumes that the economy will continue to grow, dividends and earnings should also continue to grow, thus continuing to drive stock performance. Capital gains did not, however, outpace the stock market—primarily because the P/E increased by a factor of 2 during the same period. In other words, investors' appetite to pay for per unit of earnings has increased roughly two times over the period.

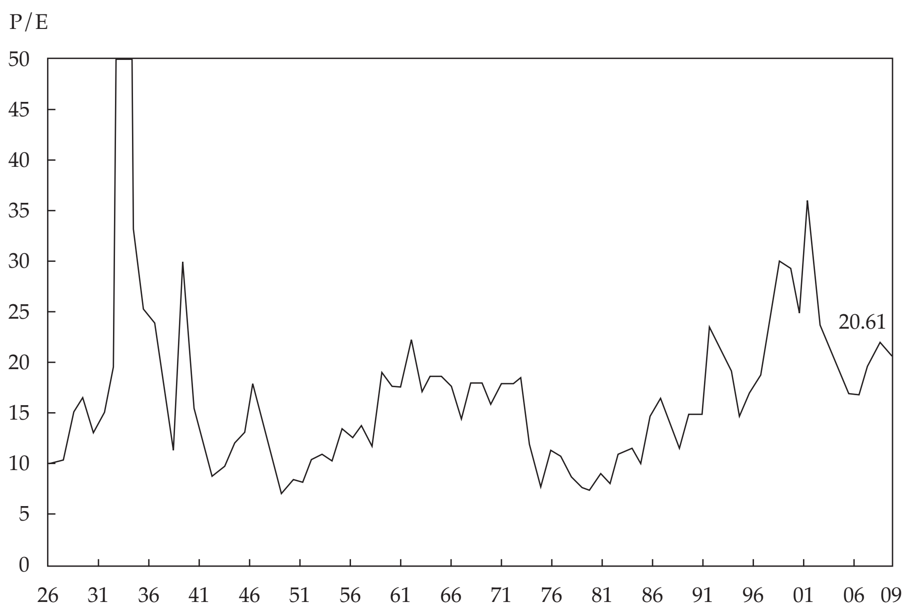
Figure 3. Growth of $1.00 in GDP per Capita, Earnings, and Dividends, 31 December 1925 to December 2010



■ *Forward-looking earnings model.* Two main components make up the supply of equity returns: current returns in the form of dividends and long-term productivity growth in the form of capital gains. The discussion that follows identifies and analyzes components of the earnings model that are tied to the supply of equity returns. This discussion leads to an estimate of the long-term sustainable equity return based on historical information about the supply components.

The Ibbotson Associates earnings model breaks the historical equity return into four components. Only three—inflation, income return, and growth in real earnings per share—have historically been supplied by companies. The growth in P/Es, the fourth piece, is a reflection of investors' increased appetite to pay the price per unit of earnings produced. We believe that the past supply of corporate growth (through dividend and earnings growth) is forecasted to continue but that a continued increase in investors' appetite to pay for per unit of earnings is not. The P/E rose dramatically over the past 80 years because investors believed that corporate earnings would grow faster in the future. This growth in P/E accounted for a small portion of the total return on equities during the period. **Figure 4** depicts the P/E from 1926 to 2009. The P/E was 10.22 at the beginning of 1926 and 20.61 in 2009—an average increase of 0.84 percent

Figure 4. P/E, 1926–2009



Note: The P/E in 1932 went off the chart to 136.50.

per year. The highest P/E was 136.50, recorded in 1932, and the lowest was 7.07, recorded in 1948. (The P/Es in Figure 4 may differ from some of the others presented in this book because of varying definitions of earnings.)

Ibbotson Associates subtracts the historical P/E growth rate from the equity risk premium forecast because we do not believe that the P/E will continue to increase in the future. The market serves as the cue. The current P/E is the market's best guess regarding the future of corporate earnings, and we have no reason to believe, at this time, that the market will change its mind. Thus, the supply of equity return includes only inflation, the growth in real EPS, and income return. Instead of using one-year earnings in calculating the P/E, as in Ibbotson and Chen (2003), we use three-year average earnings in this calculation. The reason is that reported earnings are affected not only by long-term productivity but also by "one-time" items that do not necessarily have the same consistent impact year after year.[3] For example, the 2003 earnings used in this calculation are the average reported earnings from 2002, 2003, and 2004. For 2009, the earnings are the average of reported earnings in 2008 and 2009 and the estimated earnings for 2010. Using a three-year average rather than year-by-year numbers is more reflective of the long-term trend.

The historical P/E expansion is calculated to be roughly 0.82 percent per year; therefore, by subtracting the 0.82 percent from the 4.16 percent historical equity risk premium estimate, we obtain the forward-looking equity risk premium estimate of 3.34 percent. Adding this ERP estimate to the 4.13 percent bond yield, we estimate the forward-looking equity nominal compounded return to be 7.61 percent. In other words, we expect stocks to beat bonds by 3.34 percent per year over the next 20 years.

At the end of 2010, the 20-year Treasury inflation index yield was 1.64 percent, the nominal 20-year bond yield was 4.13 percent, and expected inflation was 2.45 percent. Therefore, the forecasted real stock return is 5.04 percent—again outperforming the forecasted real bond return of 1.64 percent by 3.34 percent compounded per year. The final results are presented in Table 4 and **Table 5**.

Implications for the Investor

For the long-term investor, asset allocation is the primary determinant of the variability of returns. Of all the decisions investors make, therefore, the asset allocation decision is the most important.

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[3]Effective March 2009, Ibbotson Associates began using a blend of operating and reporting earnings for the period 1988 to the present when calculating P/Es. This approach mitigates the impact of severe write-downs of reported earnings and the resulting P/Es.

Table 5. Expected Return (20-Year Horizon), 31 December 2010

Benchmark	Geometric Return	Standard Deviation
Stocks (S&P 500)	7.61%	20.39%
BarCap U.S. Aggregate	4.45	6.59
Ibbotson U.S. Long-Term Government	4.13	11.73
Ibbotson U.S. Intermediate-Term Government	3.61	6.59
T-bills	2.49	3.43

The most important asset allocation decision is the allocation between stocks and bonds. Thus, the expected return between stocks and bonds, or the equity risk premium, is the most important number. A negative ERP implies that the investor should favor allocations to fixed income, whereas a positive ERP indicates an allocation to equities. (Of course, in addition to the ERP, the investor's risk tolerance, investment goals, time horizon, etc., need to be considered.) Therefore, the asset allocation decision is only as good as the accuracy of the investor's forecast of the expected equity risk premium.

Ibbotson Associates believes that stocks will continue to provide significant returns over the long run. We calculate the geometric, or the compounded, ERP based on applying the supply-side earnings model with three-year average earnings to be 3.34 percent—82 bps lower than the straight historical estimate. This forecast for the market is in line with both the historical supply measures of public corporations (i.e., earnings) and overall economic productivity (GDP per capita).

Conclusion

Not only have bonds outperformed stocks over various recent periods because of the financial crisis, but they also have roughly matched stock performance over the past 40 years. This fact raises the question, will bonds continue to outperform stocks?

This paper demonstrated that a close examination of history shows that stock returns over the last 40 years were virtually in line with the long-term historical average. Bond returns, however, were not only much higher than their historical averages but also higher than their current yields. This high bond return is the result of high interest rates in the 1970s and a subsequent declining interest rate environment. Given today's low-interest-rate environment, this scenario for bonds is very unlikely to repeat itself in the future. Investors hoping that bonds will outperform stocks in the coming years are likely to be disappointed.

Stocks tend to outperform bonds over time but are much riskier, even over longer periods. Bonds can outperform stocks over a long period, but investors need almost perfect timing to get in and out of the market to realize such returns. Ibbotson Associates believes the right strategy is to follow a disciplined asset allocation policy that considers the return–risk trade-offs by taking advantage of the diversification benefits over time provided by investing in both stocks and bonds.

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Price-to-Earnings Ratios: Growth and Discount Rates

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In a present-value model, movements in price-to-earnings ratios must reflect variations in discount rates (which embed risk premiums) and growth opportunities (which involve the cash flow and earnings-generating capacity of the firm's investments).[1] We decomposed P/Es into a no-growth value, defined to be the perpetuity value of future earnings that are held constant with full payout of earnings, and the present value of growth opportunities (PVGO), which is the value of the stock in excess of the no-growth value. To accomplish this decomposition, we used a dynamic model that accounts for time-varying risk premiums and stochastic growth opportunities.

An important aspect of our work is that we took into account a stochastic investment opportunity set with time-varying growth and discount rates. P/Es can be high not only when growth opportunities are perceived to be favorable but also when expected returns are low. For example, during the late 1990s and early 2000s, P/Es were very high. The cause might have been high prices incorporating large growth opportunities, but Jagannathan, McGrattan, and Scherbina (2000) and Claus and Thomas (2001), among others, have argued that during this time, discount rates were low. In contrast to our no-growth and PVGO decompositions, in which both discount rates and growth rates are stochastic, in the standard decompositions of no-growth and PVGO components, discount rates and growth rates are constant. Other standard analyses in the industry, such as the ratio of the P/E to growth (often called the "PEG ratio"), implicitly assign all variations in P/Es to growth opportunities because the analyses do not allow for time-varying discount rates.

[1]This approach decomposes the value of a firm into the value of its assets in place plus real options (or growth opportunities). This decomposition was recognized as early as Miller and Modigliani (1961).

Static Case

An instructive approach is to consider first the standard decomposition of the P/E into the no-growth and growth components that is typically done in an MBA-level finance class. The exposition here is adapted from Bodie, Kane, and Marcus (2009, p. 597).

Suppose earnings grow at rate g, the discount rate is δ, and the payout ratio is denoted by po. The value of equity, P, is then given by

$$P = \frac{EA \times po}{\delta - g}, \tag{1}$$

where EA is expected earnings next year. The P/E—that is, $P/E = P/EA$—is then simply

$$\begin{aligned} P/E &= \frac{P}{EA} \\ &= \frac{po}{\delta - g}. \end{aligned} \tag{2}$$

We can decompose market value P into a no-growth component and a growth component. The growth component is considered to be the PVGO. The no-growth value, P^{ng}, is defined as the present value of future earnings with no growth (so, $g = 0$ and $po = 1$):

$$P^{ng} = \frac{EA}{\delta}. \tag{3}$$

The growth component is defined as the remainder:

$$\begin{aligned} PVGO &= \frac{EA \times po}{\delta - g} - \frac{EA}{\delta} \\ &= \frac{EA\left[g - (1 - po)\delta\right]}{\delta(\delta - g)}, \end{aligned} \tag{4}$$

and the two sum up to the total market value:

$$P = P^{ng} + PVGO. \tag{5}$$

The decomposition of firm value into no-growth and PVGO components is important because, by definition, the no-growth component involves only discount rates whereas the PVGO component involves both the discount rate and the effects of cash flow growth. Understanding which component dominates gives insight into what drives P/Es. The static case cannot be used to decompose P/Es into no-growth and PVGO values over time, however, because it assumes that earnings growth (g), discount rates (δ), and payout ratios (po) remain constant over time. Clearly, this assumption is not true. Thus, to examine the no-growth and PVGO values of P/Es, we need to build a dynamic model.

The Dynamic Model

We made two changes to the static case to handle time-varying investment opportunities. First, we put "t" subscripts on the variables to indicate that they change over time. Second, for analytical tractability, we worked in log returns, log growth rates, and log payout ratios.

We defined the discount rate, δ_t, as

$$\delta_t = \ln E_t\left(\frac{P_{t+1} + D_{t+1}}{P_t}\right), \tag{6}$$

where P_t is the equity price at time t and D_t is the dividend at time t. Earnings growth is defined as

$$g_t = \ln\left(\frac{EA_t}{EA_{t-1}}\right), \tag{7}$$

where EA_t is earnings at time t. Finally, the log payout ratio at time t is

$$po_t = \ln\left(\frac{D_t}{EA_t}\right). \tag{8}$$

In this notation, if $\delta_t = \bar{\delta}$, $g_t = \bar{g}$, and $po_t = \overline{po}$ are all constant, then the familiar P/E in Equation 2 written in simple growth rates or returns becomes

$$\frac{P}{EA} = \frac{\exp\left(\overline{po}\right)}{\exp\left(\bar{\delta} - \bar{g}\right) - 1}. \tag{9}$$

Factors. We specified factors X_t that drive P/Es. The first three factors in X_t are the risk-free rate, r_t^f; the earnings growth rate, g_t; and the payout ratio, po_t. We included two other variables that predict returns: the growth rate of industrial production, ip_t, and term spreads, $term_t$. We selected these variables after considering variables that, on their own, forecast total returns, earnings growth, or both. We also included a latent factor, f_t, that captures variation in expected returns not accounted for by the observable factors. We specified latent factor f_t to be orthogonal to the other factors. Thus, $X_t = (r_t^f \; g_t \; po_t \; ip_t \; term_t \; f_t)'$.

We assumed that state variables X_t follow a vector autoregression (VAR) with one lag:

$$X_{t+1} = \boldsymbol{\mu} + \Phi X_t + \Sigma\varepsilon_{t+1}, \tag{10}$$

where ε_t follows a standard normal distribution with zero mean and unit standard deviation. The companion form, Φ, allows earnings growth and payout ratios to be predictable by both past earnings growth and payout ratios and other macro variables.

The long-run risk model of Bansal and Yaron (2004) incorporates a highly persistent factor in the conditional mean of cash flows. Our model accomplishes the same effect by including persistent variables in X_t, especially the risk-free rate and payout ratio, which are both highly autocorrelated.

To complete the model, we assumed that discount rates δ_t are a linear function of state variables X_t:

$$\delta_t = \delta_0 + \boldsymbol{\delta}_1' X_t. \tag{11}$$

Equation 11 subsumes the special cases of constant total expected returns by setting $\delta_1 = 0$ and subsumes the general case of time-varying discount rates when $\delta_1 \neq 0$. Because f_t is latent, we placed a unit coefficient in δ_1 that corresponds to f_t for identification.

The Dynamic P/E. Under the assumptions shown in Equation 10 and Equation 11, the dynamic P/E can be written as

$$P/E_t = \sum_{i=1}^{\infty} \exp\left(a_i + \boldsymbol{b}_i' X_t\right). \tag{12}$$

The coefficients a_i and b_i are given in Appendix A.[2]

Our model of the P/E belongs to the asset-pricing literature that builds dynamic valuation models. The approaches of Campbell and Shiller (1988) and Vuolteenaho (2002) to model the price/dividend ratio (P/D) and the P/E, respectively, require log-linearization assumptions. In contrast, our model produces analytically tractable solutions for P/Es. Recently, Bekaert, Engstrom, and Grenadier (2010) and van Binsbergen and Koijen (2010) examined dynamic P/Ds, but not P/Es, in models with closed-form solutions. Our model is more closely related to the analytical dynamic earnings models of Ang and Liu (2001) and Bakshi and Chen (2005), in which cash flows are predictable and discount rates vary over time. Ang and Liu, however, modeled price-to-book ratios instead of P/Es, and Bakshi and Chen's model of the P/E requires the payout ratio to be constant.

Growth and No-Growth Components. The no-growth P/E can be interpreted as a perpetuity, where at each time, a unit cash flow is discounted by the cumulated market discount rates prevailing up until that time. In the full P/E in Equation 12, growth occurs by plowing earnings back into the firm. In the no-growth P/E, earnings are fully paid out; consequently, the payout ratio

[2] A full derivation is available in the online appendix at www.columbia.edu/~aa610.

does not directly influence the no-growth P/E value. The payout ratio is relevant in the no-growth P/E, however, because the payout ratio is a state variable and its dynamics are allowed to influence future earnings through the VAR process.

The no-growth P/E, P/E_t^{ng}, where earnings growth is everywhere 0 and the payout ratio is equal to 1, can be written as

$$P/E_t^{ng} = \sum_{i=1}^{\infty} \exp\left(a_i^* + \boldsymbol{b}_i^{*\prime} X_t\right), \tag{13}$$

where a_i^* and b_i^* are given in Appendix A.

The present value of growth opportunities is defined as the difference between the P/E, which incorporates growth, and the no-growth P/E:

$$P/E_t = P/E_t^{ng} + PVGO_t. \tag{14}$$

Empirical Results

We used data on dividend yields, P/Es, price returns (capital gains only), and total returns (capital gains and dividends) on the S&P 500 Index from the first quarter (Q1) of 1953 to the fourth quarter (Q4) of 2009.

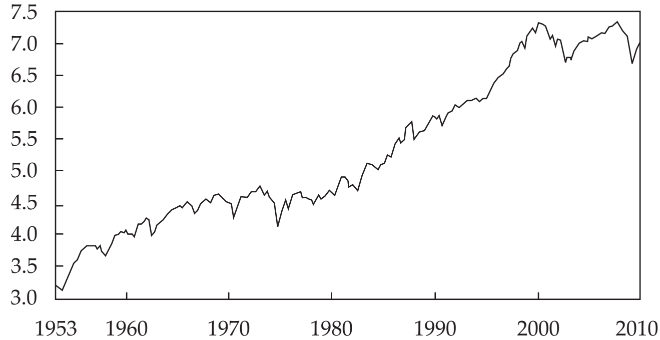
Panel A of **Figure 1** plots the log index of the S&P 500 Total Return Index across our sample. The decline during the mid-1970s recession, the strong bull market of the 1990s, the decline after the technology bubble in the early 2000s, and the drop resulting from the 2008–09 financial crisis are clearly visible. Panel B graphs the P/E, which averages 18.5 over the sample period. The P/E suddenly increased in Q4:2008 to 60.7 and reached a peak of 122 in Q2:2009. In Q4:2009, the P/E came down to 21.9. The large increase in the P/E from Q4:2008 through Q3:2009 is the result of large, negative reported earnings in Q4:2008 during the financial crisis. This development caused the moving four-quarter average of earnings to sharply decrease. While prices were declining during the financial crisis, an even greater decrease was occurring in reported earnings, which caused the increase in the P/E. Panel C of Figure 1 reports S&P 500 dividend yields, which reached a low at the end of the bull market in 2000.

Estimation Results. **Table 1** reports the parameter estimates of the model. The two most significant predictors of the discount rate are earnings growth, *g*, with a coefficient of 0.38, and the growth rate of industrial production, *ip*, with a coefficient of –1.28. The estimated VAR parameters show that all factors are highly persistent, and this persistence dominates: No other factor except the variables themselves Granger-causes risk-free rates, earnings growth, or payout ratios.[3]

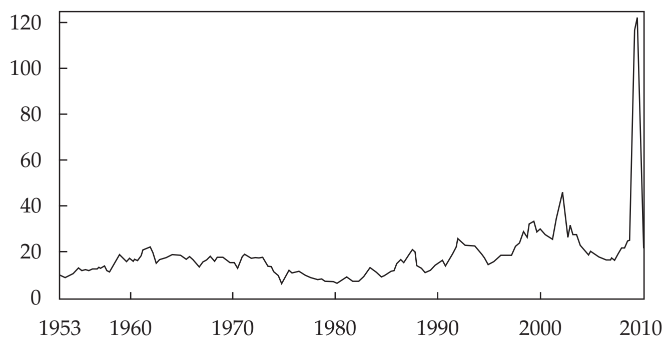
[3] Estimation of the model is discussed in the online appendix at www.columbia.edu/~aa610.

Figure 1. Log Index Levels, Payout Ratios, and Dividend Yields for S&P 500 Total Return Index, Q1:1953–Q4:2009

A. Log of the Index Level



B. P/E



C. Dividend Yield

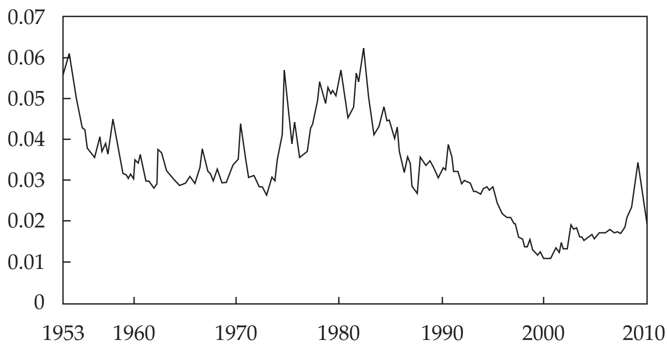


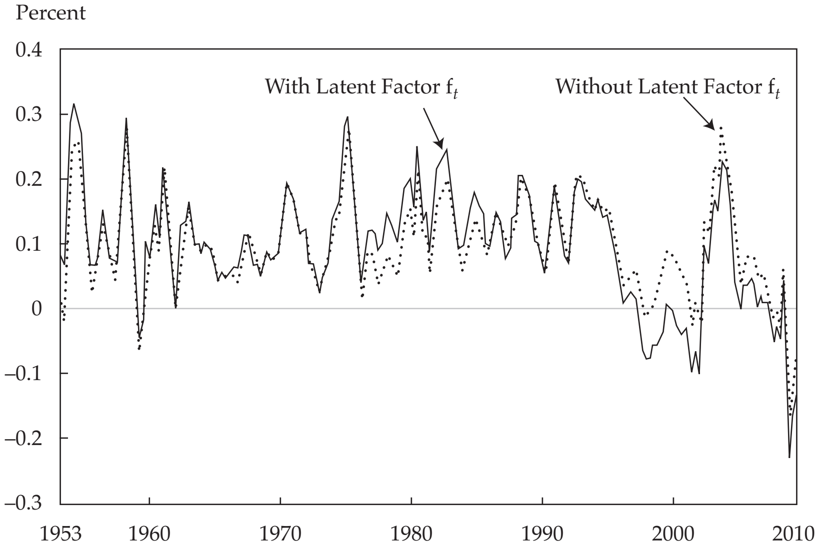
Table 1. Parameter Estimates
(*p*-values in parentheses)

	rf	*g*	*po*	*ip*	*term*	*f*
Discount rate parameters δ_1:	0.325	0.381	0.164	−1.283	1.203	1
	(0.775)	(0.121)	(0.088)	(0.238)	(1.728)	—
VAR parameter Φ						
rf	0.863	0.26	0.012	−0.005	0.088	0
	(0.089	(0.008)	(0.012)	(0.033)	(0.191)	—
g	0.917	0.628	0.650	0.115	3.677	0
	(1.385)	(0.353)	(0.426)	(0.362)	(3.446)	—
po	−0.771	−0.514	0.303	0.045	−2.805	0
	(1.292)	(0.328)	(0.415)	(0.360)	(3.131)	—
ip	−0.244	0.096	0.071	−0.169	0.908	0
	(0.237)	(0.057)	(0.041)	(0.108)	(0.737)	—
term	0.021	−0.017	−0.003	−0.025	0.502	0
	(0.036)	(0.005)	(0.007)	(0.019)	(0.092)	—
f	0	0	0	0	0	0.904
	—	—	—	—	—	(0.003)

We plotted the estimated discount rates in **Figure 2**. The full discount rate (solid line) is overlaid with the implied discount rate without the latent factor, f_t (dotted line). The two discount rates have a correlation of 0.91. Thus, the observable factors capture most of the variation in expected returns. Without the latent factor, the observable factors $z_t = (r_t^f\ g_t\ po_t\ ip_t\ term_t)$ account for 18.0 percent of the variance of total returns; adding the latent factor brings the proportion up to 27.5 percent.

Figure 2 shows that discount rates declined noticeably in the 1990s—from 14.5 percent in Q1:1991 to −14.5 percent in Q1:2002. The −14.5 percent corresponds to what was at that time the all-time-high P/E in the sample, 46.5. The latent factor was very negative during this time; the model explains the high P/E as coming from low discount rates. Recently, during the financial crisis, discount rates were again negative. For example, in Q4:2008, the discount rate was −16.3 percent. Q4:2008 was characterized by pronounced negative reported earnings. The P/E increased to 60.7 at this time because of the low earnings relative to market values. The model again explains the high P/E by the low discount rate. The low discount rates at this time were caused by the large decrease in earnings growth. Subsequent returns over the 2008–09 period were indeed extremely low.

Figure 2. Discount Rates, Q1:1953–Q4:2009



Drivers of the P/E. In Table 2, we report variance decompositions of the P/E. We computed the variance of the P/E implied by the model through the sample, where the factor z was held constant at its unconditional mean, $\text{var}_z(P/E)$. The variance decomposition resulting from factor z is given by $1 - \text{var}_z(P/E)/\text{var}(P/E)$, where $\text{var}(P/E)$ is the variance of the P/E in the data. These decompositions do not sum to 1.0 because the factors are correlated. Table 2 shows that the macro variables play a large role in explaining the dynamics of P/Es. Risk-free rates, earnings growth, and payout ratios explain, respectively, 18 percent, 38 percent, and 66 percent of the variance of P/Es.

Table 2. Variance Decompositions of the P/E

Parameter	Variance Explained
rf	17.8%
g	38.3
po	65.9
ip	–38.6
term	7.5
f	70.5

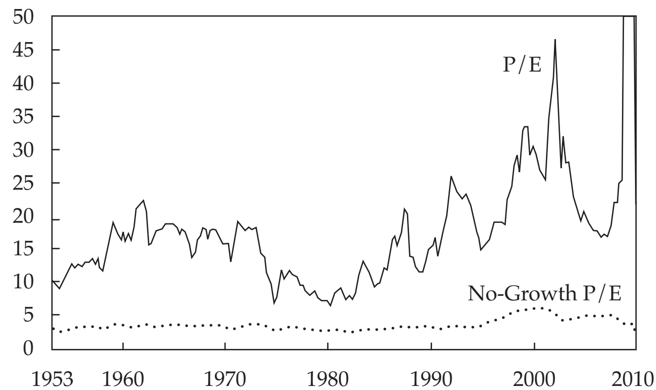
The variance attribution for growth in industrial production is negative because diminished industrial production results in more volatile discount rates and greater volatility of P/Es. The latent factor, *f*, plays an important role in matching P/Es, with a variance attribution of 71 percent. This finding is consistent with Figure 2, where some occasionally pronounced differences are visible between discount rates produced only with macro variables and discount rates estimated with the latent factor.

Growth and No-Growth Decompositions. Figure 3 plots the no-growth components together with the P/E. Most of the variation in the P/E is a result of growth components. The average no-growth P/E defined in Equation 13 is 3.8, compared with an average P/E in the data of 18.5. Thus, no-growth components account for, on average, 20.7 percent of the P/E; most of the total P/E is a result of the PVGO. The no-growth component is remarkably constant (as is clearly shown in Figure 3) and has a volatility of 0.853, compared with a volatility of 12.7 for the P/E. A variance decomposition of the P/E is

$$\underset{100\%}{\operatorname{var}\left(P/E_t\right)} = \underset{0.5\%}{\operatorname{var}\left(P/E_t^{ng}\right)} + \underset{94.8\%}{\operatorname{var}\left(PVGO_t\right)} + \underset{4.7\%}{2\operatorname{cov}\left(P/E_t^{ng},\ PVGO_t\right)}. \quad (15)$$

Thus, 95 percent of P/E variation is explained by growth components, or the PVGO term. The perpetuity value of no-growth is relatively constant because discount rates are highly mean reverting: The year-on-year autocorrelation of discount rates over the sample is 0.34. Thus, the discounted earnings in the no-growth P/E rapidly revert to their long-term average.

Figure 3. No-Growth and Growth Components of the P/E, Q1:1953–Q4:2009



In **Table 3**, we report various correlations of the no-growth and PVGO P/Es. The no-growth and PVGO components have a correlation of 0.363, but this correlation has only a small effect on total P/E variation because of the low volatility of no-growth P/E values. Thus, most of the variation in the total P/E is caused by growth opportunities, and not surprisingly, the PVGO P/E and the total P/E are highly correlated, at 0.998. Both the growth P/E and the total P/E decrease when risk-free rates and earnings growth increase. The correlation of the total P/E with earnings growth is particularly strong at –0.766. High earnings growth by itself increases earnings, which is the denominator of the P/E, and causes P/Es to decrease, resulting in the high negative correlation between earnings growth and the P/E. But another discount rate effect occurs because high earnings growth causes discount rates to significantly increase (see Table 1). This effect also causes P/Es to decrease. High payout ratios, as expected, are positively correlated with the P/E at 0.713. Finally, the latent factor, *f*, is negatively correlated with the P/E because it is only a discount rate factor: By construction, P/Es are high when *f* is low.

Table 3. Correlation of Growth (PVGO) and No-Growth Components of the P/E

	No Growth P/E	PVGO P/E
PVGO P/E:	0.363	
Data P/E:	0.421	0.998
rf	–0.353	–0.426
g	–0.051	–0.766
po	–0.292	0.713
ip	0.114	–0.303
term	0.027	0.390
f	–0.903	–0.538

Conclusion

We decomposed the P/E into a no-growth component (the perpetuity value of future earnings held constant with full payout) and a component termed PVGO that reflects the growth opportunities and real options a firm has to invest in the future. We valued both components in a dynamic stochastic environment where risk premiums and earnings growth are stochastic. We found that discount rates exhibit significant variation: 27.5 percent of the variation in total returns is caused by persistent, time-varying expected return components. However, although the variation of discount rates is large, these rates are highly mean reverting. The result is that the no-growth value of earnings exhibits relatively little volatility. The PVGO component dominates; it accounts for the bulk of the level and variation of P/Es in the data: Approximately 80 percent of the level and 95 percent of the variance of P/Es are a result of time-varying growth opportunities.

We thank Geert Bekaert, Sigbjørn Berg, and Tørres Trovik for helpful discussions.

Appendix A

Here, we provide the coefficients a_i and b_i and the definition of the P/E as used by the S&P 500. All the formulas are derived in the online appendix at www.columbia.edu/~aa610.

Full and No-Growth P/Es. The coefficients a_i and b_i for the P/E in Equation 12 are given by

$$a_{i+1} = -\delta_0 + a_i + (\mathbf{e}_2 + \boldsymbol{b}_i)' \boldsymbol{\mu} + \frac{1}{2}(\mathbf{e}_2 + \boldsymbol{b}_i)' \Sigma\Sigma' (\mathbf{e}_2 + \boldsymbol{b}_i)$$

and

$$b_i = -\boldsymbol{\delta}_1 + \Phi'(\mathbf{e}_2 + \boldsymbol{b}_i),$$

where $\mathbf{e}_n$ is a vector of 0s with a 1 in the nth position. The initial conditions are

$$a_1 = -\delta_0 + (\mathbf{e}_2 + \mathbf{e}_3)' \boldsymbol{\mu} + \frac{1}{2}(\mathbf{e}_2 + \mathbf{e}_3)' \Sigma\Sigma' (\mathbf{e}_2 + \mathbf{e}_3)$$

and

$$b_1 = -\boldsymbol{\delta}_1 + \Phi'(\mathbf{e}_2 + \mathbf{e}_3).$$

The coefficients in the no-growth P/E, P/E_t^{ng}, in Equation 13 are given by

$$a_{i+1}^* = -\delta_0 + a_i^* + \boldsymbol{b}_i^{*\prime} \boldsymbol{\mu} + \frac{1}{2}\boldsymbol{b}_i^{*\prime} \Sigma\Sigma' \boldsymbol{b}_i^*$$

and

$$\boldsymbol{b}_{i+1}^* = -\boldsymbol{\delta}_1 + \Phi' \boldsymbol{b}_i^*,$$

where a_i^* and b_i^* have initial values $a_i^* = -\delta_0$ and $\boldsymbol{b}_i^* = -\delta_1$.

Data. The P/E defined by Standard & Poor's is the market value at time t divided by trailing 12-month earnings reported from t to $t - 1$. To back out earnings growth from P/Es, we used the following transformation:

$$\exp(g_{t+1}) = \frac{EA_{t+1}}{EA_t} = \left(\frac{P/E_t}{P/E_{t+1}}\right)\left(\frac{P_{t+1}}{P_t}\right),$$

where P_{t+1}/P_t is the price gain (capital gain) on the market from t to t +1.

The dividend yield reported by Standard & Poor's is also constructed from trailing 12-month summed dividends. We computed the log payout ratio from the ratio of the dividend yield, $dy_t = D_t/P_t$, to the inverse P/E:

$$\exp(po_t) = \frac{dy_t}{1/(P/E)_t} = \frac{D_t}{EA_t}.$$

For the risk-free rate, r_t^f, we used one-year zero-coupon yields expressed as a log return, which we obtained from the Fama Files derived from the CRSP U.S. Government Bond Files. For the macro variables, we expressed industrial production growth, *ip*, as a log year-on-year growth rate for which we used the industrial production index from the St. Louis Federal Reserve. We defined the term spread, *term*, as the difference in annual yields between 10-year and 1-year government bonds, which we obtained from CRSP.

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Long-Term Stock Returns Unshaken by Bear Markets

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Wharton School of the University of Pennsylvania

The first Equity Risk Premium Forum, sponsored by CFA Institute, was held on 8 November 2001, not long after the September 11 terrorist attacks and coincident with the first of two devastating bear markets in the first decade of the new millennium. At the time of the first forum, stocks had already fallen by more than half of what would become a nearly 50 percent decline from the peak reached in March 2000 to the low in October 2002. Over the four years after the low, the equity market recovered all of its losses and moved into new all-time-high territory. But the 2008 financial crisis precipitated a more severe bear market than 2000–2002 and the worst since the Great Crash of 1929–1932. In the financial crisis, the S&P 500 Index plunged 57 percent from October 2007 to March 2009 and non-U.S. equity markets fell more than 60 percent. As of this writing (May 2011), stocks worldwide have made a strong recovery and are now within 15 percent of their all-time highs.

Nevertheless, the returns for stocks during the past decade have not been good. Since the first forum was held, the stock returns on the broad-based Russell 3000 Index have averaged 5.6 percent per year; when offset against 2.5 percent annual inflation, the real return is only a little more than 3 percent per year. The nominal yields on Treasuries have averaged 2.2 percent during the decade, leaving a real return of –0.2 percent per year on those instruments. These returns mean that the realized equity premium, or excess return of stocks over T-bills, has been between 3 percent and 3.5 percent. These numbers are not far from the predictions that I made at the first forum 10 years ago. At the time, I expected real returns of equities to be 4.5–5.5 percent and an equity risk premium of 2 percent (200 bps).

As I read through my analysis from 10 years ago, I could see that the main reason I overestimated the real return on stocks was that I overestimated the price-to-earnings ratio (P/E) that investors would pay for stocks. There were good reasons back then for why the P/E of stocks should be higher than its historical average of 15, a level computed from earnings data extending back to 1871, and should instead range between 20 and 25. First, the sharp decline in transaction costs caused by the development of index funds and the plunge in commission prices gave investors a much more favorable realized risk–return trade-off than they received in earlier years. Another reason I conjectured that the P/E would be higher than its historical level was the decline in the volatility of real economy variables. This increase in macroeconomic stability was termed by economists at the time as the "Great Moderation."

Of course, the 2007–09 recession dispelled the idea that the business cycle had been tamed. It is my opinion that the Great Moderation was indeed real, but the long period of macroeconomic stability led to an excessive decline in risk premiums, particularly in housing-related securities. So, when real estate prices unexpectedly fell, the entire financial system came crashing down. The financial crisis greatly increased the risk aversion of investors, and that result brought the P/E back down to historical levels and led to the poor stock returns of the past decade.

This observation can be confirmed by examining the data. When the first forum was held in November 2001, the reported earnings of the S&P 500 over the preceding 12 months were $15.90, which yielded a P/E of 36.77. The trailing 12-month earnings on the S&P 500 at the time of the second forum in January 2011 were $81.47, more than a threefold increase. Yet the index itself was up by only 30 percent, and the P/E had fallen to 16.66. If the P/E had fallen only to 22.5, the middle of my valuation range, stock returns would have been about 3 percentage points per year higher.

Another prediction that did not materialize was my estimate of future bond yields. I believed that the real yields on bonds would remain between 3 and 4 percent, the level that prevailed when Treasury Inflation-Protected Securities (TIPS) were first issued in 1997. I also believed that the realized bond returns in the period after World War II (WWII) were biased downward because of the unanticipated inflation from the late 1960s through the early 1980s. So, I did not consider historical returns on bonds; instead, I used the current yield on TIPS in making my forecast for future bond yields.

Instead, real yields fell dramatically, especially in the wake of the financial crisis. As of early 2011, 10-year TIPS yields are less than 1 percent and 5-year TIPS yields are negative. The two primary reasons for the drop in real yields are the slowdown in economic growth and the increase in the risk aversion of the investing public, which, in turn, is caused by both the aging of the population and the shocks associated with the financial crisis. The decline in inflation has caused the yields on nominal bonds to drop even more, generating very large realized returns for nominal bond investors. Over the last decade, realized bond returns were 4.7 percent per year after inflation, swamping stock returns. Over the past 20 years, realized bond returns were 6.0 percent per year, 1 percentage point less than the 7.0 percent real returns on stocks.

Updated Return Data

Table 1 shows historical returns for stocks, bonds, and T-bills from 1802 through April 2011. The past decade has shaved one-tenth of a percent off of the annualized real returns on stocks from 1802 through April 2001; three-tenths off of the equity returns from 1871, which is when the Cowles Foundation for Research in Economics data became available; and five-tenths off of the real return since 1926, which is the period that Ibbotson and Sinquefield popularized in their research.[1] Over all long-term periods, the real return on stocks remained in the 6–7 percent range. Over the past 30 years, the real annual return on stocks has been 7.9 percent, and over the past 20 years, the real return has been 7.0 percent. In fact, the numbers that now fill the table are almost identical to those that I calculated when I started my research in the late 1980s. In essence, the poor returns of the past 10 years just offset the very high returns of the previous decade.

Table 2 summarizes some of the important statistics about the equity market, such as the P/E, earnings growth, and dividend growth, for 1871–April 2011. The average P/E has changed very little over the past decade. In the version of Table 2 prepared for the 2001 forum, the average P/E was 14.45; adding the subsequent 10 years of data increased it by 0.06 to 14.51. The earnings yield, which is the reciprocal of the P/E, obviously also changes little.

One important issue that was in contention in the first forum is still debated today. Finance theory, particularly that of Modigliani and Miller (M&M), predicts that when the dividend payout ratio declines, the dividend yield will also decline, but this decline will be offset by an increase in the growth rate of future earnings and dividends.[2] Cliff Asness, at the 2001 forum, and Rob Arnott, at the most recent forum, cite research, which they performed together, that suggests that a lower payout ratio, in contrast to what finance theory would predict, does not actually lead to faster earnings growth.[3] At the first forum, I claimed that this finding was a result of the cyclical behavior of earnings. Asness and Arnott claimed to have run further tests to contest this point. Notwithstanding their results, my data clearly show that over long periods of time, the payout ratio is inversely correlated with dividend and earnings growth as predicted by finance theory.

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[1]Roger G. Ibbotson and Rex A. Sinquefield, "Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns (1926–1974)," *Journal of Business*, vol. 49, no. 1 (January 1976):11–47.

[2]Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, vol. 48, no. 3 (June 1958):261–297.

[3]Robert D. Arnott and Clifford S. Asness, "Surprise! Higher Dividends = Higher Earnings Growth," *Financial Analysts Journal*, vol. 59, no. 1 (January/February 2003):70–87.

Table 1. Historical Returns for Stocks, Bonds, and T-Bills, 1802–April 2011

	Real Return						Stocks' Excess Return Over			
	Stocks		Bonds		T-Bills		Bonds		T-Bills	
	Geometric	Arithmetic	Geometric	Arithmetic	Geometric	Arithmetic	Geometric	Arithmetic	Geometric	Arithmetic
Periods										
1802–2011	6.7%	8.2%	3.6%	3.9%	2.7%	2.9%	3.1%	4.3%	3.9%	5.3%
1870–2011	6.5	8.2	3.0	3.3	1.6	1.7	3.5	4.9	4.9	6.5
Major subperiods										
1802–1870	7.0%	8.3%	4.8%	5.1%	5.1%	5.4%	2.2%	3.2%	1.9%	2.9%
1871–1925	6.6	7.9	3.7	3.9	3.2	3.3	2.9	4.0	3.5	4.7
1926–2011	6.4	8.4	2.5	3.0	0.6	0.7	4.0	5.4	5.8	7.7
After World War II										
1946–2011	6.4%	8.3%	1.8%	2.2%	0.5%	0.6%	4.6%	6.0%	6.0%	7.6%
1946–1965	10.0	11.4	–1.2	–1.0	–0.8	–0.7	11.2	12.3	10.9	12.1
1966–1981	–0.4	1.4	–4.2	–3.9	–0.2	–0.1	3.8	5.2	–0.2	1.5
1982–1999	13.6	14.3	8.5	9.3	2.9	2.9	5.1	5.0	10.7	11.4
1982–2011	7.9	9.1	7.5	7.9	1.8	1.7	0.4	1.2	6.1	7.4
1991–2011	7.0	8.5	6.0	6.3	0.9	0.9	0.9	2.1	6.1	7.6
2001–2011	0.8	2.8	4.7	4.7	–0.3	–0.3	–4.0	–1.9	1.1	3.0

Table 2. Historical Equity Market Statistics, 1871–April 2011

	Real Stock Return	Average P/E	Inverse of Average P/E	Real Earnings Growth	Real Dividend Growth	Dividend Yield	Real Capital Gains	Average Payout Ratio
1871–2011	6.51%	14.51	6.89%	1.81%	1.22%	4.47%	1.55%	59.92%
1871–1945	6.39	13.83	7.23	0.67	0.74	5.31	1.11	70.81
1946–2011	6.44	15.29	6.54	3.14	1.76	3.50	2.85	47.42

In fact, the evidence in favor of M&M has been strengthened by the addition of the past 10 years of data. In the 1871–1945 data, annual real per share earnings growth was only 0.67 percent per year and the payout ratio averaged nearly 72 percent. In the post-WWII period, real earnings growth was 3.14 percent and the payout ratio was only 47.42 percent.[4]

It is true that adding the past 10 years increases post-WWII real per share dividend growth only marginally because the payout ratio is still declining and has not yet reached a new "steady state" in which dividend growth will increase to the level of earnings growth.

Projections for the Next Decade

I hope a third forum will be held in 2021 so we can look back on our predictions in 2011, either nursing our wounds or congratulating ourselves on our astuteness. Using the current P/E as a basis, I expect real stock returns to be between 6 and 7 percent. But I will not be surprised if they are higher because the same factors that influenced my prediction of P/Es in the range of 20–25 are as operative in 2011 as they were at the time of the first forum in 2001.

Real bond returns are on track to be much lower. Ten-year TIPS are now yielding about 1 percent, so the excess returns of stocks over bonds should be in the 5–6 percent range, which is higher than the historical average. And the bias, if any, will be toward a higher equity premium if real bond yields rise from their extremely low levels, as I think they should. In short, relative to bonds, stocks look extraordinarily attractive, and I expect stock investors will look back a decade from now with satisfaction.

[4]Note that the 3.14 percent growth rate is more than 1 percentage point higher than the post-WWII real earnings growth rate presented at the first forum; the addition of the past 10 years also reduces the post-WWII average payout ratio from 50.75 percent to 47.42 percent.

The Equity Premium Puzzle Revisited

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In the two and a half decades since "The Equity Premium: A Puzzle" (Mehra and Prescott 1985) was published, attempts to successfully account for the equity premium have become a major research impetus in finance and economics. In an effort to reconcile theory with observations, I will elaborate on the appropriateness of three crucial abstractions in that article. In particular, I will argue that our finding (i.e., the premium for bearing nondiversifiable aggregate risk is small) is not inconsistent with the average equity premium over the past 120 years.

The three abstractions that I address here are

- using T-bill prices as a proxy for the expected intertemporal marginal rate of substitution of consumption;
- ignoring the difference between borrowing and lending rates (a consequence of agent heterogeneity and costly intermediation);
- abstracting from life-cycle effects and borrowing constraints on the young.

I examine each of these in detail below.

Using T-Bill Prices as a Proxy for the Expected Intertemporal Marginal Rate of Substitution of Consumption

An assumption implicit in Mehra and Prescott (1985) is that agents use both equity and the riskless asset to smooth consumption intertemporally. This assumption is a direct consequence of the first-order condition (see Equation 1) for the representative household in our model. It implies that agents save by optimally allocating resources between equity and riskless debt.

$$0 = E_t\left[\frac{U_c\left(c_{t+s}\right)}{U_c\left(c_t\right)}\left(r^e_{t,t+s} - r^d_{t,t+s}\right)\right]. \tag{1}$$

Author Note: This paper draws widely on my collaborations with George Constantinides, John Donaldson, and Edward Prescott. Quite independently of our joint work, they have made substantial contributions to the literature on the equity premium puzzle. Consequently, the views expressed in this paper do not necessarily reflect their views.

Equation 1 is the standard asset-pricing equation in macroeconomics and finance. $U_c(c_{t+s})$ is the marginal utility of consumption at time $t + s$; $r^e_{t,t+s}$ and $r^d_{t,t+s}$ are, respectively, the return on equity and the return on the riskless asset over the period t, $t + s$; and E_t is the expectation conditional on the agent's information set at time t.

If the results from the model are to be compared with data, it is crucial to identify the empirical counterpart of the riskless asset that is actually used by agents to smooth consumption. In Mehra and Prescott (1985), we used the highly liquid T-bill rate, corrected for expected inflation, as a proxy for this asset. But one might ask: Is it reasonable to assume that T-bills are an appropriate proxy for the riskless asset that agents use to save for retirement and smooth consumption? Do households actually hold T-bills to finance their retirement? *Only if this question is empirically verified would it be reasonable to equate their expected marginal rate of substitution of consumption to the rate of return on T-bills.*

This question cannot be answered in the abstract without reference to the asset holdings of households, so a natural next step is to examine the assets held by households. **Table 1** details these holdings for U.S. households. The four big asset-holding categories of households are tangible assets, pension and life insurance holdings, equity (both corporate and noncorporate), and debt assets.

Table 1. Household Assets and Liabilities as a Fraction/ Multiple of GDP
(average of 2000 and 2005)

Assets (GDP)		Liabilities (GDP)	
Asset	GDP (×)	Liability	GDP (×)
Tangible household	1.65	Liabilities	0.7
Corporate equity	0.85	Net worth	4.15
Noncorporate equity	0.5		
Pension and life insurance reserves	1.0		
Debt assets	0.85		
Total	4.85		4.85

In 2000, privately held government debt was only 0.30 times GDP, a third of which was held by foreigners. The amount of interest-bearing government debt with maturity less than a year was only 0.085 times GDP, which is a small fraction of total household net worth. Virtually no T-bills are directly owned by households.[1] Approximately one-third of the T-bills outstanding are held by foreign central banks, and two-thirds are held by U.S. financial institutions.

[1] See Table B-89, *Economic Report of the President* (2005).

Although large amounts of debt assets are held, most of these are in pension fund and life insurance reserves. Some are in demand deposits, for which free services are provided. Most government debt is held indirectly; a small fraction is held as savings bonds.

Thus, much of intertemporal saving is in debt assets, such as annuities and mortgage debt, held in retirement accounts and as pension fund reserves. Other assets, not T-bills, are typically held to finance consumption in retirement. *Hence, T-bills and short-term debt are not reasonable empirical counterparts to the risk-free asset priced in Equation 1*, and it would be inappropriate to equate the return on these assets to the expected marginal rate of substitution for an important group of agents.

An inflation-indexed, default-free bond portfolio with a duration similar to that of a well-diversified equity portfolio would be a reasonable proxy for a risk-free asset used for consumption smoothing.[2] For most of the 20th century, equity has had an implied duration of about 25 years, so a portfolio of TIPS (Treasury Inflation-Protected Securities) of a similar duration would be a reasonable proxy.

Because TIPS have only recently (1997) been introduced in U.S. capital markets, it is difficult to get accurate estimates of the mean return on this asset class. The average return for the 1997–2005 period is 3.7 percent. An alternative (though imperfect) proxy would be to use the returns on indexed mortgages guaranteed by Ginnie Mae (Government National Mortgage Association) or issued by Fannie Mae (Federal National Mortgage Association). I conjecture that if these indexed default-free securities are used as a benchmark, the equity premium will be closer to 4 percent than to the 6 percent equity premium relative to T-bills. By using a more appropriate benchmark for the riskless asset, I can account for 2 percentage points of the "equity premium."

Ignoring the Difference between Borrowing and Lending Rates

A major disadvantage of the homogeneous household construct is that it precludes the modeling of borrowing and lending among agents. In equilibrium, the shadow price of consumption at date $t + 1$ in terms of consumption at date t is such that the amount of borrowing and lending is zero. However, there is a large amount of costly intermediated borrowing and lending between households, and as a consequence, borrowing rates exceed lending rates. When borrowing and lending rates differ, a question arises: Should the equity premium be measured relative to the riskless borrowing rate or the riskless lending rate?

[2]McGrattan and Prescott (2003) use long-term high-grade municipal bonds as a proxy for the riskless security.

To address this question, Mehra, Piguillem, and Prescott (2011) constructed a model that incorporates agent heterogeneity and costly financial intermediation. The resources used in intermediation (3.4 percent of GNP) and the amount intermediated (1.7 percent of GNP) imply that the average household borrowing rate is at least 2 percentage points higher than the average household lending rate. Relative to the level of the observed average rates of return on debt and equity securities, this spread is far from being insignificant and cannot be ignored when addressing the equity premium.

In this model,[3] a subset of households both borrow money and hold equity. Consequently, a no-arbitrage condition is that the return on equity and the borrowing rate are equal (5 percent). The return on government debt, the household lending rate, is 3 percent. If I use the conventional definition of the equity premium—the return on a broad equity index less the return on government debt—I would erroneously conclude that in this model, the equity premium is 2 percent. The difference between the government borrowing rate and the return on equity is not an equity premium; it arises because of the wedge between borrowing and lending rates. Analogously, if borrowing and lending rates for equity investors differ, and they do in the U.S. economy, the equity premium should be measured relative to the investor borrowing rate rather than the investor lending rate (the government's borrowing rate). Measuring the premium relative to the government's borrowing rate artificially increases the premium for bearing aggregate risk by the difference between the investor's borrowing and lending rates.[4] If such a correction is made to the benchmark discussed earlier, the "equity premium" is further reduced by 2 percentage points. Thus, I have accounted for 4 percentage points of the equity premium reported in Mehra and Prescott (1985) by factors other than aggregate risk.

Abstracting from Life-Cycle Effects and Borrowing Constraints on the Young

In Constantinides, Donaldson, and Mehra (2002), we examined the impact of life-cycle effects, such as variable labor income and borrowing constraints, on the equity premium. We illustrated these ideas in an overlapping-generations exchange economy in which consumers live for three periods. In the first period, a period of human capital acquisition, the consumer receives a relatively low endowment income. In the second period, the consumer is employed and receives wage income subject to large uncertainty. In the third period, the consumer retires and consumes the assets accumulated in the second period.

[3]There is no aggregate uncertainty in our model.

[4]For a detailed exposition of this and related issues, see Mehra and Prescott (2008).

In the article, we explored the implications of a borrowing constraint by deriving and contrasting the stationary equilibriums in two versions of the economy. In the *borrowing-constrained* version, the young are prohibited from borrowing and from selling equity short. The *borrowing-unconstrained* economy differs from the borrowing-constrained one only in that the borrowing constraint and the short-sale constraint are absent.

The attractiveness of equity as an asset depends on the correlation between consumption and equity income. Because the marginal utility of consumption varies inversely with consumption, equity will command a higher price (and consequently, a lower rate of return) if it pays off in states when consumption is high and vice versa.[5]

A key insight of ours in the article is that as the correlation of equity income with consumption changes over the life cycle of an individual, so does the attractiveness of equity as an asset. Consumption can be decomposed into the sum of wages and equity income. Young people looking forward at the start of their lives have uncertain future wage and equity income; furthermore, the correlation of equity income with consumption will not be particularly high as long as stock and wage income are not highly correlated. This is empirically the case, as documented by Davis and Willen (2000). Equity will, therefore, be a hedge against fluctuations in wages and a "desirable" asset to hold as far as the young are concerned.

The same asset (equity) has a very different characteristic for the middle-aged. Their wage uncertainty has largely been resolved. Their future retirement wage income is either zero or deterministic, and the innovations (fluctuations) in their consumption occur from fluctuations in equity income. At this stage of the life cycle, equity income is highly correlated with consumption. Consumption is high when equity income is high, and equity is no longer a hedge against fluctuations in consumption; hence, for this group, equity requires a higher rate of return.

The characteristics of equity as an asset, therefore, change depending on the predominant holder of the equity. Life-cycle considerations thus become crucial for asset pricing. If equity is a desirable asset for the marginal investor in the economy, then the observed equity premium will be low relative to an economy where the marginal investor finds it unattractive to hold equity. The *deus ex machina* is the stage in the life cycle of the marginal investor.

[5]This is precisely the reason why high-beta stocks in the simple capital asset pricing model framework have a high rate of return. In that model, the return on the market is a proxy for consumption. High-beta stocks pay off when the market return is high—that is, when marginal utility is low and, hence, their price is (relatively) low and their rate of return high.

We argued that the young, who should be holding equity in an economy without frictions, are effectively shut out of this market because of borrowing constraints. The young are characterized by low wages; ideally, they would like to smooth lifetime consumption by borrowing against future wage income (consuming a part of the loan and investing the rest in higher return equity). However, they are prevented from doing so because human capital alone does not collateralize major loans in modern economies for reasons of moral hazard and adverse selection.

Therefore, in the presence of borrowing constraints, equity is exclusively priced by middle-aged investors because the young are effectively excluded from the equity markets and a high equity premium is thus observed. If the borrowing constraint is relaxed, the young will borrow to purchase equity, thereby raising the bond yield. The increase in the bond yield induces the middle-aged to shift their portfolio holdings from equities to bonds. The increase in demand for equity by the young and the decrease in demand for equity by the middle-aged work in opposite directions. On balance, the effect is to increase both the equity and the bond return, while shrinking the equity premium.

The results suggest that, depending on the parameterization, between 2 and 4 percentage points of the observed equity premium can be accounted for by incorporating life-cycle effects and borrowing constraints.

Conclusion

I have argued that using an appropriate benchmark for the risk-free rate, accounting for the difference between borrowing and lending rates, and incorporating life-cycle features can account for the equity premium. That this can be accomplished without resorting to risk supports the conclusion of Mehra and Prescott (1985) that the premium for bearing systematic risk is small.

My projection for the equity premium is that at the end of the next decade, it will be higher than that observed in the past. During the next 10 years, the ratio of the retired population to the working-age population will increase. These retired households, in an attempt to hedge against outliving their assets, will likely rebalance their portfolios by substituting annuity-like products for equity. Because, in equilibrium, all assets must be held, this substitution will lead to an increase in the expected equity premium. Consequently, during this adjustment process, the realized equity premium will probably be lower than the historical average.

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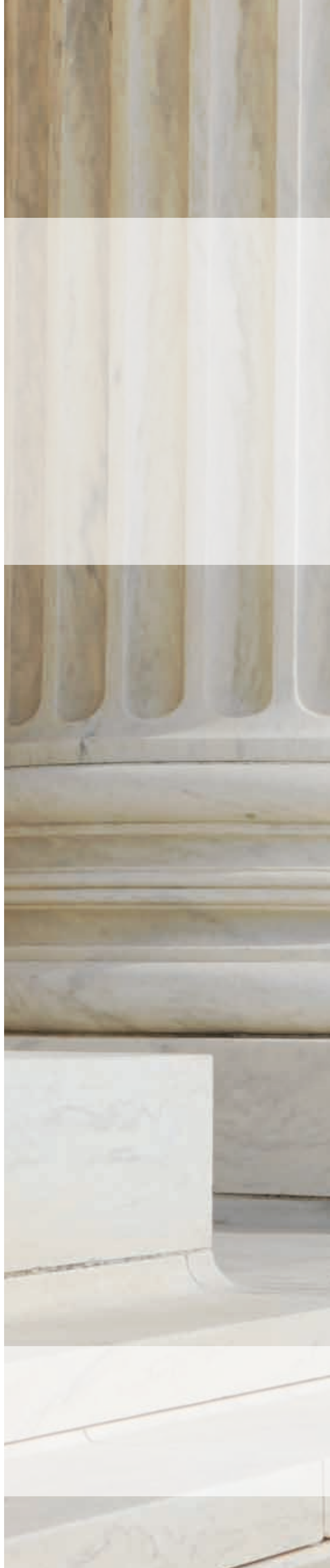

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"An Opening of Minds"

"I think investors are starting to come around to the view that stocks aren't quite as special as they once thought," says Rob Arnott

By Jonathan Barnes

"My career has largely been successful as a consequence of the fact that I love to test ideas," says Rob Arnott, chairman and CEO of Research Affiliates and former editor in chief of the *Financial Analysts Journal*. Arnott's reputation for testing conventional investment wisdom made him one of the key contributors when the Research Foundation of CFA Institute gathered leading academics and practitioners in 2011 to discuss the equity risk premium (ERP), the expected return for equities in excess of a risk-free rate. He delivered a presentation titled "Equity Risk Premium Myths," which was subsequently included in the book *Rethinking the Equity Risk Premium*. In this interview with *CFA Institute Magazine*, Arnott corrects some of the misconceptions about the ERP, argues that "a cult of equities is worshipping a false idol," deconstructs the notion of a risk-free rate, and explains why "our industry, both on the practitioner and on the academic sides, has tremendous inertia, a resistance to new ideas."

Do we need a stronger definition of the equity risk premium?
All too often, the term "equity risk premium" is attached to widely different concepts. It is applied to the historical difference in returns between stocks and bonds—or between stocks and cash—and it is also applied to forward-looking expectational return differences. Really, a risk premium is an *expectational* return, so when we look at historical returns, I think it is important to use different terminology. I prefer the term "historical excess return," not risk premium.

If we turn attention from past to future, the equity risk premium should be the expected incremental return that an investor will likely earn from a willingness to hold stocks instead of bonds or cash. So, one needs to further define one's terms. The risk premium versus bonds and the risk premium versus cash are very different. Today, cash yields nothing; 30-year bonds have yields around 3%.

Which measure is more widely used?
Academia tends to think of the equity risk premium relative to a risk-free rate (never mind that there is nothing that is really risk free in life), and typically that is thought of as a cash yield. A much more relevant measure is equities versus long bonds because they both have a long investment horizon. Cash is very risky for the long-term investor!

ALL TOO OFTEN, THE TERM "EQUITY RISK PREMIUM" IS ATTACHED TO WIDELY DIFFERENT CONCEPTS.

When we look at stocks relative to long bonds, we can do some very simple arithmetic as it relates to expectational returns. Thirty-year bonds have yields around 3%, and the real return as indicated by long-term Treasury Inflation-Protected Securities (TIPS) is 0.5%, give or take.

Stocks produce returns in a real return form because earnings and dividends grow with inflation, plus a real growth kicker. Historically, going back a hundred years, you find earnings and dividends have grown a little less than 1.5% above the rate of inflation. If you add that to the current yield, you get something on the order of a 3.5% expected real return, as against 0.5% for long TIPS. That gives you a 3% risk premium. And that assumes that past rates of growth can continue, given the headwinds from our aging population, as well as our burgeoning debt and deficits.

So when we reframe the definition in terms of forward-looking return expectations for stocks (relative to forward-looking real return expectations for long bonds), we get a comparison of two relatively similar-horizon investments and a comparison that has some real economic meaning. That's my preferred way of thinking about the equity risk premium.

Is more standardization of the ERP needed?
Discussions about the equity risk premium often occur in vague terms: How much more do you expect to earn from a willingness to bear equity market risk? How much more return relative to what? Over what investment horizon? These questions are left ambiguous in all too many examinations of the equity risk premium. If they are defined with any precision, you get much more reasonable apples-with-apples comparisons. Then, you have an ability to examine the underlying assumptions.

There is an annual academic survey of estimates on the equity risk premium in which the ERP is defined as a long-term return against T-bills. But you still have to factor inflation expectations, and on a long-term basis, inflation is anyone's guess, not to mention the future real T-bill yields. So, even with studies that define their terms, if you have a gap in return horizon—cash has a horizon that is measured in weeks or months, stocks have a horizon that is measured in decades—then again, you get into ambiguous comparisons of apples and oranges and a relatively meaningless phenomenon.

Can you explain the myth that the equity risk premium is 5%?
The notion that stocks beat bonds by 5% was embraced in the 1990s by much of the consulting community (and through the consulting community, by much of the plan sponsor community). It is something of a core belief in the practitioner community. This myth is very dangerous because the long-term historical excess return—while not far from 5%—is driven in large measure by a change in valuation multiples for equities. The long-term historical average dividend yield for stocks going back a hundred or more years is about 4%. If the yield now is 2%—a rise in valuation multiples from 25 years of dividends to 50 years of dividends—that is a big change in valuation multiples. So, it creates an inflated historical excess return, which people then translate into an inflated expectational risk premium.

How does your estimate of 3% compare historically?
It's above the historic norms. In 2002, I wrote a paper with Peter Bernstein for the *Financial Analysts Journal* that showed that the reasonable historical equity risk premium—not the excess

return—but what would reasonably have been expected historically for stocks relative to long bonds—was 2.4%.

So, if we are looking at 3% today, that means that right now we have a modestly outsized equity risk premium (if future economic growth matches past growth). It's predicated on negative real yields at the long end of the bond market, so that is a big problem. If you are looking at anemic real returns on bonds (and less-anemic real returns on stocks), you get a positive risk premium through the unfortunate path of generally dismal returns.

I THINK THE MYTHS ARE A CONSEQUENCE OF INERTIA. OUR INDUSTRY, BOTH ON THE PRACTITIONER AND ON THE ACADEMIC SIDES, HAS TREMENDOUS INERTIA, A RESISTANCE TO NEW IDEAS.

Another myth is that the ERP is static over time, companies, and markets. Can you say more?

There are respected academics who build their theories on the notion that the equity risk premium must be static. Yet, on the other hand, there are those who argue that the equity risk premium varies from one stock to another. If it varies from one stock to another, why shouldn't it vary from one month or year to another? The notion of a static equity risk premium is another unfortunate myth.

The risk premium is really a function of pricing. When bond yields are high, the risk premium can get very skinny indeed. Ever so briefly in 2000, you could buy TIPS, *long-term* TIPS, extending out 20–30 years that had a yield of over 4%. I believe the top was 4.3%. A 4.3% real return guaranteed with full faith and credit of the U.S. Treasury is a marvelous default risk–free return. To have that available in bonds at a time when stocks had a yield of 1% is really quite breathtaking. So, what we find is that the risk premium is dynamic. It changes over time.

And across companies and markets.

Yes, let's look across companies. Bank of America is a huge company and comprises less than 1% of the U.S. stock market. Apple is a much smaller company that comprises over 4% of the U.S. stock market. Is it reasonable to assume that Apple—with wonderful growth, no serious competition, and viewed widely as a safe haven—should have the same risk premium as Bank of America, a company that has in recent years seemed to lose its way strategically and is facing daunting headwinds in the years ahead? Should they be priced at the same forward-looking rate of return? Probably not.

By the same token, compare the risk premium when people were worried about financial Armageddon in early 2009 and the risk premium when people felt that things were getting solidly back on track in early 2011. Should that risk premium be the same from one year to the next? Of course not.

So, yes, risk premia vary cross-sectionally, across time, across markets, across companies. Is the Greek risk premium higher than the U.S. risk premium today? Yeah, I would think so, which means that investors in Greek stocks should be expecting a higher return than investors in U.S. stocks because of the higher expected uncertainty.

Why are these myths so enduring?

I think the myths are a consequence of inertia. Our industry, both on the practitioner and on the academic sides, has tremendous inertia, a resistance to new ideas. Once people are taught a particular way of thinking, there is a resistance to questioning that way of thinking. One could characterize it even as a bit of intellectual laziness. People embrace an idea that they have been taught, and they hang on to that idea. They are reluctant to relinquish it in favor of something else.

People are taught the normal risk premium is 5%. In early 2001, Ron Ryan and I wrote a paper titled "The Death of the Risk Premium," which was first published as a First Quadrant "President's Letter" and later published in the *Journal of Portfolio Management*, where we suggested that the equity risk premium was now negative. That created a firestorm of controversy and even outrage in some quarters—to suggest that stocks would produce a lower return than bonds. But if stocks have a dividend yield of 1% and bonds have a yield of 6% in an environment of 2% inflation, that points to a negative risk premium, unless stocks can deliver long-term earnings and dividend growth north of 5%. There is nothing written into contract law in the finance community that says, "Stocks must have a positive risk premium."

WE DO OURSELVES A GREAT FAVOR IF WE ABANDON THE NOTION OF A RISK-FREE RATE AND REPLACE IT WITH A NOTION OF A RISK-MINIMIZING ASSET OR PORTFOLIO OVER A HORIZON MATCHING THE INTENDED LIABILITIES.

Why are you so interested in these myths?
My career has largely been successful as a consequence of the fact that I love to test ideas. The more widely accepted an idea is, the more I am inclined to say, "Let's test it and see if it is true."

One of the things that startled me over the course of my career is how few people pursue that line of reasoning—"If an idea is well accepted, maybe we should test it"—and how many people resist those tests when they turn out to suggest that conventional wisdom is wrong. Conventional wisdom isn't always wrong; it's just not always *right*.

How risk free is the risk-free rate?
I think the whole notion of a risk-free rate is a distraction which takes our eye off of the ball in terms of how people think about investments. First, risk free in what context?

The risk of a 30-day Treasury bill defaulting is, for all intents and purposes, zero. The risk of it producing a real return that is less than we expect—that is a much bigger risk because the uncertainty about next month's CPI has a certain standard deviation that makes that so-called risk-free asset a little less risk free than we might think or hope.

Try to persuade any investor with a long-term liability—a typical pension fund, for instance—that owning and rolling T-bills is a risk-free way to fund those pensions. Come on! We don't know what the rates are going to be over the coming years. We don't know what the inflation is going to be, and we don't know what the growth of the liability itself will be. There is *no such thing* as a risk-free rate. The sooner we abandon the notion that there is a risk-free rate, the better off we will be.

If not risk free, then what?
For most long-term investors, the risk-*minimizing* asset—not risk *free*—is something that is duration-matched to your intended spending stream and to your liabilities. If you are a pension fund, for instance, if those liabilities have an inflation kicker to them—if they are sensitive to the rates of inflation—then long TIPS are your risk-minimizing asset.

If we think in terms of risk-minimizing assets over a horizon long enough to matter, we arrive at very, very different answers. All of a sudden, what feels low risk (a cash-dominated portfolio) turns out to be very high risk measured in terms of long-term return expectations and long-term liabilities. Something that feels pretty volatile, a 30-year TIPS instrument, winds up being very low risk measured against long-term liabilities. So, I think we do ourselves a great favor if we abandon the notion of a risk-free rate and replace it with a notion of a risk-minimizing asset or portfolio over a horizon matching the intended liabilities.

Would that alter the traditional asset-pricing models that evaluate risk–return trade-offs?
Peter Bernstein and I published a paper way back in 1988 in the *Harvard Business Review* (they assigned the title "The Right Way to Manage Your Pension Fund," which I thought was a pretty arrogant title). The paper simply said, "If you redefine your efficient frontier to characterize risk as the mismatch between your assets and liabilities, you wind up with a very different efficient frontier and a very different portfolio mix." We urged consultants and pension funds to consider optimizing their holdings on the basis of a redefinition of risk. To this day, I believe that makes absolute sense, and to this day, hardly anyone does it.

How does the LIBOR scandal tie in to this?
I think that the LIBOR scandal is simultaneously a big deal and much ado about nothing, which sounds contradictory.

I say much ado about nothing because when people price swaps off LIBOR, when it is a gamed LIBOR, they figure out what they want to charge for the swap and they price it relative to that gamed LIBOR. The gaming of the LIBOR has nothing to do with the rate that they are charging. The rate that they are charging relative to LIBOR is really an outcome of setting a rate that you want to charge and subtracting the gamed LIBOR from it. So if the gaming of LIBOR is much the same from one period to the next, no one is harmed.

But it was a very big deal in the sense that people trusted that it was a fair interbank borrowing rate. We have had so many damaging body blows to the public's sense of trust in the capital markets. How useful are the capital markets if we can't trust them? How effective is the capitalist system that is predicated on trust? When we do a deal, we trust that the other side will honor their side of the deal.

You attended the CFA Institute forums on the equity risk premium in 2001 and 2011. What did you learn? What was your experience at the forums?

They were fun. As I mentioned, when Ron Ryan and I wrote the paper "The Death of the Equity Risk Premium" in 2000, we ran into a buzz saw of resistance. Today, you don't get that pushback. One thing that has changed is that people, probably by dint of the pain of the last dozen years, are beginning to recognize that the cult of equities is itself promulgating huge myths.

The notion that double-digit returns are natural for stocks, the notion that lower yields are the market's way of telling you to expect faster growth, the notion that stocks are assuredly going to produce higher returns than long bonds for those patient enough to stay the course over the course of one or two economic cycles and that stocks are less risky than bonds for the truly long-term investor—these are all myths that are fast dissipating.

My view that a cult of equities is worshipping a false idol is no longer a fringe view that gets one consigned to our industry's virtual lunatic asylum. It's becoming an acceptable view. So I think we are seeing an opening of minds. The opening of minds is unfortunately a dozen years too late to avert damage, but it is important and interesting to see that it is happening.

You've written on the necessity of challenging deeply rooted assumptions of finance theory. Can you explain?

Neoclassical finance and the capital asset pricing model are predicated on an array of powerful theories and, in many cases, mathematical proofs that demonstrate that if the market behaves in thus and such a fashion, it will have thus and such implications.

Take the capital asset pricing model. If markets are efficient and if investors share a common view on forward-looking risks and returns, if investors trade for free with no taxes and no trading costs, and if all investors have a similar utility function, then the market-clearing portfolio will be the "mean–variance-efficient portfolio" and you can't beat it on a risk-adjusted basis.

That is a very powerful conclusion—deservedly winning a Nobel Prize for Bill Sharpe—built on a foundation of heroic and clearly inaccurate assumptions. I think finance theory is *wonderful*, but I think it is important that we acknowledge that finance theory is theory. It is not the real world. Theory is designed to tell us how the world *ought* to work. The more we can learn from theory and conform theory to better match the real world, the deeper our understanding of markets.

I think, with the coming quarter century, it will be marvelous if we see a marriage—and it will be an uncomfortable marriage—of neoclassical finance with behavioral finance, a theoretical foundation for the empirical observations of behavioral finance. The big issues in finance theory are really simple. If you assume that the theory is correct and true, then we are tacitly assuming that the assumptions are correct and true. And yet nobody would argue that the assumptions are true. I think we need to back off from the notion that theory is reality.

FINANCE THEORY IS THEORY. IT IS NOT THE REAL WORLD.

Are equities worth the risk, given the potentially low equity risk premium?

I think investors are starting to come around to the view that stocks aren't quite as special as they once thought. The sad irony is that the more extravagantly expensive stocks are, the more members you will have in the cult of equities. The reason for that is simple. Stocks become extravagantly expensive by performing brilliantly. After they have performed brilliantly, it is painful to argue the case that stocks are a lousy investment. People come around to the view that stocks aren't guaranteed a premium return *after* equities have underperformed badly for a long period of time. That is unfortunate and it is ironic, but it is a simple fact.

Jonathan Barnes is a financial journalist and author of the novel *Reunion*.

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Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

1a. Are you more or less optimistic about your country's economy compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	120	26.1 %	± 4.0 %
0=No change	152	33.0 %	± 4.3 %
-1=Less optimistic	188	40.9 %	± 4.5 %
Total	460	100.0 %	

Mean = -0.15
SD = 0.81

Missing Cases = 4
Response Percent = 99.1 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

1b. Rate your optimism about your country's economy on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 0

Maximum = 95

Mean = 60.3

Median = 60

Standard Deviation (Unbiased Estimate) = 17.6

95 Percent Confidence Interval Around The Mean = 58.6 - 62.1

Quartiles

1 = 50
2 = 60
3 = 75

Valid Cases =395
Missing Cases =67
Response Percent = 85.5%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

2a. Are you more or less optimistic about the financial prospects for your own company compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	189	41.0 %	± 4.5 %
0=No change	132	28.6 %	± 4.1 %
-1=Less optimistic	140	30.4 %	± 4.2 %
Total	461	100.0 %	

Mean = 0.11
SD = 0.84

Missing Cases = 3
Response Percent = 99.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

2b. Rate your optimism about the financial prospects for your own company on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 0

Maximum = 100

Mean = 65.9

Median = 70

Standard Deviation (Unbiased Estimate) = 20.0

95 Percent Confidence Interval Around The Mean = 64.0 - 67.9

Quartiles

1 = 50
2 = 70
3 = 80

Valid Cases =398
Missing Cases =64
Response Percent = 86.1%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team?

	Number	Percent	95% CI
Economic uncertainty	191	42.7 %	± 4.6 %
Cost of benefits	162	36.2 %	± 4.5 %
Difficulty attracting / retaining qualified employees	156	34.9 %	± 4.4 %
Regulatory requirements	149	33.3 %	± 4.4 %
Government policies	136	30.4 %	± 4.3 %
Weak demand for your products/services	112	25.1 %	± 4.0 %
Data security	106	23.7 %	± 4.0 %
Employee productivity	84	18.8 %	± 3.6 %
Employee morale	81	18.1 %	± 3.6 %
Access to capital	68	15.2 %	± 3.3 %
Rising wages and salaries	63	14.1 %	± 3.2 %
Currency risk	47	10.5 %	± 2.9 %
Corporate tax code	44	9.8 %	± 2.8 %
Cost of borrowing	36	8.1 %	± 2.5 %
Geopolitical / health crises	22	4.9 %	± 2.0 %
Rising input or commodity costs	17	3.8 %	± 1.8 %
Deflation	16	3.6 %	± 1.7 %
Inflation	12	2.7 %	± 1.5 %
Other	35	7.8 %	± 2.5 %
Total	1537		

Number of Cases = 447
Number of Responses = 1537
Average Number Of Responses Per Case = 3.4
Number Of Cases With At Least One Response = 447
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team? - Other specified

Agr, Forestry, Fishing	Deflation
Bank/Fin/Insur/Real Est	Increasing competition
Bank/Fin/Insur/Real Est	insurance pricing
Bank/Fin/Insur/Real Est	low interest rates
Bank/Fin/Insur/Real Est	non-traditional competition - less regulated
Bank/Fin/Insur/Real Est	Sales staff
Bank/Fin/Insur/Real Est	stasis in consumer and business demand
Energy	Low oil and gas prices
Healthcare/Pharm	Dependent on Government funding
Healthcare/Pharm	impact of health care reform
Healthcare/Pharm	Low Medicare payments
Healthcare/Pharm	Medical premiums
Manufacturing	agresssive competitor pricing
Manufacturing	Declining commodity costs
Manufacturing	drought
Manufacturing	Falling Commodity Costs
Manufacturing	Major Customer disfunction
Manufacturing	poor production quality
Manufacturing	Trained and Skilled Production Employees
Manufacturing	Weak retail sales
Other	Global Economy
Other	Hiring the right person
Pub Admin	terrorist action slowing economy/travel
Retail/Wholesale	Ability to scale quickly
Retail/Wholesale	Driving more top-line growth
Retail/Wholesale	drop in oil prices
Retail/Wholesale	Loss of sales revenue
Retail/Wholesale	SUPPLY FROM VENDORS
Services, Consulting	Cash flow
Services, Consulting	Competition
Services, Consulting	Cost Containment
Services, Consulting	Dropping oil price
Services, Consulting	Energy industry earnings outlook and its impact on the US economy.
Services, Consulting	Energy prices,
Services, Consulting	Government idiots
Tech [Soft/Hard/Bio]	Service delivery
Transp, Public Util	Steel Imports affecting Customers

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Agr, Forestry, Fishing	Ag Chemical & Seed company consolidation
Agr, Forestry, Fishing	European and China economic uncertainty.
Agr, Forestry, Fishing	Increasing supply of the product we produce will put downward pressure on selling prices
Agr, Forestry, Fishing	Low world wide growth, terrible emerging market area, terrorism and unless one is associated with a
Agr, Forestry, Fishing	N/A
Agr, Forestry, Fishing	royalty checks and lack of knowledge what happened to them.
Bank/Fin/Insur/Real Est	Benefits costs; excessive and restrictive government regulations
Bank/Fin/Insur/Real Est	CFBP and attracting qualified employees
Bank/Fin/Insur/Real Est	Changes in consumer preferences.
Bank/Fin/Insur/Real Est	Competition
Bank/Fin/Insur/Real Est	Cyber Security issues
Bank/Fin/Insur/Real Est	economic challenges in mid-level economies (we do a lot of business internationally)
Bank/Fin/Insur/Real Est	Economic stagnation and soft insurance markets
Bank/Fin/Insur/Real Est	Economic uncertainty in 2016
Bank/Fin/Insur/Real Est	Expanding product offerings into into new geographical areas (other USA States)
Bank/Fin/Insur/Real Est	Geopolitical risks, interest rate environment
Bank/Fin/Insur/Real Est	Growing the top line again.
Bank/Fin/Insur/Real Est	Higher interest rates will be a challenge for loan growth
Bank/Fin/Insur/Real Est	Increased shareholder activism
Bank/Fin/Insur/Real Est	Increasing costs driven by customer and prospect demands
Bank/Fin/Insur/Real Est	Increasing tax rates - property tax
Bank/Fin/Insur/Real Est	Interest Rate stagnation
Bank/Fin/Insur/Real Est	Interest rate risk due to anticipated rising interest rates.
Bank/Fin/Insur/Real Est	interest rate and geopolitical uncertainty
Bank/Fin/Insur/Real Est	interest rate risk
Bank/Fin/Insur/Real Est	Managing rising interest rates
Bank/Fin/Insur/Real Est	New Government Regulations
Bank/Fin/Insur/Real Est	not enough qualified employees to hire
Bank/Fin/Insur/Real Est	Possibility of deflation
Bank/Fin/Insur/Real Est	Presidential election-induced uncertainty or consumer/business conservatism
Bank/Fin/Insur/Real Est	rising interest rates, depressed oil prices,cyber threats, regulatory excesses.
Bank/Fin/Insur/Real Est	Trying to manage income growth at a pace in excess of increases in fixed costs
Bank/Fin/Insur/Real Est	uncertainty on all the concerns mentioned above
Communication/Media	Dwindling Financing
Communication/Media	Technological advances in delivering media via various platforms
Energy	Continued economic head winds driven by greater macroeconomic drivers.
Energy	culture changes need to be implemented or we will lose key personnel
Energy	Low oil and gas prices!
Healthcare/Pharm	Acces to cheap labor
Healthcare/Pharm	Cash Flow and expansion
Healthcare/Pharm	China Meltdown
Healthcare/Pharm	Extensive Labor shortage in region
Healthcare/Pharm	Increasing consolidation and competition
Healthcare/Pharm	IT security
Healthcare/Pharm	none I know of
Healthcare/Pharm	Nurse and Physician shortages
Healthcare/Pharm	OBAMA HEALTHCARE POLICIES AND DIRECTIVES
Healthcare/Pharm	Patient engagement
Healthcare/Pharm	Political climate with the election
Healthcare/Pharm	Reimbursement Rate Pressure
Healthcare/Pharm	State regulatory action to limit payments for services rendered.
Manufacturing	1) Suitability of acquisition / disposition opportunities and 2) increased import competition

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Manufacturing	80% drop in oil and gas market responsible for 15% of our sales increased competition elsewhere
Manufacturing	a need for velocity on new product development
Manufacturing	ACA
Manufacturing	Believe increase in interest rates will only hurt US economy as other countries keep rates low.
Manufacturing	Changing markets for goods sold
Manufacturing	Continued drop in commodity prices including base metals, petroleum and natural gas.
Manufacturing	Customer retention
Manufacturing	Employee Productivity
Manufacturing	Executing and integrting acquisitions
Manufacturing	FDA regulations
Manufacturing	Finding material
Manufacturing	Globalization of our business
Manufacturing	Government policies that increase cost of operations. For example, cost comply with ACA reporting.
Manufacturing	Growing the business with new customers
Manufacturing	Industry regulation changes affecting demand
Manufacturing	Inventory destocking of customers. Push is on you hold it until I need it. Lead time shrinkage.
Manufacturing	Lack of focus by government in improving business conditions and productivity.
Manufacturing	lack of leadership in Washington DC
Manufacturing	launching new MRP system and impact on running our business
Manufacturing	low oil prices that affect the markets where we sell our products
Manufacturing	Managing a viable business through the oil and gas sector downturn.
Manufacturing	na
Manufacturing	Obamacare taxes are beginning to have an effect on employees.
Manufacturing	Overall position in the cycle - we appear to be at a peak
Manufacturing	political uncertainty
Manufacturing	political unrest, more layoffs at large corporations we source our components from, strikes
Manufacturing	Potential loss of customers due to re-compete of major contracts
Manufacturing	raw ingredient sourcing - drought
Manufacturing	Rising interest rates effect on economy
Manufacturing	rising interest rate effect on overall economy
Manufacturing	Risks related to inventory, intelectual property related to sustaining new products
Manufacturing	Stagnant economy and ACA costs results with higher out of pocket costs.
Manufacturing	State Economics
Manufacturing	supply chain issues created by our vendors ability to supply our needs
Manufacturing	Supply costs
Manufacturing	Tariffs
Manufacturing	The ability to ramp up quickly enough to meet increasing market demand.
Manufacturing	Trans Pacific Partnership Deal - (NAFTA all over again)
Manufacturing	Uncertainty in the global economic status.US shows no income growth as medical and local taxes inc.
Manufacturing	We do not have weak demand for our products, but we struggle with how to have double digit growth.
Mining/Construction	Continued squeeze on profit margins due to P&C insurance companies to cap claim estimates/payouts
Mining/Construction	Expanding into new types of work/markets
Mining/Construction	Foreign competition
Mining/Construction	Managing growth and meeting customer expectations.
Mining/Construction	Plant productivity, shrinking capital market, rising cost of raw materials
Mining/Construction	Raw goods and commodities are currently what they were 10 to 20 years ago, when will inflation begin

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Mining/Construction	Terrorist attacks on U.S. targets, keeping employees safe
Other	Additional employee mandates from government
Other	aging staff
Other	declining member base
Other	Decreased reimbursement from Medicaid is creating a number of issues.
Other	deteriorating infrastructure
Other	Global terrorism security concerns presses identical election in the USA?
Other	Governmental regulations with out the funding to implement
Other	Health care costs will cost us more jobs over 55 jobs out of 100.
Other	Increased competition
Other	Increased difficulties i repatriating funds and conflicting government requirements.
Other	International terrorism returning to the US
Other	low price of mined products: copper, gold, iron- we do business on 4 continents
Other	Mergers and acquisitions
Other	Minimum wages and changes in DOL regulations.
Other	Need to improve program profitability
Other	new competition coming into market.
Other	Politics and related poor decisions.
Other	Qualified labor force
Other	Regulatory Constraints
Other	Shortage of qualified employees
Other	Some slowing of growth in the luxury hospitality market
Other	Technology changes
Other	Terrorism fear affecting the international exchange programs.
Other	uncertain trajectory of interest rates
Other	Union relations/bargaining.
Other	We receive funding from WV State, they are facing increasing challenges. University enrollment down
Pub Admin	Health care costs number 1 issue. Sky rocketing provider cost increases Cadillac tax huge issue
Pub Admin	health insurance cost are sky rocketing
Pub Admin	World unrest
Retail/Wholesale	Channel Blurring
Retail/Wholesale	competing with big box stores
Retail/Wholesale	Cost of Corporate Taxes and Insurance
Retail/Wholesale	global economic impact of terrorism
Retail/Wholesale	Impact of technology on middle class jobs
Retail/Wholesale	local county tax and regulation
Retail/Wholesale	Potentially slower economic growth, which would pressure sales.
Retail/Wholesale	Recruiting talent
Retail/Wholesale	Slower growth environment
Retail/Wholesale	stable senior leadership
Retail/Wholesale	Strong US dollar continue to challenge Mexico peso valuation
Retail/Wholesale	Terrorism
Retail/Wholesale	terrorists attacks on financial institutions and or commodities desks.
Retail/Wholesale	The cost of healthcare goes up each year and changes making it less likely that we will offer it.
Services, Consulting	A decline in corporate earnings driving down the stock market causing additional layoffs and recess
Services, Consulting	All the above
Services, Consulting	Attracting new business
Services, Consulting	Borrowing money
Services, Consulting	Changing landscape in our industry
Services, Consulting	Cuts in Government grants.
Services, Consulting	Decreasing demand for our services.

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Services, Consulting	Delays in governmental action, specifically, the delay in renewing the expired Federal tax deduction
Services, Consulting	Domestic Terrorism
Services, Consulting	ensuring Continuing economic growth
Services, Consulting	Find qualified people.
Services, Consulting	Global economic softness.
Services, Consulting	Global security threats from terrorism.
Services, Consulting	GLobal uncertainty and it's impact on our business
Services, Consulting	health insurance issues
Services, Consulting	Healthcare cost and an economic slow down due to the political issues in the middle east
Services, Consulting	lack of understanding of the marketing activity
Services, Consulting	Loss of Key personnel for retirement
Services, Consulting	Macro economic risk in Asia Pacific, China esp and Latin America, Brazil esp.
Services, Consulting	Market acceptance of products.
Services, Consulting	Market fluctuation
Services, Consulting	Metal commodity price drops
Services, Consulting	New regulatory opportunities occur to bureaucrats every day.
Services, Consulting	Political uncertainly
Services, Consulting	Qualified and affordable workforce
Services, Consulting	Regulations from our government are stifling the entire economy.
Services, Consulting	Replace it with a republican one that is business friendly and follow through on what they promise.
Services, Consulting	Retaining customers & increasing customer base.
Services, Consulting	Risk of another liberal Democrat being elected President and the tanking of the US economy.
Services, Consulting	The ongoing threat of terrorism abroad and the effect on the oil and gas industry.
Services, Consulting	The successful award of prime contracts within of marketplace.
Services, Consulting	Turmoil in Europe depressing business activity and spreading to other parts of the world.
Services, Consulting	USA Govt. regulations on export/import
Services, Consulting	We foresee a continuing decline in economic activity and the market we serve (HD Trucks)
Services, Consulting	Worldwide Terrorism
Tech [Soft/Hard/Bio]	Best case is a flat economy due to demand limitation for GNP being reached.
Tech [Soft/Hard/Bio]	Capital markets from higher interest rates
Tech [Soft/Hard/Bio]	China's investments into core technology infrastructure (e.g. semiconductors,etc.)
Tech [Soft/Hard/Bio]	Competitor action
Tech [Soft/Hard/Bio]	Continuing increase in regulation and no change in the tax code=50
Tech [Soft/Hard/Bio]	Cost of potential exit strategies for owners.
Tech [Soft/Hard/Bio]	customer retention, product launches
Tech [Soft/Hard/Bio]	Geopolitical risks (ISIS)
Tech [Soft/Hard/Bio]	Global credit crisis. Significant ISIS events
Tech [Soft/Hard/Bio]	Health Legislation and additional direction toward Acute Care Organization formats
Tech [Soft/Hard/Bio]	Increased competition with less opportunities
Tech [Soft/Hard/Bio]	Increased technology demands
Tech [Soft/Hard/Bio]	Lack of growth causing a pause and uncertainty how to regain it again.
Tech [Soft/Hard/Bio]	Not enough high skilled labor available.
Tech [Soft/Hard/Bio]	Rising real estate rental costs
Tech [Soft/Hard/Bio]	terrorism globally
Tech [Soft/Hard/Bio]	We were recently purchased by Stanley Black and Decker and were all on pins and needles.
Transp, Public Util	employee dissatisfaction with health care cost solutions
Transp, Public Util	Increasing supply of industry capacity without corresponding increasing demand
Transp, Public Util	Industry changes.

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Transp, Public Util	Need federal govt action to fund infrastructure investments in the US
Transp, Public Util	The effect of new regulations on the core business.
Unspecified Industry	lack of sales commitments from customers
Unspecified Industry	none

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Unweighted - Winsorized]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	8.14	6.52	7.48 - 8.81	7	-6.52	23.72	311
Technology spending	6.46	9.08	5.33 - 7.59	5	-15	31.63	298
Revenue	6.18	11.45	5.01 - 7.35	5	-20.90	34.82	31
Earnings	6.05	15.15	4.33 - 7.77	5	-30.70	44.82	297
Marketing/advertising spending	6.03	10.94	4.69 - 7.37	3	-22.90	38.54	368
Dividends	4.62	6.19	2.44 - 6.80	2	0	24.23	256
Research and development spending	3.84	5.48	3.00 - 4.68	1	-7.36	15.72	296
Number of domestic full-time employees	3.58	7.41	2.73 - 4.42	2.50	-14.90	22.38	196
Wages/Salaries	3.35	3.26	3.00 - 3.69	3	-10.50	18.01	120
Productivity (output per hour worked)	3.07	3.87	2.55 - 3.59	2	-5.30	12.17	278
Cash on the balance sheet	2.67	12.75	1.22 - 4.11	0.50	-27.40	34.85	212
Capital spending	2.66	17.46	0.72 - 4.60	3	-39.60	47.43	163
Number of domestic temporary employees	1.77	7.21	0.76 - 2.78	0	-19.50	23.43	368
Number of offshore outsourced employees	1.57	3.40	0.97 - 2.18	0	0	12.16	105
Prices of your products	1.43	4.10	0.94 - 1.91	2	-9.64	11.90	248
Share repurchases	0.44	4.86	-0.49 - 1.37	0	-20.80	22.53	345

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months for: [Unweighted - Sorted]

(N=464)

	Mean & SD	Positive 1	Zero 0	Negative -1
Wages/Salaries	0.89 0.41	320 92.8%	13 3.8%	12 3.5%
Health care costs	0.87 0.43	331 89.9%	25 6.8%	12 3.3%
Technology spending	0.65 0.61	180 72.6%	50 20.2%	18 7.3%
Productivity (output per hour worked)	0.61 0.60	143 67.5%	56 26.4%	13 6.1%
Dividends	0.58 0.50	18 58.1%	13 41.9%	0 0.0%
Revenue	0.58 0.79	281 76.4%	18 4.9%	69 18.8%
Marketing/advertising spending	0.52 0.66	157 61.3%	75 29.3%	24 9.4%
Number of domestic full-time employees	0.51 0.75	197 66.6%	52 17.6%	47 15.9%
Research and development spending	0.50 0.54	84 51.5%	76 46.6%	3 1.8%
Earnings	0.48 0.82	206 69.4%	28 9.4%	63 21.2%
Prices of your products	0.43 0.77	168 60.4%	62 22.3%	48 17.3%
Capital spending	0.37 0.85	189 60.8%	47 15.1%	75 24.1%
Number of domestic temporary employees	0.29 0.63	75 38.3%	102 52.0%	19 9.7%
Number of offshore outsourced employees	0.24 0.43	29 24.2%	91 75.8%	0 0.0%
Cash on the balance sheet	0.23 0.85	149 50.0%	68 22.8%	81 27.2%
Share repurchases	0.08 0.41	13 12.4%	87 82.9%	5 4.8%

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Revenue Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Earnings	6.85	14.14	5.33 - 8.36	5	-30.70	44.82	332
Technology spending	5.98	8.59	4.98 - 6.97	5	-15	31.63	227
Dividends	5.28	4.99	4.36 - 6.19	5	0	24.23	375
Revenue	4.23	8.62	3.35 - 5.10	4	-20.90	34.82	354
Cash on the balance sheet	3.79	10.69	2.59 - 4.99	1.50	-27.40	34.85	281
Marketing/advertising spending	3.72	7.87	2.80 - 4.64	2	-22.90	38.54	335
Research and development spending	3.30	4.93	2.66 - 3.94	2	-7.36	15.72	306
Capital spending	2.61	13.94	1.16 - 4.06	2	-39.60	47.43	114
Prices of your products	0.78	3.44	0.41 - 1.15	1	-9.64	11.90	169
Share repurchases	0.05	6.33	-0.91 - 1.00	0	-20.80	22.53	288

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Employee Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	7.06	5.67	6.48 - 7.65	6	-6.52	23.72	248
Wages/Salaries	2.93	2.59	2.67 - 3.20	3	-10.50	18.01	324
Productivity (output per hour worked)	2.61	2.99	2.24 - 2.99	2	-5.30	12.17	239
Number of domestic full-time employees	2.40	6.82	1.66 - 3.14	2	-14.90	22.38	175
Number of offshore outsourced employees	2.33	3.56	1.80 - 2.86	0	0	12.16	369
Number of domestic temporary employees	0.83	7.71	-0.15 - 1.80	0	-19.50	23.43	358

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Public Companies - Winsorized - Revenue Weighted]

	Mean	SD	95% CI	Median	Minimum	Maximum
Earnings	9.47	12.84	7.35 - 11.58	8	-30.70	44.82
Cash on the balance sheet	6.29	10.11	4.52 - 8.05	5	-25	34.85
Dividends	5.36	4.99	4.44 - 6.28	5	0	24.23
Revenue	4.35	7.31	3.18 - 5.51	3	-12	30
Share repurchases	-0.01	7.38	-1.41 - 1.40	0	-20.80	10

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4b. For 2016, what is your planned change in capital spending...

N=464	Total	Ownership		Foreign Sales			
		Public	Private	0%	1-24%	25-50%	>50%
		A	B	A	B	C	D
Number	464	54	322	240	143	43	28
Percent	100.0%	14.4%	85.6%	52.9%	31.5%	9.5%	6.2%
Within the US							
N	420	46	294	217	132	39	24
Mean	9.3	7.3	7.6	10.4	7.4	11.9	2.0
SD	34.9	25.0	29.6	39.8	29.7	31.4	10.5
Median	3.0	2.5	3.0	3.0	4.0	1.5	0.0
Outside the US							
N	236	32	162	94	83	32	24
Mean	2.4	5.3	2.1	0.4	2.6	5.5	5.2
SD	10.9	9.5	12.4	1.8	14.2	15.7	10.5
Median	0.0	1.5	0.0	0.0	0.0	0.5	0.0
				CD		A	A

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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4b. For 2016, what is your planned change in capital spending... [Winsorized - Revenue Weighted]

N=464	Total	Ownership		Foreign Sales			
		Public A	Private B	0% A	1-24% B	25-50% C	>50% D
Number	408	197	211	128	143	146	36
Percent	100.0%	48.2%	51.8%	28.2%	31.6%	32.3%	8.0%
Within the US							
N	355	161	194	111	136	125	27
Mean	3.5	2.5	4.3	4.6	2.3	4.1	0.4
SD	15.9	12.4	18.2	16.4	19.3	10.5	7.3
Median	3.0	3.0	2.0	2.5	3.0	2.0	0.0
Outside the US							
N	260	140	121	52	92	108	27
Mean	4.1	6.4	1.4	0.3	2.0	7.2	4.2
SD	7.3	7.9	5.5	1.6	5.1	8.7	7.5
Median	0.0	5.0	0.0	0.0	0.0	5.0	5.0
		B	A	bCD	aC	AB	A

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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5. Compared to a "normal" economic environment, have the following factors affected your capital spending this year or next year?

(N=464)

	Mean & SD	Up +1	No Effect 0	Down -1
	-0.06	16	311	38
Currency valuation (2015 actual)	0.38	4.4%	85.2%	10.4%
	-0.04	20	283	34
Currency valuation (2016 planned)	0.40	5.9%	84.0%	10.1%
	0.06	60	302	37
Interest rates (2015 actual)	0.49	15.0%	75.7%	9.3%
	0.02	65	253	56
Interest rates (2016 planned)	0.57	17.4%	67.6%	15.0%
	-0.14	14	288	66
Slowdown in China (2015 actual)	0.44	3.8%	78.3%	17.9%
	-0.11	24	263	62
Slowdown in China (2016 planned)	0.49	6.9%	75.4%	17.8%
Economic/political changes in Latin	-0.04	10	318	23
America (2015 actual)	0.30	2.8%	90.6%	6.6%
Economic/political changes in Latin	-0.05	9	295	26
America (2016 planned)	0.32	2.7%	89.4%	7.9%
New or anticipated regulatory	0.05	106	204	88
requirements (2015 actual)	0.70	26.6%	51.3%	22.1%
New or anticipated regulatory	0.07	122	164	94
requirements (2016 planned)	0.75	32.1%	43.2%	24.7%
	-0.03	58	269	71
Price of fuel (2015 actual)	0.57	14.6%	67.6%	17.8%
	-0.01	50	267	52
Price of fuel (2016 planned)	0.53	13.6%	72.4%	14.1%

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5. Compared to a "normal" economic environment, have the following factors affected your capital spending this year or next year?

	Mean & SD	Up +1	No Effect 0	Down -1
Dividends/share repurchases (2015 actual)	0.05 0.29	20 6.8%	270 91.2%	6 2.0%
Dividends/share repurchases (2016 planned)	0.00 0.31	14 5.1%	247 90.1%	13 4.7%
Other: (2015 actual)	-0.11 0.49	5 6.8%	55 75.3%	13 17.8%
Other: (2016 planned)	-0.06 0.55	8 11.9%	47 70.1%	12 17.9%

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5. How have the following factors affected your capital spending THIS year? (sorted)

(N=464)

	Mean & SD	Up +1	No Effect 0	Down -1
	0.06	60	302	37
Interest rates	0.49	15.0%	75.7%	9.3%
	0.05	20	270	6
Dividends/share repurchases	0.29	6.8%	91.2%	2.0%
New or anticipated regulatory	0.05	106	204	88
requirements	0.70	26.6%	51.3%	22.1%
	-0.03	58	269	71
Price of fuel	0.57	14.6%	67.6%	17.8%
Economic/political changes in Latin	-0.04	10	318	23
America	0.30	2.8%	90.6%	6.6%
	-0.06	16	311	38
Currency valuation	0.38	4.4%	85.2%	10.4%
	-0.14	14	288	66
Slowdown in China	0.44	3.8%	78.3%	17.9%
	-0.11	5	55	13
Other:	0.49	6.8%	75.3%	17.8%

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5. How have the following factors affected your capital spending plans for NEXT year? (sorted)

(N=464)

	Mean & SD	Up +1	No Effect 0	Down -1
New or anticipated regulatory	0.07	122	164	94
requirements	0.75	32.1%	43.2%	24.7%
	0.02	65	253	56
Interest rates	0.57	17.4%	67.6%	15.0%
	0.00	14	247	13
Dividends/share repurchases	0.31	5.1%	90.1%	4.7%
	-0.01	50	267	52
Price of fuel	0.53	13.6%	72.4%	14.1%
	-0.04	20	283	34
Currency valuation	0.40	5.9%	84.0%	10.1%
Economic/political changes in Latin	-0.05	9	295	26
America	0.32	2.7%	89.4%	7.9%
	-0.11	24	263	62
Slowdown in China	0.49	6.9%	75.4%	17.8%
	-0.06	8	47	12
Other:	0.55	11.9%	70.1%	17.9%

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6. Considering the normal aging of your assets and your rate of investment in new assets, by about how much has the age of your fixed assets changed relative to five years ago?

	Number	Percent	95% CI
+2=Large increase in age	27	6.0 %	± 2.1 %
+1=Moderate increase in age	214	47.9 %	± 4.6 %
0=No change	84	18.8 %	± 3.5 %
-1=Moderate decrease in age	102	22.8 %	± 3.8 %
-2=Large decrease in age	20	4.5 %	± 1.9 %
Total	447	100.0 %	

Mean = 0.28
SD = 1.02

Missing Cases = 17
Response Percent = 96.3 %

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6b. Is the aging of your fixed assets a drag on your productivity growth?

	Number	Percent	95% CI
No	118	60.5 %	± 6.4 %
Yes	77	39.5 %	± 5.9 %
Total	195	100.0 %	

Missing Cases = 46
Response Percent = 80.9 %

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7. Going forward, is the nature of your business changing in a way that affects your firm's required amount of capital investment?

	Number	Percent	95% CI
-2=Much less capital investment will be required	13	2.9 %	± 1.5 %
-1=Moderately less	46	10.3 %	± 2.7 %
0=No change	171	38.3 %	± 4.4 %
+1=Moderately more	168	37.6 %	± 4.4 %
+2=Much more capital investment will be required	49	11.0 %	± 2.8 %
Total	447	100.0 %	

Mean = 0.43
SD = 0.92

Missing Cases = 17
Response Percent = 96.3 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Q7a. Why will you require LESS capital investment?

Agr, Forestry, Fishing	Older equipment and less sales.
Bank/Fin/Insur/Real Est	Improvements in new location & technology higher in the past three years due to rapid growth and development.
Bank/Fin/Insur/Real Est	Strategic base already developed, can develop incrementally going forward
Bank/Fin/Insur/Real Est	Now doing branch expansion vs. mergers and acquisitions
Bank/Fin/Insur/Real Est	More technology enables customers to do business with us remotely.
Bank/Fin/Insur/Real Est	more oriented toward services that require little capital investment
Bank/Fin/Insur/Real Est	Winding down company
Bank/Fin/Insur/Real Est	Choose to hold cash or buy shares rather than spend on investments in thisenvironment
Energy	being more efficient and end prices have dropped
Energy	Current assets are relatively less aged and we have additional capacity with our current assets
Healthcare/Pharm	more outsourcing
Manufacturing	We are seeking to outsource more production
Manufacturing	Customers are demanding product in short delivery timeframes and expect it to be available over night - for unique build to order products. The amazon effect.
Manufacturing	Attempting to grow the business
Manufacturing	slowdown of the economy does not justify investment in new plants and delays renewal of existing infrastructure
Manufacturing	We have eliminated products that require a lot of in-house work.
Manufacturing	Lower production volumes due to decreased customer demand.
Manufacturing	Likely
Manufacturing	better inventory management
Mining/Construction	Transitioning to cloud based IT
Other	Reaching a targeted level of investment
Other	Will keep assets longer and will refurbish assets to extend useful life.
Other	Completion of expansion project in early 2016
Pub Admin	Incurred significant 2015 capital one time capital purchases that will taper in 3-5 years.
Pub Admin	more internet transactions less brick and mortar
Pub Admin	more internet transactions less brick and mortar
Retail/Wholesale	just finished large project
Retail/Wholesale	Less done in house
Retail/Wholesale	Moved to a more franchised model
Services, Consulting	Efficiency of scale and productivity
Services, Consulting	technology costs decreasing
Services, Consulting	Improvements and operational cost reductions from previously purchased equipment and technology
Services, Consulting	Built new plant this year. Won't do that again for awhile.
Services, Consulting	IT is cheaper
Services, Consulting	service industry people are our product
Tech [Soft/Hard/Bio]	We have achieved sufficient size, profitability and cashflow that we have access to reasonable debt to finance our growth
Tech [Soft/Hard/Bio]	Partnerships with other players in the industry
Tech [Soft/Hard/Bio]	Moving to the cloud
Tech [Soft/Hard/Bio]	Our primary capital needs relate to technology infrastructure, and we may divest portions of our revenue stream that are capital-intensive.
Tech [Soft/Hard/Bio]	Lower cost of new equipment, more features less cost.
Tech [Soft/Hard/Bio]	Smarter technology choices; have lessened the need for increase capital investments.
Transp, Public Util	less growth

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Q7b. Why will you require MORE capital investment?

Agr, Forestry, Fishing	To meet company growth objectives
Agr, Forestry, Fishing	to produce product to meet changing consumer demand for more 'natural' foods
Agr, Forestry, Fishing	New products, lower cost of existing products, changing technology such as 3D printing
Bank/Fin/Insur/Real Est	Tenant Improvements in order to capture higher market rents
Bank/Fin/Insur/Real Est	Acquisition by larger firm
Bank/Fin/Insur/Real Est	Intend to move from private non-traded REIT status to publicly traded REIT sometime in the next 2 or 3 years.
Bank/Fin/Insur/Real Est	Need to stay on the leading edge of the technology curve; cybersecurity
Bank/Fin/Insur/Real Est	Repairs and Maintenance, renovations.
Bank/Fin/Insur/Real Est	more technology
Bank/Fin/Insur/Real Est	Industry deliver platform requires technology investment
Bank/Fin/Insur/Real Est	need updates to systems
Bank/Fin/Insur/Real Est	Expansion
Bank/Fin/Insur/Real Est	Maintain currency of technology
Bank/Fin/Insur/Real Est	Regulatory requirements
Bank/Fin/Insur/Real Est	Mostly on technology and some for new locations
Bank/Fin/Insur/Real Est	Growth requires facilities expansion and greater investment in technology which is also driven by more more technology oriented delivery of our products and services.
Bank/Fin/Insur/Real Est	Technology needs, especially digital.
Bank/Fin/Insur/Real Est	To upgrade IT systems.
Bank/Fin/Insur/Real Est	continued upgrade in platform and compliance control software
Bank/Fin/Insur/Real Est	Cost to comply with with banking regs are rising annually
Bank/Fin/Insur/Real Est	Business requiring better data, so more technology spending will be required.
Bank/Fin/Insur/Real Est	increasing competive environment
Bank/Fin/Insur/Real Est	Make larger loans to customers than historically required
Bank/Fin/Insur/Real Est	technology and real estate
Communication/Media	There are now a lot of best-in-class applications, rather than 1 main suite of products
Communication/Media	building new facility
Communication/Media	Major market expansion
Communication/Media	Technological advances in products
Energy	we are growing as a company
Energy	Capacity expansion to meet customer demand
Healthcare/Pharm	IT and Regulatory requirements
Healthcare/Pharm	More IT as Electronic Health Record is finalized
Healthcare/Pharm	Information Technology
Healthcare/Pharm	Technology, and we are growing.
Healthcare/Pharm	Transformation of the core business
Healthcare/Pharm	increased healthcare regulation
Healthcare/Pharm	Aging equipment
Healthcare/Pharm	New technology to stay competitive
Healthcare/Pharm	To keep up with technology
Healthcare/Pharm	greater use of tech
Healthcare/Pharm	Divestiture of new revenue streams
Healthcare/Pharm	older equipment
Healthcare/Pharm	Healthcare reform is changing to be consumer centric and will require an investment in big data
Manufacturing	Bring new products to market. Refresh existing products.
Manufacturing	We are holding more inventory and doing a poorer job of production scheduling as we grow.
Manufacturing	our product mix and growth areas will dictate additional investments in higher growth areas
Manufacturing	Competitors are acquiring companies and increasing their economies to scale
Manufacturing	Need to obtain more up to date equipment that will produce more product with less quality issues

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Q7b. Why will you require MORE capital investment?

Manufacturing	New technology for improved productivity
Manufacturing	Additional manufacturing capabilities
Manufacturing	technological changes require higher reinvestment into the business
Manufacturing	growth
Manufacturing	Insourcing
Manufacturing	maintain leadership position, if you're not growing you're dying
Manufacturing	purchasing line capacity, new line, new markets
Manufacturing	Changes in USDA regulations and expectations require significant additional and newer machinery and it's very expensive to keep up with the changes.
Manufacturing	Restructuring, moving lines
Manufacturing	To increase production efficiency as machines will replace people.
Manufacturing	In time
Manufacturing	to support growth and increase capacity
Manufacturing	New technologies and M&A activity
Manufacturing	Expansion into new product
Manufacturing	Increased revenue
Manufacturing	We may be forced to provide more rental options and need to invest in such.
Manufacturing	Perhaps
Manufacturing	To buy new equipment with better technology
Manufacturing	expanding R&D and product offering to remain competitive in global marketplace. Need to modernize factory and produce more efficiently
Manufacturing	Change in product mix and sales volume
Manufacturing	Growth and start up of new products
Manufacturing	Updating product lines and expanding assortments to remain competitive
Manufacturing	Expansion
Manufacturing	Enhanced manufacturing processes, new assets required for increase in volume and efficiency
Manufacturing	Innovation to produce products more efficiently
Manufacturing	changing market needs
Manufacturing	Growth is not scalable now without more capital spending.
Manufacturing	adding more automation in order to on-shore manufacturing and still remain price competitive
Manufacturing	New Development Programs, New Capital Equipment to support increased production demands
Manufacturing	Newer more modern plants are more efficient due to many small changes, not disruptive change but cost prohibitive to retrofit older facilities
Manufacturing	Our plant equipment is aging, and new equipment is just now hiotting the market and we will need to invest quickly over the next few years to maximize the productivity gains
Manufacturing	manufacturing efficiencies/work flow
Manufacturing	need to build new capacity to replace old, old capacity
Manufacturing	Upgrade Machine efficency
Manufacturing	May move to more automated processes
Manufacturing	technological advancements
Manufacturing	Change in technology required
Manufacturing	Increased FDA regulation requires more testing equipment
Manufacturing	need to automate also replace aging facilities
Manufacturing	New program development
Manufacturing	Automation
Manufacturing	eventual growth after current downtrend
Mining/Construction	Introduction of new and/or changes in existing technology
Mining/Construction	need to invest in technology to keep up or get ahead of the industry
Mining/Construction	Depleted inventories of land used to build on.
Mining/Construction	Growth in the overall company
Mining/Construction	Larger inventory of diverse repair parts required.
Mining/Construction	Aging manufacturing plants need to be replaced.
Mining/Construction	Economic opportunities exist from our capital investment

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Q7b. Why will you require MORE capital investment?

Mining/Construction	More locations
Mining/Construction	We need better equipment that works more efficiently; each labor dollar spent must be more productive. The inability to hire and retain employees means technology must take the place of workers.
Other	Age of facilities. Deferred capital spending during lean years leaves growing need to reinvest in physical assets
Other	To Keep Assets Current
Other	distribution infrastructure globally
Other	reinvest in physical plant
Other	Technology changes and customer expectations.
Other	Changing scope of operations will require less people-centric activities where customer services levels would not be negatively affected.
Other	better facilities to handle the increase in revenue growth
Other	expanding locations
Other	GO bonds
Other	new equipment technology changing
Other	Aging equipment and buildings must be replaced, and become more dire as time advances without it being addressed.
Other	Growing. Competitive acquisition environment
Other	New systems and tools.
Other	Stressed facilities.
Other	Expansion
Other	Updating our facilities where our guests stay.
Other	We need to keep our properties up to date.
Other	More research and development, New IT equipment
Other	Bonding
Other	competition
Retail/Wholesale	Competition is driving newer, nicer stores.
Retail/Wholesale	Business model change, Growth
Retail/Wholesale	growth is driving need for more robust infrstructure
Retail/Wholesale	Increased technological integration
Retail/Wholesale	To build more hotels
Retail/Wholesale	Need to reduce labor costs and increase productivity
Retail/Wholesale	Keeping up with competition
Retail/Wholesale	update assets to stay competitive
Retail/Wholesale	New Growth in stores.
Retail/Wholesale	opening new sales & warehouse locations
Retail/Wholesale	Upgrade computers and invest in new technology to increase productivity
Retail/Wholesale	Growth requires additional equipment purchases
Retail/Wholesale	Expansion of plants and facilities
Retail/Wholesale	Facilities need updating.
Retail/Wholesale	Consumer expectations
Services, Consulting	increase in staffing and increase in computer equipment and software
Services, Consulting	Purchase of real estate
Services, Consulting	Expansion of markets and new acquisition(s)
Services, Consulting	growing company
Services, Consulting	Equipment replacement
Services, Consulting	For Software Development
Services, Consulting	To keep up with the ability to improve the performance. As well as make it easier for our clients to work with us and pay us.
Services, Consulting	Expanding into new services offered.
Services, Consulting	Increased use of technology to supplant labor increases
Services, Consulting	upgrade building - increase collaberation
Services, Consulting	New systems are needed to keep up with competiotion
Services, Consulting	New technology
Services, Consulting	New hardware is more expensive
Services, Consulting	Technical obsolescence

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Q7b. Why will you require MORE capital investment?

Services, Consulting	Replace fixed assets
Services, Consulting	Keeping up with technology advancements
Services, Consulting	Enter new markets
Services, Consulting	Needs for new employees and for data security.
Services, Consulting	New regulations mean growth, requiring capital.
Services, Consulting	Growing in new markets
Services, Consulting	Improve equipment
Tech [Soft/Hard/Bio]	Aging computer equipment will need to be replaced
Tech [Soft/Hard/Bio]	Product extension and customer capture
Tech [Soft/Hard/Bio]	changing business model; new model requires a bit more capital
Tech [Soft/Hard/Bio]	We need new servers, new computers, and new phones
Tech [Soft/Hard/Bio]	Growth and Expansion
Tech [Soft/Hard/Bio]	Expansion, go to market
Tech [Soft/Hard/Bio]	Acquisitions
Tech [Soft/Hard/Bio]	We plan to significantly grow the business
Tech [Soft/Hard/Bio]	Continuing technology changes
Tech [Soft/Hard/Bio]	Growth and new product introduction and associated production capabilities
Tech [Soft/Hard/Bio]	Need for continued productivity improvement (higher cost of labor due to PBGC costs, ACA and other regulations)
Tech [Soft/Hard/Bio]	Expansion plus replacement
Tech [Soft/Hard/Bio]	Expansion to handle increased bsuiness - domestic and global
Tech [Soft/Hard/Bio]	To fund growth
Transp, Public Util	We must invest to meet the demographic growth demands for goods in the US Southeast. US Ports will reach capacity in 10-15 years.
Transp, Public Util	Increased cost of replacement due to inflation, regulation (environmental) and technology
Transp, Public Util	growing customer base, turnover aged equipment
Transp, Public Util	Clean Power Plan

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8. For firms in your industry, do you believe increased payouts (dividends, repurchases) are constraining corporate investment?

	Number	Percent	95% CI
2=Yes, a lot	21	6.4 %	± 1.9 %
1=Yes, a little	74	22.5 %	± 3.3 %
0=No	234	71.1 %	± 4.6 %
Total	329	100.0 %	

Mean = 0.35
SD = 0.60

Missing Cases = 135
Response Percent = 70.9 %

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9. By how much do you expect the value of the USD to change over the next 12 months? (e.g., -15%, +10%)

Minimum = -40

Maximum = 100

Mean = 1.88

Median = 3

Standard Deviation (Unbiased Estimate) = 8.02

95 Percent Confidence Interval Around The Mean = 1.11 - 2.64

99 Percent Confidence Interval Around The Mean = 0.87 - 2.88

Quartiles

1 = -3
2 = 3
3 = 5

Valid Cases =388
Missing Cases =42
Response Percent = 90.2%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

9. How has currency valuation affected your capital spending in 2015 broken down the change in the value of the dollar?

N=464	Total	Change in US dollar					
		<-5 Large depreciation A	-5 to <0 Small depreciation B	0 No Change C	1 to <5 Small appreciation D	5 Medium appreciation E	>5 Large appreciation F
Total	422	35	88	34	97	98	70
	100.0%	8.3%	20.9%	8.1%	23.0%	23.2%	16.6%
+1=Up	16	1	2	2	3	2	6
	4.4%	3.8%	2.8%	8.7%	3.8%	2.4%	9.7%
0=No Effect	311	22	60	20	69	70	50
	85.2%	84.6%	84.5%	87.0%	87.3%	84.3%	80.6%
-1=Down	38	3	9	1	7	11	6
	10.4%	11.5%	12.7%	4.3%	8.9%	13.3%	9.7%
Mean	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.0
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

9. How has currency valuation affected your capital spending plans for 2016 broken down the change in the value of the dollar?

N=464	Total	Change in US dollar					
		<-5 Large depreciation A	-5 to <0 Small depreciation B	0 No Change C	1 to <5 Small appreciation D	5 Medium appreciation E	>5 Large appreciation F
Total	422 100.0%	35 8.3%	88 20.9%	34 8.1%	97 23.0%	98 23.2%	70 16.6%
+1=Up	20 5.9%	1 4.3%	2 3.1%	2 9.5%	5 6.7%	4 5.2%	6 10.2%
0=No Effect	283 84.0%	19 82.6%	54 84.4%	17 81.0%	66 88.0% f	66 85.7%	43 72.9% d
-1=Down	34 10.1%	3 13.0%	8 12.5%	2 9.5%	4 5.3% f	7 9.1%	10 16.9% d
Mean SD	0.0 0.4	-0.1 0.4	-0.1 0.4	0.0 0.4	0.0 0.3	0.0 0.4	-0.1 0.5

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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10a. Is your firm's rate of productivity growth changing?

	Number	Percent	95% CI
-2=Slowing a lot	14	3.1 %	± 1.6 %
-1=Slowing moderately	122	26.6 %	± 4.0 %
0=No change	133	29.0 %	± 4.1 %
+1=Accelerating moderately	182	39.7 %	± 4.5 %
+2=Accelerating a lot	7	1.5 %	± 1.1 %
Total	458	100.0 %	

Mean = 0.10
SD = 0.92

Missing Cases = 6
Response Percent = 98.7 %

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10b. Have the following factors affected the productivity growth rate at your company?

(N=331)

	Mean & SD	Very positive 1	Positive 2	No impact 3	Negative 4	Very negative 5
	1.99	62	218	42	8	0
Automation and technology use	0.64	18.8%	66.1%	12.7%	2.4%	0.0%
	2.13	45	213	57	10	3
Process change	0.71	13.7%	64.9%	17.4%	3.0%	0.9%
	2.66	14	104	182	20	2
New business model	0.69	4.3%	32.3%	56.5%	6.2%	0.6%
	3.10	2	21	248	46	6
Currency valuation	0.54	0.6%	6.5%	76.8%	14.2%	1.9%
	3.23	4	36	168	114	3
Unit labor costs	0.70	1.2%	11.1%	51.7%	35.1%	0.9%
Business disruption from external events (e.g., bad weather, political turmoil,	3.30	1	7	219	87	9
supply chain interruptions)	0.57	0.3%	2.2%	67.8%	26.9%	2.8%
	3.35	3	64	99	136	25
Economic conditions	0.91	0.9%	19.6%	30.3%	41.6%	7.6%
	3.71	1	18	115	131	59
Regulation	0.84	0.3%	5.6%	35.5%	40.4%	18.2%
	3.11	0	3	57	2	4
Other:	0.56	0.0%	4.5%	86.4%	3.0%	6.1%

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10b. Have the following factors affected the productivity growth rate at your company? - Other specified

Manufacturing	Ability fo find skilled workforce
Healthcare/Pharm	timing and type of contracts
Pub Admin	affordable care act
Other	Affordable Care Act
Manufacturing	more SKUs
Bank/Fin/Insur/Real Est	training
Services, Consulting	Comets
Other	declining reimbursement

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11. On November 16, 2015 the annual yield on 10-yr treasury bonds was 2.3%. Please complete the following:

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	1.11	6.11	0.51 - 1.71	2	-50	30	400
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	6.49	6.66	5.85 - 7.13	5	-10	80	417
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	12.40	50.43	7.44 - 17.35	9	-10	1000	398
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-2.90	9.09	-3.79 - -2.01	0	-40	25	397
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	4.32	4.47	3.89 - 4.75	4.50	-20	30	416
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	8.56	5.03	8.06 - 9.05	8	-10	30	395

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Revenue Weighted: 11. On November 16, 2015 the annual yield on 10-yr treasury bonds was 2.3%. Please complete the following:

	Mean	SD	95% CI	Median	Minimum	Maximum
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	0.79	4.34	0.37 - 1.20	2	-8.93	11.16
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	5.99	3.77	5.63 - 6.35	5	-4.46	17.44
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	10.45	8.65	9.62 - 11.28	9	-10	95.35
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-2.83	6.89	-3.49 - -2.16	0	-17.90	12.06
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	4.18	2.88	3.90 - 4.45	4	-3.03	11.68
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	8.33	3.65	7.98 - 8.68	8	0.28	16.83

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Employee Weighted: 11. On November 16, 2015 the annual yield on 10-yr treasury bonds was 2.3%. Please complete the following:

	Mean	SD	95% CI	Median	Minimum	Maximum
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	0.92	4.39	0.49 - 1.34	2	-8.93	11.16
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	5.98	3.68	5.63 - 6.33	5	-4.46	17.44
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	10.53	9.41	9.62 - 11.45	10	-10	95.35
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-3.02	7.18	-3.72 - -2.32	0	-17.90	12.06
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	4.11	2.92	3.83 - 4.38	4	-3.03	11.68
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	8.22	3.75	7.85 - 8.58	8	0.28	16.83

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Return on assets (ROA=operating earnings/assets)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% Approximate ROA in 2014	9.83	15.73	8.27 - 11.40	6.90	-25	100	387
% Expected ROA in 2015	10.54	17.21	8.82 - 12.27	7	-25	100	383

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Manufacturing capacity utilized

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in first half of 2015	69.89	18.13	66.21 - 73.58	70	1	100	93
% of capacity utilization planned for the remainder of 2015	68.54	19.41	64.59 - 72.48	70	1	100	93

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Manufacturing capacity utilized (Revenue Weighted)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in first half of 2015	73.15	16.34	70.14 - 76.17	75	1	100	113
% of capacity utilization planned for the remainder of 2015	72.25	16.76	69.15 - 75.34	70	1	100	113

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Industry

	Number	Percent	95% CI
Manufacturing	94	20.4 %	± 3.7 %
Services, Consulting	77	16.7 %	± 3.4 %
Banking/Finance/Insurance/Real Estate	58	12.6 %	± 3.0 %
Retail/Wholesale	46	10.0 %	± 2.7 %
Technology [Software/Hardware/Biotech]	40	8.7 %	± 2.6 %
Healthcare/Pharmaceutical	34	7.4 %	± 2.4 %
Mining/Construction	16	3.5 %	± 1.7 %
Transportation & Public Utilities	15	3.3 %	± 1.6 %
Public Administration	11	2.4 %	± 1.4 %
Agriculture, Forestry, & Fishing	11	2.4 %	± 1.4 %
Communication/Media	6	1.3 %	± 1.0 %
Energy	5	1.1 %	± 0.9 %
Other Industry	48	10.4 %	± 2.8 %
Total	461	100.0 %	

Missing Cases = 3
Response Percent = 99.4 %

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Industry (Other specified)

Advertising Agency
Aerospace
audult beverage manufacturer
Charity
CPA firm
Dental services
Education
Education
Education
Education
education
Entertainment/ Hospitality
Equipment rental
For profit Education
General contracting
Governmenrt
Higher Education
Home Building
Hospitality
Hospitality
Hospitality
Hospitality consulting
Human Services - Non Profit
Leisure / Hospitality
luxury hospitality
Medical Membership Association
Non Profit
Non-profit
Non-profit
non-profit
non-profit, religious
non-profit-chamber
Nonprofit
Nonprofit Social Welfare
Not for Profit
not for profit
not for profit
not for profit - foundation
performing arts
PK-8 education
Public Education
Public Sector - Education
Publishing
Real Estate operation and development
Religious Institution
Rental & repair service
Retail
scientific research- brain processes
Telecommunications
telecommunications
wholesale /light mfg

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Sales Revenue

	Number	Percent	95% CI
Less than $25 million	172	37.4 %	± 4.4 %
$25-$99 million	130	28.3 %	± 4.1 %
$100-$499 million	80	17.4 %	± 3.5 %
$500-$999 million	19	4.1 %	± 1.8 %
$1-$4.9 billion	34	7.4 %	± 2.4 %
$5-$9.9 billion	5	1.1 %	± 0.9 %
More than $10 billion	20	4.3 %	± 1.9 %
Total	460	100.0 %	

Missing Cases = 4
Response Percent = 99.1 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Weighted Sales Revenue (Millions)

Minimum = 25

Maximum = 11000

Mean = 891.54

Median = 62

Variance (Unbiased Estimate) = 5795454.95

Standard Deviation (Unbiased Estimate) = 2407.38

Standard Error Of The Mean = 112.24

95 Percent Confidence Interval Around The Mean = 671.54 - 1111.54

99 Percent Confidence Interval Around The Mean = 602.51 - 1180.57

Skewness = 3.47

Kolmogorov-Smirnov Statistic For Normality = 38.45

Quartiles

1 = 25
2 = 62
3 = 300

Valid Cases =460
Missing Cases =4
Response Percent = 99.1%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Number of Employees

	Number	Percent	95% CI
Fewer than 100	150	38.3 %	± 4.3 %
100-499	120	30.6 %	± 4.0 %
500-999	27	6.9 %	± 2.1 %
1,000-2,499	31	7.9 %	± 2.3 %
2,500-4,999	22	5.6 %	± 1.9 %
5,000-9,999	11	2.8 %	± 1.4 %
Over 10,000	31	7.9 %	± 2.3 %
Total	392	100.0 %	

Missing Cases = 72
Response Percent = 84.5 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Weighted Number of Employees

Minimum = 100

Maximum = 12000

Mean = 1690.05

Median = 300

Variance (Unbiased Estimate) = 11240130.94

Standard Deviation (Unbiased Estimate) = 3352.63

Standard Error Of The Mean = 169.33

95 Percent Confidence Interval Around The Mean = 1358.16 - 2021.94

99 Percent Confidence Interval Around The Mean = 1254.02 - 2126.08

Skewness = 2.40

Kolmogorov-Smirnov Statistic For Normality = 32.68

Quartiles

1 = 100
2 = 300
3 = 750

Valid Cases =392
Missing Cases =72
Response Percent = 84.5%

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Where are you personally located?

	Number	Percent	95% CI
Midwest U.S.	120	26.2 %	± 4.0 %
Northeast U.S.	97	21.2 %	± 3.7 %
South Atlantic U.S.	82	17.9 %	± 3.5 %
Pacific US	77	16.8 %	± 3.4 %
South Central U.S.	49	10.7 %	± 2.8 %
Mountain U.S.	33	7.2 %	± 2.3 %
Canada	0	0.0 %	± 0.0 %
Latin America	0	0.0 %	± 0.0 %
Europe	0	0.0 %	± 0.0 %
Asia	0	0.0 %	± 0.0 %
Africa	0	0.0 %	± 0.0 %
Other	0	0.0 %	± 0.0 %
Total	458	100.0 %	

Missing Cases = 6
Response Percent = 98.7 %

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Where are you personally located? - Other specified

A

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Ownership

	Number	Percent	95% CI
Private	322	73.7 %	± 4.2 %
Nonprofit	42	9.6 %	± 2.6 %
Public, NYSE	37	8.5 %	± 2.5 %
Government	19	4.3 %	± 1.8 %
Public, NASDAQ/AMEX	17	3.9 %	± 1.7 %
Total	437	100.0 %	

Missing Cases = 27
Response Percent = 94.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Foreign Sales

	Number	Percent	95% CI
0%	240	52.9 %	± 4.6 %
1-24%	143	31.5 %	± 4.2 %
25-50%	43	9.5 %	± 2.7 %
More than 50%	28	6.2 %	± 2.2 %
Total	454	100.0 %	

Missing Cases = 10
Response Percent = 97.8 %

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In what region of the world are most of your foreign sales?

	Number	Percent	95% CI
Europe	80	43.2 %	± 6.5 %
Asia/Pacific Basin	41	22.2 %	± 5.3 %
Canada	41	22.2 %	± 5.3 %
Latin America	22	11.9 %	± 4.1 %
Africa	1	0.5 %	± 0.9 %
Total	185	100.0 %	

Missing Cases = 29
Response Percent = 86.4 %

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What is your company's credit rating?

	Number	Percent	Cumulative
AAA	46	13.9 %	13.9 %
AA+	37	11.2 %	25.2 %
AA	43	13.0 %	38.2 %
AA-	10	3.0 %	41.2 %
A+	24	7.3 %	48.5 %
A	34	10.3 %	58.8 %
A-	29	8.8 %	67.6 %
BBB+	21	6.4 %	73.9 %
BBB	21	6.4 %	80.3 %
BBB-	7	2.1 %	82.4 %
BB+	12	3.6 %	86.1 %
BB	13	3.9 %	90.0 %
BB-	6	1.8 %	91.8 %
B+	4	1.2 %	93.0 %
B	7	2.1 %	95.2 %
B-	7	2.1 %	97.3 %
CCC	7	2.1 %	99.4 %
CC	0	0.0 %	99.4 %
D	2	0.6 %	100.0 %
Total	330	100.0 %	100.0 %

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

What is your company's credit rating?

N=330	Total	Credit Rating	
		Actual A	Estimate B
Total	330 100.0%	134 40.6%	196 59.4%
AAA	46 13.9%	26 19.4% b	20 10.2% a
AA+	37 11.2%	18 13.4%	19 9.7%
AA	43 13.0%	13 9.7%	30 15.3%
AA-	10 3.0%	6 4.5%	4 2.0%
A+	24 7.3%	5 3.7% b	19 9.7% a
A	34 10.3%	14 10.4%	20 10.2%
A-	29 8.8%	7 5.2%	22 11.2%
BBB+	21 6.4%	11 8.2%	10 5.1%
BBB	21 6.4%	8 6.0%	13 6.6%
BBB-	7 2.1%	3 2.2%	4 2.0%
BB+	12 3.6%	6 4.5%	6 3.1%
BB	13 3.9%	4 3.0%	9 4.6%
BB-	6 1.8%	5 3.7% b	1 0.5% a
B+	4 1.2%	3 2.2%	1 0.5%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

What is your company's credit rating?

N=330	Total	Credit Rating	
		Actual A	Estimate B
B	7 2.1%	1 0.7%	6 3.1%
B-	7 2.1%	2 1.5%	5 2.6%
CCC	7 2.1%	2 1.5%	5 2.6%
CC	0 0.0%	0 0.0%	0 0.0%
D	2 0.6%	0 0.0%	2 1.0%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
CFO	183	40.8 %
Controller	37	8.3 %
CEO	20	4.5 %
President	17	3.8 %
Finance Director	7	1.6 %
controller	7	1.6 %
VP Finance	5	1.1 %
Corporate Controller	5	1.1 %
Chief Financial Officer	5	1.1 %
COO	5	1.1 %
VP	5	1.1 %
Treasurer	4	0.9 %
Owner	4	0.9 %
Manager	4	0.9 %
Managing Director	3	0.7 %
Vice President	3	0.7 %
president	3	0.7 %
Managing Partner	3	0.7 %
Partner	2	0.4 %
Director of Accounting	2	0.4 %
VP of Finance	2	0.4 %
Director of Operations	2	0.4 %
Principal	2	0.4 %
Divisional CFO	2	0.4 %
CMO	2	0.4 %
SVP	2	0.4 %
COO-CFO	1	0.2 %
Asst. Treasurer	1	0.2 %
CDO	1	0.2 %
Accounting Manager	1	0.2 %
CFO/Treasurer	1	0.2 %
EVP & Chief Investment Officer	1	0.2 %
Vice President Finance Accounting	1	0.2 %
VP & CFO	1	0.2 %
EVP	1	0.2 %
Financial Analyst	1	0.2 %
VP Treasurer	1	0.2 %
Director, Treasury	1	0.2 %
Senior Vice President & Treasurer/CFO	1	0.2 %
Vice President of Finance	1	0.2 %
VP of Finance and Admin	1	0.2 %
VP Business Planning	1	0.2 %
pres	1	0.2 %
Strategic Advisor	1	0.2 %
President/CFO	1	0.2 %
Senior Manager	1	0.2 %
director of Finance	1	0.2 %
Sr Business Consultant	1	0.2 %
SVP Financial Reporting/Corp Secretary	1	0.2 %
Directer of Finance	1	0.2 %
Auditor	1	0.2 %
C. F. O.	1	0.2 %
President mnÃ¹	1	0.2 %
Managing partner	1	0.2 %
CEO Owner	1	0.2 %
evp	1	0.2 %
Comptroller	1	0.2 %

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Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
contractor	1	0.2 %
Head of Finance	1	0.2 %
Senior VP Finance	1	0.2 %
Retired CFO and Investor	1	0.2 %
owner	1	0.2 %
Vp	1	0.2 %
Director of Budget	1	0.2 %
Director, Finance	1	0.2 %
Tax Administrator	1	0.2 %
Board Director	1	0.2 %
President & CFO	1	0.2 %
Treasury Manager	1	0.2 %
Regional Director	1	0.2 %
general mgr	1	0.2 %
Principal/Owner	1	0.2 %
President & CEO (Sole Owner)	1	0.2 %
County Administrator	1	0.2 %
VP Business Affairs	1	0.2 %
Division Controller	1	0.2 %
Sr. Finance Manager	1	0.2 %
VP, Finance	1	0.2 %
Senior Accountant	1	0.2 %
General Manager	1	0.2 %
sr vp financial srervices	1	0.2 %
CEO - CFO	1	0.2 %
Presdient/CEO	1	0.2 %
CEO & President	1	0.2 %
Co-CFO	1	0.2 %
CFO & VP Finance	1	0.2 %
Director Finance	1	0.2 %
Asst Controller	1	0.2 %
Sr Director	1	0.2 %
Consultant	1	0.2 %
CEO/Owner	1	0.2 %
Manager, Financial Reporting	1	0.2 %
VP-Finance & Analytics	1	0.2 %
Global Controller - Divisional	1	0.2 %
VP Finance & Admin	1	0.2 %
Board	1	0.2 %
CFO and CEO	1	0.2 %
VP Finance and Group Controller	1	0.2 %
Pres/CEO	1	0.2 %
CFO/Controller	1	0.2 %
Director of Finance and Operations	1	0.2 %
EVP CFO	1	0.2 %
President/CEO	1	0.2 %
President/Owner	1	0.2 %
Audit Committee Chair	1	0.2 %
SVP, Finance and Treasury	1	0.2 %
Invsestment Professional	1	0.2 %
Director	1	0.2 %
President, CFO, CEO and CIO	1	0.2 %
Manager of Finance	1	0.2 %
General manager	1	0.2 %
VP Admin	1	0.2 %
Board member/audit chair	1	0.2 %
Chief Operating Officer	1	0.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - Fourth Quarter, 2015

Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
Chairman (& principal owner)	1	0.2 %
BOD	1	0.2 %
VP/CFO	1	0.2 %
Sr. Dir. Fin & Acct	1	0.2 %
CFO and EVP Operations	1	0.2 %
Vice President and Controller	1	0.2 %
Mg Dir	1	0.2 %
VP FP&A	1	0.2 %
Sr. Managing Director - Asset Management	1	0.2 %
Director of Finance	1	0.2 %
Director Facilities Finance	1	0.2 %
CFO, Assistant General Manager	1	0.2 %
Asst. Controller	1	0.2 %
Shareholder	1	0.2 %
Financial Reporting Manager	1	0.2 %
Division controller	1	0.2 %
owner-president	1	0.2 %
senior vice president	1	0.2 %
Senior Director Finance	1	0.2 %
PRINCIPAL	1	0.2 %
Regional Controller	1	0.2 %
CIO	1	0.2 %
VP - Financial Analysis	1	0.2 %
Director of Finance/HR	1	0.2 %
Total	448	100.0 %

Missing Cases = 16
Response Percent = 96.6 %

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Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

1a. Are you more or less optimistic about your country's economy compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	143	22.8 %	± 3.3 %
0=No change	187	29.9 %	± 3.6 %
-1=Less optimistic	296	47.3 %	± 3.9 %
Total	626	100.0 %	

Mean = -0.24
SD = 0.80

Missing Cases = 3
Response Percent = 99.5 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

1b. Rate your optimism about your country's economy on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 0

Maximum = 100

Mean = 58.6

Median = 60

Standard Deviation (Unbiased Estimate) = 18.4

95 Percent Confidence Interval Around The Mean = 57.1 - 60.2

Quartiles

1 = 50
2 = 60
3 = 75

Valid Cases =546
Missing Cases =77
Response Percent = 87.6%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

2a. Are you more or less optimistic about the financial prospects for your own company compared to last quarter?

	Number	Percent	95% CI
1=More optimistic	261	41.8 %	± 3.9 %
0=No change	175	28.0 %	± 3.5 %
-1=Less optimistic	189	30.2 %	± 3.6 %
Total	625	100.0 %	

Mean = 0.12
SD = 0.84

Missing Cases = 4
Response Percent = 99.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

2b. Rate your optimism about the financial prospects for your own company on a scale from 0-100, with 0 being the least optimistic and 100 being the most optimistic.

Minimum = 0

Maximum = 100

Mean = 66.0

Median = 70

Standard Deviation (Unbiased Estimate) = 20.3

95 Percent Confidence Interval Around The Mean = 64.3 - 67.7

Quartiles

1 = 50
2 = 70
3 = 80

Valid Cases =549
Missing Cases =76
Response Percent = 87.8%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team?

	Number	Percent	95% CI
Economic uncertainty	299	49.1 %	± 4.0 %
Cost of benefits	229	37.6 %	± 3.9 %
Difficulty attracting / retaining qualified employees	202	33.2 %	± 3.8 %
Regulatory requirements	187	30.7 %	± 3.7 %
Government policies	174	28.6 %	± 3.6 %
Weak demand for your products/services	152	25.0 %	± 3.4 %
Data security	130	21.3 %	± 3.3 %
Employee productivity	123	20.2 %	± 3.2 %
Access to capital	106	17.4 %	± 3.0 %
Employee morale	99	16.3 %	± 2.9 %
Currency risk	72	11.8 %	± 2.6 %
Rising wages and salaries	68	11.2 %	± 2.5 %
Corporate tax code	47	7.7 %	± 2.1 %
Cost of borrowing	40	6.6 %	± 2.0 %
Geopolitical / health crises	28	4.6 %	± 1.7 %
Rising input or commodity costs	26	4.3 %	± 1.6 %
Deflation	21	3.4 %	± 1.5 %
Inflation	8	1.3 %	± 0.9 %
Other	48	7.9 %	± 2.1 %
Total	2059		

Number of Cases = 609
Number of Responses = 2059
Average Number Of Responses Per Case = 3.4
Number Of Cases With At Least One Response = 609
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

3a. During the past quarter, which items have been the most pressing concerns for your company's top management team? - Other specified

Agr, Forestry, Fishing	Over supply of our product
Bank/Fin/Insur/Real Est	Acquisitions and Divestitures
Bank/Fin/Insur/Real Est	Increasing Interest Rates
Bank/Fin/Insur/Real Est	Interest Rate Curve Flattening
Bank/Fin/Insur/Real Est	low interest rates
Bank/Fin/Insur/Real Est	Presidential Election
Bank/Fin/Insur/Real Est	Pressures for divestment
Energy	Low oil price and demand
Healthcare/Pharm	impact of Obama care/reduced reimbursement for medical care
Healthcare/Pharm	Large demand for our services
Healthcare/Pharm	Medicare payments to healthcare providers
Healthcare/Pharm	Restructuring
Healthcare/Pharm	revenue/volume growth and strategic partnerships
Manufacturing	Ablity to keep up wiht changes
Manufacturing	ACA
Manufacturing	increasing competition
Manufacturing	Large capital project completion
Manufacturing	low metal sales prices
Manufacturing	Manufacturing capacity
Manufacturing	Organic Growth
Manufacturing	Weak export markets
Manufacturing	work capital
Mining/Construction	Corporate policy implementation
Other	Cost of Saving
Other	Expenses rising faster than income
Other	Healthcare costs and plans
Other	Huge increase in software license costs
Other	Low unemployment in Elkhart, Indiana and lack of qualified workers.
Other	Maturing Market - Shrinking Industry
Other	Portfolio Risk
Other	public detractors
Other	uncertain state and local financing incentives for construction projects
Pub Admin	cadillac Tax
Pub Admin	Collective bargaining impasse
Retail/Wholesale	Cost Structure
Retail/Wholesale	Increased and intense competition.
Retail/Wholesale	Oil prices
Retail/Wholesale	political outcome
Services, Consulting	criminals in government
Services, Consulting	declined demand for commodities
Services, Consulting	Government infrastructure funding
Services, Consulting	Managing Direct costs
Services, Consulting	National uncertainty. Where is US government going??!! AND, who will lead the US to wherever it IS going??!!
Services, Consulting	Political uncertainty - presidential/congressional elections
Services, Consulting	Price of oil, gold. Demand for coal
Tech [Soft/Hard/Bio]	changing competitive landscape
Tech [Soft/Hard/Bio]	Competition stealing our technology
Tech [Soft/Hard/Bio]	do not know
Transp, Public Util	Inability of suppliers to meet our requirements
Transp, Public Util	Regional construction cost escalation

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Agr, Forestry, Fishing	Poor farm economy
Bank/Fin/Insur/Real Est	Access to Capital
Bank/Fin/Insur/Real Est	Adverse impact of NIRP, strong USD impacting EM and companies, a possible sovereign default
Bank/Fin/Insur/Real Est	An increase in interest rates causing an economic slowdown.
Bank/Fin/Insur/Real Est	concern of global influences on our economy
Bank/Fin/Insur/Real Est	Credit quality of customers.
Bank/Fin/Insur/Real Est	cyber security
Bank/Fin/Insur/Real Est	Data security
Bank/Fin/Insur/Real Est	data security; product diversification
Bank/Fin/Insur/Real Est	Debt levels of most major countries.
Bank/Fin/Insur/Real Est	difficulty attracting qualified staff, employee productivity
Bank/Fin/Insur/Real Est	Govt turning Socialist principles
Bank/Fin/Insur/Real Est	I see the overall global environment as a new challenge
Bank/Fin/Insur/Real Est	impact of Chinese economy on world markets
Bank/Fin/Insur/Real Est	Increased competition
Bank/Fin/Insur/Real Est	Increasing supply of competing real estate product in a minority of product sectors
Bank/Fin/Insur/Real Est	Interest rates not rising
Bank/Fin/Insur/Real Est	Irrational exuberance in commercial and multi-family trades has stagnated our deal flow
Bank/Fin/Insur/Real Est	Joint Venture Performance Development Time Line
Bank/Fin/Insur/Real Est	Long end of the rate curve
Bank/Fin/Insur/Real Est	More terrorism and uncertainty from elections
Bank/Fin/Insur/Real Est	Negative interest rates
Bank/Fin/Insur/Real Est	Political landscape
Bank/Fin/Insur/Real Est	Recession
Bank/Fin/Insur/Real Est	recession
Bank/Fin/Insur/Real Est	Regulatory changes & adverse developments
Bank/Fin/Insur/Real Est	Replacing outdated IT infrastructure and processes that will weigh heavily on our internal resources
Bank/Fin/Insur/Real Est	Socialized medicine.
Bank/Fin/Insur/Real Est	Staying current with technology
Bank/Fin/Insur/Real Est	Systems challenges - cost, integration, etc.
Bank/Fin/Insur/Real Est	the ever changing world of the Non profit sector and the pressure that it faces.
Bank/Fin/Insur/Real Est	Very competitive environment for loan demand and loan structuring seems to be weakening.
Bank/Fin/Insur/Real Est	Volatility in oil prices
Bank/Fin/Insur/Real Est	Well tenured Executive / Staff retirements (Succession Planning)
Bank/Fin/Insur/Real Est	WV State economy is in the toilet.
Communication/Media	none
Communication/Media	Potential weakening of U.S. economy, perhaps associated with added political turmoil
Communication/Media	pricing pressure
Communication/Media	The rising taxes in all states.
Communication/Media	trade secret theft
Energy	High cost of employee medical is a huge issue.
Energy	low oil prices
Energy	plummeting oil price, excess oil supply
Energy	Presidential election
Energy	Weak commodity prices
Healthcare/Pharm	340b drug discount status
Healthcare/Pharm	Additional cost reductions to sustain margin
Healthcare/Pharm	Available funding through grants. As a start up question #4 and h. below does not make much sense.
Healthcare/Pharm	Continued high demand

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Healthcare/Pharm	Continued integration of two companies merging per a transaction in late 2014 and an IPO in 2015.
Healthcare/Pharm	Data security and technology
Healthcare/Pharm	Every increasing administrative burdens placed on companies in order to carry out social mandates
Healthcare/Pharm	Executive orders issued by this Administration
Healthcare/Pharm	Financing
Healthcare/Pharm	Healthcare legislation impacts and changes/uncertainty
Healthcare/Pharm	inability to increase market share
Healthcare/Pharm	Increasing rents
Healthcare/Pharm	IRS penalties on ObamaCare taxpayers who will have large tax penalties and risk dropping health care
Healthcare/Pharm	Lack of available talent in our industry to back fill the number of people exiting the industry
Healthcare/Pharm	na
Healthcare/Pharm	Overall employee 'quality'
Healthcare/Pharm	presidential election
Healthcare/Pharm	Reversal of lower fuel costs; increased health benefit costs; access to professional talent
Healthcare/Pharm	Stock market volitility
Healthcare/Pharm	Uncertain federal policy regarding healthcare as we attempt to adapt to the future state.
Healthcare/Pharm	Uncertainties related to a material investment in an acquisition currently in play.
Healthcare/Pharm	Uncertainty in petroleum market
Healthcare/Pharm	Upgrading/replacing software.
Manufacturing	Ability to keep up with changes
Manufacturing	AR risk for global sales - non-U.S. , currency for peso and Canadian dollar.
Manufacturing	Attracting qualified employees
Manufacturing	Competition from chipper labor countries (Mexico, some central American countries
Manufacturing	Concern about our customers reducing capital investments and deferring repair and replacement of equ
Manufacturing	customers market volatility: specifically agriculture and oil
Manufacturing	Function leaders implementing best practices to obtain cost-effective, benchmark productivity.
Manufacturing	Global Economy - Brazil, India, China
Manufacturing	Growing revenue via new business and/or price increases has been very difficult.
Manufacturing	Increase health care costs with new wave of Obamacare Law.
Manufacturing	Increased bureaucracy with Canadian business.
Manufacturing	Increasing local/global socioeconomic unrest
Manufacturing	Increasing throughput - decreasing lead times
Manufacturing	Keeping up with demand for products.
Manufacturing	Lack of coherent energy policy.
Manufacturing	Lack of residential housing rebound
Manufacturing	launching new MRP software
Manufacturing	Low oil prices will continue to hinder our business.
Manufacturing	none
Manufacturing	none
Manufacturing	Orders-down turn in the US economy
Manufacturing	Overall economic softening along with strengthening US Dollar (making exports too expensive)
Manufacturing	price of oil
Manufacturing	Reduced published pricing for our products, upon which our prices are determined.
Manufacturing	restructure of the company and subsequent separation of operation units into 3 independent companies

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Manufacturing	Shift in demand for commodity industry capital spending.
Manufacturing	Skilled workers
Manufacturing	Strength of the dollar is weakening our position vs. foreign goods.
Manufacturing	Technology around LED's and channel shift towards e-commerce.
Manufacturing	Uncertainty in global economy and cyclical industries
Manufacturing	Uncertainty to related to US presidential election
Manufacturing	US Aerospace/Defense budgets
Manufacturing	Watching wages and shift premiums to attract employees. Impact on low prices on countries capital b
Manufacturing	Weakening demand for our products due to overall weakening consumer demand.
Mining/Construction	Chaos and irrational reactions to energy prices and costs
Mining/Construction	Continued Growth at 10% to 20% annually stretches the structure of our organization
Mining/Construction	EPA requiring 3 year testing for our refrigerant licenses. Just another money grab, tax.
Mining/Construction	None
Mining/Construction	Our firm anticipates a slow down in business due to the upcoming presidential election.
Mining/Construction	Recession
Mining/Construction	There are data security concerns and the economic uncertainty has lowered employee morale.
Mining/Construction	uncertainty of China projects moving ahead
Mining/Construction	Well, even though, January '16 looked bad, I'm optimistic that in the Americas hemisphere things wil
Other	Ability to add more people as we grow
Other	access to markets with the changing internet marketing challenges
Other	Addressing affordability of higher education in general and my university specifically.
Other	As a higher education entity we are not subject to the normal market risks.
Other	Changing environment in government defense contracting. Greater compliance requirements.
Other	Communications and PR Issues
Other	Consumer behavior changing as a result of public reports of economic slowing.
Other	continuing to grow and to integrate that growth into the organization in a profitable way
Other	Controlling discounting.
Other	export / import controls
Other	Flat student tuition
Other	General public's perception that the economy is doing much worse than the indicators show.
Other	home mortgage interest rates
Other	Implementing the necessary technology
Other	Increased difficulty in complying with conflicting regulations and rules.
Other	increased competition
Other	Keeping up with latest technology
Other	LACK OF NEW BUSINESSES TO AREA SERVED
Other	long term contract renewal
Other	Negative interest rates, coming financial crash among many world powers, less consumer expend income
Other	none
Other	Overtime/exempt wages
Other	Philanthropic Environment as affected by market and other risk
Other	political stability of the USA
Other	Prolonged downturn in the market
Other	Recession will start a new cycle, this time coming from China along with the Middle E. crisis

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Other	The government is killing businesses when given the chance
Other	turnover at key positions
Other	US elections will create uncertainty
Other	We have a large amount of capital that needs to be raised late in 2016
Pub Admin	Excess demand for our funds-we are an authority that manages community development funds.
Pub Admin	financial management
Pub Admin	Low returns on investments and higher risk on investments due to ecomony
Pub Admin	Low unemployment rate.
Pub Admin	n/a
Pub Admin	political risk in US is increasing. How do we pay for all the promises being made.
Pub Admin	Rising healthcare costs
Pub Admin	We are going to try a new approach to sales, which has reached a critical point.
Retail/Wholesale	Competition and squeezing margin because of it.
Retail/Wholesale	Competition within our sector - Threat from Amazon and Staples into Jan-San sector
Retail/Wholesale	compliance with SEC reporting rules/regs
Retail/Wholesale	consumer uncertainty about the economy
Retail/Wholesale	Declining wages that support the economy.
Retail/Wholesale	eCommerce
Retail/Wholesale	Economic bubbles created by government and the Fed.
Retail/Wholesale	employee morale
Retail/Wholesale	Excessive regulatory/environmental policies make doing business in California increasingly difficult
Retail/Wholesale	Government's increasing level of reporting and compliance not balanced with value.
Retail/Wholesale	healthcare costs
Retail/Wholesale	increasing employee wages, increasing costs of goods, regulatory uncertainty
Retail/Wholesale	None
Retail/Wholesale	possible global or national recession
Retail/Wholesale	Pricing pressure from customers
Retail/Wholesale	REVENUE GROWTH
Retail/Wholesale	Sales growth
Retail/Wholesale	slowing growth
Retail/Wholesale	Too many regulations and taxes plus a slow economy
Retail/Wholesale	Very large players, e.g. McDonalds invading our space.
Retail/Wholesale	Weak Global economic activity and strong US dollar
Services, Consulting	?
Services, Consulting	Bad debt on the books of the US banks due to low oil prices and the problem it creates for Frackers.
Services, Consulting	Bankruptcy of Energy Company customers.
Services, Consulting	Billing rate resistance
Services, Consulting	Cash Flow
Services, Consulting	Cash Flow Management
Services, Consulting	Cash flow and demand for services as a small firm.
Services, Consulting	Changing and evolving industry
Services, Consulting	Changing consumer demands from less informed and little care for the welfare of producers
Services, Consulting	Clients scared to spend1
Services, Consulting	Collections and late payments from customers
Services, Consulting	Consistent financial growth.
Services, Consulting	Continued control of hiring from the HR sector who are out of touch
Services, Consulting	Continuing mergers in all industries simply to survive
Services, Consulting	Crumbling infrastructur
Services, Consulting	Developing automated systems that make the company capable of its growth potential.

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Services, Consulting	Election - no candidates that I have confidence in
Services, Consulting	Fascist TPP takeover
Services, Consulting	FLSA wage increase requirements
Services, Consulting	General slow down of the economy
Services, Consulting	Generating new ckients
Services, Consulting	Getting new customers & retaining employees
Services, Consulting	Governments role in business
Services, Consulting	I am a Financial Consultant for School Districts. As they continue to suffer losses, I lose $.
Services, Consulting	Income disparity will at some point reduce our markets. I think this is a big looming problem.
Services, Consulting	Increased competition
Services, Consulting	Instability and chaos created by GOP in United states is scaring the businesses and U S interests.
Services, Consulting	International stability especially in the Middle East
Services, Consulting	Marketing a new cyber security service
Services, Consulting	na
Services, Consulting	New, elevated Government Regulations levels will make business ever more difficult for our clients.
Services, Consulting	Offshoring.
Services, Consulting	Response to new service offerings
Services, Consulting	Retail clients closing stores due to lagging sales environment.
Services, Consulting	Sales growth to meet targets
Services, Consulting	Slow growth with rising wages due to low unemployment but massive under-employment
Services, Consulting	Stagnate or no decision making during an election year
Services, Consulting	Succession Implementation
Services, Consulting	Taking new products to market
Services, Consulting	technology cost
Services, Consulting	Terrorism
Services, Consulting	The Continuation of the Affordable Care Act.
Services, Consulting	the expectations for, and cost of, compliance is a growing threat
Services, Consulting	The way customers buy and the constant undermining of small business via regulation and taxation.
Services, Consulting	Uncertainty about political climate. Bad news if a Democrat wins the Presidential election.
Services, Consulting	Uncertainty of the political climate
Services, Consulting	We export to China and we are concerned about political changes with China.
Services, Consulting	We need a pro business environment in the U.S.
Services, Consulting	Weakening of the capitol goods market and risk of increasingly intrusive government policies
Services, Consulting	Weakness in steering of companies by their Board of Directors
Tech [Soft/Hard/Bio]	Across the globe we are seeing increasing patterns of instability, economic and political. Politics
Tech [Soft/Hard/Bio]	Continuing monetary risk in foreign markets.
Tech [Soft/Hard/Bio]	currency exchange rates
Tech [Soft/Hard/Bio]	Developing the operations structure for the production of new products and servicing existing client
Tech [Soft/Hard/Bio]	fiscal policy direction and consumer behaviour
Tech [Soft/Hard/Bio]	Getting more clients.
Tech [Soft/Hard/Bio]	government confiscation of employee assets in 401ks
Tech [Soft/Hard/Bio]	increased sales with existing clientle
Tech [Soft/Hard/Bio]	Longer time to collect receivables; Maintaining sales velocity during an uncertain economy
Tech [Soft/Hard/Bio]	Low interest rates impacting our clients (Financial Services)
Tech [Soft/Hard/Bio]	NA

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3b. Other than your answers to 3a, please write any new challenges or emerging risks that your firm anticipates in the next year.

Tech [Soft/Hard/Bio]	Product innovation
Tech [Soft/Hard/Bio]	Productivity of the marketing and sales personnel
Tech [Soft/Hard/Bio]	regulatory overhead:need to invest in non-productive costs,impedes growth and prevents new jobs
Tech [Soft/Hard/Bio]	Sector consolidation
Tech [Soft/Hard/Bio]	The velocity of technology change and related customer requirements.
Tech [Soft/Hard/Bio]	Training staff quickly in a dynamic business in order to meet strategic needs.
Tech [Soft/Hard/Bio]	Uncertain global economic risk
Tech [Soft/Hard/Bio]	world economy
Transp, Public Util	Acquiring new assets and Establishing new services
Transp, Public Util	Gas prices and the need for natural gas.
Transp, Public Util	increasing portion of our workforce eligible to retire.
Transp, Public Util	It being a Presidential campaign year, I expect little support from law makers in Washington, D.C.
Transp, Public Util	Most challenges center around regulator requirements and government policies.
Transp, Public Util	Uncertainty in the global container shipping business.
Transp, Public Util	We are seeing a softening in the market for trucking services. Capacity exceeds demand.
Unspecified Industry	Hiring qualified professionals.
Unspecified Industry	M&A integration
Unspecified Industry	Thanks

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Unweighted - Winsorized]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	8.63	7.32	7.98 - 9.29	8	-10.20	29.41	465
Revenue	6.85	14.91	5.54 - 8.17	5	-29.10	46.24	420
Technology spending	6.04	9.48	5.01 - 7.06	4	-20.10	35.45	51
Earnings	5.56	16.17	4.01 - 7.11	3	-31.80	44.80	419
Marketing/advertising spending	4.33	10.05	3.31 - 5.36	2	-23.20	33.43	475
Number of domestic full-time employees	4.01	9.37	3.14 - 4.87	2	-21.30	31.47	370
Research and development spending	3.83	8.65	2.78 - 4.88	0	-19.80	28.96	451
Wages/Salaries	3.74	4.26	3.35 - 4.13	3	-10.10	18.85	292
Productivity (output per hour worked)	3.00	4.86	2.45 - 3.55	2	-9.46	16.29	188
Capital spending	2.97	17.85	1.35 - 4.60	1	-41	47.61	381
Cash on the balance sheet	2.47	16.32	0.91 - 4.03	0	-37.60	44.39	299
Prices of your products	1.32	4.77	0.84 - 1.80	1	-12.50	14.45	259
Share repurchases	1.09	5.70	0.22 - 1.96	0	-21.40	26.57	491
Number of offshore outsourced employees	0.95	4.12	0.36 - 1.54	0	-13.70	15.65	164
Number of domestic temporary employees	0.80	6.77	0.02 - 1.57	0	-20.70	23.07	330
Dividends	0.52	9.57	-2.10 - 3.15	0	-28.10	26.96	469

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months for: [Unweighted - Sorted]

(N=629)

	Mean & SD	Positive 1	Zero 0	Negative -1
	0.89	435	29	11
Health care costs	0.38	91.6%	6.1%	2.3%
	0.87	419	39	11
Wages/Salaries	0.40	89.3%	8.3%	2.3%
	0.65	236	74	20
Technology spending	0.59	71.5%	22.4%	6.1%
	0.56	373	22	96
Revenue	0.80	76.0%	4.5%	19.6%
	0.56	190	87	22
Productivity (output per hour worked)	0.63	63.5%	29.1%	7.4%
	0.48	221	107	42
Marketing/advertising spending	0.69	59.7%	28.9%	11.4%
	0.44	273	102	76
Number of domestic full-time employees	0.76	60.5%	22.6%	16.9%
	0.40	126	111	22
Research and development spending	0.64	48.6%	42.9%	8.5%
	0.40	264	57	98
Earnings	0.84	63.0%	13.6%	23.4%
	0.38	204	118	59
Prices of your products	0.74	53.5%	31.0%	15.5%
	0.31	243	124	98
Capital spending	0.80	52.3%	26.7%	21.1%
	0.23	200	116	104
Cash on the balance sheet	0.82	47.6%	27.6%	24.8%
Number of domestic temporary	0.22	94	167	31
employees	0.62	32.2%	57.2%	10.6%
	0.16	13	33	5
Dividends	0.58	25.5%	64.7%	9.8%
Number of offshore outsourced	0.12	28	155	5
employees	0.40	14.9%	82.4%	2.7%
	0.10	20	141	3
Share repurchases	0.36	12.2%	86.0%	1.8%

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Revenue Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Technology spending	4.28	8.48	3.40 - 5.15	3	-20.10	35.45	388
Earnings	3.85	15.71	2.31 - 5.40	4	-31.80	44.80	271
Revenue	3.67	12.48	2.54 - 4.80	4	-29.10	46.24	469
Cash on the balance sheet	2.91	13.98	1.55 - 4.27	0	-37.60	44.39	498
Marketing/advertising spending	2.77	7.60	2.00 - 3.54	2	-23.20	33.43	375
Capital spending	1.99	14.79	0.70 - 3.29	1	-41	47.61	399
Research and development spending	1.20	7.50	0.31 - 2.09	0	-19.80	28.96	404
Share repurchases	1.15	4.06	0.59 - 1.72	0	-21.40	26.57	135
Prices of your products	0.77	4.93	0.28 - 1.26	1	-12.50	14.45	202
Dividends	0.39	7.16	-0.82 - 1.60	0	-28.10	26.96	360

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [All Companies - Winsorized - Employee Weighted - Sorted]

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Health care costs	7.14	6.28	6.57 - 7.70	7	-10.20	29.41	321
Wages/Salaries	3.21	3.32	2.90 - 3.51	3	-10.10	18.85	452
Productivity (output per hour worked)	2.61	3.87	2.18 - 3.03	2	-9.46	16.29	309
Number of domestic full-time employees	2.04	8.13	1.29 - 2.79	1	-21.30	31.47	207
Number of offshore outsourced employees	1.11	3.96	0.57 - 1.65	0	-13.70	15.65	449
Number of domestic temporary employees	-0.27	6.69	-1.01 - 0.48	0	-20.70	23.07	470

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4. Relative to the previous 12 months, what will be your company's PERCENTAGE CHANGE during the next 12 months? [Public Companies - Winsorized - Revenue Weighted]

	Mean	SD	95% CI	Median	Minimum	Maximum
Cash on the balance sheet	3.16	15.23	0.70 - 5.62	1	-37.60	44.39
Share repurchases	2.13	3.97	1.36 - 2.89	0	0	20
Earnings	1.63	16.27	-0.87 - 4.13	5	-31.80	44.80
Dividends	0.37	7.47	-0.97 - 1.71	0	-28.10	25
Revenue	-1.64	11.30	-3.33 - 0.04	3	-29.10	40

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4b. For 2016, what is your planned change in capital spending...

N=629		Total	Ownership		Foreign Sales			
			Public A	Private B	0% A	1-24% B	25-50% C	>50% D
Number		629	78	416	330	205	51	30
Percent		100.0%	15.8%	84.2%	53.6%	33.3%	8.3%	4.9%
Within the US								
	N	588	76	388	310	188	51	29
	Mean	92.6	79.0	94.2	99.0	93.0	74.0	54.8
	SD	19.0	27.9	16.7	8.2	15.1	27.6	34.9
	Median	100.0	95.0	100.0	100.0	100.0	77.5	50.0
			B	A	BCD	ACD	ABD	ABC
Outside the US								
	N	588	76	388	310	188	51	29
	Mean	7.4	21.0	5.8	1.0	7.0	26.0	45.2
	SD	19.0	27.9	16.7	8.2	15.1	27.6	34.9
	Median	0.0	5.0	0.0	0.0	0.0	20.0	50.0
			B	A	BCD	ACD	ABD	ABC

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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4b. For 2016, what is your planned change in capital spending... [Winsorized - Revenue Weighted]

N=629		Total	Ownership		Foreign Sales			
			Public A	Private B	0% A	1-24% B	25-50% C	>50% D
Number		479	247	232	222	222	95	69
Percent		100.1%	51.6%	48.5%	36.6%	36.5%	15.6%	11.3%
Within the US								
	N	466	242	224	217	212	95	68
	Mean	86.9	81.2	93.0	99.8	93.2	70.9	64.6
	SD	16.4	16.8	13.5	2.4	11.1	12.7	8.5
	Median	100.0	80.0	100.0	100.0	100.0	61.3	61.3
			B	A	BCD	ACD	ABD	ABC
Outside the US								
	N	466	242	224	217	212	95	68
	Mean	13.1	18.8	7.0	0.2	6.8	29.1	35.4
	SD	16.4	16.8	13.5	2.4	11.1	12.7	8.5
	Median	0.0	15.0	0.0	0.0	0.0	38.7	38.7
			B	A	BCD	ACD	ABD	ABC

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

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5a. What do you think is the probability that your country's economy will be in recession at the end of 2016?

	Number	Percent	Cumulative
0	38	6.2 %	6.2 %
1-10	97	15.8 %	22.0 %
11-20	104	16.9 %	38.9 %
21-30	103	16.7 %	55.6 %
31-40	77	12.5 %	68.1 %
41-50	82	13.3 %	81.5 %
51-60	33	5.4 %	86.8 %
61-70	21	3.4 %	90.2 %
71-80	35	5.7 %	95.9 %
81-90	10	1.6 %	97.6 %
91-99	3	0.5 %	98.0 %
100	12	2.0 %	100.0 %
Total	615	100.0 %	100.0 %

Mean = 31.1
SD = 24.2

Missing Cases = 14
Response Percent = 97.8 %

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5b. What are the key risks that might lead to recession in your country at year-end 2016?

	Number	Percent	95% CI
Slowdown in China	369	58.7 %	± 3.9 %
Political risk	331	52.6 %	± 3.9 %
Stock market decline	313	49.8 %	± 3.9 %
Budget Deficit	258	41.0 %	± 3.9 %
Price of oil	251	39.9 %	± 3.8 %
Slowdown in Europe	245	39.0 %	± 3.8 %
New regulations	191	30.4 %	± 3.6 %
Slowdown in emerging economies other than China	185	29.4 %	± 3.6 %
Terrorism	153	24.3 %	± 3.4 %
Currency valuation	150	23.8 %	± 3.3 %
Interest rates	100	15.9 %	± 2.9 %
Health crises	90	14.3 %	± 2.7 %
Corruption	64	10.2 %	± 2.4 %
Price of non-oil commodities	59	9.4 %	± 2.3 %
Low Inflation	56	8.9 %	± 2.2 %
Infrastructure	50	7.9 %	± 2.1 %
High inflation	42	6.7 %	± 2.0 %
Workforce disruptions	29	4.6 %	± 1.6 %
Other	38	6.0 %	± 1.9 %
Total	2974		

Number of Cases = 629
Number of Responses = 2974
Average Number Of Responses Per Case = 4.7
Number Of Cases With At Least One Response = 623
Response Percent = 99.0 %

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5b. What are the key risks that might lead to recession in your country at year-end 2016? Other specified

Bank/Fin/Insur/Real Est	Monetary Policy
Bank/Fin/Insur/Real Est	Changes in the housing industry detrimental to the rental housing sector
Energy	election
Healthcare/Pharm	U.S. elections
Healthcare/Pharm	Credit contraction and failure of QE
Healthcare/Pharm	Hillary or Bernie
Healthcare/Pharm	republicans elected
Healthcare/Pharm	New President & Administration
Manufacturing	National Debt
Manufacturing	Lower consumer spending
Manufacturing	Corporate Management
Manufacturing	too little government spending
Manufacturing	Election stagnation
Manufacturing	minimum wage
Manufacturing	Democratic presidential victory
Manufacturing	Consumer spending /Consumer Debt
Mining/Construction	Donal Trump or HIllary Clinton
Other	Congressional bickering
Other	high taxes
Other	An indecisive government with no foreward looking policies
Other	Election results
Other	Political Stale Mate
Other	lack of federal government support
Retail/Wholesale	Deflation
Retail/Wholesale	Donald Trump elected president
Services, Consulting	Oil & Gas exposure on Bank Balance Sheets
Services, Consulting	Bad debt on the books of Chnia's banks.
Services, Consulting	Consumer confidence
Services, Consulting	Too many young people on government disability who should be working.An infrastructure work program
Services, Consulting	Income disparity and reduced markets
Services, Consulting	Political Chaos
Services, Consulting	UNCERTAINTY AND MALAISE OF BUSINESS COMMUNITY
Services, Consulting	Substantial Regulatory Regulations elevations.
Services, Consulting	We are in a depression now
Tech [Soft/Hard/Bio]	all the above?
Tech [Soft/Hard/Bio]	Risk of new President in the US
Transp, Public Util	Consumer confidence
Unspecified Industry	Election

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6a. Assume that core inflation is between 0% and 1% each year for the foreseeable future. What effect would an extended low core inflation scenario have on your firm's financial performance?

	Number	Percent	95% CI
-2=Very negative	15	2.5 %	± 1.2 %
-1=Negative	151	24.7 %	± 3.3 %
0=No effect	229	37.4 %	± 3.8 %
+1=Positive	184	30.1 %	± 3.6 %
+2=Very positive	33	5.4 %	± 1.7 %
Total	612	100.0 %	

Mean = 0.11
SD = 0.92

Missing Cases = 17
Response Percent = 97.3 %

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6b. Do you believe that an extended period of low core inflation would …

(N=629)

	Yes	No
substantially diminish your company's ability to raise prices to keep pace with rising labor and non-labor costs?	288 46.6%	330 53.4%
substantially diminish your company's ability to meet its profitability targets?	205 33.3%	410 66.7%
change the competitive balance in your industry?	92 15.1%	518 84.9%

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6b. How would the competitive balance change?

Bank/Fin/Insur/Real Est	Insurance will need more underwriting discipline while the investment returns stay low
Bank/Fin/Insur/Real Est	Excess capacity
Bank/Fin/Insur/Real Est	Competition among landlords to drive market rents south. However, on the flip side lower borrowing costs to help with refinancing
Bank/Fin/Insur/Real Est	Most firms would be unable to competitively price their product or service
Bank/Fin/Insur/Real Est	Very difficult to operate with reduced profit margins
Bank/Fin/Insur/Real Est	There will be more consolidation
Bank/Fin/Insur/Real Est	Less similar industries would survive
Bank/Fin/Insur/Real Est	further consolidations
Bank/Fin/Insur/Real Est	We wouldn't be able to enjoy an economies of scale relative to costs.
Bank/Fin/Insur/Real Est	NIRP is a failed policy, adversely impacting EM countries & companies
Bank/Fin/Insur/Real Est	Only those entities with large capital reserves will be able to withstand the strain of more prolonged profitability struggles.
Bank/Fin/Insur/Real Est	The larger companies have more options to get larger returns compared with smaller insurance companies like mine.
Bank/Fin/Insur/Real Est	Fewer banks equals fewer clients
Bank/Fin/Insur/Real Est	Flattening yield curve damage profitability. Regulatory burden costs keep increasing.
Energy	Bankruptcy of many small players.
Healthcare/Pharm	Our competitors don't have the scale nor capital to invest in technologies that result in lower production costs. This allows us to refrain from having to raise prices.
Healthcare/Pharm	Some competitors will be slow or unable to adapt
Healthcare/Pharm	Diminish access to raw materials
Healthcare/Pharm	Price wars and loss leaders used to 'buy business'
Manufacturing	new entrants would add capacity and depress selling prices
Manufacturing	new competitive entrants
Manufacturing	I believe the industry leaders would have to change their business model, which would put pressure on their earnings and revenues.
Manufacturing	accelerate competition for limited sales volume may lead to price erosion
Manufacturing	Foreign Competitors are gaining share.
Manufacturing	overseas competition, US dollar imbalance to other currencies
Manufacturing	Low cost producers could gain market share from higher-quality producers because of price contractions.
Mining/Construction	Larger companies will buy smaller companies, less competition, putting a squeeze on smaller companies to purchase at volume.
Mining/Construction	Well, the capital mass will make well capitalized companies be more competitive, like being able to hired better employees and play 'price-cut' strategies.
Mining/Construction	Larger companies will have the bid advantage because they can spread cost of medical increases over a larger base of jobs.
Mining/Construction	allow for more affiliated industries to enter the niche market
Other	More students seeking retraining
Other	More established companies (in our case private schools) would have a bigger cushion
Other	Harder to take existing market share if pricing static
Other	Yes. It will trigger more M&A and consolidations of similar business
Other	LOW INFLATION REFLECTS WEAK BUSINESS DEMAND
Other	The industry would not shrink as fast
Retail/Wholesale	more consolidation
Retail/Wholesale	small companies would unable to compete
Retail/Wholesale	cheap money leads to greater industry consolidation
Retail/Wholesale	Our competitive environment would decrease as the number of competitors would decrease
Retail/Wholesale	SHIFT TO ON-LINE
Retail/Wholesale	We are a upscale quick service restaurant low inflation could reduce the ability for us to offer widely affordable products

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6b. How would the competitive balance change?

Retail/Wholesale	Our largest competitors will not be as affect as we are as a smaller entity
Retail/Wholesale	go negative if over 24 months
Services, Consulting	Larger firms will have the ability to withstand the disruptions, thereby force us out of certain markets and services
Services, Consulting	those firms with high fixed costs would have a harder time keeping profitability up
Services, Consulting	We're in outsourced services - with technology investment limiting staff payroll cost, we are in place to offer better prices as wages outpace core prices.
Services, Consulting	GOVERNMENT INTERFERENCE WOULD OCCUR
Services, Consulting	Better managed core competencies
Services, Consulting	n/a
Services, Consulting	shift in market
Services, Consulting	Costs are already stressed low and would tend to grow faster than revenue
Tech [Soft/Hard/Bio]	favor 'unicorns' that borrow and spend at 150% of revenues... instead of reality crushing them
Tech [Soft/Hard/Bio]	Larger companies with cash will put a tighter squeeze on smaller companies with a smaller cash balance.
Tech [Soft/Hard/Bio]	Larger companies survive - consolidation.
Tech [Soft/Hard/Bio]	move to lowest cost position, driving down innovation acceptance
Tech [Soft/Hard/Bio]	Smaller players would be reduced
Tech [Soft/Hard/Bio]	Smaller players may find it harder to survive allowing us to thin the market.
Transp, Public Util	Smaller firms hurt relatively more than larger firms.
Transp, Public Util	Low demand keeps inflation low. Companies will need to adapt to compete in a market with a low demand for services. Those adaptations could take many forms.

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Agr, Forestry, Fishing	work to enhance productivity per man hour
Agr, Forestry, Fishing	No special steps required. We are a commodity business (forest products) low inflation is favorable for product demand.
Agr, Forestry, Fishing	Merger
Agr, Forestry, Fishing	Watch input costs carefully and try to increase selling prices
Agr, Forestry, Fishing	Strict controls
Bank/Fin/Insur/Real Est	We are a credit union. Low inflation allows us to keep rates low.
Bank/Fin/Insur/Real Est	reduce employee benefits
Bank/Fin/Insur/Real Est	try to keep operating expenses at a minimum with little or no expansion
Bank/Fin/Insur/Real Est	We would continue to employ the best available person and be competitive on pricing.
Bank/Fin/Insur/Real Est	merger
Bank/Fin/Insur/Real Est	Maintain low cost sources of funds
Bank/Fin/Insur/Real Est	Utilize changes in fees and cut expenses to compete.
Bank/Fin/Insur/Real Est	EXPENSE CONTAINMENT
Bank/Fin/Insur/Real Est	n/a
Bank/Fin/Insur/Real Est	Focus on productivity growth/headcount reductions
Bank/Fin/Insur/Real Est	Sell more
Bank/Fin/Insur/Real Est	improve service offerings
Bank/Fin/Insur/Real Est	Watch expenses, keep production high.
Bank/Fin/Insur/Real Est	increase capital expenditure
Bank/Fin/Insur/Real Est	Negotiate contracts to temporarily lower rates.
Bank/Fin/Insur/Real Est	?
Bank/Fin/Insur/Real Est	Increase employee productivity and hold wage increases
Bank/Fin/Insur/Real Est	keep expenses low and work on continued efficiency improvements.
Bank/Fin/Insur/Real Est	protect a niche
Bank/Fin/Insur/Real Est	Update technology and become more productive
Bank/Fin/Insur/Real Est	Keep costs low, slow down growth
Bank/Fin/Insur/Real Est	Deleverage. Setup and maintain adequate working capital reserves.
Bank/Fin/Insur/Real Est	Monitor supplier cost
Bank/Fin/Insur/Real Est	Maintain profit margins
Bank/Fin/Insur/Real Est	Reduce Costs
Bank/Fin/Insur/Real Est	curb and cut back on staff; freeze salary increases and bonuses; rely more on outsourced staff
Bank/Fin/Insur/Real Est	na
Bank/Fin/Insur/Real Est	Look to expand market share
Bank/Fin/Insur/Real Est	Acquire as much prime land as possible for future development. Enhance internal communication to assure employees understand company's contribution to their heathl care costs.
Bank/Fin/Insur/Real Est	New products that replace traditional fixed income.
Bank/Fin/Insur/Real Est	expanded mkts and services
Bank/Fin/Insur/Real Est	more focus on increasing productivity
Bank/Fin/Insur/Real Est	Cut employees
Bank/Fin/Insur/Real Est	Retain core customers and increase cross-sell.
Bank/Fin/Insur/Real Est	Look for merger with another financial institution.
Bank/Fin/Insur/Real Est	Reduce labor cost.
Bank/Fin/Insur/Real Est	as a financial firm, we adjust our market positions based on macro-economic models. Low inflation will persist for extended periods
Bank/Fin/Insur/Real Est	Put emphasis on growth markets - outside US. Emphasis on cash cows. Reduce risk.
Bank/Fin/Insur/Real Est	Mergers
Bank/Fin/Insur/Real Est	Offer additional amenities that would generate revenues greater than costs.
Bank/Fin/Insur/Real Est	Increase operating efficiencies; Find Better sales analytics tools; Seek higher yielding customers.
Bank/Fin/Insur/Real Est	Market extension
Bank/Fin/Insur/Real Est	higher allocation to alternative investments.
Bank/Fin/Insur/Real Est	Leverage existing work over new clients

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Bank/Fin/Insur/Real Est	Find other ways to provide value added services
Bank/Fin/Insur/Real Est	tighten up on expenses
Bank/Fin/Insur/Real Est	cut costs and lay off staff
Bank/Fin/Insur/Real Est	Continue to offer strong value proposition and customer service
Bank/Fin/Insur/Real Est	Hold wages. Focus on cost cutting.
Bank/Fin/Insur/Real Est	Business as usual - no special steps
Bank/Fin/Insur/Real Est	be more aggressive
Communication/Media	No net hiring.
Communication/Media	increase employee productivity
Communication/Media	invest in technologies that will lower operating expenses
Communication/Media	Reduce expenses in the raw materials used.
Communication/Media	we've grown through aquisition
Communication/Media	Differentiate and improve the core product
Energy	focus attention on value-added activities and correcting course relative to employees and resources
Energy	Align cost structure
Energy	no real steps
Energy	Cut costs
Energy	Use working capital to purchase oil and gas properties
Energy	cut costs
Energy	Nothing
Energy	operation's cost control, as well as manufacturing plant utilization increases
Energy	We simply manage our overhead
Healthcare/Pharm	Increased focus on client service in order to ensure high satisfaction and retention
Healthcare/Pharm	Continue to invest in R&D and technologies that enable to reduce our cost of production.
Healthcare/Pharm	Maintain growth pattern
Healthcare/Pharm	Continue innovating to reduce labor and operational costs.
Healthcare/Pharm	Reduce wage increases.
Healthcare/Pharm	Closely analyze market pricing
Healthcare/Pharm	Reduce office staff; freeze wages
Healthcare/Pharm	Increase R&D spending to improve our ability to innovate and capture market share.
Healthcare/Pharm	Continue lean operations and improve contracting with health payors.
Healthcare/Pharm	Continued push for productivity gains
Healthcare/Pharm	Automate more, be more aggressive collecting debts
Healthcare/Pharm	Productivity and purchasing offsets
Healthcare/Pharm	Utilize low cost capital for M&A and expansion
Healthcare/Pharm	NA
Healthcare/Pharm	increase revenue growth thru customer acquisition and increased marketing spending.
Healthcare/Pharm	focus on patient payment for services
Healthcare/Pharm	Manage labour costs and expectations
Healthcare/Pharm	Reduction of bricks and mortar and number of full time employees
Healthcare/Pharm	Improve operational efficiency to low cost overhead structure.
Healthcare/Pharm	INCREASE EFFICIENCY
Healthcare/Pharm	Cut costs
Healthcare/Pharm	Good cost management!
Healthcare/Pharm	Manage costs
Healthcare/Pharm	Stay the course, as we have no fears of this low core inflation.
Healthcare/Pharm	Aggressive sales campaign
Healthcare/Pharm	Seek alternative investments
Healthcare/Pharm	N/A
Healthcare/Pharm	Expand products to customer base
Healthcare/Pharm	provide better service - push employee productivity - reward high performing employees
Healthcare/Pharm	growth, cost productivity
Healthcare/Pharm	Pricing strategies Group purchasing discounting

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Healthcare/Pharm	price increases
Manufacturing	Process improvement, product re-design
Manufacturing	eliminate positions that may impact long term but could help with lowering costs in the short term
Manufacturing	Specific cost reduction programs and continuous improvement activities
Manufacturing	Improve Processes and Productivity
Manufacturing	We have steps to implement improved productivity.
Manufacturing	ruthless focus on productivity and innovation
Manufacturing	same thing we do every year; work on productivity, other cost reductions as well as developing new products and pursue new markets
Manufacturing	lower pricing
Manufacturing	Strict expenditure control; raise cash reserves; drop low profitability, non-growth products
Manufacturing	strong cost reduction program
Manufacturing	Steps to increase productivity via planbt floor automation and Re-Engineering our products
Manufacturing	Sharpen pencils when quoting long term packages
Manufacturing	cost containment and product innovation
Manufacturing	Rely more on automation and less on employees
Manufacturing	Keep wages down, keep commodity prices low.
Manufacturing	Look for productivity savings and efficiencies.
Manufacturing	continue cost cutting measures
Manufacturing	improve productivity
Manufacturing	Manage our overhead, maintain our excellent customer relations.
Manufacturing	Lowering COGS.
Manufacturing	We would work to reduce our operating costs as much as possible, including reducing head count. We likely would be unable to raise prices, so we would need to be more efficient and effective in production to lower costs.
Manufacturing	Control COGS, Add innovative new products
Manufacturing	Hold prices constant.
Manufacturing	cost cutting to become the lowest cost supplier, limit availability in certain areas where we cannot compete on cost
Manufacturing	Accelerate Review all product categories and trim non essential lines, Streamline back office support activities to bare bones to combat inflation, resource supply chain based on cost more than lead time, trim business with least profitable customers to name a few.
Manufacturing	more aggressive advertising
Manufacturing	We are tied to the housing industry, so low inflation improves home affordability, which is a benefit to our company.
Manufacturing	focus on improved efficiency and remain price competitive.
Manufacturing	just do our best
Manufacturing	Reduce number of employees
Manufacturing	N/A
Manufacturing	continue to automate to reduce number of remployees
Manufacturing	Continue to work on improvements
Manufacturing	Hold wage growth in line with inflation growth.
Manufacturing	Change sourcing to lower cost areas; expand product offering to increase margin dollars
Manufacturing	low inflation is drive by excess capacity or low demand. The only thing we can do is continue to balance resources and investment with demand.
Manufacturing	increase productivity & cost effectiveness
Manufacturing	expansion
Manufacturing	First, we would substitute capital equipment and technology for labor. Second, we would move more towards value added manufacturing and away from low value distribution.
Manufacturing	Restrain annual normal wage increases
Manufacturing	improve efficiency and cost management

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Manufacturing	Further cost cutting, including labor force reductions.
Manufacturing	Cut costs
Manufacturing	Continued focus on quality over quantity output.
Manufacturing	workforce reduction, cost containment
Manufacturing	Reduce labor costs including benefits.
Manufacturing	Cost containment to offset wage increases while demanding increase productivity.
Manufacturing	To be a low production cost leader
Manufacturing	manage spending (SG&A, capex)
Manufacturing	Increase productivity
Manufacturing	We are in a low competition product/market. Low inflation would benefit our product growth.
Manufacturing	Unlikely to be a factor
Manufacturing	streamline costs
Manufacturing	New product introduction
Manufacturing	Continue to find lower costs in sourcing, new markets and automation , technology wins. Reduce pain points, labor costs, health care, worker compensation insurance.
Manufacturing	Productivity, cost reductions
Manufacturing	Use of technology
Manufacturing	Implement floor price for our products
Manufacturing	Continue to drive supply chain costs lower. Focus on reducing manufacturing costs. Reduce headcount and investment in growth initiatives.
Manufacturing	Cost-cutting to increase margins.
Manufacturing	Develop new products , Add value to current products thru R&D, extend customer base, look for blue oceans
Manufacturing	Invest in marketing.
Manufacturing	add value added services to goods
Mining/Construction	Focus on improving productivity, through pre-fabrication and other off-site construction measures.
Mining/Construction	not sure
Mining/Construction	Avoid capital expenditures.
Mining/Construction	Control production costs, salaries & wages, and strenghten customer relationships
Mining/Construction	invest in technology / productivity tools
Mining/Construction	Focus on improved operational efficiency.
Mining/Construction	decrease prices charged and reduce benefits paid to employees
Mining/Construction	revisit our estimating procedures and adjust where needed
Mining/Construction	Cost control and seek new revenue opportunities
Mining/Construction	increase market share
Mining/Construction	Cost containment
Mining/Construction	Increased advertising.
Mining/Construction	cut employee costs
Mining/Construction	Cost Control, and Internal Controls focus, as well as, execution.
Mining/Construction	Fewer employees, use more outsourced labor.
Mining/Construction	Increase workforce training
Mining/Construction	cost management - wages, material, equipment
Other	Reduce workforce numbers
Other	Keep tuition and fees at present level
Other	innovation
Other	We would probably need to invest in systems to become more efficient.
Other	Increased use of technology to keep overall costs in check
Other	Cut costs while raising benefits
Other	N/A
Other	Offer discounts for spending more
Other	This should keep our costs down and we are a donor driven organization.
Other	Cost control
Other	We would keep prices low to stay competitive in the market. Controlling our expenses to the best of our ability.

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Other	n/a
Other	Accelerate plans to reduce direct labor
Other	Keep tuition and salaries low; shift costs of medical insurance premium
Other	Need to make our product unique.
Other	We have to keep our operation costs at a minimum and price our product at the low end of the spectrum.
Other	lower costs
Other	Advertising
Other	control costs
Other	Cut costs
Other	We are in professional services, architecture and engineering. Low inflation doesn't much affect us.
Other	Continuous drive for productivity
Other	Increase presence in foreign markets
Other	Increase productivity, reduction of management layer, business simplification, boost multi year deals, charge for all free of charge services, reduce dividends, maintain a healthy BS
Other	Provided more services.
Other	Improve purchasing procedures to control costs.
Other	Lower pay increases and lower tuition increases
Other	Since our industry is very labor intensive, and the labor is growing in age demographics, other areas of operating cost reductions will be sought.
Other	review all jobs and consolidate tasks as much as possible
Other	Improve efficiency; control costs
Other	keep salaries as they are now
Other	cut costs
Other	no significant changes in a low inflation environment
Other	just fucking do it literally
Other	Continue to be more efficient.
Other	DECREASE EMPLOYEES
Other	Maintain our core values, faith and attitude
Other	Continue to look for alternative revenue sources
Other	Have to work harder
Other	Our number one step is to be efficient with the current tonnage being processed in a maturing/shrinking market
Other	Reduce G&A - Increase per customer sales
Other	Cost control and efficiency/effectiveness
Other	Cost control and more efficiency with what we have in place.
Other	workforce reduction
Other	Compete in new markets.
Other	Review compensation levels, insurance and benefits
Other	None
Pub Admin	very little
Pub Admin	smaller salary increases
Pub Admin	Stay the course.
Pub Admin	Invest in investments with increased risk to generate higher returns
Pub Admin	efficiency improvement, new services products, elimination of old non competitive services/products
Pub Admin	None
Pub Admin	Identify new revenue sources and continue efforts to retain high quality staff
Pub Admin	N/A - Governmental Agency
Pub Admin	None, we should be no worse than others and since we have a low overhead we will probably be ok.
Retail/Wholesale	Continued aggressive cost cutting.
Retail/Wholesale	manage costs lower
Retail/Wholesale	find new sources of revenue
Retail/Wholesale	contain costs

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Retail/Wholesale	New product development and investment in additional sales team
Retail/Wholesale	Quality vs. price war.
Retail/Wholesale	Cut overhead
Retail/Wholesale	Increased labor efficiency, adding new products
Retail/Wholesale	Remain competitive? Low inflation is a good thing, not bad. Zero inflation is even better. Why would anyone be so stupid as to think lower prices are a bad thing? Keynesians are idiots.
Retail/Wholesale	Continually need to introduce new products to avoid commodity pricing.
Retail/Wholesale	Concentrate on holding on to current customers
Retail/Wholesale	cut capex, slow pay increases, review hiring at the fringes.
Retail/Wholesale	Negotiate better supply terms/costs with vendors.
Retail/Wholesale	more value add services for our customer
Retail/Wholesale	monitor expenses and product cost
Retail/Wholesale	none needed
Retail/Wholesale	increase the value of our services and effectiveness
Retail/Wholesale	Work with our supply chain to reduce costs
Retail/Wholesale	Cost structure, merechandise mix,continue migration to omnichannel business model
Retail/Wholesale	add a new line of products or services to go along with core products
Retail/Wholesale	expand product portfolio
Retail/Wholesale	INCREASE POINTS OF DISTRIBUTION
Retail/Wholesale	Reduce operating costs.
Retail/Wholesale	None
Retail/Wholesale	Reduce Labor Costs
Retail/Wholesale	Innovation in products, better financial management.
Retail/Wholesale	keep wages down
Retail/Wholesale	Focus on service
Retail/Wholesale	Stay the course with quality and prices and continue to attract customers who are moved by quality and service more than price.
Retail/Wholesale	cannot sell product for less. close shop
Retail/Wholesale	Cut back health care
Retail/Wholesale	Reign in labor increases and very cost focused reducing strategic investments
Retail/Wholesale	reduce costs
Retail/Wholesale	minimize price increases; keep labor cost low
Retail/Wholesale	readjust our plan and see where revenues and expenses are in and balance where we have to be with reserves.
Retail/Wholesale	we are a regional company and better able to adapt to the local market needs.
Retail/Wholesale	New products & expansion into new channels of distribution
Retail/Wholesale	cut prices
Services, Consulting	It is difficult to say in a service industry tied to jobs. If jobs slow due to an inability of our clients to pass on price increases to outpace labor costs, we may be forced to evaluate pricing concessions if the competition moves in that direction.
Services, Consulting	Introduce services which differentiate us but do not add to delivery costs
Services, Consulting	Control costs
Services, Consulting	Increase level of service
Services, Consulting	Maintain lower prices relative to competitors
Services, Consulting	none
Services, Consulting	Take further actions to boost productivity and gain market share
Services, Consulting	streamline processes
Services, Consulting	attempt to keep cost in check and limit hiring and raises
Services, Consulting	work to keep costs down - less spending
Services, Consulting	not raise prices
Services, Consulting	Consider expansion into more countries
Services, Consulting	continued cash management and reserve buildup
Services, Consulting	Continue process improvements to work more efficiently. Continue to gain new customers from leads from our existing, satisfied customers.

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Services, Consulting	Increase marketing efforts
Services, Consulting	Focus on wages, 'greening' of staff on long term projects
Services, Consulting	Monitor gross margin closely.
Services, Consulting	I can't assume that salaries will remain stagnant. Offshoring is a logical alternative to rising wages.
Services, Consulting	Hold wages to levels of 2010 which have not changed since then. Reduce marking efforts.
Services, Consulting	We are not capitol intensive; therefore, our risk is minimized. Our customers face capitol risk and react by reducing their needs which intensifies their need for our services.
Services, Consulting	We are in a low inflationary time so our competitive standing will not be significantly affected.
Services, Consulting	Little effects
Services, Consulting	Hire best and brightest and continue to pump cash into evolution of our product/ service offerings.
Services, Consulting	quality service
Services, Consulting	Reduce prices, cut staff
Services, Consulting	cut costs where possible.
Services, Consulting	Improve efficiency, less outsourcing
Services, Consulting	Try to identify cost savings areas to reduce expenses.
Services, Consulting	Investment in capital expenditures
Services, Consulting	Control costs
Services, Consulting	Keep in the NICHE market. Excellent client relationship to retain there business. Innovation. Advertising to get new business, Hiring quality employees for high performance.
Services, Consulting	add further value added services
Services, Consulting	Manage headcount, automate processes, drive efficiency.
Services, Consulting	limit wage increases
Services, Consulting	focus on maintaining low wage growth
Services, Consulting	Adjust benefits
Services, Consulting	Limit/freeze hiring. Less raises, more performance based pay. Limit credit granted to small clients - raise credit granted to large established clients with added fees.
Services, Consulting	Find an additional investor principal or sell practice for best available price.
Services, Consulting	Continue marketing aggressively.
Services, Consulting	Maintain current policies
Services, Consulting	Keep on wages at the current inflation rates.
Services, Consulting	Continue to market and spend on marketing and sales initiatives
Services, Consulting	We are a very small player in a huge market. We would attempt to hold or increase market share.
Services, Consulting	SINCE WE ARE A FEE BASED ENTITY WE WOULD LOWER FEES
Services, Consulting	Continue to drive efficiencies within the business. Look for more margin based sales opportunities.
Services, Consulting	must raise productivity, hire better people and retain them,
Services, Consulting	Since we provide services to much larger entitiesâ€¦try to keep the price reductions that these large entities try to push on us in order to retain the contracts. Negotiate very hard with our vendors in order for us to maintain our gross margin. Forgo hiring additional workers in order to meet our net profit goals
Services, Consulting	NA. We are consulting focused. Impact would be more focused on clients.
Services, Consulting	Inflation has been between 8-11% each year for the last 3 years. Where are you living that you use the term 'low inflation environment'?
Services, Consulting	Concentrate on better management of core competencies
Services, Consulting	Drive sales
Services, Consulting	maximize system efficiencies, reduce reduncanies and review activities performed outside the organization
Services, Consulting	Use loans effectively to upgrade equipment
Services, Consulting	Adjust salary increases and have proactive cost management to keep cost at or below low inflation. Seek efficiencies.

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Services, Consulting	Focus on increasing market share. Prices for our services haven't gone up in years. The key is expanding revenue and becoming more productive
Services, Consulting	new technologies enhance value of products
Services, Consulting	New Offerings
Services, Consulting	cut marketing expenditures
Services, Consulting	Expand to other markets
Services, Consulting	Not applicable
Services, Consulting	Strengthen client relationships. Concentrate on development of automated systems and other efficiency.
Services, Consulting	Keep prices to what the market can bare and minimize hiring
Services, Consulting	hire more competent employees, cut cost accordingly
Services, Consulting	cost controls, extensive marketing to find and retain new clients
Services, Consulting	Adapt
Services, Consulting	Seek more clients - potentially shift to a different model, as trainer rather than service provider
Services, Consulting	If our cost remain firm our selling price strategy will be to continue testing the market for increases that are min 5% about inflation.
Services, Consulting	More marketing
Services, Consulting	More competitive advertisement.
Tech [Soft/Hard/Bio]	Disinflation is unlikely to last. We see a whipsaw of disinflation followed by the risk of high inflation.
Tech [Soft/Hard/Bio]	more aggressive innovation and selling
Tech [Soft/Hard/Bio]	Increase our marketing efforts to attract new customers.
Tech [Soft/Hard/Bio]	Improve productivity
Tech [Soft/Hard/Bio]	Stay on the leading edge of technological change.
Tech [Soft/Hard/Bio]	shred costs, automate at every opportunity
Tech [Soft/Hard/Bio]	capital
Tech [Soft/Hard/Bio]	None needed
Tech [Soft/Hard/Bio]	Higher level of outsourcing
Tech [Soft/Hard/Bio]	Focus on productivity improvements.
Tech [Soft/Hard/Bio]	Slow spending/investment
Tech [Soft/Hard/Bio]	Shift composition of employment away from high cost employees
Tech [Soft/Hard/Bio]	Improve productivity, rationalize wage increases, other cost management initiatives
Tech [Soft/Hard/Bio]	Keep pricing the same
Tech [Soft/Hard/Bio]	No price increases
Tech [Soft/Hard/Bio]	Deliver continuously better software technology
Tech [Soft/Hard/Bio]	Competitive prices and low wage increases
Tech [Soft/Hard/Bio]	Grow revenue
Tech [Soft/Hard/Bio]	Develop new ways to market and price products
Tech [Soft/Hard/Bio]	reduce R&D investment and reduce jobs
Tech [Soft/Hard/Bio]	reorder product mix to best cost position, create more value driven demand to support price levels, and eliminate marginal products or acquire products to gain market share
Tech [Soft/Hard/Bio]	Unique products, support and reputation.
Tech [Soft/Hard/Bio]	cut employees
Tech [Soft/Hard/Bio]	Minimize S&W inflation
Tech [Soft/Hard/Bio]	Include additional product features without raising price
Tech [Soft/Hard/Bio]	Keep prices and wages lower than normal. Employee turnover is OK to counter wage increases.
Tech [Soft/Hard/Bio]	None necessary
Tech [Soft/Hard/Bio]	none
Tech [Soft/Hard/Bio]	Manage costs that are manageable and look for alternatives for those that are not.
Tech [Soft/Hard/Bio]	Doesn't really affect us.
Tech [Soft/Hard/Bio]	reduce staff, increase productivity of remaining staff
Tech [Soft/Hard/Bio]	refocus on inefficiencies in the system
Tech [Soft/Hard/Bio]	Operational efficiency

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6c. What steps would your firm take to remain competitive in an extended low inflation environment?

Tech [Soft/Hard/Bio]	Pursue acquisitions with relatively cheap money. Invest in projects to bring contract manufacturing in-house.
Tech [Soft/Hard/Bio]	inorganic growth
Tech [Soft/Hard/Bio]	focus on efficiency initiatives and focus on technology to automate routine processing
Tech [Soft/Hard/Bio]	No extraordinary steps - just maintain our current path
Transp, Public Util	Shrink with the industry
Transp, Public Util	renegotiate contracts
Transp, Public Util	Seek volume through holding prices, offering concessions on terms. Cutting costs, including holding wages and reducing variable pay.
Transp, Public Util	Offer more and a greater variety of services
Transp, Public Util	Increase offerings of services as we have since 2008
Transp, Public Util	Continuing investment in technology, emphasis on employee empowerment and not chasing lower prices fully.
Transp, Public Util	Try to keep costs low and operational efficiencies high.
Transp, Public Util	as a regulated utility serving a defined territory, we feel no direct competitive pressures. Indirect pressures, however, including the lack of economic growth in the region and state, are substantial.
Transp, Public Util	Low inflation would have very little effect on our company.
Transp, Public Util	Maintain strong fiscal expense discipline
Transp, Public Util	We are reviewing all of or process and procedures with an eye to reducing staff and gaining efficiencies. Centralizing wherever possible.
Transp, Public Util	Cost reductions and reduced capital spending
Unspecified Industry	Yesz
Unspecified Industry	Maintain cost controls and invest in technology.

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7. Holding everything else constant, did the December 2015 increase in interest rates affect your company?

	Number	Percent	95% CI
-2=Very negative	3	0.5 %	± 0.5 %
-1=Negative	91	14.7 %	± 2.8 %
0=No effect	503	81.1 %	± 3.1 %
+1=Positive	20	3.2 %	± 1.4 %
+2=Very positive	3	0.5 %	± 0.5 %
Total	620	100.0 %	

Mean = -0.11
SD = 0.45

Missing Cases = 9
Response Percent = 98.6 %

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8. Compared to interest rates today, how much would your borrowing costs have to increase to cause your company to 'reduce hiring plans'?

	Number	Percent	Cumulative
0.25	16	4.3 %	4.3 %
0.5	20	5.4 %	9.8 %
0.75	13	3.5 %	13.3 %
1.0	55	14.9 %	28.3 %
1.5	24	6.5 %	34.8 %
2.0	86	23.4 %	58.2 %
2.5	28	7.6 %	65.8 %
3.0	45	12.2 %	78.0 %
3.5	8	2.2 %	80.2 %
4.0	73	19.8 %	100.0 %
Total	368	100.0 %	100.0 %

Mean = 2.21
SD = 1.19

Missing Cases = 261
Response Percent = 58.5 %

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8. Compared to interest rates today, how much would your borrowing costs have to increase to cause your company to 'reduce capital spending plans'?

	Number	Percent	Cumulative
0.25	17	4.2 %	4.2 %
0.5	19	4.7 %	8.9 %
0.75	19	4.7 %	13.6 %
1.0	57	14.1 %	27.7 %
1.5	39	9.6 %	37.3 %
2.0	93	23.0 %	60.2 %
2.5	28	6.9 %	67.2 %
3.0	59	14.6 %	81.7 %
3.5	7	1.7 %	83.5 %
4.0	67	16.5 %	100.0 %
Total	405	100.0 %	100.0 %

Mean = 2.15
SD = 1.15

Missing Cases = 224
Response Percent = 64.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

8. Compared to interest rates today, how much would your borrowing costs have to increase to cause your company to 'reduce borrowing plans'?

	Number	Percent	Cumulative
0.25	18	4.7 %	4.7 %
0.5	15	3.9 %	8.6 %
0.75	18	4.7 %	13.3 %
1.0	53	13.8 %	27.2 %
1.5	30	7.8 %	35.0 %
2.0	98	25.6 %	60.6 %
2.5	27	7.0 %	67.6 %
3.0	53	13.8 %	81.5 %
3.5	14	3.7 %	85.1 %
4.0	57	14.9 %	100.0 %
Total	383	100.0 %	100.0 %

Mean = 2.15
SD = 1.13

Missing Cases = 246
Response Percent = 60.9 %

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9a. Approximately what percentage of your primary workforce currently earns minimum wage? [US Headquarters Only] (mean is an estimate)

	Number	Percent	95% CI
0% (None)	453	74.9 %	± 3.5 %
5%	59	9.8 %	± 2.3 %
10%	33	5.5 %	± 1.8 %
20%	13	2.1 %	± 1.1 %
30%	11	1.8 %	± 1.0 %
40%	4	0.7 %	± 0.6 %
50%	4	0.7 %	± 0.6 %
60%	2	0.3 %	± 0.4 %
70%	2	0.3 %	± 0.4 %
80%	0	0.0 %	± 0.0 %
90%	1	0.2 %	± 0.3 %
95%	1	0.2 %	± 0.3 %
100% (All)	22	3.6 %	± 1.5 %
Total	605	100.0 %	

Mean = 6.98
SD = 20.79

Missing Cases = 15
Response Percent = 97.6 %

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9b. Among your primary workforce, how much do the lowest paid workers currently earn in hourly wages? [US Headquarters Only] (mean is an estimate derived from category midpoints)

	Number	Percent	95% CI
$7.25 or less per hour	9	1.6 %	± 0.9 %
$7.26-$8.74	28	5.1 %	± 1.6 %
$8.75-$9.99	55	9.9 %	± 2.2 %
$10-$11.99	133	24.0 %	± 3.2 %
$12-$14.99	149	26.9 %	± 3.4 %
$15 or more per hour	180	32.5 %	± 3.6 %
Total	554	100.0 %	

Mean = 12.60
SD = 2.30

Missing Cases = 66
Response Percent = 89.4 %

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ALL RESPONDENTS: If the minimum wage were increased, would your company...

	increased to $8.75/hr			increased to $10.00/hr			increased to $15.00/hr		
	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Net: Reduce current or future employment	13 39.4%	17 51.5%	3 9.1%	40 47.1%	40 47.1%	5 5.9%	256 72.5%	86 24.4%	11 3.1%
Reduce current workforce	4 11.1%	25 69.4%	7 19.4%	18 19.6%	61 66.3%	13 14.1%	152 41.2%	168 45.5%	49 13.3%
Slow future hiring	13 36.1%	17 47.2%	6 16.7%	40 44.4%	41 45.6%	9 10.0%	247 66.4%	93 25.0%	32 8.6%
Shift towards labor-saving technologies	11 30.6%	19 52.8%	6 16.7%	40 43.5%	36 39.1%	16 17.4%	268 72.2%	81 21.8%	22 5.9%
Reduce employee benefits	4 11.4%	24 68.6%	7 20.0%	25 28.1%	51 57.3%	13 14.6%	177 48.0%	127 34.4%	65 17.6%
Raise product prices	8 22.2%	18 50.0%	10 27.8%	38 42.7%	45 50.6%	6 6.7%	177 48.5%	142 38.9%	46 12.6%
Reduce employee turnover	8 22.2%	20 55.6%	8 22.2%	20 22.0%	50 54.9%	21 23.1%	93 25.5%	181 49.6%	91 24.9%
Increase worker output	6 16.7%	20 55.6%	10 27.8%	32 34.8%	45 48.9%	15 16.3%	151 40.9%	145 39.3%	73 19.8%
Attract higher-quality talent	6 17.1%	24 68.6%	5 14.3%	12 13.5%	60 67.4%	17 19.1%	122 33.3%	171 46.7%	73 19.9%

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MANUFACTURING SECTOR: If the minimum wage were increased, would your company...

	increased to $8.75/hr			increased to $10.00/hr			increased to $15.00/hr		
	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Net: Reduce current or future employment	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	8 61.5%	3 23.1%	2 15.4%
Reduce current workforce	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2 15.4%	6 46.2%	5 38.5%
Slow future hiring	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	8 61.5%	3 23.1%	2 15.4%
Shift towards labor-saving technologies	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	10 76.9%	2 15.4%	1 7.7%
Reduce employee benefits	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	3 23.1%	4 30.8%	6 46.2%
Raise product prices	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	6 46.2%	5 38.5%	2 15.4%
Reduce employee turnover	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	3 25.0%	6 50.0%	3 25.0%
Increase worker output	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	6 46.2%	4 30.8%	3 23.1%
Attract higher-quality talent	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	5 38.5%	6 46.2%	2 15.4%

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RETAIL/WHOLESALE SECTOR: If the minimum wage were increased, would your company...

	increased to $8.75/hr			increased to $10.00/hr			increased to $15.00/hr		
	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Net: Reduce current or future employment	2 40.0%	2 40.0%	1 20.0%	7 43.8%	8 50.0%	1 6.3%	37 77.1%	8 16.7%	3 6.3%
Reduce current workforce	1 20.0%	3 60.0%	1 20.0%	4 25.0%	11 68.8%	1 6.3%	22 45.8%	18 37.5%	8 16.7%
Slow future hiring	2 40.0%	2 40.0%	1 20.0%	7 43.8%	8 50.0%	1 6.3%	35 72.9%	8 16.7%	5 10.4%
Shift towards labor-saving technologies	2 40.0%	2 40.0%	1 20.0%	7 43.8%	7 43.8%	2 12.5%	39 81.3%	7 14.6%	2 4.2%
Reduce employee benefits	2 50.0%	1 25.0%	1 25.0%	4 25.0%	10 62.5%	2 12.5%	25 52.1%	15 31.3%	8 16.7%
Raise product prices	1 20.0%	2 40.0%	2 40.0%	7 43.8%	6 37.5%	3 18.8%	26 55.3%	14 29.8%	7 14.9%
Reduce employee turnover	0 0.0%	4 80.0%	1 20.0%	3 18.8%	9 56.3%	4 25.0%	11 22.9%	23 47.9%	14 29.2%
Increase worker output	0 0.0%	3 60.0%	2 40.0%	6 37.5%	8 50.0%	2 12.5%	21 43.8%	19 39.6%	8 16.7%
Attract higher-quality talent	0 0.0%	4 80.0%	1 20.0%	1 6.7%	13 86.7%	1 6.7%	19 40.4%	20 42.6%	8 17.0%

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LESS THAN 100 EMPLOYEES: If the minimum wage were increased, would your company...

	increased to $8.75/hr			increased to $10.00/hr			increased to $15.00/hr		
	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Net: Reduce current or future employment	2 25.0%	5 62.5%	1 12.5%	6 27.3%	14 63.6%	2 9.1%	73 72.3%	27 26.7%	1 1.0%
Reduce current workforce	1 12.5%	6 75.0%	1 12.5%	4 17.4%	15 65.2%	4 17.4%	42 40.8%	48 46.6%	13 12.6%
Slow future hiring	2 25.0%	5 62.5%	1 12.5%	6 27.3%	14 63.6%	2 9.1%	72 68.6%	28 26.7%	5 4.8%
Shift towards labor-saving technologies	1 12.5%	5 62.5%	2 25.0%	8 34.8%	7 30.4%	8 34.8%	73 70.2%	26 25.0%	5 4.8%
Reduce employee benefits	1 12.5%	6 75.0%	1 12.5%	5 21.7%	15 65.2%	3 13.0%	42 40.4%	39 37.5%	23 22.1%
Raise product prices	0 0.0%	6 75.0%	2 25.0%	9 42.9%	12 57.1%	0 0.0%	51 49.5%	43 41.7%	9 8.7%
Reduce employee turnover	2 25.0%	6 75.0%	0 0.0%	6 27.3%	12 54.5%	4 18.2%	26 25.2%	53 51.5%	24 23.3%
Increase worker output	1 12.5%	5 62.5%	2 25.0%	9 39.1%	11 47.8%	3 13.0%	39 37.1%	47 44.8%	19 18.1%
Attract higher-quality talent	2 25.0%	6 75.0%	0 0.0%	4 17.4%	16 69.6%	3 13.0%	31 29.5%	58 55.2%	16 15.2%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

100-999 EMPLOYEES: If the minimum wage were increased, would your company...

	increased to $8.75/hr			increased to $10.00/hr			increased to $15.00/hr		
	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Net: Reduce current or future employment	1 11.1%	8 88.9%	0 0.0%	16 55.2%	12 41.4%	1 3.4%	80 66.7%	33 27.5%	7 5.8%
Reduce current workforce	0 0.0%	8 88.9%	1 11.1%	5 16.7%	20 66.7%	5 16.7%	51 40.8%	54 43.2%	20 16.0%
Slow future hiring	1 11.1%	8 88.9%	0 0.0%	16 53.3%	13 43.3%	1 3.3%	77 61.6%	35 28.0%	13 10.4%
Shift towards labor-saving technologies	3 33.3%	6 66.7%	0 0.0%	15 50.0%	12 40.0%	3 10.0%	93 73.8%	26 20.6%	7 5.6%
Reduce employee benefits	0 0.0%	8 100.0%	0 0.0%	8 28.6%	16 57.1%	4 14.3%	61 48.8%	42 33.6%	22 17.6%
Raise product prices	1 11.1%	6 66.7%	2 22.2%	10 34.5%	16 55.2%	3 10.3%	53 43.1%	51 41.5%	19 15.4%
Reduce employee turnover	2 22.2%	6 66.7%	1 11.1%	6 20.0%	17 56.7%	7 23.3%	29 23.8%	63 51.6%	30 24.6%
Increase worker output	1 11.1%	7 77.8%	1 11.1%	11 36.7%	17 56.7%	2 6.7%	48 38.7%	54 43.5%	22 17.7%
Attract higher-quality talent	1 12.5%	7 87.5%	0 0.0%	4 13.3%	19 63.3%	7 23.3%	44 36.1%	53 43.4%	25 20.5%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

1000+ EMPLOYEES: If the minimum wage were increased, would your company...

	increased to $8.75/hr			increased to $10.00/hr			increased to $15.00/hr		
	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Net: Reduce current or future employment	5 45.5%	4 36.4%	2 18.2%	13 52.0%	10 40.0%	2 8.0%	62 81.6%	11 14.5%	3 3.9%
Reduce current workforce	2 14.3%	9 64.3%	3 21.4%	5 16.7%	21 70.0%	4 13.3%	35 42.2%	36 43.4%	12 14.5%
Slow future hiring	5 35.7%	4 28.6%	5 35.7%	13 44.8%	10 34.5%	6 20.7%	61 72.6%	12 14.3%	11 13.1%
Shift towards labor-saving technologies	3 21.4%	8 57.1%	3 21.4%	10 33.3%	15 50.0%	5 16.7%	62 74.7%	15 18.1%	6 7.2%
Reduce employee benefits	2 14.3%	8 57.1%	4 28.6%	8 27.6%	15 51.7%	6 20.7%	46 55.4%	24 28.9%	13 15.7%
Raise product prices	3 21.4%	6 42.9%	5 35.7%	12 40.0%	15 50.0%	3 10.0%	43 51.8%	26 31.3%	14 16.9%
Reduce employee turnover	2 14.3%	7 50.0%	5 35.7%	6 20.0%	17 56.7%	7 23.3%	25 29.8%	33 39.3%	26 31.0%
Increase worker output	1 7.1%	7 50.0%	6 42.9%	8 26.7%	14 46.7%	8 26.7%	43 51.2%	22 26.2%	19 22.6%
Attract higher-quality talent	1 7.1%	9 64.3%	4 28.6%	2 7.4%	20 74.1%	5 18.5%	27 32.1%	36 42.9%	21 25.0%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

ANSWERED ALL THREE MINIMUM WAGE BREAKPOINTS: If the minimum wage were increased, would your company...

	increased to $8.75/hr			increased to $10.00/hr			increased to $15.00/hr		
	Yes	No	Not Sure	Yes	No	Not Sure	Yes	No	Not Sure
Net: Reduce current or future employment	12 40.0%	15 50.0%	3 10.0%	19 63.3%	7 23.3%	4 13.3%	25 83.3%	3 10.0%	2 6.7%
Reduce current workforce	3 8.6%	25 71.4%	7 20.0%	15 42.9%	13 37.1%	7 20.0%	26 74.3%	5 14.3%	4 11.4%
Slow future hiring	12 34.3%	17 48.6%	6 17.1%	21 60.0%	7 20.0%	7 20.0%	29 82.9%	3 8.6%	3 8.6%
Shift towards labor-saving technologies	10 29.4%	18 52.9%	6 17.6%	17 50.0%	9 26.5%	8 23.5%	28 82.4%	3 8.8%	3 8.8%
Reduce employee benefits	3 9.1%	23 69.7%	7 21.2%	13 39.4%	14 42.4%	6 18.2%	22 66.7%	8 24.2%	3 9.1%
Raise product prices	7 20.0%	18 51.4%	10 28.6%	21 60.0%	9 25.7%	5 14.3%	28 80.0%	4 11.4%	3 8.6%
Reduce employee turnover	7 20.0%	20 57.1%	8 22.9%	9 25.7%	13 37.1%	13 37.1%	19 54.3%	9 25.7%	7 20.0%
Increase worker output	5 14.3%	20 57.1%	10 28.6%	16 45.7%	12 34.3%	7 20.0%	21 60.0%	7 20.0%	7 20.0%
Attract higher-quality talent	5 15.6%	22 68.8%	5 15.6%	7 21.9%	15 46.9%	10 31.3%	13 40.6%	7 21.9%	12 37.5%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

10. On February 15, 2016 the annual yield on 10-yr treasury bonds was 1.7%. Please complete the following:

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	1.90	8.34	1.21 - 2.60	2	-50	125	558
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	6.32	7.95	5.67 - 6.98	5	-20	100	568
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	10.04	13.28	8.94 - 11.15	8	-5	164	557
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-3.79	9.73	-4.60 - -2.98	0	-50	50	557
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	3.13	6.04	2.64 - 3.63	3	-30	90	566
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	7.15	5.56	6.69 - 7.61	6	-5	50	554

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Revenue Weighted: 10. On February 15, 2016 the annual yield on 10-yr treasury bonds was 1.7%. Please complete the following:

	Mean	SD	95% CI	Median	Minimum	Maximum
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	1.56	4.55	1.19 - 1.93	2	-11.80	15.62
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	5.89	3.23	5.63 - 6.16	5	-6.75	19.39
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	9.37	5.57	8.91 - 9.82	8	-5	31.89
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-4.31	7.96	-4.96 - -3.65	0	-19.80	12.22
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	2.50	4.05	2.17 - 2.83	3	-6.80	13.07
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	7.00	3.97	6.67 - 7.32	6	-1.99	16.29

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Employee Weighted: 10. On February 15, 2016 the annual yield on 10-yr treasury bonds was 1.7%. Please complete the following:

	Mean	SD	95% CI	Median	Minimum	Maximum
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	1.67	4.11	1.33 - 2.00	2	-11.80	15.62
Over the next 10 years, I expect the average annual S&P 500 return will be: Expected return:	5.75	3.03	5.50 - 5.99	5	-6.75	19.39
Over the next 10 years, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	9.09	5.23	8.66 - 9.51	8	-5	31.89
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be less than:	-3.80	7.57	-4.43 - -3.18	0	-19.80	12.22
Over the next year, I expect the average annual S&P 500 return will be: Expected return:	2.79	3.76	2.49 - 3.10	3	-6.80	13.07
Over the next year, I expect the average annual S&P 500 return will be: There is a 1-in-10 chance it will be greater than:	7.01	3.92	6.69 - 7.33	6	-1.99	16.29

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Return on assets (ROA=operating earnings/assets)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% Approximate ROA in 2015	9.74	17.79	8.22 - 11.25	5.50	-25	100	528
% Expected ROA in 2016	11.08	17.26	9.59 - 12.57	6.40	-25	100	517

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Manufacturing capacity utilized

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in last half of 2015	71.27	17.11	68.10 - 74.44	73.50	10	100	112
% of capacity utilization planned for the first half of 2016	71.44	17.21	68.25 - 74.62	73.50	11	100	112

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Manufacturing capacity utilized (Revenue Weighted)

	Mean	SD	95% CI	Median	Minimum	Maximum	Total
% of capacity utilized in last half of 2015	76.33	11.08	74.52 - 78.15	75	38.52	100	143
% of capacity utilization planned for the first half of 2016	76.77	11.60	74.87 - 78.67	75	38.45	100	143

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Industry

	Number	Percent	95% CI
Manufacturing	116	18.6 %	± 3.0 %
Services, Consulting	96	15.4 %	± 2.8 %
Banking/Finance/Insurance/Real Estate	80	12.8 %	± 2.6 %
Retail/Wholesale	59	9.5 %	± 2.3 %
Technology [Software/Hardware/Biotech]	55	8.8 %	± 2.2 %
Healthcare/Pharmaceutical	50	8.0 %	± 2.1 %
Mining/Construction	24	3.9 %	± 1.5 %
Transportation & Public Utilities	20	3.2 %	± 1.4 %
Energy	14	2.2 %	± 1.2 %
Public Administration	13	2.1 %	± 1.1 %
Communication/Media	10	1.6 %	± 1.0 %
Agriculture, Forestry, & Fishing	6	1.0 %	± 0.8 %
Other Industry	80	12.8 %	± 2.6 %
Total	623	100.0 %	

Missing Cases = 6
Response Percent = 99.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Industry (Other specified)

accounting
accounting
Aerospace
Architecture/Engineering
architecture/engineering
Associations
Botanical Garden
Building materials
charity
Charity non-profit
conglomerate of auto and entertainment
Conservation
Contractor/ Developer?Construction Mng.
Custom Vehicle Manufacturing
distribution
DOD Ship Repair
Education
Education
Education
Education
Education non-profit
education
education
education services
Entertainment
federal govt contractor
government
Higer Education
Higher Education
Higher Education
Higher Education
Higher Education
Higher Education/
HOLDING COMPANY
Home Builder
Hospitality
Hospitality
Hospitality
Hotel/entertainment
Hotels & hotel management
Industrial Automation
Information services
Insurance
Investment company
K-12 Public Education
Marketing/Advertising
No -profit
Non profit
Non profit
Non-Profit Association
Non-Profit Religious
Non-profit
non profit
non-profit religious
Nonprofit
Nonprofit
Nonprofit

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Industry (Other specified)

Nonprofit Foundation
nonprofit
Not For Profit
Not For Profit
Not for profit
not for profit
not for profit
Oil Services
Paper Recycling
private equity
Professional Sports
Publishing
Realestate and Hotels
repair/overhaul equi.pment
Sales and distribution
Services (plumbing ect.)
steel distribution
Tax and accounting
telecommunications
Utilities
Water Filtration
wholesale distribution
wholesale-retail home items
wine producer

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Sales Revenue

	Number	Percent	95% CI
Less than $25 million	255	41.3 %	± 3.8 %
$25-$99 million	141	22.8 %	± 3.3 %
$100-$499 million	108	17.5 %	± 3.0 %
$500-$999 million	37	6.0 %	± 1.8 %
$1-$4.9 billion	45	7.3 %	± 2.0 %
$5-$9.9 billion	11	1.8 %	± 1.0 %
More than $10 billion	21	3.4 %	± 1.4 %
Total	618	100.0 %	

Missing Cases = 11
Response Percent = 98.3 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Weighted Sales Revenue (Millions)

Minimum = 25

Maximum = 11000

Mean = 847.52

Median = 62

Variance (Unbiased Estimate) = 5108721.52

Standard Deviation (Unbiased Estimate) = 2260.25

Standard Error Of The Mean = 90.92

95 Percent Confidence Interval Around The Mean = 669.32 - 1025.72

99 Percent Confidence Interval Around The Mean = 613.40 - 1081.64

Skewness = 3.57

Kolmogorov-Smirnov Statistic For Normality = 44.60

Quartiles

1 = 25
2 = 62
3 = 300

Valid Cases =618
Missing Cases =11
Response Percent = 98.3%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Number of Employees

	Number	Percent	95% CI
Fewer than 100	223	42.5 %	± 3.8 %
100-499	149	28.4 %	± 3.3 %
500-999	34	6.5 %	± 1.8 %
1,000-2,499	31	5.9 %	± 1.7 %
2,500-4,999	35	6.7 %	± 1.8 %
5,000-9,999	19	3.6 %	± 1.3 %
Over 10,000	34	6.5 %	± 1.8 %
Total	525	100.0 %	

Missing Cases = 104
Response Percent = 83.5 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Weighted Number of Employees

Minimum = 100

Maximum = 12000

Mean = 1578.10

Median = 300

Variance (Unbiased Estimate) = 10074786.44

Standard Deviation (Unbiased Estimate) = 3174.08

Standard Error Of The Mean = 138.53

95 Percent Confidence Interval Around The Mean = 1306.58 - 1849.61

99 Percent Confidence Interval Around The Mean = 1221.39 - 1934.81

Skewness = 2.49

Kolmogorov-Smirnov Statistic For Normality = 37.27

Quartiles

1 = 100
2 = 300
3 = 750

Valid Cases =525
Missing Cases =104
Response Percent = 83.5%

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Where are you personally located?

	Number	Percent	95% CI
Midwest U.S.	165	26.5 %	± 3.4 %
Northeast U.S.	159	25.6 %	± 3.4 %
South Atlantic U.S.	92	14.8 %	± 2.8 %
Pacific US	88	14.1 %	± 2.7 %
South Central U.S.	70	11.3 %	± 2.5 %
Mountain U.S.	46	7.4 %	± 2.0 %
Other	2	0.3 %	± 0.4 %
Canada	0	0.0 %	± 0.0 %
Latin America	0	0.0 %	± 0.0 %
Asia	0	0.0 %	± 0.0 %
Africa	0	0.0 %	± 0.0 %
Europe	0	0.0 %	± 0.0 %
Total	622	100.0 %	

Missing Cases = 7
Response Percent = 98.9 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Where are you personally located? - Other specified

Arizona
Southeast US

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Ownership

	Number	Percent	95% CI
Private	416	71.6 %	± 3.7 %
Nonprofit	68	11.7 %	± 2.4 %
Public, NYSE	54	9.3 %	± 2.2 %
Public, NASDAQ/AMEX	24	4.1 %	± 1.5 %
Government	19	3.3 %	± 1.3 %
Total	581	100.0 %	

Missing Cases = 48
Response Percent = 92.4 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Foreign Sales

	Number	Percent	95% CI
0%	330	53.6 %	± 3.9 %
1-24%	205	33.3 %	± 3.7 %
25-50%	51	8.3 %	± 2.1 %
More than 50%	30	4.9 %	± 1.7 %
Total	616	100.0 %	

Missing Cases = 13
Response Percent = 97.9 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

In what region of the world are most of your foreign sales?

	Number	Percent	95% CI
Europe	93	37.3 %	± 5.5 %
Canada	63	25.3 %	± 4.8 %
Asia/Pacific Basin	62	24.9 %	± 4.8 %
Latin America	28	11.2 %	± 3.5 %
Africa	3	1.2 %	± 1.2 %
Total	249	100.0 %	

Missing Cases = 37
Response Percent = 87.1 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

What is your company's credit rating?

	Number	Percent	Cumulative
AAA	66	15.0 %	15.0 %
AA+	56	12.8 %	27.8 %
AA	50	11.4 %	39.2 %
AA-	22	5.0 %	44.2 %
A+	34	7.7 %	51.9 %
A	42	9.6 %	61.5 %
A-	25	5.7 %	67.2 %
BBB+	46	10.5 %	77.7 %
BBB	18	4.1 %	81.8 %
BBB-	10	2.3 %	84.1 %
BB+	11	2.5 %	86.6 %
BB	15	3.4 %	90.0 %
BB-	7	1.6 %	91.6 %
B+	5	1.1 %	92.7 %
B	13	3.0 %	95.7 %
B-	7	1.6 %	97.3 %
CCC	7	1.6 %	98.9 %
CC	2	0.5 %	99.3 %
D	3	0.7 %	100.0 %
Total	439	100.0 %	100.0 %

Missing Cases = 0
Response Percent = 100.0 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

What is your company's credit rating?

N=439	Total	Credit Rating	
		Actual A	Estimate B
Total	439 100.0%	171 39.0%	268 61.0%
AAA	66 15.0%	34 19.9% b	32 11.9% a
AA+	56 12.8%	24 14.0%	32 11.9%
AA	50 11.4%	17 9.9%	33 12.3%
AA-	22 5.0%	13 7.6% b	9 3.4% a
A+	34 7.7%	14 8.2%	20 7.5%
A	42 9.6%	10 5.8% b	32 11.9% a
A-	25 5.7%	8 4.7%	17 6.3%
BBB+	46 10.5%	18 10.5%	28 10.4%
BBB	18 4.1%	5 2.9%	13 4.9%
BBB-	10 2.3%	4 2.3%	6 2.2%
BB+	11 2.5%	3 1.8%	8 3.0%
BB	15 3.4%	5 2.9%	10 3.7%
BB-	7 1.6%	4 2.3%	3 1.1%
B+	5 1.1%	1 0.6%	4 1.5%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

What is your company's credit rating?

N=439	Total	Credit Rating	
		Actual A	Estimate B
B	13 3.0%	6 3.5%	7 2.6%
B-	7 1.6%	2 1.2%	5 1.9%
CCC	7 1.6%	2 1.2%	5 1.9%
CC	2 0.5%	0 0.0%	2 0.7%
D	3 0.7%	1 0.6%	2 0.7%

Significance Tests Between Columns: Lower case: p<.05 Upper case: p<.01

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
CFO	273	45.3 %
Controller	41	6.8 %
President	25	4.2 %
CEO	23	3.8 %
Treasurer	11	1.8 %
Director of Finance	9	1.5 %
Director	6	1.0 %
Principal	6	1.0 %
Managing Director	5	0.8 %
Finance Director	4	0.7 %
Cfo	4	0.7 %
Corporate Controller	4	0.7 %
owner	4	0.7 %
Accounting Manager	4	0.7 %
VP	4	0.7 %
COO	4	0.7 %
VP Finance	3	0.5 %
VP of Finance	3	0.5 %
Partner	3	0.5 %
controller	3	0.5 %
Vice President Finance	3	0.5 %
SVP Finance	2	0.3 %
Manager	2	0.3 %
VP/CFO	2	0.3 %
VP, Finance	2	0.3 %
CEO/CFO	2	0.3 %
Owner	2	0.3 %
SVP	2	0.3 %
Financial Controller	2	0.3 %
President and CEO	2	0.3 %
Director of Financial Operations	2	0.3 %
Vice President	2	0.3 %
Executive Director	2	0.3 %
Assistant Controller	2	0.3 %
managing member	1	0.2 %
Coo &CFO	1	0.2 %
Executive Vice President - Finance	1	0.2 %
SVP & Asst. Treasurer	1	0.2 %
CEO/Owner	1	0.2 %
SVP Strategic Planning	1	0.2 %
Director of Finance and Operations	1	0.2 %
Senior Partner, VP Corporate Development	1	0.2 %
Controller & Treasurer	1	0.2 %
Group CFO	1	0.2 %
Co-CFO	1	0.2 %
DIRECTOR	1	0.2 %
VP Finance & Administration	1	0.2 %
Director, Facilities Financial & Administrative	1	0.2 %
Director of FInance	1	0.2 %
Accountant	1	0.2 %
Sr Director	1	0.2 %
Global IA Lead	1	0.2 %
contractor	1	0.2 %
VP of FInance and Admin	1	0.2 %
CFO of Holding Company	1	0.2 %
Director - Budget & Operational Analysis	1	0.2 %
CFO/Controller	1	0.2 %

Duke CFO magazine Global Business Outlook survey - U.S. - First Quarter, 2016

Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
Controller - Division	1	0.2 %
Director of Budget	1	0.2 %
Vice President finance.	1	0.2 %
Head of Finance & Accounting	1	0.2 %
President-CEO	1	0.2 %
Area Vice President	1	0.2 %
General Manager	1	0.2 %
Senior Financial Officer	1	0.2 %
Senior Analyst	1	0.2 %
Senior Investment Manager	1	0.2 %
EVP/CFO	1	0.2 %
Trustee	1	0.2 %
Board Member	1	0.2 %
consultant	1	0.2 %
Chief Financial Officer	1	0.2 %
VP Sales	1	0.2 %
AVP & Cashier	1	0.2 %
manager	1	0.2 %
president	1	0.2 %
Investment Accountant	1	0.2 %
VP Business Planning	1	0.2 %
EVP Finance	1	0.2 %
Senior Director of Finance	1	0.2 %
ex vp brokerage	1	0.2 %
Senior Engineer	1	0.2 %
Chief Financial Officer and President	1	0.2 %
Divitional CFO	1	0.2 %
VP Finance (CFO)	1	0.2 %
Vice President Tax	1	0.2 %
Director, Treasury	1	0.2 %
Director of FP&A	1	0.2 %
Chairman	1	0.2 %
finance director	1	0.2 %
Group Controller	1	0.2 %
Finance	1	0.2 %
TSE	1	0.2 %
President & CEO	1	0.2 %
Sales	1	0.2 %
Strategic Advisor	1	0.2 %
Manager of Finance	1	0.2 %
DIrector of Accounting	1	0.2 %
finance	1	0.2 %
EVP	1	0.2 %
Manager of Finance and Accounting	1	0.2 %
President & CFO	1	0.2 %
Vice President of Finance	1	0.2 %
Vice Chairman	1	0.2 %
Board	1	0.2 %
Director of Financial Services	1	0.2 %
FOUNDER	1	0.2 %
Sr analyst	1	0.2 %
Sr Director-Finance	1	0.2 %
Senior Accountant	1	0.2 %
Internal Audit Manager	1	0.2 %
VP-Finance	1	0.2 %
Founder & Principle	1	0.2 %
VP & CFO	1	0.2 %

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Your job title (e.g., CFO, Asst. Treasurer, etc):

	Number	Percent
Sr. VP Finance	1	0.2 %
Director of Operations	1	0.2 %
EVP - Finance	1	0.2 %
VP, Finance and Administration	1	0.2 %
Division Controller	1	0.2 %
Group Vice President of Finance	1	0.2 %
County Administrator	1	0.2 %
Senior Manager	1	0.2 %
Co-CEO, CFO	1	0.2 %
asst treasurer	1	0.2 %
President/CEO	1	0.2 %
Sr. Financial Management	1	0.2 %
PRESIDENT	1	0.2 %
CEO & CFO	1	0.2 %
Deputy cfo	1	0.2 %
vp finance	1	0.2 %
sole prop	1	0.2 %
CFO/Treasurer	1	0.2 %
Deputy CFO & Treasurer	1	0.2 %
Director Finance	1	0.2 %
VP Controller	1	0.2 %
CFO and COO	1	0.2 %
sr v p	1	0.2 %
Director of Finance & HR	1	0.2 %
Supply Chain Director	1	0.2 %
CEO & President	1	0.2 %
Director Finance and HR	1	0.2 %
CFO/COO	1	0.2 %
VP - Corporate Strategy & Financial Analysis	1	0.2 %
Chief Adminisitrator	1	0.2 %
Vice President of Accounting	1	0.2 %
Mill Division Controller	1	0.2 %
Executive Vice President & CFO	1	0.2 %
TREASURER; DIRECTOR FP&A	1	0.2 %
SR VP Financial Services	1	0.2 %
VP FP&A	1	0.2 %
Contoller	1	0.2 %
Controlled	1	0.2 %
Treasury Manager	1	0.2 %
Assistant Treasurer	1	0.2 %
Chief Investment Officer	1	0.2 %
Sr Project Manager/ V.P. Finance	1	0.2 %
Utilities Financial Manager	1	0.2 %
Finance Manager	1	0.2 %
Chief Accounting Officer	1	0.2 %
Sr Dir Capital Development	1	0.2 %
Senior VP	1	0.2 %
Sr. Director of Accounting	1	0.2 %
Director of Treasury Services	1	0.2 %
Director Internal Audit	1	0.2 %
President/Owner	1	0.2 %
CEO / President	1	0.2 %
Senior Accountant/Analyst	1	0.2 %
DIRECTOR OF ACCOUNTING	1	0.2 %
Total	602	100.0 %

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Your job title (e.g., CFO, Asst. Treasurer, etc):

Missing Cases = 27
Response Percent = 95.7 %

A comprehensive long-term analysis of S&P 500 index additions and deletions

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Highlights

- Investigate the long-term effects of S&P 500 index revisions from 1962 to 2003.
- Significant long-term price increases for both added and deleted stocks.
- Deleted stocks outperforming added stocks.
- The difference can be explained by analyst coverage and operating performance.

Abstract

We investigate the long-term effects of S&P 500 index additions and deletions on a sample of stocks from 1962 to 2003 and find a significant long-term price increase for both added and deleted stocks, with deleted stocks outperforming added stocks. The long-term price increase for added stocks can be attributed to increases in institutional ownership, liquidity, and analyst coverage, and a decrease in the shadow cost in the long-term. However, while deletion has no significant effect on analyst coverage and shadow cost, we find a rebound in the institutional ownership and liquidity of deleted stocks. The difference in the long-term price increase of added and deleted stocks can be explained by analyst coverage and operating performance.

JEL classification

G11;

G12;

G14

Keywords

S&P 500 index revision;

Long-run performance;

Operating performance;

Information quality;

Liquidity

1. Introduction

The number of index-related financial assets has increased significantly in the past few decades. In the United States, the proportion of index fund assets to the total equity funds increased from 16% in 2001 to 33% in 2011.[3] The underlying assets of the S&P index component stocks, which are now worth about US$1.1 trillion, include investment products such as index funds, exchange traded funds, index futures, and index options. The composition of the constituent index stocks has an important effect on the value of these assets, and the stocks are continuously monitored by institutional investors. Accordingly, additions and deletions to the S&P index may have both short- and long-term effects on firm fundamentals. However, previous studies typically investigate the short-term price performance after index additions and deletions (e.g., Scholes, 1972, Harris and Gurel, 1986 and Wurgler and Zhuravskaya, 2002). As a result, there is little research on the long-term effects of index additions and deletions on stocks.[4] In this study, we conduct a comprehensive analysis of the long-term performance of S&P 500 index stock additions and deletions. We examine the stock price performance and the operating performance of firms five years before and after index addition or deletion. We also analyze whether there are any long-term effects on the information quality and liquidity of the affected stocks, including changes in institutional ownership, liquidity, analyst coverage, and investor recognition.

There are a number of reasons why the long-term effects of addition or deletion on information quality and liquidity can be expected to influence permanent stock prices. Stocks added to the S&P 500 index are subject to greater scrutiny by investors and analysts, which helps to reduce information asymmetry (Denis et al., 2003). Furthermore, as the constituent stocks are chosen to be representative of the market, the addition of a stock to the index signals that the company is an industry leader, thereby resulting in greater investor recognition (Cai, 2008). As more investors become aware of the company, the shadow cost declines (Chen et al., 2004 and Baran and King, 2012). An addition to the index may also improve the liquidity of a stock, which in turn would lower the liquidity premium required by investors. These factors signal either an increase in future operating cash flows or a reduction in the risk premium required by investors, both of which have long-term positive effects on stock prices.

For deleted stocks, the return required by investors may increase if there is a decline in analyst coverage, investor recognition, or liquidity. However, it remains unknown whether deletion will result in a decline in long-term operating performance.[5] While a firm may have been deleted for having poor prospects, it is possible for the firm to restructure so that its operating performance does not deteriorate in the long term.

We investigate the long-term effect of S&P 500 index addition and deletion on stocks from 1962 to 2003 and find a significant long-term price increase for both added and deleted stocks. It is interesting to note that the average abnormal return is higher for deleted stocks than for added stocks.[6] The long-term price increase for added stocks can be attributed to increases in institutional ownership, liquidity, and analyst coverage, and a decrease in the long-term shadow cost. The long-term effect for deleted stocks is a bit more complicated. While there is no significant effect on analyst coverage and shadow cost, there is a rebound in institutional ownership and liquidity after stock deletion. One interesting result is that the long-term operating performance declines for added stocks and increases slightly for deleted stocks subsequent to the year of stock addition or deletion (*year t*). This suggests that firms are added to the index during their peak performance stage and cannot sustain this performance in the long-run. In contrast, firms are deleted from the index during their worst performance stage but tend to recover somewhat in the long term, displaying a U-shaped pattern from year $t - 5$ to year $t + 5$. A cross-sectional regression analysis shows that the difference between the long-term returns of deleted stocks and added stocks can be explained by the difference in their operating performance.

The remainder of this paper is organized as follows. Section 2 reviews the literature on the effects of index composition changes. Section 3 describes the data. The results for long-term stock price performance are presented in Section 4, and those for operating performance in Section 5. Section 6 presents the evidence on the changes in information quality and liquidity after index revisions, and Section 7 introduces some regression analyses. We present our conclusions in Section 8.

2. Literature review

Previous studies have examined the effects of index composition changes on constituent stocks, with a focus on the addition of stocks to an index. There is a significant and well-documented stock price increase when a stock is added to an index, a finding for which several hypotheses have been advanced.

The first explanation is the downward-sloping demand hypothesis, which posits that when a stock is added to an index, there is additional demand from index-related users to hold the stock, which results in short-term upward price pressure. According to this hypothesis, the demand curve is downward sloping not only in the short run, but also in the long run (Scholes, 1972, Shleifer, 1986 and Lynch and Mendenhall, 1997). Several studies provide consistent empirical evidence for stocks in the S&P 500 index (Harris and Gurel, 1986 and Wurgler and Zhuravskaya, 2002), and the hypothesis is also supported by evidence from other US indices and markets, such as the Russell 2000 index (Biktimirov et al., 2004), the S&P Small Cap 600 index (Shankar and Miller, 2006), the TSE 300 index (Chung and Kryzanowski, 1998), the FTSE 100 index (Mase, 2007), and the ISE-100 and ISE-30 indices (Bildik and Gulay, 2008).

The second explanation is the liquidity effect hypothesis, which predicts that liquidity will improve (deteriorate) after a stock is added to (deleted from) an index (Chen et al., 2004). The amount of information on a stock increases upon its addition to an index due to greater attention from investors and greater coverage from analysts, the media, and other financial intermediaries. As a result, the information asymmetry declines and more liquidity becomes available. The concurrent decline in the liquidity premium causes a positive price movement. Furthermore, the presence of more investors trading the stock reduces the inventory cost component of liquidity, which results in a further positive price adjustment (Chen et al., 2004). Various studies provide empirical support for the liquidity effect hypothesis for the S&P 500 index (Hegde and McDermott, 2003 and Becker-Blease and Paul, 2006), for the Dow Jones index (Beneish and Gardner, 1995), and for the TSE 300 index (Chung and Kryzanowski, 1998).

The third explanation is the investor recognition or ‘shadow cost’ hypothesis (Merton, 1987), which states that investors hold incompletely diversified portfolios in segmented markets. The return required by less than fully diversified investors is higher than that required in a full-information setting, with the difference between the two returns representing the shadow cost. When a stock is added to an index, this raises the awareness of investors, who will hold it to achieve diversification. The shadow cost of the stock thus falls, resulting in an increase in the stock price (Chen et al., 2004). Elliott et al. (2006) report that increased investor awareness explains the cross-section of abnormal announcement returns for stocks on the S&P 500 index.

The fourth explanation is the operating performance hypothesis, which states that stocks added to an index are more likely to have better prospects and to display improved operating performance. Furthermore, as institutional investors monitor the constituent stocks more closely, they will exert pressure on the firm to improve performance (Denis et al., 2003).

The addition of a stock to a major index signals that the firm is a leader in a leading industry. For example, Cai (2007) finds that the addition of a stock to the S&P 500 index conveys favorable information about the company or industry. Several studies (Denis et al., 2003 and Elliott et al., 2006) look at changes in analyst earnings forecasts and realized earnings in the current year and in the fiscal year after a stock is added to the S&P 500 index, but do not find evidence of higher earnings. However, this may be because they examine the short-term operating performance.

Clearly, there are several fundamental reasons to expect a permanent, long-term price effect from the addition of a stock to an index. Although there are fewer grounds on which to predict the effects of a deletion from an index, the driving factors for added stocks should work in the opposite direction for deleted stocks. In the next section, we provide empirical evidence for both added and deleted stocks.

3. Data

3.1. Sample construction

We analyze the changes in the constituent stocks underlying the S&P 500 index from July 1962 to December 2003. The data from July 1962 to December 2000, which are also used by Chen et al. (2004), can be downloaded from the *Journal of Finance* website. [7] The data on effective dates between 2001 and 2003 are collected from CRSP, and the data on announcement dates are from the S&P 500 Index Focus Monthly Review and the ProQuest database. We collect information on the stock returns, trading volume, number of shares outstanding, and market capitalizations from the CRSP database, and related accounting data from the Compustat database. Institutional ownership data are obtained from the Thomson Financial Institutional database, the analyst forecasts are taken from IBES, and the Fama–French three-factor data are downloaded from Kenneth French's website. [8]

Over the study period, the number of constituent stock changes per year in the S&P 500 index ranges from 8 to 60. Fig. 1 plots the number of changes to the S&P 500 index between 1962 and 2003. Altogether, 937 stocks were added to or deleted from the S&P 500 index so that, on average, 22 stocks were added to the index and 22 deleted, every year.

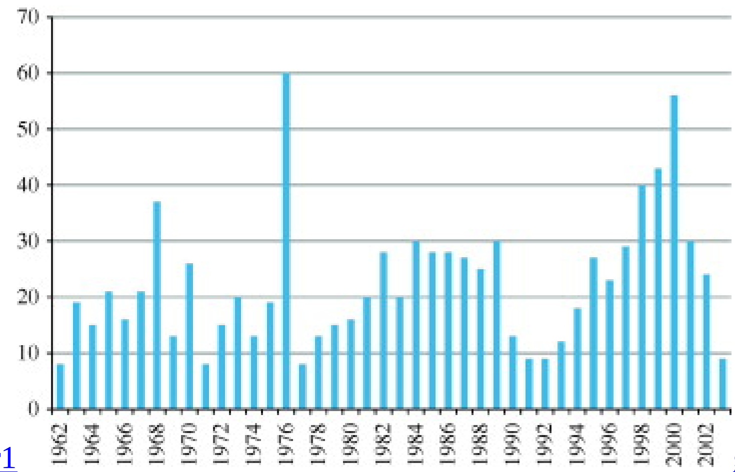
gr1  gr1

Fig. 1.

Number of constituent stock changes. The data extend those used by Chen et al. (2004). The data for before 2001 are from the website of the *Journal of Finance.* The method of Chen et al. is used to collect the data for the period from January 2001 to December 2003.

Figure options

gr1

http://services.elsevier.com/SDWebExport/export/figure/S0378426613003592/1-s2.0-S0378426613003592-gr1.jpg/ppt

Following Chen et al. (2004), we exclude stocks that were added due to a merger or takeover (54), spinoff (37), or change in share type (10), or for which there are insufficient data (48). Seven hundred eighty-eight added stocks are included in the sample.

In terms of deleted stocks, we first exclude 436 stocks for which trading stopped within two days of deletion, as according to Chen et al. (2004) these stocks are most likely merger targets. Of the remaining stocks, we exclude those that were deleted due to a final merger offer that had been or was likely to be accepted by stockholders (161); spinoffs (27); divestiture, bankruptcy, or liquidation (25); buyout, suspension, or delisting from the NYSE (8); LBO or MBO (5); treatment as a foreign firm (7), and other reasons such as a change in share type (24). Two hundred forty-four deleted stocks are included in the final sample, which is roughly a quarter of the 937 total changes. This sample is consistent with that used by Chen et al. (2004), who find that about three quarters of stock deletions from the index are involuntary and due to merger, bankruptcy, or other forms of major restructuring.

3.2. Deleted stock sample

According to Chen et al. (2004), stocks are involuntarily deleted from the index either because the firm is no longer representative of its industry, or the industry is no longer representative of the economy. We check the universe of stocks (937 added and deleted stocks). We check the numbers of stocks added to or deleted from the same industry (added–deleted) from 1962 to 2003 year by year, and then in four sub-periods. There is strong evidence that over time greater numbers of manufacturing industry stocks (SIC codes 2 and 3) are replaced by stocks in the finance, insurance, real estate, and services industries (SIC codes 6 and 7) in the S&P 500 index. For example, for SIC code 2 stocks, the number of added stocks minus deleted stocks is −8, −10, −25, and −25 in 1962–

1971, 1972–1981, 1982–1991, and 1992–2003, respectively. For stocks in SIC code 7, the number of added stocks minus deleted stocks is 3, 4, 10, and 23 in 1962–1971, 1972–1981, 1982–1991, and 1992–2003, respectively.

We further check some two-digit sub-industries such as stone, clay, glass, and concrete products (SIC code 32), railroad transportation (SIC code 40), security and commodity brokers, dealers, exchanges, and services (SIC code 62), and health services (SIC code 80). We find there are more deleted stocks than added stocks in some of the older industries (SIC 32 and 40), while the result is reversed for some of the newer industries (SIC 62 and 80). Therefore, stock deletion appears to be related to poor industry prospects.

For the remaining 244 deleted firms in the 1995–2003 period, we find two common reasons for being deleted from the S&P 500. One reason is that the firms are no longer "considered leading companies in leading industries". Again, this is related to the firms' poor prospects. Another common reason is that the firm switches to the S&P SmallCap 600 Index, which occurs after a company declines in market capitalization due to a significant drop in its stock price.

3.3. Summary statistics

Table 1 presents the characteristics of the sample stocks. *Firm Size* (in millions of dollars) is calculated at the end of the previous month by multiplying the closing monthly stock price by the number of shares outstanding. *RET_P1Y* is the cumulative raw return in the previous year. *RET_P5Y* is the cumulative raw return over the previous five years. *M/B* is the market-to-book ratio in the previous month.

Table 1.

Summary statistics for the sample stocks.

	Firm Size	***RET_P1Y***	***RET_P5Y***	***M/B***
Panel A: Additions				
Mean	2890	0.39	3.78	3.3
Median	951	0.21	1.49	2.16
S.D.	5808	0.77	10.87	3.53
P10	104	−0.22	0.12	0.86
P90	7112	1.12	7.5	6.76
Panel B: Deletions				
Mean	322	−0.05	0.01	1.34
Median	128	−0.01	−0.14	0.86
S.D.	527	0.4	0.84	2.85

P10	17	−0.61	−0.8	0.35
P90	905	0.39	0.9	1.84

This table reports the summary statistics for sample firms added to or deleted from the S&P 500 index between July 1962 and December 2003. *Firm Size* is the closing price at the end of month $t-1$ times the number of shares outstanding in millions of dollars. *RET_P1Y* is the cumulative raw return from month $t-12$ to $t-1$. *RET_P5Y* is the cumulative raw return from month $t-60$ to $t-1$. *M/B* is the market-to-book ratio at month $t-1$. The sample comprises 788 added stocks and 244 deleted stocks.

Table options

t0005

Table 1 demonstrates that the firms being added to the S&P 500 index are much larger than those being deleted. The average firm size for added stocks is US$2,890 million, compared to US$322 million for deleted stocks. The added stocks perform significantly better before index revision, with average cumulative returns of 39% in the previous one-year period and 378% in the previous five-year period. In comparison, the average cumulative returns for the deleted stocks are −5% and 1%, respectively. The added stocks have higher market-to-book ratios (3.3) than the deleted stocks (1.34), suggesting that added stocks are more likely to be growth stocks.

4. Long-term stock performance

4.1. Buy and hold raw returns and stock market index adjusted returns

We now examine the long-term stock price performance of the added and deleted stocks after index revision. Table 2 reports the three- and five-year raw returns and the market adjusted cumulative returns. We use the CRSP Value Weighted index (including dividends) as the benchmark for calculating the market adjusted returns.

Table 2.

Market adjusted buy-and-hold long-term returns.

	Post-event months		
	[0, 36]	**[1, 36]**	**[1, 60]**
Raw returns (additions)	0.44	0.40	0.75
Raw (additions) – CRSP	0.09[□□]	0.06	0.11[□□]
t-Value	2.22	1.59	2.17
Raw returns (deletions)	0.61	0.68	1.07
Raw (deletions) – CRSP	0.32[□□□]	0.41[□□□]	0.54[□□□]

t-Value	3.83	4.40	4.92
Raw ret (deletions) – raw ret (additions)	0.17*	0.28***	0.32***
t-Value	1.90	3.22	2.62

This table reports the mean market-adjusted returns of stocks added to or deleted from the S&P 500 index between July 1962 and December 2003. The sample comprises 788 added stocks and 244 deleted stocks. CRSP denotes the CRSP value-weighted index return (with dividends).

*

Significance at the 10% level of confidence.

**

Significance at the 5% level of confidence.

***

Significance at the 1% level of confidence.

Table options

t0010

Table 2 shows that both added and deleted stocks have positive raw returns in the three- and five-year post-event periods. The average cumulative raw returns of added stocks are 40% over the three-year period and 75% over the five-year period. Rather surprisingly, the average cumulative returns of deleted stocks are even larger, at 68% and 107% in the three- and five-year periods, respectively. Although the short-term price pressure for added stocks is well documented, this is not the focus of this study. Nevertheless, we can still infer the short-term price pressure based on return performance over the [1, 36]- and [0, 36]-month periods, as the difference between the two event windows represents the effect of short-term price pressure. The difference is 4% for added stocks and −7% for deleted stocks, which is consistent with the previous evidence on short-term price pressure. For example, Harris and Gurel (1986) find that there is an immediate price increase of more than 3% after the announcement of the addition of a stock to the S&P 500 index, although the increase is almost fully reversed after two weeks. Some studies, such as that of Lynch and Mendenhall (1997), also provide evidence that is consistent with the short-term price pressure effect, although they also find that a portion of the increase remains permanent and cannot be explained by price pressure.

Table 2 shows that both added and deleted stocks outperform the market (CRSP Value-Weighted index) in the long-run. Over a five-year period, added stocks outperform the market by 11% (with a *t*-value of 2.17), whereas deleted stocks outperform the market by 54% (with a *t*-value of 4.92). [9] The difference in returns between the added and deleted stocks is 28% over the three-year period (with a *t*-value of 3.22) and 32% over the five-year period (with a *t*-value of 2.62). These results are consistent with those of Cai (2008), who investigates the long-term effect of Russell 2000 index rebalancing.

One concern is that because some deleted stocks are simply delisted from the exchange, survivorship bias may explain why the returns for the deleted stocks that remain listed are higher than those for added stocks after index composition changes. To address this issue, we check the reasons for the delisting of added and deleted stocks over the subsequent five years. The results are reported in Table 3. Following Shumway (1997), we classify the reasons for delisting as merger, exchange, liquidation, or performance. Of the 99 added stocks that were subsequently delisted, 86 are due to mergers, 5 are due to migration to another exchange, and 8 are due to performance. Of the 55 deleted stocks that were delisted, 30 are due to mergers, 3 due to exchanges, 3 due to liquidation, and 19 due to performance. The inclusion of the delisting returns in our sample, which is calculated by comparing a value after delisting against the price on the security's last trading date, does not materially affect the results in Table 2.[10]

Table 3.

Delisting time.

Reasons for delisting	**Post-event period (months)**					
	[1, 12]	**[13, 24]**	**[25, 36]**	**[37, 48]**	**[49, 60]**	**Total**
Panel A: Additions						
Merger	11	21	21	19	14	86
Exchange	3			2		5
Liquidation						0
Δ Exchange						0
Performance			2	1	5	8
Total	14	21	23	22	19	99
Panel B: Deletions						
Merger	7	6	6	5	6	30
Exchange		2		1		3
Liquidation		2		1		3
Δ Exchange						0
Performance	7	6	1	2	3	19

Total	14	16	7	8	9	55

This table reports the reasons for and timing of the delisting of added and deleted stocks from the stock exchange and the categories of reasons for delisting. Following Shumway (1997), we treat Merger, Exchange, Liquidation, and Δ Exchange as non-negative news and Performance as negative news. The number reported is the number of stocks delisted for that particular period and particular reason.

The sample period runs from July 1962 to December 2003. The sample comprises 788 added stocks and 244 deleted stocks at month *t*.

Table options

t0015

4.2. Calendar-time abnormal returns

In addition to the standard event study, we also employ the calendar time approach to measure the abnormal returns associated with index additions and deletions. An advantage of this approach is that the variance in the portfolio automatically takes into account the cross-sectional correlation among the individual stocks that comprise the portfolio. In addition, the calendar-time event portfolio approach represents an implementable investment strategy (Desai et al., 2002). We form equal- and value-weighted portfolios of added and deleted stocks in the event months and investigate the portfolio performance in the following five years. We then regress the excess returns of the portfolios against the Fama–French three factors and Carhart's momentum factor. The excess return is computed as follows:

equation(1)

$$R_{pt}^{AorD} - R_{ft} = \alpha + \beta_m (R_{mt} - R_{ft}) + \beta_s SMB_t + \beta_h HML_t + \beta_m MOM_t + \varepsilon_t$$

RptAorD-Rft=α+βm(Rmt-Rft)+βsSMBt+βhHMLt+βmMOMt+εt

where R_{pt} is a portfolio's return for month *t*, with *A* and *D* in the superscript indicating added and deleted stocks, respectively; R_{ft} is the risk-free interest rate; $(R_{mt} - R_{ft})$ is the market excess return; SMB_t is the difference in the returns of portfolios of small and large cap stocks; HML_t is the difference between the returns of portfolios of high and low book-to-market ratio stocks; and MOM_t is the highest monthly portfolio return minus the lowest monthly portfolio return over the previous 2- to 12-month period. The expected value of the intercept α, which measures the monthly abnormal return, is zero under a null hypothesis of no abnormal performance.

The regression results are reported in Table 4. Panel A reports the results based on the value-weighted portfolio returns. For added stocks, α is 0.4% and significant at the 1% confidence level.

For deleted stocks, α is 0.6% and also significant at the 1% level. Thus, both added and deleted stocks outperform the benchmark in the five-year period after the index change. In terms of factor loadings, the coefficient on the *SMB* factor for added stocks is 0.167 (with a *t*-value of 8.32) and is smaller than the coefficient for deleted stocks (0.772, with a *t*-value of 15.04). This is consistent with Table 1, which shows that deleted stocks are much smaller than added stocks. The coefficient on the *HML* factor is positively significant for deleted stocks (0.655, with a *t*-value of 10.66) but insignificant for added stocks. The finding that added stocks do not load on the *HML* factor indicates that such stocks are healthier firms with little distress risk. It is interesting to note that the coefficients on the momentum factor (*MOM*) are significantly negative for both added and deleted stocks, suggesting that added and deleted companies do not ride on market momentum.

Table 4.

Calendar-time abnormal long-run returns.

	Intercept	$R_m - R_f$	***SMB***	***HML***	***MOM***	R^2
Panel A: Value-weighted						
Additions	0.004***	1.208***	0.167***	−0.011	−0.151***	0.32
t-Value	6.14	76.92	8.32	−0.48	−9.92	
Deletions	0.006***	1.004***	0.772***	0.655***	−0.355***	0.17
t-Value	3.41	22.49	15.04	10.66	−9.13	
Panel B: Equal-weighted						
Additions	0.002***	1.251***	0.22***	0.089***	−0.229***	0.34
t-Value	3.48	80.62	11.08	3.75	−15.26	
Deletions	0.004**	1.051***	0.839***	0.711***	−0.357***	0.19
t-Value	1.99	23.75	16.47	11.66	−9.25	

This table presents the monthly abnormal returns of stocks added to or deleted from the S&P 500 index.

The sample period is from July 1962 to December 2003. The sample comprises 788 added stocks and 244 deleted stocks. The factors are available from French’s website.

**

Significance at the 5% level of confidence.

***

Significance at the 1% level of confidence.

Table options

t0020

Panel B of Table 4 reports the results for the equal-weighted portfolios, which are similar to those reported in Panel A. The intercepts (α) are 0.2% (with a t-value of 3.48) and 0.4% (with a t-value of 1.99) for added and deleted stocks, respectively. The coefficients on the factor loadings are similar to those in Panel A, with the exception that the coefficient of *HML* for added stocks is significantly positive. The deleted stocks, again, have higher factor loadings on *SMB* and *HML*, and the coefficients on *MOM* remain significantly negative for both the added and deleted stocks.

Overall, the evidence complements existing research on index additions in showing not only a short-term price appreciation for stocks added to the index, but also the persistence of this price increase in the subsequent five-year period. However, contrary to conventional wisdom, it may not be wise for investors to sell deleted stocks that move to the S&P Small Cap 600 Index or are no longer the leading companies in their industries, as these stocks also outperform the market in the long run.

5. Changes in operating performance

As stocks that are added to and deleted from the S&P 500 index experience abnormal returns in the long run, the evidence clearly cannot be explained by the downward-sloping demand curve. Rather, the evidence suggests the influence of changes to company fundamentals. In this section, we examine whether there are any noticeable changes in the operating performance of companies added to or deleted from an index.

We follow Loughran and Ritter (1997) and examine several operating efficiency measures. The first is *Profit Margin*, which is defined as net income divided by sales. The second is *ROA*, which is defined as net income over total assets. The third is *OIBD/Assets*, which is operating income divided by total assets, with operating income defined as the operating income before depreciation, amortization, and taxes, plus interest income. The fourth is (*C&RD*)*/Assets*, which is capital and R&D expenditure as a proportion of total assets. The fifth is *M/B*, or the firm's market-to-book ratio.

We classify the companies into industry sectors based on the two-digit SIC codes. The five operating efficiency measures are adjusted by the respective industry averages in the corresponding year. We then compare the measures from year $t-5$ to year $t+5$, with t being the year of index addition or deletion.

Table 5 reports the operating performance over the 10-year period for added and deleted stocks. Panel A presents the results for added stocks. The adjusted operating measures are all positive in the 10-year period, and the added stocks all record a better performance than that of their industry peers. The performance is especially good just before addition to the index. For example, the adjusted values of *OBID/Assets* are 3.58% and 3.44% in years $t-1$ and t, respectively, but decline to 2.92% and 2.60% in years $t+1$ and $t+2$, respectively. This is not surprising, because the S&P 500 index is likely to choose better performing companies for its constituent stocks. Compared with industry peers, these companies continue to perform well in terms of operating results as much as five years after addition to the index. Panel B presents the results for deleted stocks. In contrast to the results for added stocks, the adjusted operating measures for deleted stocks are mostly negative in the 10-year period, indicating that companies that are deleted from the S&P 500 index are poor performers in the industry both before and after deletion from the index.

Table 5.

Changes in industry-adjusted operating performance.

Year	Obs	*OIBD/Assets*	*C&RD/Assets*	*Profit Margin*	*ROA*	*M/B*
Panel A: Additions						
−5	515	0.0251	0.0156	0.0188	0.0122	0.5
−4	565	0.0253	0.0151	0.0187	0.0148	0.6
−3	604	0.0313	0.0131	0.0193	0.0161	0.71
−2	636	0.0301	0.0094	0.0213	0.0172	0.74
−1	656	0.0358	0.0096	0.0244	0.0196	0.85
0	662	0.0344	0.0086	0.0222	0.016	0.74
1	644	0.0292	0.0098	0.0198	0.014	0.57
2	629	0.026	0.0108	0.0172	0.0109	0.5
3	612	0.0245	0.0062	0.0194	0.0127	0.4
4	593	0.0212	0.0028	0.0175	0.0128	0.34
5	568	0.0188	0.002	0.0181	0.0105	0.28
Panel B: Deletions						
−5	155	−0.0093	−0.0009	−0.0005	−0.0056	−0.11
−4	159	−0.0067	−0.0036	−0.002	−0.0047	−0.17
−3	162	−0.0062	−0.0051	−0.0041	−0.0067	−0.18
−2	165	−0.0154	−0.0055	−0.0097	−0.0104	−0.2
−1	167	−0.0144	−0.0074	−0.0111	−0.0125	−0.22
0	165	−0.015	−0.0092	−0.0109	−0.0122	−0.2
1	150	−0.0098	−0.0057	−0.0071	−0.0065	−0.15
2	144	−0.0049	−0.0101	−0.0091	−0.0087	−0.16
3	143	−0.0025	−0.0122	0.0006	−0.0023	−0.09
4	133	−0.0086	0	−0.0052	−0.0021	−0.08

5	127	−0.0121	−0.0059	−0.0044	−0.0024	−0.07
Panel C: Significance of difference						
Additions						
$t-5$ vs. t		2.07[□□]	−2.27[□□]	1.81[□]	1.81[□]	2.18[□□]
t vs. $t+5$		−4.41[□□□]	−2.43[□□]	−2.75[□□□]	−3.63[□□□]	−7.54[□□□]
Deletions						
$t-5$ vs. t		−1.79[□]	−2.29[□□]	−3.05[□□□]	−3.12[□□□]	−1.89[□]
t vs. $t+5$		1.07	0.79	1.76[□]	2.44[□□]	2.00[□□]

This table reports the industry-adjusted average values of operating performance before and after a stock is added to or deleted from the S&P 500 index. *Profit Margin* is defined as net income divided by sales. *ROA* is defined as net income over total assets. *OIBD/Assets* is operating income divided by total assets, where operating income is defined as operating income before depreciation, amortization, and taxes, plus interest income. (*C&RD*)*/Assets* is capital and R&D expenditure as a proportion of total assets. *M/B* is the firm's market-to-book ratio. Panels A and B report the operating performance for added and deleted stocks, respectively, between fiscal years $t-5$ and $t+5$. Panel C reports the t-values for the differences in the means. The sample period is from July 1962 to December 2003. The data are taken from the CRSP and Compustat databases.

□

Significance at the 10% level.

□□

Significance at the 5% level.

□□□

Significance at the 1% level.

Table options

t0025

Panel C of Table 5 reports the results of the Wilcoxon test for the differences in operating measures in year $t-5$ vs. year t and in year t vs. year $t+5$ for added and deleted stocks. For added stocks, all of the operating measures except for *C&RD/Assets* increase from year $t-5$ to year t and then decrease from year t to year $t+5$, although they are still above the industry average. For deleted stocks, all five operating measures decrease from year $t-5$ to year t. In the post-deletion period, there is evidence of improvement in operating performance. For example, *ROA* and the *M/B* ratio increase at the 5% significance level, and the profit margin increases at the 10% significance level. Overall, Panel C shows that the operating performance of deleted stocks generally displays a U-shape from year $t-5$ to year $t+5$. [11]

6. Information quality and liquidity

As we have shown, both added and deleted stocks outperform the benchmark in terms of stock price and long-term performance. However, as Table 5 demonstrates, although added stocks perform better than their industry peers in terms of operating results, the same cannot be said of deleted stocks. Thus, the stock price performance of added and deleted stocks clearly cannot be wholly attributed to operating performance. We further investigate the relationship between stock price performance and operating performance later. In this section, we examine the changes in information quality and liquidity for added and deleted stocks after index revisions. Information quality is measured by institutional ownership, investor recognition, and analyst coverage while liquidity is measured by turnover and Amihud illiquidity, as described in the subsections that follow.

6.1. Institutional ownership

Many institutional investors adopt investment strategies that are tied to the S&P 500 index. In addition to passive funds such as index and exchange-traded funds, many actively managed funds adopt the S&P 500 index as the benchmark to beat. Consequently, the announcement by Standard and Poor's of changes to the component stocks of the index affects the holdings of institutional investors. We expect the institutional ownership of a company to increase when it is added to the S&P 500 index, and to decrease when it is deleted. We create two proxies for institutional ownership: *IO_NO* and *IO_RATIO*. *IO_NO* is the number of institutions holding the stock and *IO_RATIO* is the proportion of the stock that is held by institutions, which is calculated by the total number of shares held by institutions divided by the number of shares outstanding. Because ownership data is only available from 1980 onward and we need to investigate ownership five years before and after index changes, we can only analyze the changes in institutional ownership from 1985 to 2003.

Table 6 reports the results. For added stocks, both of the institutional ownership proxies increase significantly from year $t-5$ to year $t-1$, indicating that institutional investors increase their holdings in these companies before they are added to the index. The proportion of institutional ownership (*IO_RATIO*) increases from 0.52 in year $t-5$ to 0.59 in year $t-1$, and the number of institutional investors (*IO_NO*) increases from 105 in year $t-5$ to 176 in year $t-1$. This is probably because the added stocks gain recognition before addition to the index for outperforming the market in terms of stock price and operating performance. In the year of addition to the index, the two institutional ownership proxies further increase. *IO_NO*, in particular, increases from 176 in year $t-1$ to 228 in year t. There is no noticeable change in institutional ownership for deleted stocks before deletion from the index, but immediately after deletion the institutional ownership decreases dramatically, with *IO_RATIO* decreasing from 0.55 in year $t-1$ to 0.48 in year t and *IO_NO* decreasing from 125 in year $t-1$ to 88 in year t.

Table 6.

Changes in institutional ownership and the shadow cost.

Year	Obs (IO)	*IO_RATIO*	*IO_NO*	Obs (shadow costs)	Shadow costs
Panel A: Additions					
−5	182	0.52	105	368	12.321
−4	204	0.55	118	385	9.307
−3	245	0.56	129	422	12.715
−2	281	0.57	148	453	10.094
−1	310	0.59	176	513	8.949
0	342	0.61	228	535	5.395
1	358	0.59	240	538	4.41
2	376	0.59	244	540	3.726
3	370	0.59	256	550	3.199
4	379	0.6	260	537	2.912
5	386	0.61	269	533	3.15
Panel B: Deletions					
−5	69	0.55	127	81	0.267
−4	70	0.55	128	80	0.448
−3	72	0.54	129	84	0.375
−2	74	0.55	131	89	0.395
−1	75	0.55	125	104	0.459
0	74	0.48	88	143	0.375
1	70	0.48	75	137	0.353
2	63	0.53	84	137	0.397
3	64	0.55	101	146	0.392
4	64	0.59	114	139	0.407
5	62	0.6	118	133	0.424

Panel C: Significance of difference

Additions				
$t-5$ vs. t	9.28***	24.96***		−2.75***
t vs. $t+5$	4.84***	9.96***		−3.47***
Deletions				
t−5 vs. t	−1.69*	−5.51***		4.14***
t vs. $t+5$	4.85***	2.83***		1.18

This table reports the institutional ownership and shadow cost of stocks five years before and five years after their addition to or deletion from the S&P 500 index from 1985 to 2003. *IO_NO* is the number of institutions holding the stock and *IO_RATIO* is the proportion of the stock held by institutions, which is defined as the total number of shares held by institutions divided by the number of shares outstanding. The shadow cost ($\times 10^9$) is defined as:

$$ShadowCost_t = \frac{ResidualStandardDev_t}{S\&P500MarketCap_0} \times \frac{FirmSize_0}{NumberofShareholders_t}$$

ShadowCostt=ResidualStandardDevtS&P500MarketCap0×FirmSize0NumberofShareholderst

where $FirmSize_0$ (the market value of equity) and $S\&P500MarketCap_0$ are measured on the announcement dates of index changes. $ResidualStandardDev_t$ is the standard deviation of the difference between a firm's return and the S&P 500 total return from year $t-5$ to year t before the index change announcement or from year t to $t+5$ after the effective day for the post-period. The data are taken from the CRSP and Compustat databases. The *t*-values for the differences in the means are reported.

*

Significance at the 10% level.

***

Significance at the 1% level.

Table options

t0030

Consistent with previous studies, we find that institutions increase their holdings of stocks that are added to the S&P 500 index and decrease their holdings of stocks that are deleted from the index. However, the effect seems to be confined to the year of addition or deletion. For added stocks, although *IO_NO* increases from 228 in year t to 269 in year $t + 5$, *IO_RATIO* remains fairly stable in the post-addition period. For deleted stocks, we find that institutional ownership rebounds somewhat, with *IO_RATIO* increasing from 0.48 in year $t + 1$ to 0.60 in year $t + 5$, and *IO_NO* increasing from 88 in year $t + 1$ to 118 in year $t + 5$. This shows that the decline in institutional ownership for deleted stocks appears to be temporary.

Although not reported, we classify mutual funds as either index-related or non-index-related, and find a significant increase in *IO_RATIO* for added stocks and a significant decrease for deleted stocks among index-related funds from quarter $t - 1$ to t. These results are available on request.

Our results thus complement the existing reported findings. For example, Pruitt and Wei (1989) find that institutional ownership increases for added stocks, but decreases for deleted stocks using data from before and after S&P 500 index revisions from 1973 to 1986. Hegde and McDermott (2003) find that institutional ownership increases following S&P 500 index addition for NYSE stocks in the 1993–1998 period. However, these studies focus on the quarter immediately after index revisions. Our study extends the post-event period to five years and shows that the percentage of institutional ownership does not increase for added stocks after the year of index addition, and does not decline for deleted stocks in the long-term.

6.2. Shadow costs

As noted, another explanation for the short-term price reaction of stocks added to and deleted from the S&P 500 index is the investor awareness hypothesis (Chen et al., 2004). According to this hypothesis, investor awareness affects the degree of diversification among investors, because if some investors know only a subset of stocks and hold only those stocks of which they are aware, then they will be inadequately diversified and demand a premium known as a shadow cost for the non-systematic risk that they bear. When a stock is added to the S&P 500 index and investors are alerted to its existence, the required rate of return on that stock should fall due to a reduction in the nonsystematic portfolio risk. We investigate the shadow cost over a long event window from year $t - 5$ to $t + 5$. Following Chen et al. (2004), we compute the shadow cost (multiplied by 10^9) as

equation(2)

$$ShadowCost_t = \frac{ResidualStandardDev_t}{S\&P500MarketCap_0} \times \frac{FirmSize_0}{NumberofShareholders_t}$$

ShadowCostt=ResidualStandardDevtS&P500MarketCap0×FirmSize0NumberofShareholderst

$FirmSize_0$ (the market value of equity) and $S\&P500MarketCap_0$ are measured on the announcement date of an index change; $ResidualStandardDev_t$ is the standard deviation of the difference between a firm's return and the

S&P 500 total return from year $t-5$ to year t before the index change announcement and from year t to $t+5$ after the effective day for the post announcement period; and $NumberofShareholders_t$ is the number of shareholders before the index change announcement.

The results for the changes in shadow cost are also reported in Table 6. For added stocks, the shadow cost decreases significantly, dropping from 12.321 in year $t-5$ to 8.949 in year $t-1$, 5.395 in year t, and 3.15 in year $t+5$. Panel C shows that the decreases in shadow cost from year $t-5$ to t and from year t to $t+5$ are significant for added stocks. For deleted stocks, the shadow cost increases slightly from year $t-5$ to t and remains at that level thereafter. The average shadow cost is 0.267, 0.459, 0.375, and 0.424 in years $t-5$, $t-1$, t, and $t+5$, respectively. Panel C shows that the change in shadow cost is significant from year $t-5$ to t, but insignificant from t to $t+5$.

Our results for the long-term changes in the shadow cost are consistent with those of existing studies. For example, Baran and King (2012) find that the shadow cost is reduced for stocks added to the S&P 500 index, but not for stocks that are deleted from the index. Elliott et al. (2006) find that the shadow cost of added stocks is reduced based on a sample of S&P 500 constituent stocks. Our results demonstrate that the effect of addition to the index on the shadow costs continues over the five-year period, although the effect does not extend as long for deleted stocks. This is because although investor awareness of added stocks increases over time, investors will not be any less aware of deleted stocks once they are removed from the index.

6.3. Analyst coverage and forecasts

Index revisions also have a long-term effect on analyst activity. Financial analysts are important providers of information about listed companies. When there are more analysts covering a company, the speed of information diffusion is faster, which leads to more efficient stock prices. We examine two measures of analyst activity, coverage (*COVERAGE*) and dispersion (*DISPERSION*), where *COVERAGE* is the number of analysts following a stock and *DISPERSION* is the standard deviation of the analysts' annual earnings per share (EPS) forecasts for the fiscal year divided by their average EPS forecast. We expect *COVERAGE* to increase for a stock after it is added to an index and to decrease after the stock is deleted. The *DISPERSION* of deleted stocks should be higher than that of added stocks due to greater uncertainty.

Table 7 reports the analyst coverage and dispersion of analyst earnings forecasts five years before and five years after stocks are added to or deleted from the S&P 500. Consistent with our predictions, for added stocks, *COVERAGE* increases from year $t-5$ to year t and further increases thereafter, with values of 10.2, 14.2, 15.9, and 16.2 in years $t-5$, t, $t+2$, and $t+5$, respectively. In contrast, for deleted stocks, *COVERAGE* decreases from year $t-5$ to year t and but does not decreases thereafter, with values of 10.4, 7.1, 5.3, and 6 in years $t-5$, t, $t+2$, and $t+5$, respectively.

Table 7.

Changes in analyst coverage and the dispersion of earnings forecasts.

Year	Obs	Coverage	Dispersion
Panel A: Additions			
−5	340	10.2	0.0789
−4	381	10.2	0.1098

−3	412	11.2	0.0801
−2	452	12	0.128
−1	474	13.2	0.1233
0	538	14.2	0.0803
1	556	15.3	0.0818
2	559	15.9	0.1561
3	554	16.1	0.1685
4	547	16.3	0.1352
5	534	16.2	0.1406
Panel B: Deletions			
−5	81	10.4	0.1626
−4	82	10.3	0.2762
−3	82	9.9	0.1978
−2	80	9.8	0.2874
−1	80	9.6	0.3781
0	100	7.1	0.3103
1	104	5.6	0.4836
2	106	5.3	0.3723
3	107	5.7	0.2342
4	109	5.7	0.2242
5	101	6	0.2851
Panel C: Significance of difference			
Additions			
$t - 5$ vs. t		17.75***	−2.03**

t vs. *t* + 5	9.27[***]	3.58[***]
Deletions		
t − 5 vs. *t*	−2.95[***]	3.28[***]
t vs. *t* + 5	0.02	1.24

Analyst coverage and the dispersion of analyst earnings forecasts are plotted for five years before and five years after stocks are added to or deleted from the S&P 500 index from 1979 to 2003. *Coverage* is the number of analysts following a stock. *Dispersion* is the standard deviation of analysts' earnings per share forecasts divided by their average earnings per share forecast. The data is obtained from the IBES database. The *t*-values for the differences in the means are reported.

**

Significance at the 5% level.

***

Significance at the 1% level.

Table options

t0035

DISPERSION for deleted stocks is consistently higher than for added stocks. Over time, *DISPERSION* for added stocks is quite stable from year *t* − 5 to *t*, which means that in general the uncertainty of analyst forecasts does not change much. However, we do find an increase in *DISPERSION* after year *t* + 2. For deleted stocks, there is an upward trend in *DISPERSION* from year *t* − 5 to year *t*. After that, *DISPERSION* decreases significantly and remains at a lower level from year *t* + 3 to year *t* + 5.

Our results are consistent with those of previous studies on analyst coverage around index revisions. For example, Elliott et al. (2006) find that for stocks added to the S&P 500 index between 1993 and 2000, the analyst coverage increased by 11%. Our results provide strong evidence that the analyst coverage of added stocks increases significantly even over the five-year period, whereas the analyst coverage of deleted stocks does not decrease sharply.

6.4. Liquidity

We also investigate the long-term effect of index revisions on liquidity. Three liquidity proxies are constructed. The first is turnover ratio (*TURNOVER*), which is trading volume divided by the number of shares outstanding. The second is the market-adjusted turnover ratio (*ADJTURNOVER*), which is *TURNOVER* divided by an adjustment factor (*ADJFACTOR*). *ADJFACTOR* is the monthly CRSP turnover ratio, for which we set January 1950 as the base month with a value of 1. The third is the Amihud illiquidity ratio (*ILLIQUIDITY*), which is calculated according to Amihud (2002) as follows:

equation(3)

$$ILLIQUIDITY_{it} = \frac{1}{D_{im}} \sum_{t=1}^{D_{im}} \frac{|R_{imd}|}{VOLD_{imd}}$$

ILLIQUIDITYit=1Dim∑t=1Dim|Rimd|VOLDimd

where D_{im} is the number of days for which data is available for stock *i* in month *m*, R_{imd} is the return on stock *i* on day *d* of month *t*, and $VOLD_{imd}$ is the respective daily volume in dollars.

Table 8 reports the results. *TURNOVER* increases for both added and deleted stocks before the index revision, with values of 0.4926 and 0.7319 for added stocks at years $t - 5$ and *t* and values of 0.4250 and 0.4523 for deleted stocks at years $t - 5$ and *t*, respectively. Panel C shows that the difference between *TURNOVER* at year $t - 5$ and year *t* is statistically significant for both added and deleted stocks. In the post-event period, there is a further increase in *TURNOVER* for added stocks, with values of 0.7679 and 0.7825 at years $t + 1$ and $t + 5$, respectively. For deleted stocks, *TURNOVER* does not decrease, but rather increases in the long run, with values of 0.4657 and 0.5544 at years *t* and year $t + 5$, respectively.

Table 8.

Changes in liquidity.

Year	Obs	*TURNOVER*	*ADJTURNOVER*	*ILLIQUIDITY*
Panel A: Additions				
−5	521	0.4926	0.093	0.156
−4	559	0.5537	0.0892	0.1137
−3	603	0.5967	0.088	0.0913
−2	638	0.6435	0.0823	0.0749
−1	667	0.6719	0.08	0.0656
0	693	0.7319	0.081	0.0572
1	696	0.7679	0.0777	0.0514
2	683	0.7608	0.072	0.0585
3	667	0.774	0.0691	0.0586
4	648	0.7679	0.0666	0.0542
5	629	0.7825	0.0657	0.0542

Panel B: Deletions				
−5	210	0.425	0.092	0.288
−4	212	0.4249	0.0897	0.2633
−3	216	0.4103	0.0895	0.2831
−2	216	0.4341	0.0854	0.3686
−1	218	0.4256	0.083	0.432
0	220	0.4523	0.0788	0.4809
1	220	0.4657	0.0803	0.5477
2	207	0.4717	0.0796	0.5363
3	191	0.4826	0.0751	0.4578
4	183	0.5182	0.0768	0.4565
5	172	0.5544	0.0776	0.3569
Panel C: Significance of difference				
Additions				
t − 5 vs. *t*		9.52□□□	−6.36□□□	−11.33□□□
t vs. *t* + 5		4.16□□□	−7.41□□□	−2.14□□
Deletions				
t − 5 vs. *t*		1.92□	−2.63□□□	3.47□□□
t vs. *t* + 5		5.44□□□	0.28	−2.08□□

This table reports the liquidity of stocks five years before and five years after they are added to or deleted from the S&P 500 index from 1962 to 2003. *TURNOVER* is the trading volume divided by the number of shares outstanding. *ADJTURNOVER* is *TURNOVER* divided by an adjustment factor *ADJFACTOR*. *ADJFACTOR* is an index based on the CRSP turnover in January 1950 as the base month. *ILLIQUIDITY* represents Amihud (2002)'s illiquidity measure. The data are taken from the CRSP and Compustat databases. The *t*-values for the differences in the means are reported.

□

Significance at the 10% level.

□□

Significance at the 5% level.

□□□

Significance at the 1% level.

Table options

t0040

Notably, market turnover has generally increased over the past four decades, and we thus look at *ADJTURNOVER*, as it is independent of market trends. Relative to the market, *ADJTURNOVER* declines for both added and deleted stocks in the pre-event period, indicating that newly added stocks are liquid before being added to the S&P 500. In contrast, *ADJTURNOVER* for deleted stocks does not decrease after their removal from the index. The values of *ADJTURNOVER* at year $t-5$ and year t are 0.0930 and 0.0810 for added stocks and 0.0920 and 0.0788 for deleted stocks, respectively. Panel C shows that the difference in *ADJTURNOVER* between year $t-5$ and year t is statistically significant for both added and deleted stocks. In the post-event period, there is a further decline of *ADJTURNOVER* for added stocks, but not for deleted stocks. The corresponding figures are 0.0777 and 0.0657 for added stocks and 0.0803 and 0.0776 for deleted stocks at year $t+1$ and year $t+5$, respectively.

ILLIQUIDITY, or the Amihud illiquidity measure, of added stocks decreases from year $t-5$ to year t and further decreases from year t to $t+5$. The corresponding values of *ILLIQUIDITY* are 0.1560, 0.0572, and 0.0542 at years $t-5$, t and $t+5$, respectively. These findings are consistent with those for *TURNOVER*, which increases not only in the pre-event period, but also in the post-event period. Conversely, *ILLIQUIDITY* for deleted stocks increases from year $t-5$ to year t, but decreases from year t to year $t+5$. The corresponding values of *ILLIQUIDITY* are 0.2880, 0.4809, and 0.3569 at years $t-5$, t, and $t+5$, respectively. This is inconsistent with the evidence on *TURNOVER*, which improves in the pre-event period. Panel C confirms that the changes from year $t-5$ to t and from t to $t+5$ are statistically significant for both added and deleted stocks.

To summarize, there are changes in liquidity in the long run after index additions and deletions. For added stocks, the liquidity increases before index addition, and then increases further after addition. For deleted stocks, the changes in liquidity in terms of *TURNOVER* and *ILLIQUIDITY* are mixed before index deletion, but some improvement is shown in both measures in the post-event period.

The evidence on liquidity changes for added stocks is consistent with that from previous studies. For example, Becker-Blease and Paul (2006) find that the liquidity of stocks added to the S&P 500 index increases in the long run. Baran and King (2012) find that the liquidity of added stocks improves for S&P 500 index revisions, whereas the liquidity of deleted stocks declines. We find that the liquidity of deleted stocks also improves from year t to year $t+5$.

7. Regression analysis

We now perform the regression analyses by combining all the variables relating to operating performance, information quality, and liquidity. For the sake of simplicity, we only use Δ*Illiquidity* as the liquidity measure and Δ*ROA* as the operating performance measure in the regression analyses. We define five variables to capture the changes in information quality and liquidity over the five-year post-event period: change in institutional ownership (Δ*IO_RATIO*), change in analyst coverage (Δ*Coverage*), change in shadow cost (Δ*ShadowCost*), change in Amihud illiquidity (Δ*Illiquidity*), and change in return on assets (Δ*ROA*), where the changes are measured from year *t* to year *t* + 5.

The dependent variable is the market adjusted buy-and-hold return (*ADJCRET*) over the 5-year period from Table 2. [12] We estimate the following regression for added and deleted stocks. A dummy variable for deletion stocks is added so we can investigate whether there is any difference in long-run stock returns between deleted and added stocks after the explanatory variables are controlled. The dummy variable is equal to 1 for deleted stocks and 0 for added stocks. The variables are Winsorized at the 5% level and the *t*-values are adjusted by the Rogers standard errors clustered by firm and year (Petersen, 2009).

equation(4)

$$ADJCRET_i=\alpha_0+\alpha_1*Dummy+\beta_1\Delta IO\_Ratio_i+\beta_2\Delta Coverage_i+\beta_3\Delta Illiquidity_i+\beta_4\Delta ShadowCost_i+\beta_5\Delta ROA_i+\varepsilon$$

ADJCRETi=α0+α1∗Dummy+β1ΔIO_Ratioi+β2ΔCoveragei+β3ΔIlliquidityi+β4ΔShadowCosti+β5ΔROAi+ε

Table 9 reports the regression results. As some of the variables are obtained from CRSP and Compustat and others from the Thomson Financial Institutional database and IBES, the starting period for the variables is not the same. For example, the institutional ownership data start from 1985, whereas the analyst coverage data start from 1979. Thus, Panel A reports the results based on all the available data and Panel B reports the results after 1985, for which we have data for all the variables. We present seven regression models. Model 1 includes only the dummy variable. For Models 2–6, we add one of the five variables as an explanatory variable: Δ*IO_RATIO*, Δ*Coverage*, Δ*ShadowCost*, Δ*Illiquidity*, and Δ*ROA*. Model 7 combines the dummy and the five variables to investigate the joint explanation.

Table 9.

Regression analysis.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Panel A: 1962–2003							
Int	0.9428	0.8116	−0.0893	0.9453	0.9939	0.4657	0.2458
	1.56	1.31	−0.11	1.56	1.33	1.39	0.85
Dummy	0.2915□□□	0.2043	0.4681□□□	0.2825□□□	0.3541□□	0.3950□□□	0.4334

	2.80	0.96	3.00	2.65	2.25	3.05	1.53
Δ*IO_Ratio*		1.1871***					−0.2613
		3.28					−0.47
Δ*Coverage*			0.0585***				0.0484***
			8.40				4.67
Δ*Illiquidity*				−0.0191**			0.0953
				−2.17			1.49
Δ*ShadowCost*					−0.0020		−0.0022
					−0.52		−0.59
Δ*ROA*						0.2499	1.5644***
						1.62	2.85
Adj R^2	0.08	0.03	0.16	0.08	0.03	0.07	0.12
Obs	880	341	535	854	541	716	270
Panel B: 1985–2003							
Int	0.2575	0.2410	0.2575	0.2575	0.2579	0.2362	0.2448
	0.79	0.71	0.84	0.79	0.79	0.76	0.83
Dummy	0.4524*	0.3911	0.5639**	0.4807*	0.4498*	0.2433	0.4455
	1.79	1.55	2.32	1.84	1.78	0.89	1.63
Δ*IO_Ratio*		0.5850					−0.1908
		1.10					−0.35
Δ*Coverage*			0.0499***				0.0460***
			5.52				4.73
Δ*Illiquidity*				0.1051			0.0993
				1.59			1.63

Δ*ShadowCost*					0.0006		−0.0017
					0.17		−0.47
Δ*ROA*						1.9290***	1.5122***
						3.11	2.81
Adj R^2	0.00	0.00	0.11	0.00	0.00	0.05	0.12
Obs	270	270	270	270	270	270	270

This table reports the following univariate and multivariate regression results:

$ADJCRET_i = \alpha_0 + \alpha_1 * Dummy + \beta_1 \Delta IO\_Ratio_i + \beta_2 \Delta Coverage_i + \beta_3 \Delta Illiquidity_i + \beta_4 \Delta ShadowCost_i + \beta_5 \Delta ROA_i + \varepsilon$

ADJCRET is the market adjusted buy-and-hold 5-year return on a stock that is added to or deleted from the S&P 500 index. *Dummy* is a dummy variable for deleted stocks (1 for deleted stocks and 0 for added stocks). Δ*IO_Ratio* is defined as IO_RATIO_{t+5} minus IO_RATIO_t. Δ*Coverage* is defined as $Coverage_{t+5}$ minus $Coverage_t$ scaled by $Coverage_t$. Δ*Illiquidity* is defined as $ILLIQUIDITY_{t+5}$ minus $ILLIQUIDITY_t$. Δ*ShadowCost* is defined as $ShodowCost_{t+5}$ minus $ShadowCost_t$. Δ*ROA* is defined as ROA_{t+5} minus ROA_t. The variables are Winsorized at 5% and the *t*-values are adjusted by the Rogers standard errors clustered by firm plus year dummies.

*

Significance at the 10% level.

**

Significance at the 5% level.

***

Significance at the 1% level.

Table options

t0045

We first discuss the results in Panel A. Model 1 shows that there is a significant difference of ADJCRET between deleted stocks and added stocks. The dummy coefficient is 0.2915 with a *t*-value of 2.80. Model 2 shows that post-event returns are positively related to Δ*IO_Ratio*. The coefficient of Δ*IO_Ratio* is 1.871 with a *t*-value of 3.28. However, the dummy becomes insignificant in Model 2, which means that changes of institutional ownership help to explain the difference in long-run stock returns between deleted stocks and added stocks. Model 3 includes Δ*Coverage* as an independent variable. The coefficient of Δ*Coverage* is 0.0585 with a *t*-value of 8.40, which shows that changes in analyst coverage are positively related to long-run stock returns. Model 4 includes Δ*Illiquidity* as an independent variable. The coefficient of Δ*Illiquidity* is −0.0191 with a *t*-value of 2.17, suggesting that post-event long-run returns are negatively related to Δ*Illiquidity*. However, the statistically significant dummy coefficients in Models 3 and 4 mean that Δ*Coverage* and Δ*Illiquidity* cannot adequately explain the difference in returns between deleted stocks and added stocks.

In Models 5 and 6, we add Δ*ShadowCost* and Δ*ROA* as independent variables in the regression and the coefficients are not significant. The dummy coefficients in Models 5 and 6 are statistically significant. In Model 7 we combine all five variables in a multivariate regression. The results show that the coefficients of Δ*Coverage* and Δ*ROA* are statistically significant and the dummy variable is no longer significant. In an unreported regression, we exclude Δ*IO_Ratio* as it only starts from 1985, and the results are the same as those in Model 7. Panel A shows that Δ*Coverage* has the best explanatory power, with the largest *t*-value for the coefficient and the highest adjusted-R^2. However, the results in Model 7 may not be directly comparable with those in Models 1–6 because of the different sample sizes.

Panel B of Table 9 provides a direct comparison of each variable restricted to the same sample firms. The results are slightly different from those reported in Panel A. In Model 1, the dummy coefficient remains significant, although at a marginal 10% level. In Models 2–6, the coefficients of Δ*IO_Ratio*, Δ*Illiquidity*, and Δ*ShadowCost* are not significant, while the coefficients of Δ*Coverage* and Δ*ROA* are statistically significant. Furthermore, when Δ*ROA* is included in Model 6, the dummy coefficient is no longer significant. Therefore, operating performance can explain the difference between the long-term returns of deleted stocks and added stocks. The results in Model 7 are similar to those reported in Panel A, indicating that the coefficients of Δ*Coverage* and Δ*ROA* are significant in the multivariate regressions. [13]

Overall, the results in Table 9 suggest that the difference between the long-term returns of deleted stocks and added stocks can be explained by analyst coverage and operating performance. Therefore, it seems that investors do not expect the performance of deleted stocks to rebound after deletion and that the stocks' long-term price performance can be explained by the firms' post-deletion improvement in operating performance.

8. Conclusion

We investigate the long-term effects of S&P 500 index constituent stock additions and deletions between 1962 and 2003 and find a significant price increase for added stocks in the short run and in the five-year period after addition. Nevertheless, although there is an initial price decline for deleted stocks after their deletion from the index, stocks deleted from the S&P 500 index due to a lack of industry representation or because of a transfer to the S&P Small Cap 600 index outperform the market in the long run.

We consider changes in information quality and liquidity after index revision as possible explanatory factors. For added stocks, there are increases in institutional ownership and liquidity, a decline in shadow cost, and a long-term increase in analyst coverage. For deleted stocks, there is a decline in analyst coverage, an increase in liquidity, but no significant long-term effects on institutional ownership and shadow cost. The results of our regression analyses show that the difference in the long-term returns of added and deleted stocks can be explained by analyst coverage and operating performance. These results show that the price effects associated with index addition and deletion are not simply due to changes in short-term demand, but rather reflect the long-term effects of changes in analyst coverage and operating performance.

To the best of our knowledge, this study is the first to provide a comprehensive analysis of the long-term performance of stocks added to or deleted from the S&P 500 index, and to provide evidence linking stock price performance to firm fundamentals. The finding that a subset of deleted stocks outperforms the market in the long run has important implications for long-term buy-and-hold investors.

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Wall Street Journal, February 20, 2012.

4

The exception is Cai (2008), who examines the long-term effects of Russell 2000 index rebalancing on portfolio evaluation.

5

The criteria for inclusion in the S&P 500 index include market capitalization, liquidity, domicile, public float, sector classification, financial viability, and treatment of IPOs. A stock can be deleted from the index if the company is involved in a merger, acquisition, or significant restructuring, or if it substantially violates one or more of the addition criteria (Standard and Poor's, 2011).

6

It should be noted that the sample size differs between the added and deleted stocks. The number of deleted stocks is smaller than the number of added stocks because many stocks were deleted due to mergers, spinoffs, and other corporate finance events. Trading in such stocks ceased within a few days of their deletion.

7

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8

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9

We also check whether added and deleted stocks outperform the Dow Jones Industrial Average index (DJIA), and the S&P 500 index. The results are stronger. For example, added stocks outperform the DJIA by 19% over a [1, 36] event period and by 38% over a [1, 60] event period. Deleted stocks outperform the DJIA by 57% over a [1, 36] event period and by 87% over a [1, 60] event period.

10

Some firms were added to and deleted from the S&P 500 index on the same dates, and thus their returns may not be independent of each other. Following Kolari and Pynnonen (2010), we use the scaled CAR to obtain the t-values to check the level of significance. Although not reported, the results are robust and are available on request.

11

For a robustness check, we conduct further tests for two different samples: a sample restricted to firms that appear from years t to $t + 5$; and a second sample restricted to firms that appear from years $t - 5$ to $t + 5$. The results are similar to those reported in Table 5. We also conduct similar robustness checks for Tables 6 to 8 and find similar results to those already reported.

12

We also use the raw cumulated returns over the five-year period and find that the results are similar to those reported in Table 9. These results are available on request.

13

The coefficients and t-values are slightly different in Panels A and B of Model 7, because the data are Winsorized in the 1962–2003 period and Panel B reports the results for the 1985–2003 period.

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The Level and Persistence of Growth Rates

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ABSTRACT

Expectations about long-term earnings growth are crucial to valuation models and cost of capital estimates. We analyze historical long-term growth rates across a broad cross section of stocks using several indicators of operating performance. We test for persistence and predictability in growth. While some firms have grown at high rates historically, they are relatively rare instances. There is no persistence in long-term earnings growth beyond chance, and there is low predictability even with a wide variety of predictor variables. Specifically, IBES growth forecasts are overly optimistic and add little predictive power. Valuation ratios also have limited ability to predict future growth.

THE EXPECTED RATE of growth in future cash flows (usually proxied by accounting earnings) plays a pivotal role in financial management and investment analysis. In the context of aggregate market valuation, for example, projections about future growth are instrumental in predicting the equity risk premium. Much current controversy surrounds the appropriate level of the equity risk premium, as well as whether recent market valuation levels (at least as of year-end 1999) can be justified (Asness (2000), Welch (2000), Fama and French (2002)). Debate also revolves around how much of the performance of equity asset classes, such as large glamour stocks, can be attributed to changes in profitability growth (Fama and French (1995), Chan, Karceski, and Lakonishok (2000)). When applied to the valuation of individual stocks, projected growth rates have implications for the cross-sectional distribution of cost of capital estimates (Fama and French (1997), Claus and Thomas (2001), Gebhardt, Lee, and Swaminathan (2001)), as well as widely followed valuation ratios like price-to-earnings and price-to-book ratios.

Common measures of expected growth in future earnings, such as valuation ratios and analysts' growth forecasts, vary greatly across stocks. In the case of price-to-earnings multiples for the IBES universe of U.S. firms, for example, at

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year-end 1999, the distribution of the stock price relative to the consensus forecast of the following year's earnings has a 90th percentile of 53.9, while the 10th percentile is 7.4, yielding a difference of 46.5. Firms with a record of sustained, strong past growth in earnings are heavily represented among those trading at high multiples. Security analysts issue positive recommendations for these stocks and forecast buoyant future prospects. Other stocks with a history of disappointing past growth are shunned by the investment community. They are priced at low multiples and analysts are unexcited about their outlook. Putting aside the possibility of mispricing, one reason for the disparity in multiples is differences in risk. At the level of individual stocks, however, the relation between risk and expected return is weak (Fama and French (1992)). It is thus unlikely that the large dispersion is driven primarily by risk (the evidence in Beaver and Morse (1978) also supports this view). Rather, if the pricing is rational, most of the cross-sectional variation reflects differences in expected growth rates. A more direct measure of the market's expectations, security analysts' forecasts of long-term growth in earnings, also displays large differences across stocks. For example, the 90th percentile of the distribution of IBES five-year forecasts is 40 percent as of year-end 1999, compared to the 10th percentile of 8.9 percent. If analysts and investors do not believe that future earnings growth is forecastable, they would predict the same growth rate (the unconditional mean of the distribution) for all companies, and it is unlikely that the dispersion in forecasts or price–earnings ratios would be as large as it actually is.

Based on market valuations and analysts' forecasts, then, there is a widespread belief among market participants that future earnings growth is highly predictable. However, economic intuition suggests that there should not be much consistency in a firm's profitability growth. Following superior growth in profits, competitive pressures should ultimately tend to dilute future growth. Exit from an unprofitable line of business should tend to raise the remaining firms' future growth rates. Some support for this logic comes from Fama and French (2002). Their evidence for the aggregate market suggests that while there is some short-term forecastability, earnings growth is in general unpredictable.

In short, there may be a sharp discrepancy between share valuations along with analysts' predictions on the one hand, and realized operating performance growth on the other. The discrepancy may reflect investors' judgmental biases or agency distortions in analysts' behavior. In any event, the divergence is potentially large, judging from current market conditions. For instance, take a firm with a ratio of price to forecasted earnings of 100. Such cases are by no means minor irregularities: based on values at year-end 1999, they represent about 11.9 percent of total market capitalization. To infer the growth expectations implicit in such a price earnings ratio, we adopt a number of conservative assumptions. In particular, suppose the multiple reverts to a more representative value of 20 in 10 years, during which time investors are content to accept a rate of return on the stock of zero (assume there are no dividends). A multiple of 20 is conservative, since Siegel (1999) argues that a ratio of 14 may not be an unreasonable long-term value. Further, an adjustment period of 10 years is not short, in light of the fact that many of the largest firms at year-end 1999 did not exist 10 years ago. These assumptions imply that earnings must grow by a factor of five, or at a rate of about 17.5 percent per year, for the next 10 years. Alternatively, suppose investors put up with a paltry 10 percent rate of return (Welch (2000), reports that financial economists' consensus expected return is considerably higher). Then earnings must grow at an even more stellar rate (29.2 percent per year) over 10 years to justify the current multiple.

The above example highlights the two questions we tackle in this paper. How plausible are investors' and analysts' expectations that many stocks will be able to sustain high growth rates over prolonged periods? Are firms that can consistently achieve such high growth rates identifiable ex ante? We begin by documenting the distribution of growth rates realized over horizons of 1, 5, and 10 years. This evidence lets us evaluate the likelihood of living up to the expectations of growth that are implicit in market valuation ratios. To justify rich valuations, investors must believe that high growth persists over many years. Accordingly, we also examine whether there is persistence in operating performance growth. Individual firms' earnings and incomes can be very erratic, so a robust empirical design is a crucial consideration. We employ nonparametric tests on multiple indicators of operating performance across a large cross section of stocks over relatively long horizons. In addition, we focus our tests for persistence by examining subsets of firms where future growth is more likely to be predictable (e.g., stocks in the technology sector and stocks which have displayed persistence in past growth). To give the benefit of the doubt to the possibility of persistence, we relax the definition of consistency in growth and redo our tests. Finally, we expand the list of variables to forecast growth beyond past growth rates. We examine whether valuation measures, such as earnings yields and ratios of book-to-market equity and sales-to-price, are associated with growth on an ex ante as well as ex post basis. Security analysts' earnings forecasts are also widely used as measures of the market's expectations of growth in future earnings. As a check on the quality of analysts' predictions, we evaluate how well realized growth rates align with IBES consensus forecasts.

Our main findings are as follows. Our median estimate of the growth rate of operating performance corresponds closely to the growth rate of gross domestic product over the sample period. Although there are instances where firms achieve spectacular growth, they are fairly rare. For instance, only about 10 percent of firms grow at a rate in excess of 18 percent per year over 10 years. Sales growth shows some persistence, but there is essentially no persistence or predictability in growth of earnings across all firms. Even in cases that are popularly associated with phenomenal growth (pharmaceutical and technology stocks, growth stocks, and firms that have experienced persistently high past growth), signs of persistent growth in earnings are slim. Security analysts' long-term growth estimates tend to be overoptimistic and contribute very little to predicting realized growth over longer horizons. Market valuation ratios have little ability to discriminate between firms with high or low future earnings growth. An expanded set of forecasting variables also has scant success in predicting future earnings growth. All in all, our evidence on the limited predictability of earnings growth suggests that investors should be wary of stocks that trade at very high multiples. Very few firms are able to live up to the high hopes for consistent growth that are built into such rich valuations.

Related prior research in the financial literature on the behavior of earnings growth is meager. Little (1962) and Little and Rayner (1966) examine the growth in earnings of a limited sample of U.K. firms in the 1950s. Early evidence for U.S. firms is provided by Lintner and Glauber (1967) and Brealey (1983). Beaver (1970) and Ball and Watts (1972) start a long line of papers that apply time-series models to earnings. However, few firms have sufficiently long earnings histories to allow precise estimation of model parameters, and the emphasis in this line of work has been on short-term forecasting. More recently, Fama and French (2002) examine the time-series predictability of aggregate earnings for the market. Our work is closest in spirit to that of Fama and French (2000), who look at the cross-sectional predictability of firms' earnings, but even they focus on one-year horizons.

A much larger number of studies by academics and practitioners rely on estimates of expected long-term earnings growth for stock valuation, or for estimating firms' cost of capital. A selective list includes Bakshi and Chen (1998), Lee, Myers, and Swaminathan (1999), Claus and Thomas (2001), and Gebhardt et al. (2001). In particular, many studies use long-term consensus IBES forecasts for expected growth rates (see, e.g., Mezrich et al. (2001)). Given the widespread use of IBES long-term estimates, it is important to evaluate their correspondence with realized growth rates.

The rest of the paper is organized as follows. Section I discusses our sample and some basics of the methodology. The cross-sectional distribution of firms' growth rates is reported in Section II. Section III presents the results of runs tests for consistency in growth of operating performance. Section IV takes up the issue of survivorship bias. Although our main focus is not on the determinants of valuation multiples, Section V examines the relation between growth and valuation ratios such as earnings yields and book-to-market ratios, on both an ex ante and ex post basis. We compare IBES long-term forecasts with realized growth rates in Section VI. Section VII uses cross-sectional regressions to forecast future growth using variables including past growth, valuation ratios, and IBES estimates. A final section concludes.

I. Sample and Methodology

Our sample of firms comprises all domestic common stocks with data on the Compustat Active and Research files. Firms are selected at the end of each calendar year from 1951 to 1997. The earlier years are included for the sake of completeness, even though there is a backfill bias in the earlier part of the sample period (see Chan, Jegadeesh, and Lakonishok (1995)), which may impart an upward bias to growth rates in the beginning of the sample. The number of eligible firms grows from 359 in the first sample selection year to about 6,825 in the last year; on average, the sample comprises about 2,900 firms.

We consider three indicators of operating performance: net sales (Compustat annual item number 12), operating income before depreciation (item 13), and income before extraordinary items available for common equity (item 237). While researchers and practitioners tend to focus exclusively on income before extraordinary items, measuring growth in this variable is beset with pitfalls. In many cases, earnings before extraordinary items is negative, so prospective growth rates are undefined (for our sample, in an average year, 29 percent of firms have negative values for earnings before extraordinary items). In other cases, firms grow from low positive values of base-year net income, introducing large outliers.[1] These include such disparate cases as beaten-down companies with depressed earnings and growing startup companies that are beginning to generate profits. To avoid hanging all our inferences on such a noisy variable, therefore, we also consider growth in net sales and growth in operating income before depreciation. These are relatively better-behaved measures of operating performance.

Researchers have adopted different conventions for calculating growth rates. Given our focus on the predictability of growth rates, we measure growth on a per share basis so as to strip out any predictability due to changes in the scale of the firm's operations. This also corresponds to the measurement convention in the investment industry.[2]

Thus, we take the perspective of an investor who buys and holds one share of a stock over some horizon and track the growth in sales or income that accrues to one share, after adjusting for stock splits and dividends. Moreover, two firms can offer the same expected return, but have different earnings growth rates because of their dividend payout policies. From an investor's standpoint, these two stocks would be considered equivalent. To put firms with different dividend policies on an equal footing, therefore, all cash dividends as well as any special distributions (such as when a firm spins off assets) are reinvested in the stock.

II. The Distribution of Growth Rates of Operating Performance

This section documents the distribution of historical growth rates over relatively long horizons (5 and 10 years). For the sake of completeness, results are also provided for 1-year horizons. At each calendar year-end over the sample period, we measure rates of growth in future operating performance for all eligible

[1] Some of these complications may be alleviated by averaging earnings over a number of years and measuring growth in these averages. Since our focus is on point-in-time growth rates, we do not explore this alternative procedure. In unreported work, we also experiment with other ways to calculate growth rates. These include value-weighted growth rates for portfolios, estimated growth rates from least-squares fits of linear and quadratic time trends through sales and income, and growth rates without dividend reinvestment. Generally speaking, the results are robust to how we measure growth rates.

[2] Lakonishok, Shleifer, and Vishny (1994) calculate growth in a firm's overall sales and earnings, while Daniel and Titman (2001) calculate growth on a per share basis. These studies focus on the impact of investor sentiment on stock returns. The hypothesis is that investors tend to favor companies with strong past performance, those in a glamorous line of business, or those which are perceived to be well managed. From this standpoint, it might be argued that it is the performance of the overall company that is relevant, and not just the profits earned per share.

stocks. Percentiles are calculated for the distribution obtained at each year-end. Table I reports the percentiles averaged across years in the sample period, as well as the most recent distribution corresponding to the last selection year of the sample period.

Several points are important as background to the results in Table I. First, since we include reinvestment of dividends and special distributions, the growth rates we report are typically higher than conventionally measured growth rates. The median dividend yield for our sample (averaged across all years) is about 2.5 percent. A second caveat is that the tabulated growth rates are based only on firms who survive for the following 1, 5, or 10 years. The survivorship bias may induce an upward bias in our reported growth rates. Moreover, we follow the conventional approach and do not calculate growth rates for operating income before depreciation or income before extraordinary items when the base-year value is negative.[3] To illustrate the potential magnitude of these complications, on average there are about 2,900 firms available for inclusion in the sample at each year-end. Of these, 2,782 firms survive at the end of the next year and have a reported value for income before extraordinary items. The calculations for 1-year growth in earnings before extraordinary items are based on 1994 of these firms; the remaining 788 firms have negative values for income in the base year. At the 5-year horizon, there are on average 1884 surviving firms. Growth rates are calculated for 1,398 of these; 486 have negative base-year values. At the 10-year horizon, there are 1,265 surviving firms: 1,002 and 263 with positive and negative base-year values, respectively. In a subsequent section, we examine the performance of nonsurviving firms.

Since negative base-year values are quite common for income before extraordinary items, valid growth rates are unavailable in many cases. These observations are symptomatic of another problem. In particular, the high frequency of cases with negative base values suggests that the neighboring portion of the distribution (with low, positive base-year values) contains a large fraction of the observations as well. These instances give rise to some very high growth rates. For growth over five years, for example, the 98th percentile value for growth in income before extraordinary items averages 62.4 percent per year. Hence, while growth in income before extraordinary items captures much of the investment community's interest, its behavior is the most questionable. While the same problem applies to operating income before depreciation, the frequency of negative base-year values is comparatively lower and growth in this variable is less problematic.[4] For growth in this variable, the 98th percentile is 51.2 percent on average. In comparison, sales growth is relatively well behaved, with a 98th percentile value of 40.5 percent on average. These comparisons suggest that looking at

[3] Note, however, that even if we are unable to calculate growth in income before extraordinary items in such a case, we still get a reading on a firm's operating performance growth from sales (or operating income before depreciation if it is positive).

[4] For example, of the firms surviving after one year and with a reported value for income before depreciation, about 14 percent on average have negative base-year values. The corresponding percentage for income before extraordinary items is 29 percent.

other indicators beyond income before extraordinary items helps to give a more robust picture of growth in operating performance.

The results in Table I serve as cautionary flags to analysts and investors who pursue stocks with rich price–earnings multiples. Take our original example of a stock with a current price–earnings multiple of 100, which declines to 20 in 10 years' time with an expected return of 10 percent per year. Earnings must grow at 29.2 percent per year over 10 years to justify the current multiple. This is a tall order by historical standards. In particular, the required growth rate corresponds to about the 95th percentile of the distribution of 10-year growth rates, even putting aside the inclusion of dividends. Put differently, suppose earnings grow at a historically more representative, but still healthy, annual rate of 14.7 percent (the 75th percentile of the distribution from Part I). Then the current ratio of 100 would be justified if the time it takes for the multiple to fall to 20 is stretched out to 38 years.

Small firms start from a smaller scale of operations and so have more room for potential growth, possibly justifying a high current multiple. However, high multiples also apply to many large, well-known firms. To see whether large firms in general can also achieve high growth, Table II reports the distribution of growth rates for large firms (companies ranked in the top two deciles of year-end equity market capitalization, based on NYSE breakpoints). Bigger firms have a larger scale of operations and, hence, are more likely to face limits on their growth, so extremely high growth rates are less prevalent in Table II compared to Table I. For example, the 90th percentiles of growth rates over 10 years for income before extraordinary items, operating income before depreciation, and sales are all close to 16 percent per year. Also, note that dividend yields are generally higher for large firms.

Our estimated median growth rate is reasonable when compared to the overall economy's growth rate. On average over the sample period, the median growth rate over 10 years for income before extraordinary items is about 10 percent for all firms. The behavior over the last 10-year period in the sample roughly matches the overall average. Growth in the other two indicators also exhibit comparable medians. After deducting the dividend yield (the median yield is 2.5 percent), as well as inflation (which averages 4 percent per year over the sample period), the growth in real income before extraordinary items is roughly 3.5 percent per year. This is consistent with the historical growth rate in real gross domestic product, which has averaged about 3.4 percent per year over the period 1950 to 1998. It is difficult to see how the profitability of the business sector over the long term can grow much faster than overall gross domestic product.

Looking forward, if we project future growth using the median of the distribution of historical growth rates, the implication is that the expected future return on stocks is not very high. For example, in a simple dividend discount model with constant growth rates and constant payout ratio, the expected return is equal to the dividend yield plus the expected future growth rate of earnings. Given the low level of current dividend yields (below 1.5 percent) and expected inflation of 2.5 percent, the expected return is only about 7.5 pecent. This is lower than the

Table I

Distribution of Growth Rates of Operating Performance over 1, 5 and 10 Years: All Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one, five, and ten years for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample selection date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Percentiles of the distribution are calculated each year-end; the simple average over the entire sample period of the percentiles is reported, along with the distribution of growth rates over horizons ending in the last year of the sample period.

	Percentile								
Sample period	2%	10%	25%	40%	50%	60%	75%	90%	98%
Part I: Annualized Growth Rate over 10 Years									
(A) Sales									
Average	−9.6	0.1	5.5	8.7	10.2	11.5	13.8	18.0	27.6
Ending 1998	−16.1	−3.4	2.9	6.2	7.9	9.5	12.7	19.2	32.9
(B) Operating Income before Depreciation									
Average	−13.3	−2.3	4.1	7.6	9.5	11.2	14.1	19.4	31.3
Ending 1998	−14.6	−3.3	3.3	7.2	9.0	10.9	14.1	21.5	38.6
(C) Income before Extraordinary Items									
Average	−15.6	−3.1	3.9	7.7	9.7	11.6	14.7	20.4	33.4
Ending 1998	−21.2	−6.3	2.3	6.9	9.0	11.4	15.3	24.4	48.8
Part II: Annualized Growth Rate over 5 Years									
(A) Sales									
Average	−18.7	−4.1	4.3	8.2	10.2	12.0	15.3	22.1	40.5
Ending 1998	−22.7	−6.2	2.9	8.0	10.2	12.4	17.1	27.6	56.3
(B) Operating Income before Depreciation									
Average	−26.8	−8.4	1.9	7.2	9.8	12.4	17.1	26.7	51.2
Ending 1998	−24.4	−7.8	3.5	8.7	11.5	14.4	19.9	33.4	64.4
(C) Income before Extraordinary Items									
Average	−30.9	−10.3	1.5	7.4	10.5	13.4	18.8	30.4	62.4
Ending 1998	−35.1	−11.5	2.8	9.1	12.4	15.7	23.1	40.1	88.2

Part III: 1-Year Growth Rate									
(A) Sales									
Average	−47.3	−12.9	1.2	7.6	10.9	14.2	21.0	38.7	121.7
Ending 1998	−58.3	−20.8	−1.4	6.3	10.3	14.5	24.9	54.1	181.9
(B) Operating Income before Depreciation									
Average	−69.4	−30.7	−5.6	5.9	11.8	17.7	30.6	67.4	253.3
Ending 1998	−74.1	−34.7	−4.9	6.7	12.2	18.5	32.2	76.5	273.2
(C) Income before Extraordinary Items									
Average	−76.8	−37.9	−7.4	6.9	13.3	19.9	35.8	90.2	435.3
Ending 1998	−87.3	−48.2	−13.7	5.4	13.7	21.3	40.4	115.0	727.2

Table II

Distribution of Growth Rates of Operating Performance over 1, 5 and 10 Years: Large Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one, five, and ten years for large firms (in the top two deciles of year-end equity market capitalization, based on NYSE breakpoints). The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Percentiles of the distribution are calculated each year-end; the simple average over the entire sample period of the percentiles is reported, along with the distribution of growth rates over horizons ending in the last year of the sample period.

	Percentile								
Sample period	2%	10%	25%	40%	50%	60%	75%	90%	98%
Part I: Annualized Growth Rate over 10 Years									
(A) Sales									
Average	−3.4	2.5	6.8	9.4	10.7	11.7	13.3	16.3	22.0
Ending 1998	−7.7	−0.2	4.4	6.7	8.5	9.5	11.1	15.0	21.5
(B) Operating Income before Depreciation									
Average	−8.3	0.6	5.4	8.1	9.5	10.8	12.9	16.1	22.6
Ending 1998	−11.6	−1.7	4.3	7.4	8.7	10.4	11.8	16.3	21.4
(C) Income before Extraordinary Items									
Average	−12.8	−0.9	4.5	7.5	9.3	10.8	13.1	16.6	23.8
Ending 1998	−25.6	−3.8	1.7	6.1	8.2	9.9	13.3	18.5	36.4
Part II: Annualized Growth Rate over 5 Years									
(A) Sales									
Average	−9.7	−0.6	6.9	9.4	10.8	11.9	14.1	18.1	27.9
Ending 1998	−13.6	−3.0	4.0	8.8	10.2	11.5	13.7	19.6	32.5
(B) Operating Income before Depreciation									
Average	−16.9	−3.5	4.3	7.9	9.8	11.5	14.3	19.3	32.1
Ending 1998	−13.6	−6.6	4.5	7.5	10.8	12.7	15.6	19.9	32.0
(C) Income before Extraordinary Items									
Average	−26.4	−6.4	2.8	7.6	9.8	12.0	15.3	21.3	37.2
Ending 1998	−39.5	−10.1	4.3	9.5	11.8	14.4	19.6	30.4	57.4
Part III: 1-Year Growth Rate									
(A) Sales									
Average	−36.4	−2.4	5.7	9.3	11.3	13.3	17.0	25.2	47.7
Ending 1998	−49.8	−14.7	1.5	6.6	8.9	11.8	18.1	29.1	53.0
(B) Operating Income before Depreciation									
Average	−52.3	−15.2	0.2	7.1	10.6	13.8	19.8	33.7	82.3
Ending 1998	−60.0	−30.3	−1.9	6.6	11.1	14.0	20.8	33.4	73.1
(C) Income before Extraordinary Items									
Average	−67.5	−25.3	−2.8	6.9	11.0	14.9	23.1	45.9	216.6
Ending 1998	−80.0	−46.9	−13.5	4.7	11.5	15.5	27.1	56.7	213.6

consensus forecast of professional economists (see Welch (2000)), but is in line with Fama and French (2002).

III. Persistence in Growth

Differences in valuations indicate a pervasive belief that stocks with high or low future growth are easily identifiable ex ante. For example, analysts and investors seem to believe that a firm that has grown rapidly in the past for several years in a row is highly likely to repeat this performance in the future. Conversely, stocks that have done poorly over prolonged periods are shunned and trade at low multiples. This section checks whether there is consistency in growth. We examine whether past growth or other characteristics, such as industry affiliation or firm size, help to predict future growth.

A. Consistency across All Firms

Tables I and II suggest that year-to-year growth in income can take on quite extreme values. As a result, multiyear growth rate levels may look impressive because of one or two isolated years of sharp growth, although growth in other years may be unremarkable. However, many of the firms with lofty multiples grow rapidly every year for several years. Accordingly, we test for consistency in growth using a design that does not rely heavily on the level of growth rates.[5] In our first set of tests, we define consistency as achieving a growth rate above the median for a consecutive number of years: Such cases are labeled as runs.[6]

At each year-end over the sample period, we calculate how many firms achieve runs over horizons of 1 to 10 years in the future. A run over 5 years, for example, denotes a case where in each of the subsequent 5 years, a firm's growth rate exceeds the median growth rate that year. Each year's median is calculated over all growth rate observations available in that year. Again, note that survivorship bias affects our runs tests. To see how many firms achieve runs above the median for 5 years in a row, we necessarily look at firms that survive over the full 5 years. In each of these years, we compare the survivors to a median which is based on all available firms that year, including those that do not survive for the full 5 years,

[5] Brealey (1983) uses a similar procedure.

[6] We want to avoid discarding an entire sequence of observations because one year's growth rate cannot be calculated when earnings are negative. Instead, we handle such cases as follows, taking growth in operating income per share OI_t as an example. In addition to calculating the percentage growth rate of operating income as $(OI_{t+1} - OI_t)/OI_t$ for each firm, we also scale the change in operating income by the stock price as of the base year t, $(OI_{t+1} - OI_t)/P_t$. All firms in a given year are ranked by their values of change in income relative to stock price. For any firm with negative income in a base year, we find its percentile rank based on income change relative to price. We then look up the corresponding percentile value from the distribution of growth rates of income (based on firms with positive base-year values) for that year. This growth rate is then assigned to the firm with negative base-year income. At the same time, however, it would be dangerous to pin our estimates of growth over a 5- or 10-year horizon in Tables I and II on some imputed value of base-year earnings. Accordingly, we do not impute growth rates in those tables for cases with negative base-year values.

Table III

Persistence in Growth Rates of Operating Performance: All Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to ten years (or until delisting) for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales (panel A), operating income before depreciation (panel B), or income before extraordinary items available to common equity (panel C). Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. For each of the following ten years, the number of firms with valid growth rates, the number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years, the percentage these firms represent relative to the number of valid firms, and the percentage expected under the hypothesis of independence across years, are reported. Statistics are provided for the entire sample period, and for the ten-year horizon corresponding to the last sample formation year.

	Firms with Above-Median Growth each year for Number of Years									
Variable	1	2	3	4	5	6	7	8	9	10
					(A) Sales					
Average Number of Valid Firms	2771	2500	2263	2058	1878	1722	1590	1471	1364	1265
Average Number above Median	1386	721	382	209	118	70	42	26	17	11
Percent above Median	50.0	28.8	16.9	10.2	6.3	4.0	2.7	1.8	1.3	0.9
1989–1998	50.0	30.0	18.6	11.9	7.8	5.6	3.4	2.4	1.5	1.2
					(B) Operating Income before Depreciation					
Average Number of Valid Firms	2730	2456	2219	2014	1833	1678	1546	1428	1322	1223
Average Number above Median	1365	628	290	136	67	34	18	10	6	4
Percent above Median	50.0	25.6	13.0	6.8	3.6	2.0	1.2	0.7	0.5	0.3
1989–1998	50.0	25.0	13.1	7.0	4.0	2.1	1.3	0.8	0.5	0.5
					(C) Income before Extraordinary Items					
Average Number of Valid Firms	2782	2509	2271	2065	1884	1727	1593	1473	1365	1265
Average Number above Median	1391	625	277	125	57	28	14	7	4	2
Percent above Median	50.0	24.9	12.2	6.0	3.0	1.6	0.9	0.5	0.3	0.2
1989–1998	50.0	24.8	12.2	5.7	2.6	1.3	0.8	0.5	0.2	0.0
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	1.6	0.8	0.4	0.2	0.1

and newly listed firms. Since the survivors are likely to have better performance than the population, they tend to have a greater chance of being above the median. Section IV examines differences between the growth rates of surviving and nonsurviving firms.

Table III reports the counts of runs, averaged across the year-ends. For growth in sales (Panel A), for example, out of an average number of 2,900 firms available for sample selection at each year-end, 2,771 firms on average survive until the end of the following year. Over the following 10 years, there are on average 1,265 surviving firms. Of these, 11 have sales growth rates that exceed the median in each of the 10 years, representing 0.9 percent of the eligible firms. If sales growth is independent over time, we should expect to see 0.5^{10} (about 0.1 percent) of the surviving firms achieve runs above the median over 10 years (see the last row of the table). To give a flavor of what happens in the more recent years, we also report the percentage of firms with runs over the 10-year period ending in the last year of our sample period.

There is a great deal of persistence in sales growth. Over a five-year horizon, for example, on average 118 firms, or 6.3 percent of the 1878 firms who exist over the full five years, turn in runs above the median. The number expected under the hypothesis of independence over time is about 59 (3.1 percent of 1,878), so roughly twice more than expected achieve runs over five years.

The persistence in sales growth may reflect shifts in customer demand, which are likely to be fairly long-lasting. A firm can also sustain momentum in sales by expanding into new markets and opening new stores, by rolling out new or improved products, or by granting increasingly favorable credit terms. Persistence in sales may also arise from managers' "empire-building" efforts, such as expanding market share regardless of profitability. In all these cases, however, profit margins are likely to be shrinking as well, so growth in profits may not show as much persistence as sales growth.

While it may be relatively easy for a firm to generate growth in sales (by selling at a steep discount, for example), it is more difficult to generate growth in profits. The recent experience of Internet companies, where sales grew at the same time losses were accumulating, provides a stark example. Panel B confirms that there is less persistence in operating income before depreciation compared to sales. On average, 67 firms a year, or 3.6 percent of 1,833 surviving firms, have above-median runs for 5 consecutive years. The expected frequency of runs is 3.1 percent or 57 firms. There are, thus, 10 firms more than expected out of 1,833, so the difference is unremarkable. An average of 4 firms a year (or 0.3 percent of 1,223 survivors), which is only 3 more than expected, pull off above-median growth for 10 years in a row. The patterns in the more recent years do not deviate markedly from the averages across the entire sample period.

Any sign of persistence vanishes as we get closer to the bottom line (Panel C). On average, the number of firms who grow faster than the median for several years in a row is not different from what is expected by chance. An average of 57 firms out of 1,884 survivors (3 percent) beat the median for 5 years in a row, while 59 (3.1 percent) are expected to do so. Runs above the median for 10 years occur in 0.2 percent of 1,265 cases (or 2 firms), roughly matching the expected frequency (0.1 percent, or 1 firm). To sum up, analysts and investors seem to believe that many firms' earnings can consistently grow at high rates for quite a few years. The evidence suggests instead that the number of such occurrences is not much different from what might be expected from sheer luck. The lack of consistency in earnings growth agrees with the notion that in competitive markets, abnormal profits tend to be dissipated over time.

Table IV

Persistence in Growth Rates of Operating Performance: Selected Equity Classes

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to ten years (or until delisting) for all firms in the sample. The sample period is 1951 to 1998, and the underlying sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of (the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. For each of the following ten years, the number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years is expressed as a percentage of the number of firms with valid growth rates. Statistics are provided for the following sets of stocks: technology stocks (panel A), comprising stocks whose SIC codes begin with 283, 357, 366, 38, 48, or 737; value stocks (panel B), comprising stocks ranked in the top three deciles by book-to-market value of equity; glamour stocks (panel C), comprising an equivalent number as in panel B of the lowest-ranked stocks by book-to-market value of equity; large stocks (panel D), comprising stocks ranked in the top 2 deciles by equity market value; mid-cap stocks (panel E), comprising stocks ranked in the third through seventh deciles by equity market value; and small stocks (panel F), comprising stocks ranked in the bottom three deciles by equity market value. All decile breakpoints are based on domestic NYSE stocks only.

	Percent of Firms with Above-Median Growth each Year for Number of Years									
Variable	1	2	3	4	5	6	7	8	9	10
				(A) Technology Stocks						
Sales	51.6	30.7	19.1	12.5	8.5	5.9	4.2	3.0	2.3	1.7
Operating Income	51.0	27.2	14.9	8.7	5.3	3.3	2.2	1.4	1.0	0.7
Income before Extraordinary Items	50.9	25.9	13.5	7.3	4.1	2.5	1.5	0.9	0.5	0.4
				(B) Value Stocks						
Sales	50.6	30.0	18.2	11.1	6.9	4.3	2.8	1.9	1.3	0.9
Operating Income	49.3	25.3	13.2	6.8	3.5	1.8	0.9	0.5	0.3	0.2
Income before Extraordinary Items	48.3	23.8	11.4	5.4	2.5	1.2	0.7	0.4	0.3	0.2
				(C) Glamour Stocks						
Sales	48.3	26.6	15.1	8.5	4.7	2.7	1.7	1.0	0.8	0.6
Operating Income	50.1	25.2	11.9	5.9	3.3	1.7	1.0	0.6	0.4	0.3
Income before Extraordinary Items	50.7	25.2	12.0	5.8	2.9	1.6	0.9	0.4	0.2	0.1
				(D) Large Stocks						
Sales	53.2	31.3	18.9	11.7	7.5	4.8	3.2	2.2	1.6	1.1
Operating Income	49.4	25.2	13.0	6.9	3.7	2.0	1.1	0.6	0.4	0.3
Income before Extraordinary Items	46.7	21.9	10.0	4.7	2.2	1.2	0.7	0.4	0.3	0.2
				(E) Mid-cap Stocks						
Sales	53.9	32.4	19.8	12.1	7.6	4.9	3.3	2.2	1.5	1.0
Operating Income	50.5	26.6	13.9	7.5	4.2	2.4	1.5	1.0	0.7	0.4
Income before Extraordinary Items	49.4	24.9	12.4	6.2	3.1	1.6	0.9	0.5	0.3	0.2
				(E) Small Stocks						
Sales	47.0	26.1	14.7	8.6	5.2	3.2	2.1	1.4	1.0	0.7
Operating Income	50.1	25.2	12.6	6.4	3.3	1.8	1.0	0.6	0.4	0.2
Income before Extraordinary Items	51.0	25.5	12.6	6.3	3.2	1.7	0.9	0.4	0.2	0.1
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	1.6	0.8	0.4	0.2	0.1

B. Consistency for Subsets of Firms

While Table III suggests that there may not be much consistency in growth across all firms, it is possible that consistency may show up more strongly in subsets of firms. Table IV focuses our tests by looking at the performance of subsamples of firms. For a subsample such as small stocks, we consider a "run" as a case where the firm's growth rate exceeds the median for a consecutive number of years, where each year the median is calculated across all firms in the entire sample, not just small stocks. This explains why the percentage of runs is not identically 50 percent in the first year.

Many observers single out technology and pharmaceutical firms as instances of consistently high growth over long horizons. Such firms may be able to maintain high growth rates because of their intangible assets, such as specialized technological innovations or drug patents. Panel A examines firms in these sectors. Specifically, the sample comprises firms that are relatively heavily engaged in research and development activity, and are predominantly drawn from the computer equipment, software, electrical equipment, communications, and pharmaceutical industries.[7] Growth in sales and operating income for the set of technology firms both display strong persistence. However, the percentage of runs in income before extraordinary items does not differ markedly from the expected frequency. For example, over a five-year horizon, 14 firms (or 4.1 percent of the 331 surviving technology stocks) have above-median runs. This is only 4 more than the expected number of runs (10 firms, or 3.1 percent). The recent experience of Internet companies provides numerous examples where sales grow rapidly for several years, at the same time that losses are mounting.

Panel A may exaggerate the degree of persistence in growth for technology stocks on two accounts. First, the technology stocks are evaluated against the median growth rate of the entire sample of firms, which would include, for example, utility stocks with relatively unexciting growth rates. Second, technology stocks are relatively more volatile, so survivorship bias may be a particularly acute problem in this subsample.

Technology stocks that are intensive in research and development also tend to be glamour stocks with low ratios of book-to-market value of equity. The popular sentiment regarding persistence in growth applies to glamour stocks generally. These stocks typically enjoy higher past growth in operating performance than value stocks with high book-to-market ratios (see Lakonishok et al. (1994)). The evidence from psychology suggests that individuals tend to use simple heuristics in decision making. As LaPorta et al. (1997) argue, investors may think that there is more consistency in growth than actually exists, so they extrapolate glamour stocks' past good fortunes (and value stocks' past disappointments) too far into the future. Panels B and C of Table IV test for consistency in growth for value and glamour stocks, respectively. Value stocks comprise stocks that are ranked

[7] Specifically, the sample includes all firms whose SIC codes begin with 283, 357, 366, 38, 48, or 737. See Chan, Lakonishok, and Sougiannis (2001).

in the top three deciles by book-to-market ratio based on NYSE breakpoints, while glamour stocks represent an equivalent number of stocks with the lowest positive book-to-market ratios. Growth in sales is persistent for both sets of stocks. The results for the other measures of operating performance, however, are not markedly different across the two sets of stocks.

The remaining panels perform our runs tests for large, midcapitalization, and small stocks. Large stocks include stocks in the top two deciles of market capitalization based on NYSE breakpoints as of June in the sample selection year, midcapitalization stocks fall in the next five deciles, and small stocks include the bottom three deciles. While sales growth tends to be more persistent for large firms, it does not translate into persistent growth in income. Of the large stocks, 2.2 percent achieve five-year runs in growth of income before extraordinary items, while 3.2 percent of small stocks achieve the same result (the expected fraction is 3.1 percent).

C. Runs Tests Conditional on Past Growth

It might be expected that firms that have demonstrated consistently superior past growth would be able to maintain their growth in the future. In the case of firms such as Microsoft and EMC, their valuations at year-end 1999 reflected investors' bets that these firms will beat the odds and continue the streak. Table V checks whether firms that have demonstrated consistently high (or low) past growth have continued success in the future.

Part I of Table V applies runs tests to those firms that have achieved superior past growth. In Panel A, at every year-end, we select those firms with above-median growth in each of the prior five years (or three years), and examine their subsequent growth.

Superior past growth in sales carries over into the future. In Panel A1, out of all firms whose sales grow above the median rate each year over the prior three years, on average 305 firms survive over the three years following sample selection. Of these, 70 firms have above-median growth rates in each of the three postselection years. They represent 22.8 percent of the survivors, compared to the 12.5 percent that is expected by chance. Growth in income, on the other hand, is an entirely different matter (Panels A2 and A3). For example, there are 222 firms with the impressive track record of above-median growth in income before extraordinary items in each of the three prior years and that survive over the following three years. Yet over the postselection period, only 28 or 12.5 percent manage to repeat and beat the median over all available firms each year. This matches the number expected under the null hypothesis of independence. Although sample sizes become much smaller in the case of firms with favorable growth over the past five years, the findings are similar. Starting out with roughly 2,900 eligible firms on average, 43 firms enjoy a run over the preceding five years for growth in income before extraordinary items and survive over the subsequent five years. In these five years, the percentage of firms who manage to repeat the run is 5.1 percent, while the percentage expected by chance is 3.1 percent. This corresponds to only one run more than expected, however, so the difference is not outstanding.

Table V

Persistence in Growth Rates of Operating Performance: Firms with Superior and Poor Past Growth

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to five years (or until delisting) for firms with superior (part I of the table) or inferior (part II) past growth in operating performance. Firms with superior (inferior) past growth include: firms with above-median (below-median) operating performance growth each year over the past five or past three years; firms whose average rank on growth rate each year over the past five or past three years falls in the top (bottom) quartile. The sample period is 1951 to 1998, and eligible firms include all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales (panel 1), operating income before depreciation (panel 2), or income before extraordinary items available to common equity (panel 3). Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. For each of the following five years, the number of firms with valid growth rates, the number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years, the percentage these firms represent relative to the number of valid firms, and the percentage expected under the hypothesis of independence across years are reported.

	Part I: Firms with Superior Past Growth									
	(A) Firms with Past Above-Median Run									
	Firms with Above-Median Growth each Year for Past 5 Years and Above-Median Growth each Year for Number of Future Years:					Firms with Above-Median Growth each Year for Past 3 Years and Above-Median Growth each Year for Number of Future Years:				
	1	2	3	4	5	1	2	3	4	5
	(A1) Sales									
Average Number of Valid Firms	110	103	96	90	83	355	329	305	285	265
Average Number above Median	70	42	26	17	11	209	118	70	42	26
Percent above Median	63.3	41.0	27.3	19.0	13.7	58.9	35.6	22.8	14.8	9.9
	(A2) Operating Income before Depreciation									
Average Number of Valid Firms	61	57	53	50	47	267	245	227	210	194
Average Number above Median	34	18	10	6	4	136	67	34	18	10
Percent above Median	55.9	32.3	19.4	12.2	8.0	51.1	27.2	15.1	8.8	5.3
	(A3) Income before Extraordinary Items									
Average Number of Valid Firms	53	50	47	44	43	259	240	222	207	193
Average Number above Median	28	14	7	4	2	125	57	28	14	7
Percent above Median	51.9	27.8	15.1	8.4	5.1	48.3	23.7	12.5	6.7	3.6
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	50.0	25.0	12.5	6.3	3.1

Table V—*continued*

	(B) Firms with Past Average Growth Rank in Top Quartile									
	Firms with Average Growth Rank over Past 5 Years in Top Quartile and Above-Median Growth each Year for Number of Future Years					Firms with Average Growth Rank over Past 3 Years in Top Quartile and Above-Median Growth each Year for Number of Future Years				
	1	2	3	4	5	1	2	3	4	5
(B1) Sales										
Average Number of Valid Firms	78	71	66	61	56	204	187	172	159	147
Average Number above Median	47	27	16	10	6	120	67	39	24	15
Percent above Median	60.8	37.7	24.4	16.6	11.4	58.9	35.8	22.8	14.8	9.9
(B2) Operating Income before Depreciation										
Average Number of Valid Firms	35	32	30	27	25	133	121	110	100	91
Average Number above Median	18	8	4	2	1	65	31	15	8	4
Percent above Median	50.6	26.4	15.0	8.9	5.9	49.0	25.4	13.6	7.6	4.7
(B3) Income before Extraordinary Items										
Average Number of Valid Firms	29	27	25	23	22	121	112	103	94	86
Average Number above Median	13	5	3	1	0	56	24	11	5	2
Percent above Median	44.0	19.6	10.2	4.8	2.1	46.4	21.5	10.4	5.5	2.6

	Part II. Firms with Inferior Past Growth (C) Firms with Past Below-Median Run									
	Firms with Below Median Growth each Year for Past 5 Years and Above-Median Growth each Year for Number of Future Years:					Firms with Below Median Growth each Year for Past 3 Years and Above-Median Growth each Year for Number of Future Years:				
	1	2	3	4	5	1	2	3	4	5
(C1) Sales										
Average Number of Valid Firms	106	92	82	73	66	343	302	270	244	221
Average Number above Median	35	15	7	4	2	125	59	28	14	7
Percent above Median	33.0	16.3	8.6	4.9	2.5	36.4	19.4	10.6	5.9	3.4

				(C2) Operating Income before Depreciation						
Average Number of Valid Firms	39	35	32	30	28	229	206	186	170	156
Average Number above Median	20	9	5	2	1	122	58	27	13	6
Percent above Median	51.4	25.7	14.3	6.3	3.5	53.3	28.0	14.7	7.6	3.6
				(C3) Income before Extraordinary Items						
Average Number of Valid Firms	33	30	28	26	25	220	201	184	170	157
Average Number above Median	18	9	4	2	1	127	61	28	13	5
Percent above Median	56.2	30.2	14.8	6.7	3.0	57.7	30.4	15.3	7.7	3.4
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	50.0	25.0	12.5	6.3	3.1

	(D) Firms with Past Average Growth Rank in Bottom Quartile									
	Firms with Average Growth Rank over Past 5 Years in Bottom Quartile and Above-Median Growth each Year for Number of Future Years					Firms with Average Growth Rank over Past 3 Years in Bottom Quartile and Above-Median Growth each Year for Number of Future Years				
	1	2	3	4	5	1	2	3	4	5
					(D1) Sales					
Average Number of Valid Firms	86	74	65	57	51	202	175	154	137	123
Average Number above Median	29	12	6	3	1	71	32	14	6	3
Percent above Median	33.1	16.7	8.6	4.4	2.3	35.2	18.1	9.3	4.5	2.3
				(D2) Operating Income before Depreciation						
Average Number of Valid Firms	23	20	17	15	14	111	97	86	77	70
Average Number above Median	15	7	3	1	1	68	33	15	7	3
Percent above Median	63.8	34.8	19.8	8.9	4.2	61.8	33.7	17.5	8.7	4.1
				(D3) Income before Extraordinary Items						
Average Number of Valid Firms	18	16	14	13	12	100	89	80	72	66
Average Number above Median	13	7	4	2	1	68	34	16	7	3
Percent above Median	73.5	47.1	25.1	12.1	5.3	68.1	38.9	20.7	10.3	9.8

The results caution against extrapolating past success in income growth into the future.

A firm may have extraordinary past growth even though it slips below the median for one or two years, as long as growth in the other years is very high. To include such cases of successful past growth, we use a different criterion for what qualifies as superior past growth. In particular, we also classify firms by their average growth ranks. At every calendar year-end over the sample period, we assign each firm a score based on its past growth. The score is obtained by looking back over each of the preceding five (or three) years, ranking the firm's growth rate each year relative to all available firms (where the firms with the highest growth rate and the lowest growth rate get ranks of one and zero, respectively), and then averaging the ranks over five (or three) years. Firms whose average ranks fall in the top quartile are classified as firms with superior past growth in Panel B. While high past sales growth foretells high future sales growth, there are still no signs of persistence in growth of income before extraordinary items in Panel B3. Out of the firms who survive for three years following sample selection, 103 firms have an average rank based on growth over the preceding three years falling in the top quartile. Only 11 or 10.4 percent of them have above-median runs in the three postselection years, amounting to 2 less than the expected number.

In Part II of Table V, Panel C performs the same analysis for firms with below-median growth over each of the past five or past three years. However, survivorship bias is a particularly grave concern here. After a long period of lackluster performance, the firms that are left standing at the end of the following period are particularly likely to be those who post relatively high growth rates. From Panel C1, future sales growth is persistently low. The fraction of above-median runs in sales growth is notably lower than the expected percentage. On the other hand, they are not less likely to achieve favorable above-median runs with regard to future growth in income. For example, looking at firms with a below-median run for the past three years, over the following three- and five-year horizons, the actual (expected) proportions of above-median runs are 15.3 (12.5) and 3.4 (3.1) percent for growth in income before extraordinary items. While survivorship bias makes it difficult to draw a definitive conclusion, it does not appear that, going forward, the firms with disappointing past growth differ notably from the more successful firms with respect to growth in income.

D. Alternative Criteria for Consistency in Growth

Given the large transitory component of earnings, investors may consider a firm to show persistent growth even if its growth fades for a few years, as long as there is rapid growth for the rest of the time. Even a celebrated example of a growth stock such as Microsoft, for example, falls short of delivering above-median growth in income before extraordinary items for 10 years in a row.[8]

[8] In the 10-year period preceding the latest sample selection date, Microsoft's growth rank of 0.49 in 1994 narrowly misses the median that year.

In Table VI, we adopt more relaxed criteria for defining consistency in growth. In particular, we check whether a firm beats the median for most years over the horizon, but allow it to fall short of the median for one or two years. For example, looking forward from a sample selection date, 269 firms on average have sales growth rates that exceed the median in five out of the following six years. These firms represent 15.6 percent of the surviving firms, more than the expected value of 9.4 percent. In the case of income before extraordinary items, the departures from what is expected under independence are slender, especially over longer horizons. For instance, an average of 9.9 percent have income before extraordinary items growing at a rate above the median for five out of six years, which is close to the expectation of 9.4 percent. Similarly, if we let a firm falter for two years, 4.8 percent of the surviving firms have growth in income before extraordinary items that exceeds the median in 8 out of 10 years, compared to an expected value of 4.4 percent.

As another way to single out cases of sustained high growth while allowing for some slack, we require a firm to post an average annual growth rank over the subsequent five years that falls in the top quartile (where in any year a growth rank of one denotes the highest realized growth rate that year, and zero denotes the lowest rate). The results for this definition of consistency are provided in the last column of Table VI. On average, 1.4 percent of the surviving firms (27 firms) pass this criterion with respect to growth of income before extraordinary items. Assuming independence, the expected value is 2.5 percent.

In summary, analysts' forecasts as well as investors' valuations reflect a widespread belief in the investment community that many firms can achieve streaks of high growth in earnings. Perhaps this belief is akin to the notion that there are "hot hands" in basketball or mutual funds (see Camerer (1989) and Hendricks, Patel, and Zeckhauser (1993)). While there is persistence in sales growth, there is no evidence of persistence in terms of growth in the bottom line as reflected by operating income before depreciation and income before extraordinary items. Instead, the number of firms delivering sustained high growth in profits is not much different from what is expected by chance. The results for subsets of firms, and under a variety of definitions of what constitutes consistently superior growth, deliver the same verdict. Put more bluntly, the chances of being able to identify the next Microsoft are about the same as the odds of winning the lottery. This finding is what would be expected from economic theory: Competitive pressures ultimately dissipate excess earnings, so profitability growth reverts to a normal rate.

IV. The Behavior of Nonsurvivors

Survivorship bias is a serious concern in our tests. By necessity, we condition on surviving into the future in order to calculate growth rates and to carry out our runs tests. Moreover, in our runs tests, the survivors are compared each year to all firms (survivors and nonsurvivors) available that year. To gauge the poten-

Table VI

Distribution of Firms Classified by Above-Median Growth in Operating Performance over Indicated Horizon: All Firms

At every calendar year-end over the sample period, growth rates in operating performance are calculated over each of the following one to ten years (or until delisting) for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Operating performance is measured as sales (panel A), operating income before depreciation (panel B), or income before extraordinary items available to common equity (panel C). Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. The table reports the average number of firms with above-median growth in each of the indicated categories, as well as the percentage these firms represent relative to the number of valid firms; the last row reports the percentage expected under the hypothesis of independence across years. Statistics are provided for the entire sample period and for the ten-year horizon corresponding to the last sample formation year.

	Firms with Above-Median Growth							
Variable	3 out of 4 years	4 out of 5 years	5 out of 6 years	6 out of 7 years	6 out of 8 years	7 out of 9 years	8 out of 10 years	Firms with Average Growth Rank in Top Quartile over 5 Years
					(A) Sales			
Average Number	697	432	269	170	287	191	127	79
Percent	33.9	23.0	15.6	10.7	19.5	14.0	10.0	4.2
1989–1998	36.6	26.0	18.0	12.6	21.4	16.0	12.7	5.6
					(B) Operating Income before Depreciation			
Average Number	629	341	184	100	205	119	70	34
Percent	31.2	18.6	10.9	6.5	14.4	9.0	5.7	1.9
1989–1998	31.7	19.3	11.5	7.4	15.1	10.4	8.0	2.0
					(C) Income before Extraordinary Items			
Average Number	634	334	171	88	190	109	61	27
Percent	30.7	17.7	9.9	5.5	12.9	8.0	4.8	1.4
1989–1998	29.9	16.5	8.4	5.0	12.8	8.4	5.7	0.9
Expected Percent	25.0	15.6	9.4	5.5	10.9	7.0	4.4	2.5

tial magnitude of the problem, in this section, we replicate some of our tests on firms who do not survive over the entire future horizon.

Specifically, we examine two sets of stocks. Given our focus on long-horizon growth, we first select at each year-end a sample of firms who survive over the full 10-year following period. The behavior of these (the survivors) is compared to a second set (the nonsurvivors) that also includes firms who do not last for the full period. To strike a balance between the mix of survivors and nonsurvivors in this second set, we require firms to survive for the first five years after sample selection, but they may drop out between the 6th to 10th year of the postselection period.

The results are reported in Panels A and B of Table VII. The survivors have a higher chance than expected for achieving runs above the median in growth of income before extraordinary items. Conversely, the fraction of runs is lower for the set of nonsurvivors. Of the survivors, for example, 3.4 percent sustain runs for five years of growth in income before extraordinary items above the median (where the expected proportion is 3.1 percent). The corresponding percentage for nonsurvivors is 2.3 percent. Nonetheless, the differences across the two sets are generally not substantial. Panels C and D apply the same procedure to the technology stocks considered in Table IV. Here the differences across the two sets are more notable. At the five-year horizon, for example, 5.2 percent of the survivors achieve runs above the median for growth in income before extraordinary items, compared to 3.2 percent of the nonsurvivors.

Finally, Panels A and B of Part II of Table VII give the distribution of one-year growth rates for the two sets of firms (where the percentiles are averaged across all sample selection years). The results confirm that survivors realize higher growth rates than nonsurvivors. For example, the median growth in income before extraordinary items for the survivors averages 10.6 percent, compared to 8.2 percent for nonsurvivors.

V. The Predictability of Growth: Valuation Ratios

Based on the historical record, it is not out of the question for a firm to enjoy strong growth in excess of 20 percent a year for prolonged periods. The issue, however, is whether such firms are identifiable ex ante. Our attempts in the previous sections to uncover cases of persistently high future growth using information such as past growth, industry affiliation, value–glamour orientation, and firm size have limited success. In this section, we expand our search for predictability by investigating whether valuation indicators such as earnings-to-price, book-to-market, and sales-to-price ratios distinguish between firms with high or low future growth. Further, several studies suggest that investors are prone to judgmental biases, so they respond to past growth by extrapolating performance too far into the future (see, e.g., La Porta (1996) and La Porta et al. (1997)). Consequently, after a period of above- or below-average growth, the valuations of firms with high (low) realized growth may be pushed too high (or too low).

In Table VIII, stocks are sorted into deciles at each year-end on the basis of their growth rate in income before extraordinary items over the following five years (Panel A) or over the following 10 years (Panel B). Within each decile, we

Table VII

Results for Surviving versus Non-Surviving Firms: Persistence Tests and Growth Rates

At every calendar year-end over the sample period, two sets of firms are selected: firms that survive over the following ten years (survivors), and firms that survive over the following five years but thereafter fail to survive until the tenth year (nonsurvivors). For each set of firms, growth rates in operating performance are calculated over each of the following ten years. The sample period is 1951 to 1998, and all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files are eligible. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Part I provides runs tests of persistence over each of the following ten years for the two sets of firms: the average number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years is expressed as a percentage of the number of firms with valid growth rates. Part II reports the distribution of annualized growth rates realized over the sixth to tenth year (or until delisting) following sample selection for the two sets of firms. The simple average over the entire sample period of the percentiles is reported.

Part I: Runs Tests for Persistence										
	Percent of Firms with Above-Median Growth each Year for Number of Years:									
Variable	1	2	3	4	5	6	7	8	9	10
(A) Survivors (1265 firms)										
Sales	52.8	30.9	18.1	10.8	6.6	4.2	2.7	1.8	1.3	0.9
Operating Income before Depreciation	51.5	26.8	13.7	7.0	3.8	2.1	1.2	0.7	0.5	0.3
Income before Extraordinary Items	51.7	26.9	13.5	6.7	3.4	1.8	1.0	0.5	0.3	0.2
(B) Non-Survivors										
Number of Firms	445	445	445	445	445	344	250	165	86	0
Sales	48.7	26.6	14.6	8.1	4.5	2.8	1.7	1.1	0.8	—
Operating Income before Depreciation	50.0	24.2	11.5	5.5	2.5	1.3	0.7	0.5	0.3	—
Income before Extraordinary Items	49.1	23.8	11.1	5.1	2.3	1.1	0.6	0.3	0.1	—
(C) Survivors, Technology (195 firms)										
Sales	54.6	33.2	20.5	12.9	8.4	5.8	4.2	3.0	2.3	1.7
Operating Income before Depreciation	53.6	29.7	16.5	9.6	5.9	3.6	2.2	1.4	1.0	0.7
Income before Extraordinary Items	54.1	29.9	16.3	9.0	5.2	3.1	1.9	1.1	0.6	0.4

					(D) Non-Survivors, Technology					
Number of Firms	100	100	100	100	100	77	55	37	20	0
Sales	51.5	28.6	16.7	10.6	6.5	4.6	3.1	2.0	1.4	—
Operating Income before Depreciation	49.5	24.3	12.4	6.6	3.3	2.0	1.4	1.3	1.0	—
Income before Extraordinary Items	50.1	25.0	12.4	6.7	3.2	1.7	1.0	0.5	0.0	—
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	1.6	0.8	0.4	0.2	0.1

Part II: Annualized Growth Rates

	Percentile									
Variable	2%	10%	25%	40%	50%	60%	75%	95%	98%	
					(A) Survivors					
Sales	– 15.4	– 2.0	5.6	9.1	10.9	12.5	15.5	21.7	37.6	
Operating Income before Depreciation	– 23.3	– 6.8	2.8	7.6	10.1	12.5	16.9	25.5	48.0	
Income before Extraordinary Items	– 28.6	– 8.6	2.1	7.7	10.6	13.3	18.1	28.4	56.4	
					(B) Non-Survivors					
Sales	– 18.5	– 7.0	1.0	6.0	8.4	10.4	13.9	20.3	36.8	
Operating Income before Depreciation	– 26.1	– 12.5	– 2.6	4.7	8.1	11.5	16.3	25.7	47.9	
Income before Extraordinary Items	– 27.4	– 14.5	– 3.3	4.4	8.2	11.9	17.9	28.6	55.9	–

Table VIII
Valuation Ratios and Characteristics at Beginning and End of Horizon for Firms Classified by Growth in Income before Extraordinary Items

At every calendar year-end over the sample period, growth rates in income before extraordinary items available to common equity are calculated over the following five and ten years for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Growth rates are measured on a per share basis as of the sample selection date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Firms are classified into one of ten equally-sized categories based on their realized five- and ten-year growth rates. The following statistics are calculated for firms within each category: the median realized annual growth rate over the horizon; the average size decile rank at the beginning and end of the growth horizon; median valuation ratios at the beginning and at the end of the horizon. The ratios are the prior year's income before extraordinary items to price (*EP*), net sales to price (*SP*), and book value to market value of common equity (*BM*). Results are averaged over all years in the sample period, and are also reported for the last five- or 10-year period. Panel A of the table provides results for firms classified by growth rates over five years and for firms with above-median growth each year for five consecutive years; Panel B provides results for firms classified by ten-year growth rates.

	Panel A: Classified by Annualized Growth Rate over 5 Years Decile										
Variable	1	2	3	4	5	6	7	8	9	10	5-year run above median
Median Growth Rate	−18.9	−5.0	1.5	5.8	9.1	12.0	15.1	18.9	25.1	41.7	40.9
Beginning Size Decile Rank	4.118	4.773	5.087	5.423	5.447	5.526	5.338	4.989	4.273	3.272	3.699
Ending Size Decile Rank	3.526	4.414	4.831	5.275	5.452	5.668	5.652	5.482	5.056	4.243	5.163
Beginning Median EP Ratio	0.083	0.085	0.086	0.083	0.084	0.082	0.082	0.082	0.079	0.068	0.061
At Start of Last 5-year Period	0.050	0.056	0.059	0.055	0.060	0.055	0.052	0.047	0.037	0.021	0.033
Ending Median EP Ratio	0.055	0.073	0.078	0.080	0.082	0.081	0.080	0.079	0.077	0.075	0.066
At End of Last 5-year Period	0.033	0.047	0.052	0.053	0.052	0.052	0.049	0.050	0.046	0.042	0.040
Beginning Median BM Ratio	0.650	0.654	0.678	0.665	0.685	0.679	0.694	0.726	0.777	0.880	0.694
At Start of Last 5-year Period	0.465	0.485	0.476	0.465	0.494	0.430	0.458	0.437	0.452	0.537	0.446
Ending Median BM Ratio	1.115	0.927	0.845	0.789	0.755	0.700	0.669	0.610	0.574	0.560	0.369
At End of Last 5-year Period	0.549	0.495	0.501	0.461	0.402	0.367	0.350	0.337	0.291	0.292	0.200
Beginning Median SP Ratio	1.723	1.576	1.473	1.304	1.370	1.276	1.328	1.530	1.791	2.323	1.684
At Start of Last 5-year Period	0.962	1.022	1.079	0.825	0.890	0.807	0.822	1.065	1.052	1.423	0.914
Ending Median SP Ratio	2.606	2.062	1.783	1.501	1.422	1.288	1.274	1.305	1.377	1.503	1.012
At End of Last 5-year Period	1.174	0.860	0.972	0.638	0.653	0.587	0.573	0.649	0.563	0.681	0.460

Table VIII—*continued*

Panel B: Classified by Annualized Growth Rate over 10 years

Median Growth Rate	−10.8	−3.4	−0.3	2.1	3.9	5.6	7.4	9.4	12.4	19.3
Beginning Size Decile Rank	4.565	5.223	5.577	5.641	5.597	5.508	5.563	5.480	5.040	3.890
Ending Size Decile Rank	3.950	5.087	5.608	5.818	5.882	5.921	5.981	6.100	5.851	5.100
Beginning Median EP Ratio	0.088	0.088	0.087	0.087	0.087	0.086	0.085	0.081	0.080	0.069
At Start of Last 10-year Period	0.072	0.070	0.077	0.073	0.074	0.065	0.068	0.066	0.056	0.039
Ending Median EP Ratio	0.057	0.072	0.076	0.079	0.081	0.083	0.084	0.082	0.082	0.079
At End of Last 10-year Period	0.035	0.047	0.050	0.053	0.048	0.054	0.056	0.049	0.044	0.049
Beginning Median BM Ratio	0.653	0.699	0.696	0.699	0.726	0.707	0.723	0.706	0.742	0.817
At Start of Last 10-year Period	0.550	0.605	0.548	0.564	0.595	0.543	0.609	0.504	0.597	0.724
Ending Median BM Ratio	1.048	0.860	0.796	0.761	0.748	0.734	0.725	0.673	0.647	0.622
At End of Last 10-year Period	0.626	0.482	0.382	0.439	0.392	0.396	0.409	0.321	0.343	0.337
Beginning Median SP Ratio	1.664	1.560	1.470	1.392	1.429	1.399	1.415	1.408	1.503	2.022
At Start of Last 10-year Period	1.405	1.417	1.164	1.285	1.054	1.106	1.211	1.133	1.455	1.409
Ending Median SP Ratio	2.619	1.928	1.648	1.531	1.535	1.477	1.478	1.411	1.385	1.468
At End of Last 10-year Period	1.520	0.941	0.735	0.853	0.758	0.826	0.805	0.664	0.724	0.756

calculate the median realized growth rate, as well as median characteristics such as size decile rank and valuation ratios. This is done at the beginning of the 5- or 10-year growth horizon and also at the end of the horizon. We report results averaged across all sample selection years, as well as results for the most recent 5-year or 10-year growth horizon in our sample period.

We focus the discussion on Panel A of the table (the results are similar for the 10-year horizon). In line with the results from Tables I and II, the stocks in the extreme growth deciles tend to be smaller firms. The median firm in the top decile (with a growth rate of 41.7 percent a year) falls in the third size decile, while the median firm in the bottom decile (with a growth rate of −18.9 percent) ranks in the fourth size decile. Over the following 5 years, however, the high-growth firms perform relatively well, resulting in a surge in their market values. Conversely, the market values of the low-growth firms show a relative slump.

Sorting by realized future growth induces a mechanical association between growth rates and the level of earnings at the beginning and end of the growth horizon. To weaken this link, we measure earnings one year prior to the base year (or one year before the final year) of the growth horizon. The price is measured at the start or end of the horizon, so the numbers correspond to the conventional measure of trailing earnings yield that is widely used in practice and research. There is reason to be wary about relying too heavily on the earnings yield variable, however, because net income is the most problematic of our measures of operating performance. For example, a firm may have a low earnings yield because its price impounds investors' expectations of high growth in future earnings, but another reason may be its recent performance has been poor and its earnings are currently depressed. On this account, earnings-to-price ratios are not generally used in academic research, or investment industry analysis, to classify firms as "value" or "glamour" stocks. Instead other, better-behaved, indicators such as the book-to-market ratio, are favored.

The top decile of growth firms at the beginning of the growth horizon has a median earnings-price ratio (0.068) that is much lower than the others (which cluster around 0.08). The low earnings yield for this group is consistent with the notion that the market's valuation accurately incorporates future growth. On the other hand, decile portfolios 8 and 9, which also show relatively strong growth, do not have notably low earnings yields. Rather, the association for the highest-growth decile may reflect cases where firms grow from a depressed level of income. At the end of the growth horizon, only the earnings-price ratio of the bottom decile of firms is eye-catching. Contrary to intuition, however, these firms have comparatively low earnings yields so they appear to be relatively "expensive." Instead, the explanation here may also lie in their low earnings levels, since they have gone through a period of disappointing growth.

Given the shortcomings of the earnings yield variable, we also look at valuation measures that tend to be better-behaved. Table VIII provides median ratios of book-to-market and sales-to-price at the beginning and end of the growth horizon for each decile. Firms which are ranked in the highest decile by earnings growth have relatively high sales-to-price and book-to-market ratios at the beginning. For example, their median book-to-market ratio is 0.880 (compared to 0.690

averaged across the other groups) and the median sales-to-price multiple is 2.323 (compared to 1.486 for the other groups). The modest ex ante valuations suggest that the market fails to anticipate their subsequent growth.

On the other hand, ex post valuations closely track prior growth. The top decile of high-growth firms have ending book-to-market and sales-to-price ratios of 0.560 and 1.503, respectively. These are substantially lower than the averages across all the other groups. This finding fits in with earlier evidence on the existence of extrapolative biases in investors' expectations about future growth (see La Porta (1996) and La Porta et al. (1997)).

The last column in Panel A of Table VIII provides corresponding statistics for firms whose income before extraordinary items grows above the median rate for five consecutive years. The difference between these firms' valuation ratios at the beginning and end of the growth horizon is striking. At the beginning, their book-to-market and sales-to-price ratios are not too far out of line from the average, suggesting that their future performance is not foreseen by the market. However, at the end of the growth horizon, the median book-to-market and sales-to-price ratios of this group are the lowest in Table VIII. The rich ending multiples such firms command highlight the importance investors attach to consistently superior growth, and not just high growth per se. Investors handsomely reward firms that have achieved several consecutive years of strong growth, and believe they will continue the streak (counterfactually, as the results in Table V indicate).

In summary, the results suggest that market valuation ratios have little ability to sort out firms with high future growth from firms with low growth. Instead, in line with the extrapolative expectations hypothesis, investors tend to key on past growth. Firms that have achieved high growth in the past fetch high valuations, while firms with low past growth are penalized with poor valuations.

VI. Comparisons with IBES Consensus Forecasts

Security analysts' estimates of near-term earnings are widely disseminated and receive much attention. Dramatic movements in a stock's price can arise when an influential analyst issues a revised earnings estimate. Possibly, therefore, analysts' estimates of long-term earnings growth may also be useful in forecasting future growth over longer horizons. Analysts are not shy about making aggressive growth forecasts either (the dispersion between the top and bottom decile of IBES long-term forecasts is about 31 percent), so they apparently are confident in their own ability to pick the future success stories.

The current dividend yield on a stock may also have predictive power for future growth in earnings per share. Standard textbook analysis suggests that, given a firm's investment policy and ignoring tax effects, it is a matter of indifference to a shareholder whether earnings are paid out as current dividends or retained for growth in future dividends. For example, a firm may choose to raise the amount paid out from earnings as dividends to current shareholders. To maintain investment, however, it must use external financing, thereby diluting current shareholders' claims to future profits. In other words, high current dividends come at the expense of low future growth per share. To use a simple constant-growth dividend discount model as an illustration, given investors' required rate of return, there is a one-to-one trade-off between future growth per share and the dividend yield. Furthermore, a firm's dividend payout may signal whether it has attractive investment projects available to fuel future growth.

To allow a cleaner comparison with analysts' forecasts, which do not include dividends, in the remainder of the paper, we drop our convention of reinvesting dividends when we calculate growth rates. Analysts' predictions refer to growth in income before extraordinary items, but realized growth in this variable is highly prone to measurement problems (such as the exclusion of cases with negative base-year values for income). For this reason, we also report realized growth in sales and operating income before depreciation. Growth rates in these variables are correlated with growth in income before extraordinary items, but are better behaved and are available for a much larger fraction of the sample.

A. *Individual Firm Growth Rates*

Table IX relates IBES consensus long-term growth forecasts to realized future growth. At each year-end, we rank all domestic firms with available IBES long-term forecasts and sort them into quintiles. IBES long-term estimates do not become available until 1982, so the sample period in Table IX runs from 1982 to 1998. The breakpoints for the sort use all NYSE firms available as of the sample selection date (regardless of whether they survive in the future). In Table IX, we track the subsequent growth rates of firms who survive over the next one, three, or five years in each quintile. The median realized growth rate over firms in each quintile is then averaged across all sample selection dates.

The dispersion in IBES consensus growth forecasts is large, so analysts are boldly distinguishing between firms with high and low growth prospects. The median estimate in quintile 1 averages 6 percent, while the median estimate in quintile 5 is 22.4 percent on average.[9] Notably, analysts' estimates are quite optimistic. Over the period 1982 to 1998, the median of the distribution of IBES growth forecasts is about 14.5 percent, a far cry from the median realized five-year growth rate of about 9 percent for income before extraordinary items.[10]

Near-term realized growth tends to line up closely with the IBES estimate (Panel A). In the first postranking year, the median growth rate in income before extraordinary items is 18.3 percent on average for quintile 5, and 5.1 percent on average for quintile 1. The difference between the growth rates for the other quintile portfolios is much milder, however. Comparing quintiles 4 and 2, median growth rates in income before extraordinary items are apart by only 2.5 percent.

A naive model for predicting future growth uses the dividend yield, and is based on the trade-off between current dividends and future growth. Suppose,

[9] Note that since the breakpoints are based on NYSE stocks only, the number of stocks differs across the quintiles. In particular, many firms penetrate the top quintile.

[10] To sharpen the point, note that the median realized growth rate of nine percent (without dividends reinvested) is based on all firms, including smaller firms that tend to be associated with somewhat higher growth rates. IBES forecasts, on the other hand, predominantly cover larger firms.

Table IX

Realized Median Growth Rates of Operating Performance for Stocks Classified by IBES Long-Term Growth Forecasts

At every calendar year-end *t* over the sample period, stocks are ranked and classified to one of five groups based on IBES forecasts of long-term earnings growth. Results are reported for individual stocks and for portfolios. For individual stocks, growth rates in operating performance are calculated over each of the five subsequent years (years $t+1$ to $t+5$) for all firms in the sample with available data. The sample period is 1982 to 1998, and all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files are eligible. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends. The median realized growth over all stocks in each classification is calculated each year, and the simple average over the entire sample period is reported. For portfolios, a value-weighted portfolio is formed at each year-end from all the stocks in each quintile sorted by IBES forecasts. The portfolio's income before extraordinary items is calculated over each of the subsequent five years, with the proceeds from liquidating delisted stocks reinvested in the surviving stocks. Growth rates for each portfolio are calculated in each formation year, and the simple average over the entire sample period of the growth rates is reported. Also reported are the ratios of the prior year's income before extraordinary items per share to current price, and the prior year's cumulative regular dividends per share to current price.

	Quintile Based on IBES Forecast:				
Growth in:	1 (Low)	2	3	4	5 (High)
	(A) Growth Rate in Year t+1				
Sales	1.4	4.5	6.3	8.3	13.7
Operating Income before Depreciation	3.6	6.8	7.6	10.3	16.0
Income before Extraordinary Items	5.1	9.5	10.1	12.0	18.3
Portfolio Income before Extraordinary Items	12.6	4.2	4.5	7.2	13.6
No. with Positive Base & Survive 1 year	242	256	266	318	584
No. with Negative Base & Survive 1 year	71	78	60	88	265
	(B) Growth Rate in Year t+2				
Sales	1.7	4.5	6.4	7.8	11.6
Operating Income before Depreciation	3.2	7.0	8.4	9.9	14.0
Income before Extraordinary Items	4.7	9.9	10.5	12.2	16.4
Portfolio Income before Extraordinary Items	6.9	7.5	6.1	9.1	10.6
No. with Positive Base & Survive 2 years	225	235	244	296	497
No. with Negative Base & Survive 2 years	62	75	59	85	252
	(C) Annualized Growth Rate over 3 Years				
Sales	1.1	4.0	5.6	7.3	11.3
Operating Income before Depreciation	2.5	5.2	6.8	8.1	10.9
Income before Extraordinary Items	3.1	7.4	7.0	9.0	11.5
Portfolio Income before Extraordinary Items	9.0	7.3	5.2	7.1	11.4
No. with Positive Base & Survive 3 years	202	209	230	263	439
No. with Negative Base & Survive 3 years	67	70	56	82	217
	(D) Annualized Growth Rate over 5 Years				
Sales	1.2	3.4	5.1	6.9	9.9
Operating Income before Depreciation	2.2	5.1	6.8	7.3	9.2
Income before Extraordinary Items	2.0	6.5	6.5	8.0	9.5
Portfolio Income before Extraordinary Items	8.0	10.7	7.2	7.7	11.3
No. with Positive Base & Survive 5 years	182	179	201	233	356
No. with Negative Base & Survive 5 years	57	63	50	68	170
Median IBES Forecast	6.0	10.2	12.3	15.1	22.4
Median Stock Dividend Yield, %	6.0	3.4	2.7	1.5	0.1
Portfolio Dividend Yield, %	6.9	4.6	3.3	2.5	1.3
Median Stock Earnings to Price Ratio, %	10.0	8.9	7.9	7.2	5.6

as a first approximation, that all stocks have the same long-term expected return. Given this, the naive model forecasts a spread in future growth across stocks that is identical to the spread in their current dividend yields (but in the opposite direction). The naive forecast is quite successful at picking up differences in growth across the intermediate quintiles. Over the first postranking year, the difference between the dividend yields of quintiles 2 and 4 (3.4 and 1.5 percent, respectively) corresponds roughly to the difference in their growth rates. Once differences in the dividend yield are taken into account, then, IBES estimates have forecast power for realized growth over the first year only at the extremes.

In general, IBES long-term forecasts refer to a three- to five-year horizon, so the behavior of realized growth over these horizons is more interesting. Median realized growth rates over three years and over five years are reported in Panels C and D. These panels highlight the upward bias in analysts' long-term growth estimates. In every quintile, median forecasts exceed median realized growth rates, with the most pronounced bias in quintile 5. For five-year growth in income before extraordinary items, for example, the median forecast in the top quintile is 22.4 percent, much higher than the median realized growth rate, which is only 9.5 percent. Furthermore, the realized growth rate for the firms in the top quintile should be taken with a grain of salt. In the highest-ranked quintile, the percentage of firms who survive for the full five postranking years is lower than for any of the other quintiles. For example, there are 849 firms on average who survive in the first postranking year in quintile 5, but this drops to 526 by the fifth year, so about 38 percent of the firms drop out between the first and fifth years. For quintile 3, the corresponding counts are 326 and 251, respectively, so 23 percent disappear from the sample. The upshot is that realized growth in income before extraordinary items is likely to be somewhat overstated for firms in the top quintile.

Over longer horizons, analysts' growth estimates still do not add much information beyond what is contained in the dividend yield. For example, the median realized five-year growth rate is 9.5 percent for the highest-ranked quintile by IBES forecasts, compared to 2 percent for the lowest-ranked quintile. The difference of 7.5 percent is not much higher than the spread in their dividend yields. The yields are 0.1 percent and 6 percent for the highest and lowest ranked quintiles, respectively, so the dividend yield spread is 5.9 percent. The results for growth in operating income before depreciation yield similar conclusions.

To sum up, analysts forecast that long-term earnings growth for the top quintile outperforms the bottom quintile by 16.4 percent. The realized gap in five-year growth rates, however, is only 7.5 percent. Much of the spread in realized growth reflects differences in dividend yields, and some is due to survivorship bias in the top quintile. After accounting for these influences, analyst forecasts add information only over shorter horizons.

B. Portfolio Growth Rates

Issues of survivorship bias and low or negative base-year values for income before extraordinary items are major concerns. Table IX takes another approach to measuring growth rates that tries to work around these concerns. Specifically, after ranking stocks by IBES long-term forecasts at each year-end, we form a value-weighted portfolio of the stocks in each quintile. Value-weighting affords some degree of robustness to our measures, to the extent that problems in measuring growth are less severe for large companies. We then track over the postformation period the income before extraordinary items of the portfolio as a whole. If a stock is delisted in a year after portfolio formation, we assume it generates the average income of the remaining firms in that year. Then, at the end of the year, we take the proceeds from liquidating nonsurviving firms and reallocate them proportionally across the surviving stocks. As a result, we are able to use all eligible companies to calculate growth rates, regardless of whether they survive over the full growth horizon, or whether they have positive earnings in the base year.[11] The portfolio approach, however, is not without its drawbacks. As firms drop out of the sample and the funds from their liquidation are reinvested in the remaining firms, over time, the portfolio can build up large stakes in a relatively small number of surviving firms who tend to have relatively high growth rates. The implication is that long-term portfolio growth rates for cases where survivorship bias is acute, such as the fastest-growing firms in the top quintile by IBES forecasts as noted above, should be interpreted with caution.

The results for the portfolios' long-term growth rates are in line with our earlier findings. IBES long-term forecasts are essentially unrelated to realized growth in income before extraordinary items beyond one or two years out. For example, over the five postformation years (Panel D), the bottom and top quintile portfolios on average experience growth rates of 8 and 11.3 percent per year, respectively. The spread of 3.3 percent in the portfolios' growth rates is smaller than the gap between their dividend yields (5.6 percent).

One difference between our results for individual stocks' growth rates and the portfolios' growth rate concerns the performance of the bottom quintile in the first postranking year. In the year immediately following portfolio formation, the bottom quintile portfolio experiences a strong recovery. Its short-term growth rate (12.6 percent) falls slightly short of the top quintile portfolio's growth rate (13.6 percent). This difference from the earlier results based on individual stocks reflects several methodological details, specifically the use of value-weights, the inclusion in the portfolios of nonsurviving firms as well as firms with negative income, and the use of a time-series average of the yearly portfolio growth rates rather than the cross-sectional medians. In particular, since firms with low IBES forecasts generally tend to start with low or negative values of income before extraordinary items at the portfolio formation date, the growth rate over the following year is likely to be high.[12]

Analysts' forecasts substantially overstate realized long-term growth in the top three quintile portfolios. In the top-ranked quintile, for example, the median projected future growth rate is about 22.4 percent, but the portfolio's realized

[11] The portfolio approach to measuring growth rates is described further in Chan et al. (2000, 2001).

[12] Our results parallel the findings for the prospective earnings growth of beaten-down value stocks documented in Lakonishok et al. (1994).

growth is only 11.4 percent over three years and 11.3 percent over five years. These results suggest that, in general, caution should be exercised before relying too heavily on IBES long-term forecasts as estimates of expected growth in valuation studies. The bottom quintile portfolios by IBES forecasts predominantly comprise firms in mature industries whose growth prospects are relatively unexciting, so analysts' estimates come closer to the mark here. For instance, about 25 percent of the firms in the first quintile are utilities.

The long-term estimates of analysts may be overly optimistic for several reasons. One explanation draws on evidence from studies in psychology that individuals' forecasts are susceptible to cognitive biases.[13] For example, the confirmation bias suggests that individuals tend to focus on evidence that supports their beliefs, while downplaying other information that is inconsistent. In this regard, analysts' estimates will be particularly bullish for glamour stocks that have shown strong past growth and which enjoy favorable investor sentiment. In addition, an analyst is employed by a brokerage firm and is expected to make contributions beyond predicting earnings. Up-beat forecasts may encourage trading by investors and thereby raise commission income, as well as generate investment banking business from firms that receive favorable coverage. The general perception is that these aspects of the brokerage and investment banking business are larger, and their links to analysts closer, in the U.S. market than overseas. As one piece of evidence that such considerations may lead to inflated forecasts, IBES estimates as of mid-2001 for U.S. companies project long-term growth of about 18 percent on average. At the same time, in non-U.S. markets, analysts are forecasting long-term growth for companies of roughly the same size to average 11 percent. Perhaps the close ties that exist in practice between the brokerage and investment banking businesses in the U.S. market foster an environment where analysts tend to be less impartial and err on the side of optimism.

VII. Regression Models

We close out our analysis by gathering all the variables we have previously considered individually into one model in order to take our best shot at forecasting growth. Table X reports the results from cross-sectional regressions to predict future growth in operating profits. The model is

$$\begin{aligned} y_{it+j} = {} & \beta_0 + \beta_1 PASTGS5_{it} + \beta_2 EP_{it-1} + \beta_3 G_{it-1} + \beta_4 RDSALES_{it} \\ & + \beta_5 TECH_{it} + \beta_6 BM_{it} + \beta_7 PASTR6_{it} + \beta_8 IBESLTG_{it} + \beta_9 DP_{it} \\ & + \varepsilon_{it+j}. \end{aligned} \quad (1)$$

The dependent variable, y_{it+j}, is the rate of growth for firm i over year $t+j$ in sales (SALES), operating income before depreciation (OIBD), or income before extraordinary items available to common equity (IBEI). We forecast growth over the first year following sample selection, over the three and five years subsequent to sample selection, and over the second to fifth subsequent years.

[13] The evidence is discussed in Kahnemann and Riepe (1998) and Fisher and Statman (2000).

Table X

Forecasting Regressions for Growth Rates of Operating Performance

At every calendar year-end, a cross-sectional regression model is used to forecast growth rates of operating performance, y_{it+j} for firm i over the following one to five years for all firms in the sample with available data. The model is.

$$y_{it+j} = \beta_0 + \beta_1 PASTGS5_{it} + \beta_2 EP_{it-1} + \beta_3 G_{it-1} + \beta_4 RDSALES_{it} + \beta_5 TECH_{it} + \beta_6 BM_{it} + \beta_7 PASTR6_{it} + \beta_8 IBESLTG_{it} + \beta_9 DP_{it} + \varepsilon_{it+j}.$$

The dependent variable is growth in: sales (SALES); operating income before depreciation (OIBD); or income before extraordinary items available to common equity (IBEI). The variables used to forecast a firm's growth are *PASTGS5*, the growth in sales over the five years prior to the sample selection date; *EP*, the ratio of income before extraordinary items available to common equity to equity market value; *G*, the sustainable growth rate given by the product of return on equity (income before extraordinary items available to common equity relative to book equity) and plowback ratio (one minus the ratio of total dividends to common equity to income before extraordinary items available to common equity); *RDSALES*, the ratio of research and development expenditures to sales; *TECH*, a dummy variable with a value of one for a stock in the technology sector and zero otherwise; *BM*, book-to-market ratio; *PASTRGs*, the stock's prior six-month compound rate of return; *IBESLTGs*, the IBES consensus forecast for long-term growth; and *DP* the dividend yield, accumulated regular dividends per share over the last twelve months divided by current price per share.

Growth in:	*PASTGS5*	*EP*	*G*	*RDSALES*	*TECH*	*BM*	*PASTR6*	*IBESLTG*	*DP*	R^2
				(A) Growth Rate in Year t+1						
SALES	0.0890	0.1641	0.0141	0.0979	– 0.0038	– 0.0184	0.0365	0.3018	– 0.5258	0.0709
	(3.7)	(6.0)	(1.5)	(1.6)	(– 0.5)	(– 4.7)	(3.0)	(6.1)	(– 4.8)	
OIBD	– 0.0729	– 0.2400	0.0064	0.2047	– 0.0045	0.0031	– 0.0592	0.2334	– 0.5390	0.0274
	(– 1.3)	(– 3.3)	(0.9)	(1.0)	(– 0.3)	(0.4)	(– 2.4)	(2.6)	(– 3.9)	
OBEI	– 0.0971	– 0.3982	– 0.0242	– 0.0024	– 0.0162	0.0093	– 0.0621	0.1179	– 0.9564	0.0263
	(– 1.4)	(– 3.3)	(– 1.5)	(– 0.0)	(– 0.7)	(0.4)	(– 2.0)	(0.9)	(– 3.5)	
				(B) Annualized Growth Rate over Years t+1 to t+3						
SALES	0.0469	0.1400	0.0099	0.0974	0.0014	– 0.0253	0.0311	0.1901	– 0.5758	0.0984
	(1.3)	(5.4)	(1.6)	(3.1)	(0.6)	(– 9.2)	(6.8)	(9.3)	(– 6.4)	
OIBD	– 0.0547	– 0.0554	0.0014	0.3453	– 0.0127	– 0.0073	– 0.0089	0.1147	– 0.4060	0.0296
	(– 1.5)	(– 1.8)	(0.1)	(3.1)	(– 3.2)	(– 1.1)	(– 1.7)	(2.0)	(– 2.6)	
IBEI	0.0087	– 0.1881	0.0011	0.3436	– 0.0191	– 0.0061	– 0.0279	0.0758	– 0.0630	0.0257
	(0.5)	(– 6.0)	(0.1)	(2.4)	(– 2.9)	(– 0.4)	(– 6.5)	(0.9)	(– 0.3)	

Table X—*continued*

				(C) Annualized Growth Rate over Years t+1 to t+5						
SALES	0.0252	0.1074	0.0067	0.0931	0.0014	−0.0260	0.0227	0.1538	−0.5446	0.1175
	(0.7)	(10.5)	(3.6)	(6.8)	(0.4)	(−7.4)	(3.2)	(3.1)	(−16.6)	
OIBD	−0.0645	−0.0146	−0.0035	0.3476	−0.0115	−0.0069	−0.0133	0.1227	−0.2675	0.0367
	(−3.0)	(−0.6)	(−0.5)	(7.6)	(−10.3)	(−1.8)	(−2.3)	(1.5)	(−7.4)	
IBEI	−0.0163	−0.1222	−0.0098	0.2493	−0.0133	−0.0095	−0.0293	0.0729	−0.0917	0.0313
	(−4.2)	(−2.3)	(−0.6)	(3.7)	(−3.0)	(−1.0)	(−2.8)	(0.9)	(−0.7)	
SALES	0.1128	0.0351	0.0628	0.2554						0.0507
	(2.7)	(1.8)	(2.3)	(4.3)						
OIBD	−0.0080	−0.0518	−0.0166	0.3779						0.0150
	(−0.2)	(−3.3)	(−0.7)	(13.1)						
IBEI	0.0311	−0.1295	−0.0675	0.2229						0.0148
	(25.5)	(−3.8)	(−1.5)	(2.4)						
				(D) Annualized Growth Rate over Years t+2 to t+5						
SALES	0.0175	0.0983	0.0060	0.1020	0.0007	−0.0273	0.0218	0.1237	−0.5122	0.0902
	(0.5)	(5.0)	(2.9)	(5.6)	(0.2)	(−6.3)	(3.7)	(2.8)	(−20.1)	
OIBD	−0.0665	0.0136	−0.0147	0.3856	−0.0130	−0.0049	−0.0042	0.1354	−0.3197	0.0335
	(−2.1)	(1.0)	(−1.1)	(4.9)	(−7.7)	(−0.9)	(−0.3)	(1.7)	(−2.7)	
IBEI	0.0119	−0.0932	0.0018	0.2897	−0.0174	−0.0075	−0.0245	0.0809	−0.0538	0.0268
	(0.6)	(−2.6)	(0.1)	(12.8)	(−5.8)	(−0.6)	(−1.8)	(1.0)	(−0.4)	
SALES	0.0962	0.0279	0.0655	0.2515						0.0398
	(2.1)	(1.6)	(3.1)	(5.2)						
OIBD	−0.0097	−0.0255	−0.0023	0.3840						0.0144
	(−0.2)	(−1.2)	(−0.1)	(8.6)						
IBEI	0.0534	−0.1065	−0.0448	0.2310						0.0144
	(3.2)	(−3.3)	(−0.8)	(5.5)						

Growth in each operating peformance variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends. Values of *PASTGS5, RDSALES, EP, G,* and *PASTR6* are Winsorized at their 5th and 95th percentiles; *IBESLTG* is Winsorized at its 1st and 99th percentiles; and *DP* is Winsorized at its 98th percentile. Stocks with negative values of *BM* are excluded. In the regressions for *OIBD* or *IBEI,* firms with negative values of the operating performance variable in the base year are excluded, as are stocks with ratios of price to the operating performance variable above 100. The reported statistics are the averages over all years of the estimated coefficients, with t-statistics in parentheses, as well as the average R^2 of the model. In panels B to D, standard errors are based on the Hansen-Hodrick (1980) adjustment for serial correlation.

To see whether high past growth is a precursor to future growth, we use *PASTGS5*, the growth rate in sales over the five years prior to the sample selection date. Sales growth is correlated with earnings growth, but is much less erratic and so should yield a relatively more reliable verdict on whether past growth helps to predict future growth.[14]

Simple theoretical models of earnings growth suggest one set of variables that, in principle, should help to predict growth. For instance, a firm's earnings-to-price ratio, *EP*, is widely interpreted as impounding the market's expectations of future growth. We measure this as the firm's income before extraordinary items in the year prior to the sample selection date, relative to its price at the sample selection date. Similarly, in the standard constant-growth valuation model, a firm's sustainable growth rate is given by the product of its return on equity and its plowback ratio. Our proxy for this measure is *G*, where return on equity is measured as the firm's earnings before extraordinary items in the year prior to sample selection, divided by book equity in the preceding year; plowback is one minus the ratio in the prior year of dividends to income before extraordinary items.[15] Finally, to capture the firm's investment opportunities, we use the ratio of research and development expenditures to sales, *RDSALES*. The intensity of R&D relative to sales is widely used in practice as an indicator of how much resources a firm is investing in future growth opportunities (see, e.g., Chan et al. (2001)). When a firm has no R&D spending, we set this variable to zero, so all firms are eligible for the regression.

The forecast equation also incorporates variables that are popularly thought to connote high growth. Firms in technologically innovative industries, or more generally, growth stocks as measured by low book-to-market ratios, are popularly associated with high growth. High past returns for a stock may signal upward revisions in investors' expectations of future growth. Analysts' long-term forecasts are another proxy for the market's expectations of future growth. Finally, the dividend yield may provide information on the firm's investment opportunities and hence ability to grow future earnings. Correspondingly, the other forecasting variables are *TECH*, a dummy variable with a value of one for a stock in the pharmaceutical and technology sectors (defined as in Panel A of Table IV) and zero otherwise; *BM*, the firm's book-to-market value of equity; *PASTR*6, the stock's prior six-month compound rate of return; *IBESLTG*, the *IBES* consensus forecast of long-term growth; and *DP*, the ratio of dividends per share cumulated over the previous 12 months to current price. To be eligible for inclusion in the regression at a given horizon, a firm must have nonmissing values for all the predictors. In addition it must have a positive base-year value for the operating performance indicator in question, so as to calculate a growth rate. To screen out

[14] Results using past five-year growth in *OIBD* or *IBEI* as predictor variables indicate that these variables do a worse job in capturing any persistence in growth.

[15] Firms with negative value of book equity are dropped from the sample for the regression. In cases where the measure for sustainable growth is negative (when income is negative, or when dividends to common exceed income so the plowback ratio is negative), we set the sustainable growth rate variable *G* to zero.

outliers due to low values in the base year, we exclude cases where the ratio of the price to the operating performance variable exceeds 100 in the base year.

The model is estimated each year-end, yielding a time series of estimated coefficients and the adjusted R^2. Means for the time series, and t-statistics based on the standard error from the time series, are reported in Table X. Standard errors from the overlapping regressions in Panels B to D use the Hansen–Hodrick (1980) correction for serial correlation.

The results in Table X deliver a clear verdict on the amount of predictability in growth rates. In line with our earlier results, it is much easier to forecast growth in sales than growth in variables such as *OIBD* and *IBEI*, which focus more on the bottom line. For example, the forecasting model that has the highest adjusted R^2 in Table X is the equation for five-year growth in sales (11.75 percent; Panel C). By comparison, the adjusted R^2 in the equations for *OIBD* and *IBEI* barely exceed 3 percent, so there is relatively little predictability for growth in these variables. If anything, our results may be overstating the predictability in growth. Our cross-sectional regressions are reestimated monthly, so we let the coefficients in the model change over time. As a check on the robustness of our results, we also replicated the regressions in the table using growth rate ranks (ranging from zero for the firm with the lowest growth rate in that year to one for the firm with the highest growth rate). The results from the growth rank regressions echo the findings in Table X.

Our full model includes a total of nine predictors, and the correlations between some of them are quite high. As a result, sorting out the relative importance of each variable is not straightforward. Focusing on the models for *OIBD* and *IBEI*, no variable has coefficients that are statistically significant across all forecasting horizons. The coefficient of past sales growth *PASTGS5* is generally negative, suggesting that there are reversals in growth rates. When past sales have been declining, income levels tend to be low in the base year, resulting in relatively higher future growth rates.[16]

At least over longer horizons (Panels B to D), R&D intensity, *RDSALES*, has the strongest forecast power. In accordance with economic intuition, firms that are investing heavily in R&D, and thereby building up their intangible capital base, on average tend to be associated with elevated future growth. Specifically, a firm that spends 10 percent of its sales on R&D tends to have higher five-year growth in *IBEI* by about 2.5 percent, compared to a firm with no R&D (Panel C). However, the high correlation between *RDSALES* and variables like *TECH* or *DP* suggests caution is warranted in interpreting this result.

The variable *IBESLTG* is provided by supposed experts, and is widely used as a proxy for expected future growth. Its coefficient has the expected positive sign, but it is not statistically significant in the equations for *IBEI*. This variable does somewhat better in the equations for *OIBD*, especially over shorter horizons. In general, however, *IBESLTG* does not have higher forecast power than the divi-

[16] The effect of extremely low base-year values is mitigated to some extent because we drop from the regression cases where the ratio of the price to operating performance indicator exceeds 100 in the base year. However, this is only a partial solution.

dend yield, *DP*, which can be viewed as another proxy for the firm's investment opportunities.[17] In terms of predicting long-term growth, the forecasts of highly paid security analysts are about as helpful as the dividend yield, a piece of information that is readily available in the stock listings of most newspapers.

In line with the results in Table VIII, a low earnings yield *EP* is associated with higher future growth rates, especially for *IBEI*. However, the association is driven by a relatively small number of cases with unusually low base-year earnings. Low values of the earnings base result in a low earnings yield, and given that the firm survives, in an unusually high future growth rate. This explanation agrees with the results in Table VIII, where the relation between *EP* and future growth is confined to companies with the highest growth rates. As further confirmation of this line of reasoning, when we use growth in a variable such as *OIBD*, which is less prone to the problem of a low base level, *EP* does a poor job of forecasting in Table X.

The coefficient of the technology dummy *TECH* is highly significant in many cases, but it generally has an unexpected sign. This may be due to the high correlation between *TECH* and *RDSALES*. For example, dropping *RDSALES* from the model substantially reduces the *t*-statistics for *TECH* (although its coefficient retains a negative sign).

Neither the book-to-market ratio nor our proxy for sustainable growth *G* reliably predicts growth in *OIBD* and *IBEI*. Contrary to the conventional notion that high past returns signal high future growth, the coefficient of *PASTR6* is negative. The explanation for this result echoes our explanation for our findings with respect to *EP*. When a firm's near-term prospects sour and current earnings are poor, stock returns tend to be disappointing as well. Once again, these cases of low base levels of earnings may induce a negative association between past return and future growth.

Panels *C* and *D* also provide results that are based on a simple textbook model for predicting growth. Here the predictor variables are earnings yield, sustainable growth, and R&D intensity. The textbook model has weak forecast power. For example, over a five-year horizon, the adjusted R^2 from the equation for *IBEI* is only 1.48 percent.

VIII. Summary and Conclusions

We analyze historical long-term growth rates across a broad cross section of stocks using a variety of indicators of operating performance. All the indicators yield a median growth rate of about 10 percent per year (with dividends reinvested) over the 1951 to 1998 period. With dividends taken out, the median estimate is the same magnitude as the growth rate of gross domestic product over this period, between 3 and 3.5 percent in real terms. Given the survivorship bias underlying the growth rate calculations, the expected growth rate is likely to be lower. Based on these historical values and the low level of the current dividend

[17] Forecasting models with *IBESLTG* and DP as the only predictors yield qualitatively similar conclusions. In particular, the dividend yield does at least as well as the consensus forecast in forecasting growth.

yield, looking forward, the expected return on stocks in general does not appear to be high. In particular, the expected return using a constant-growth dividend valuation model is about 7.5 percent, assuming there is no mispricing.

Expectations about long-term growth are also crucial inputs in the valuation of individual stocks and for estimating firms' cost of capital. At year-end 1999, a sizeable portion of the market commanded price–earnings multiples in excess of 100. Justifying such a multiple under some relatively generous assumptions requires that earnings grow at a rate of about 29 percent per year for 10 years or more. Historically, some firms have achieved such dazzling growth. These instances are quite rare, however. Going by the historical record, only about 5 percent of surviving firms do better than a growth rate of 29 percent per year over 10 years. In the case of large firms, even fewer cases (less than 1 percent) would meet this cutoff. On this basis, historical patterns raise strong doubts about the sustainability of such valuations.

Nonetheless, market valuation ratios reflect a pervasive belief among market participants that firms who can consistently achieve high earnings growth over many years are identifiable ex ante. The long-term growth expectations of one influential segment of the market, security analysts, boldly distinguish between firms with strong and weak growth prospects. To see whether this belief that many firms can achieve persistently high growth holds up in reality, we use an experimental design that singles out cases where a firm consistently delivers favorable growth for several years in a row. Our results suggest that there is some persistence in sales revenue growth. The persistence in sales does not translate into persistence of earnings, however. Even though we measure consistency against a hurdle that is not particularly challenging (the median growth rate), there are few traces of persistence in growth of operating income before depreciation, or in income before extraordinary items. For example, on average three percent of the available firms manage to have streaks in growth above the median for five years in a row. This matches what is expected by chance. The evidence for persistence is still slim under more relaxed criteria for consistency in growth. All in all, the evidence suggests that the odds of an investor successfully uncovering the next stellar growth stock are about the same as correctly calling coin tosses.

A skeptic might argue that while there is little persistence for the population at large, specific segments of the market are able to improve earnings steadily over long periods. In particular, popular sentiment views firms in the pharmaceutical and technology sectors, along with glamour stocks, as being able to maintain consistently high growth rates. To accommodate this argument, we narrow our search to these subsets of firms. While there is persistence in sales growth, when it comes to growth in bottom-line income, over long horizons, the likelihood of achieving streaks is not much different from sheer luck. Conversely, value firms who are out of favor do not seem to do much worse, although survivorship bias makes it difficult to deliver a definitive verdict. To narrow the search even more, we check whether firms with consistently high past growth manage to maintain their performance going forward. While past growth carries over to future sales growth, the income variables do not display strong persistence.

There is a widespread belief that earnings-to-price ratios signal future growth rates. However, the cross-sectional relation between earnings yields and future growth is weak, except possibly in the cases of firms ranked highest by realized growth. For these firms, an inverse association between ex ante earnings yields and growth may arise because they start from a battered level of earnings in the base year, so future growth is high. In light of the noisiness of the earnings yield measure, academic and practitioner research mainly focuses on other valuation ratios such as book-to-market and sales-to-price. These multiples, which are better behaved, show little evidence of anticipating future growth. On the other hand, firms that enjoy a period of above-average growth are subsequently rewarded by investors with relatively high ratios of sales-to-price and book-to-market. Conversely, investors tend to penalize firms that have experienced poor growth. These results are consistent with the extrapolation hypothesis of La Porta (1996) and La Porta et al. (1997).

Additionally, it is commonly suggested that one group of informed participants, security analysts, may have some ability to predict growth. The dispersion in analysts' forecasts indicates their willingness to distinguish boldly between high- and low-growth prospects. IBES long-term growth estimates are associated with realized growth in the immediate short-term future. Over long horizons, however, there is little forecastability in earnings, and analysts' estimates tend to be overly optimistic. The spread in predicted growth between the top and bottom quintiles by IBES forecasts is 16.4 percent, but the dispersion in realized five-year growth rates is only 7.5 percent. On the basis of earnings growth for portfolios formed from stocks sorted by IBES forecasts, the spread in realized five-year growth rates is even smaller (3.3 percent). In any event, analysts' forecasts do not do much better than a naive model that predicts a one-for-one tradeoff between current dividend yield and future growth per share.

A regression forecasting model which brings to bear a battery of predictor variables confirms that there is some predictability in sales growth, but meager predictability in long-term growth of earnings. Only about three percent of the variation in five-year earnings growth rates is captured by the model. One variable that stands out is the level of research and development intensity, suggesting that a firm's intangible assets may have an important influence on its future performance. On the whole, the absence of predictability in growth fits in with the economic intuition that competitive pressures ultimately work to correct excessively high or excessively low profitability growth.

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Why So Much Error in Analysts' Earnings Forecasts?

Vijay Kumar Chopra

Wall Street analysts tend to be too optimistic about the earnings prospects of companies they follow. The average consensus 12-month EPS growth forecast is 17.7 percent, which is more than twice the actual growth rate. In aggregate, forecasts are 11.2 percent above actual earnings at the start of a year and are revised downward continuously in the course of the year. For the full study period reported here, the percentage of 12-month earnings estimates revised downward exceeded the percentage revised upward, on average, by 4.4 percent every month. Since 1993, however, the quality of analyst forecasts seems to have improved. This article provides an intuitive explanation of the change and suggests ways in which analysts can use the explanation to improve portfolio performance.

Use of earnings estimates is an integral part of equity valuation by fundamental and quantitative analysts, and the estimates have even become an integral part of financial reporting in the popular press. The behavior and uses of earnings estimates have been widely studied. I/B/E/S International has published an excellent bibliography of earnings expectation research (Brown 1996). Studies that have shown that analysts tend to overestimate earnings include Clayman and Schwartz (1994), Dreman and Berry (1995), and Olsen (1996). Clayman and Schwartz attributed the positive bias to analysts' tendency to "fall in love" with their stocks. In addition, they proposed that investment banking relationships of investment houses and the prospect of being cut off from access to company managers make issuing negative or critical reports on companies difficult for analysts. Dreman and Berry examined quarterly earnings estimates and found that the average forecast errors tend to be high; in their study, only a small percentage of estimates fell into an acceptable error range. Olsen ascribed the positive bias and lack of accuracy in earnings estimates to herding behavior among forecasters. Francis and Philbrick (1993) argued that analysts make optimistic forecasts to maintain relationships with company managers.

The data for the studies reported here are from the I/B/E/S Global Aggregates database, which aggregates bottom-up analyst earnings forecasts to create forecasts at the market level. The specific forecasts analyzed were for the earnings of the S&P 500 Index. I/B/E/S uses market-capitalization weights to combine the mean earnings forecasts for each company in the S&P 500 into an index of earnings estimates. The data are available on a monthly basis beginning with January 1985; the cutoff point for this study is December 30, 1997.

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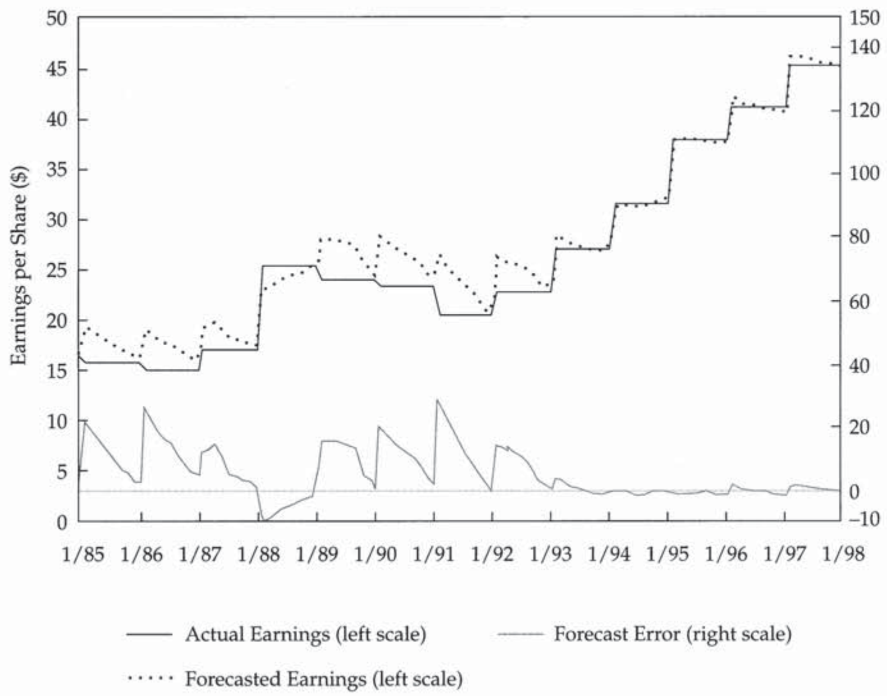
Forecast Changes during a Year

This study focused on how the forecasts for the S&P 500 earnings for the current fiscal year vary over the course of the year. **Figure 1** shows the "calendarized" current fiscal year (Calendar FY1 in I/B/E/S terminology) forecasts and actual earnings per share for the entire study period, January 1985 through December 1997.[1] Because of the delay in reporting earnings, the actual earnings are not known until after the year has ended. To make sure that all companies have reported, I used the actual earnings for a calendar year from the I/B/E/S computation made in July of the following year. Therefore, the July 1996 calculation of calendarized 1995 earnings is taken to be the actual earnings for calendarized 1995.

The calendarized actual earnings follow a stair-step pattern. The long-term upward trend and the cyclicality in actual earnings are both evident from Figure 1: Earnings tend to increase over the long run. The cumulative annualized growth rate in earnings for the period is 8 percent, but earnings

Figure 1. Calendarized FY1 Actual Earnings, Forecasted Earnings, and Forecast Errors for the S&P 500: 1985–97



have declined in some periods, such as 1986 and 1989–1991. The earnings recovery since 1992 has produced a steady step-up pattern.

In general, Figure 1 shows that earnings forecasts are very optimistic at the start of the year and decline toward actual values as the year progresses. The decline in full-year forecasts occurs as quarterly numbers are released and an increasing portion of the fiscal-year earnings becomes known. In addition, as the year progresses, company managers comment on the outlook for their companies in future quarters and analysts gather additional information that may lead them to revise their estimates. On rare occasions, analysts underestimate earnings, such as in 1988. For most years, however, analysts revise their initial estimates downward. Future research will have to separate the effect of time from the effect of better visibility for the late quarters of each year.

On average, the Street overestimated current-year earnings by 6.1 percent in the 1985–97 period. In some periods, such as around February 1991, the overestimation was as high as 30 percent, and in other periods, such as February 1988, earnings were underestimated by more than 8 percent. The average overestimation in the 1985–92 period was 9.4 percent.

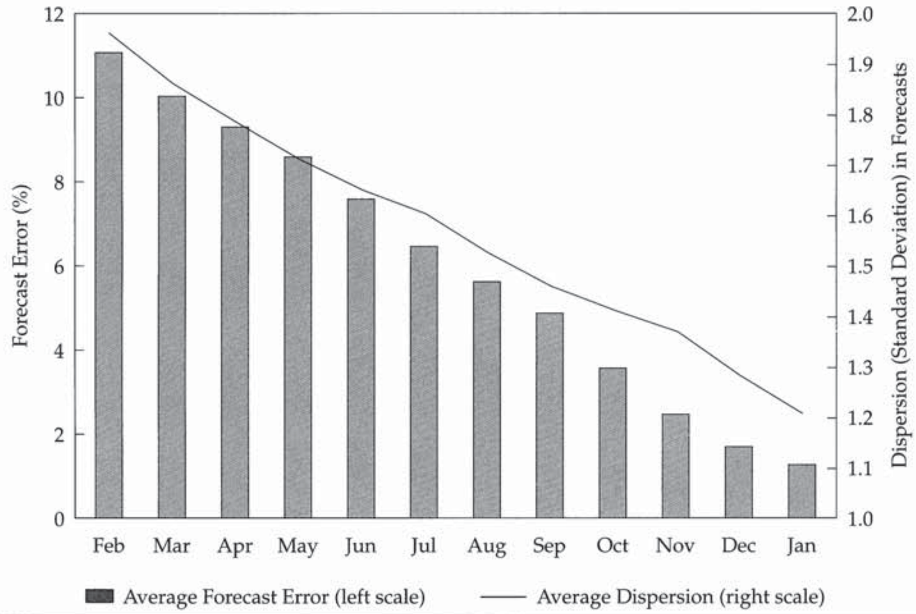
Since 1993, analyst forecasts have been much closer than in the past to actual earnings. The average forecast error since January 1993 has been remarkably small, an average overestimation of less than 1 percent.

Overestimations typically correct in the course of a year. **Figure 2** shows the decline toward reality of analyst optimism. On average, earnings are overestimated by about 11.2 percent at the start of the fiscal year. (The largest forecast errors occur in February because of the I/B/E/S convention of rolling over a calendar year at the end of January instead of at the end of December.) The overestimation declines to 8.7 percent three months later. Another quarter later, the estimate declines to only 6.6 percent above the actual. By the end of the third quarter, the overoptimism is only 3.6 percent. With attention shifting to the next fiscal year, the final overestimation is only slightly more than 1 percent on average. (Complete convergence does not occur at year end because of the delay in reporting earnings.)

The pattern of declining overestimation was more pronounced before 1993; in the pre-1993 period, the average forecast errors in February were almost 17 percent. At the end of July, they were still well over 10 percent. Since 1993, the error has been as low as 2 percent in February, fading to small negative values from September on.

Another perspective on analyst optimism can be gained by looking at the percentage of estimates of 12-month-forward earnings that are revised upward or downward every month.[2] **Figure 3**

Figure 2. Analyst Overoptimism and Dispersion in EPS Estimates: Monthly Pattern, Averages for 1985–97



Note: Estimates are from February of a calendar year to January of the following year because of the I/B/E/S February rollover. The initial estimate for Calendar FY1 is made in February, and the final estimate is made in January of Calendar FY2.

Figure 3. Net EPS Estimate Revisions

shows the net positive revisions of 12-month-forward earnings.[3] This series is volatile, but its overall trend is important. Most of the net revisions are negative, which is to be expected; analysts are constantly adjusting their estimates downward because the initial estimates are too optimistic. The average net revision for the entire period, indicated by the shaded line in Figure 3, is –4.4 percent—that is, the percentage of estimates revised downward exceeds the percentage revised upward by 4.4 percent each month. Since 1994, however, net revisions have been close to zero, which confirms the other evidence that analyst forecasts have improved in accuracy since that time.

Consider now another interesting aspect of analyst forecasts—the degree of disagreement among the estimates. Figure 2 shows the decline in the dispersion of estimates over the course of a typical year. The dispersion is greatest in February and declines systematically to its lowest value the following January. This decline can be attributed to quarterly earnings releases and the resulting increase in the visibility of the company's prospects. For the whole study period, dispersion in estimates at the level of the S&P 500 exhibits the sawtooth pattern shown in **Figure 4**. Analyst estimates of Calendar FY1 earnings show the greatest disagreement at the start of the year. As companies report interim quarterly results, the proportion of the fiscal year for which earnings have to be forecasted declines, which reduces the divergence in Calendar FY1 estimates as the year proceeds. This pattern has been particularly strong since 1988 and does not show any signs of fading in recent years. Although analysts may have gotten better at estimating the year's overall level of earnings, the disagreement among analysts over earnings estimates has not diminished over the years.

Forecasted versus Actual EPS Growth

Analysts' earnings growth rate forecasts provide another perspective on the overoptimism evident in their forward estimates of EPS. **Figure 5** shows the rolling 12-month-forward actual and forecasted growth in S&P 500 earnings. For example, the 12-month forecasted growth rate in March 1986 was 16.6 percent whereas the actual growth rate for the subsequent 12 months was –2 percent.

Figure 5 provides three key insights into analyst behavior. First, earnings growth forecasts are always positive. The forecasts lie roughly in the 10–30 percent range, with an average of 17.7 percent, whereas actual growth averages 8.6 percent, almost 9 percent below the forecasts on an annual basis. Therefore, on average, analysts' forecasts are double the actual growth rate in earnings.

Second, actual earnings growth rates vary a lot more than the forecasted rates. Actual earnings growth varies between –15 percent and 40 percent, whereas the forecasts lie within a much narrower range, 10–30 percent. The standard deviation of forecasted growth rates is only 5.4 percent, compared with a 12 percent standard deviation for actual earnings growth rates. Note that, in aggregate, analysts never forecast an absolute decline in earnings, but actual earnings have fallen for extended periods of time (e.g., January 1985 to June 1986, which coincided with a rapid decline in the pace of economic activity and a collapse in the price of oil, and again from January 1989 through June 1991, which was a time of brief economic recession).

Third, Figure 5 shows that, as with EPS levels, actual and forecasted EPS growth rates have been much closer since January 1993. **Table 1** summarizes the forecasting behavior of analysts for the

Figure 4. Dispersion in Analyst EPS Estimates over Time

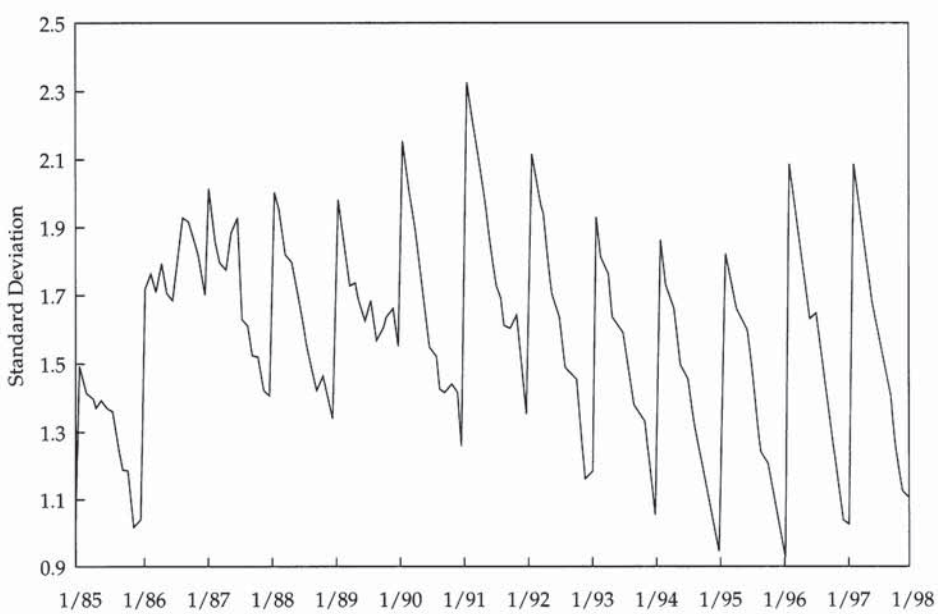
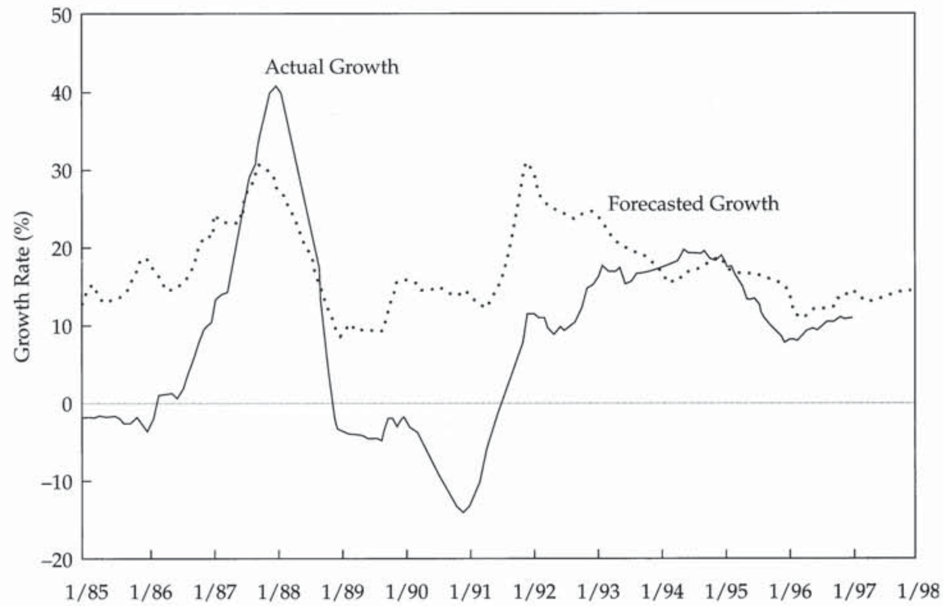


Figure 5. Forecasted versus Actual EPS Growth Rates



Note: The actual growth rates end in December 1996, whereas the forecasted growth rates are available through the end of 1997 because the actual growth rate is not known until 12 months after a given month-end. For example, the actual growth rate for March 1986 comes from March 1987 data.

Table 1. Twelve-Month-Forward Forecasted and Actual Earnings Growth Rates: Summary Statistics

Period/Statistic	Forecasted Growth Rate	Actual Growth Rate	Difference in Rates
January 1985 to December 1996			
Mean	17.7%	8.6%	9.1%
Standard deviation	5.4	12.0	9.3
Maximum	31.2	41.0	28.7
Minimum	8.4	–14.0	–13.1
January 1993 to December 1996			
Mean	16.5	14.4	2.1
Standard deviation	3.2	3.9	2.8
Maximum	24.3	19.5	8.3
Minimum	10.9	7.7	–2.9

Note: The difference between forecasted and actual growth rates is a new series. The last column shows the mean, standard deviation, maximum, and minimum for this series.

whole study period and the post-1993 periods. The average forecasted growth rate of 16.5 percent since January 1993 reported in Table 1 is only about 2 percent higher than the actual increase of 14.4 percent. The standard deviations have also been closer, at 3.2 for the forecast versus 3.9 for the actual.

The correlation between average forecasted and actual EPS growth rates for the total period is 0.67, which indicates that analysts have done a moderately good job of capturing changes in EPS growth rates over time. The correlation for the 1993–97 period was 0.70.

Does the recent convergence between analyst forecasts and actual EPS indicate a sudden increase in analyst forecasting ability? Possibly, but the more likely explanation is that analysts have continued to predict optimistic growth rates but those predictions turned out to be in line with actual rates that were high by historical standards. That is, because of restructurings during the previous decade, when the economy started strengthening in 1992, earnings per share grew strongly to match the usual analyst optimism. This explanation is supported by a comparison of rates since January 1993 with rates for the whole period. The forecasted growth rates are very close, 16.5 for the recent period and 17.7 for the whole period, which indicates that analyst optimism did not decline; the actual growth rate for the recent period, however, was almost 6 percentage points higher than growth for the whole period. In short, the actual growth rate for January 1993 through December 1997 has been close to the long-term average growth forecast in what has been one of the longest economic expansions in the history of the United States.

Economic Growth and Earnings Growth

At the aggregate level, company earnings are likely to be tied to the state of the economy. Strong economic growth should, therefore, lead to strong growth in EPS, and indeed, a comparison of growth in industrial production with earnings growth for the S&P 500 supports that expectation.[4]

Figure 6 provides plots of the year-on-year growth in industrial production and the year-on-year growth in actual earnings. Earnings growth lags industrial production growth by between 9 and 18 months, with an average of about 12 months. In order to highlight the close link between growth in industrial production and EPS growth, the earnings growth has been shifted back by 12 months; that is, for example, the June 1996 growth in industrial production is the growth for June 1995 to June 1996 and the June 1996 earnings growth is the growth from June 1996 to June 1997.

Figure 6 suggests that investment analysts could predict aggregate earnings using industrial production data. The correlation between the growth of the two series is 0.77. When industrial production is lagged by one additional month to account for the late release of the data, the correlation is still very high, 0.73. In comparison, the correlation between forecasted and actual earnings growth rates has been averaging 0.67.

An exploration of the link between the strength of the economy and earnings growth estimates will shed considerable light on why earnings estimates are consistently off the mark and why they have been closer to actual earnings since 1993. **Figure 7** shows the year-on-year growth in industrial production and plots the error in the 12-month-forward earnings growth forecast (the difference between the 12-month-forward forecasted earnings growth and actual earnings growth). The clear inverse relationship between the two series indicates that forecast errors are greatest when industrial production growth is at a peak or trough. Furthermore, when industrial production growth accelerates, forecast errors decline, and when industrial production decelerates, forecast errors increase. When growth in industrial production accelerates, earnings grow strongly and the gap between the optimistic growth forecasts and actual earnings growth narrows, which results in more-accurate forecasts. When growth in industrial production decelerates, earnings growth declines

Figure 6. Industrial Production Growth and Aggregate EPS Growth

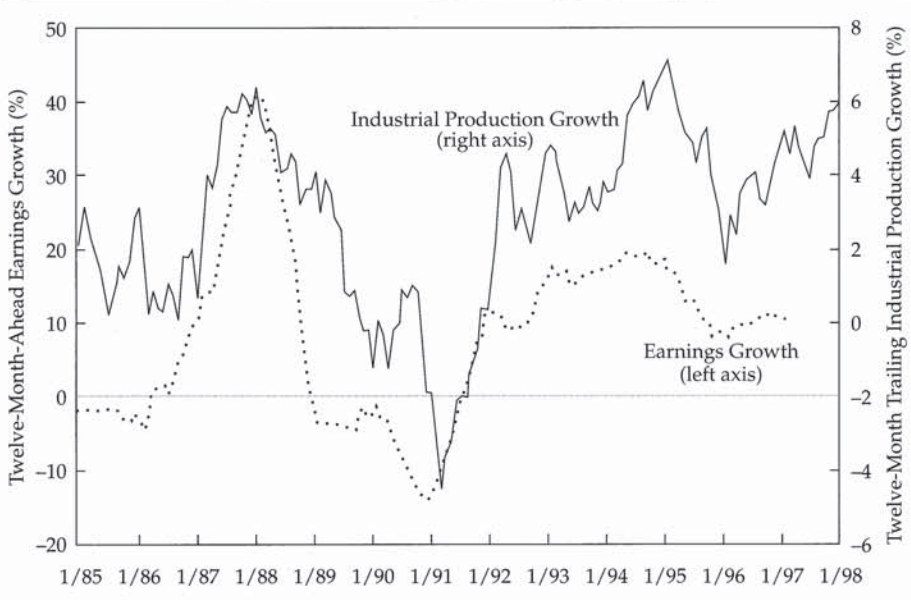
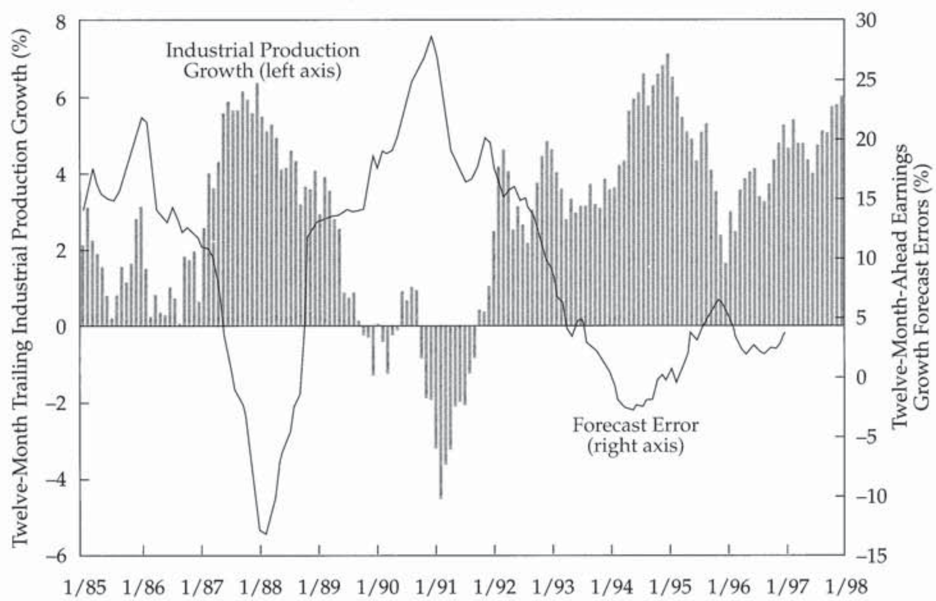


Figure 7. Industrial Production Growth and Errors in EPS Growth Forecasts



(with a 12-month lag) and the gap between the optimistic forecasts and actual earnings growth widens, which results in inaccurate forecasts. When industrial production growth is at its peak, the forecast errors overshoot on the downside and are large but negative. An example is the fourth quarter of 1987 through the first quarter of 1988. On the other hand, when the growth in industrial production started declining in January 1988 from 6.4 percent down to –4.5 percent in March 1991, the forecast errors went from –13 percent to almost 29 percent.

In light of this evidence on growth in the economy and analysts' forecasts, the aggregate behavior of analysts can be described as follows: They are normally very optimistic. When economic growth strengthens, actual earnings accelerate toward the normally optimistic forecasts, so forecast errors decline. If economic growth is very strong, earnings rise well beyond the forecasts, so analysts end up underforecasting earnings for a while. When the economy slows down, earnings start declining but the analysts' optimism prevents them from reducing their estimates far enough. Therefore, the size of forecast errors increases. If forecast errors are negative when the economy starts to slow down, as in January 1988, the errors become less negative at first; then, as the economy continues to decelerate and moves into a recession, the forecast errors move into the positive range and continue to grow. In December 1990, the errors hit a peak of almost 29 percent.

This behavior implies that analysts are likely to be most accurate in an environment of continuing strong economic growth, when earnings growth will approach the analysts' usually bullish forecasts—as has been the case since early 1992. The worst economic environment for aggregate analyst forecasts is one of an accelerating or decelerating economy, and the faster the pace of acceleration or deceleration, the greater the deviation between forecasts and actual earnings growth. The bottom line is that analysts will continue to forecast inaccurately as long as business cycles exist.[5]

Investment Implications

Users of EPS estimates will clearly benefit from recognizing the extent of analyst optimism. Valuation models that rely on earnings forecasts are likely to be biased, but if the extent of optimism is similar across industries and sectors, these valuation models will still be useful in evaluating stocks relative to each other.

The finding that forecast errors vary systematically with the business cycle suggests that analysts may focus too much on firm-specific issues and not enough on the overall macroeconomic environment. Portfolio managers could improve portfolio performance, therefore, by adjusting consensus earnings for systematic biases in forecasts.

One of the uses of aggregate estimate data is in global asset allocation, and conventional asset allocation approaches rely on comparing earnings yields with interest rates. Emanuelli and Pearson (1994) described an approach to global asset allocation that relies on estimate revisions. Recognizing that biases in earnings forecasts are linked to the business cycle and adjusting earnings forecasts to reduce the bias will improve the performance of such global asset allocation strategies.

Conclusion

Analysts' forecasts of EPS and growth in EPS tend to be overly optimistic. Calendarized earnings estimates overstate actual earnings by about 11 percent at the start of the year. These estimates are revised downward monotonically as a typical year unfolds. On average, the percentage of 12-month earnings estimates revised downward exceeds the percentage revised up by 4.4 percent a month. Analyst forecasts of 12-month earnings growth rates average 17.7 percent, more than twice the actual growth rate in the past 13 years.

Industrial production is a good predictor of earnings growth for a year in the future; the correlation is 0.77 percent. The analyst forecast for aggregate EPS growth is also a good predictor of actual growth (with a correlation of 0.67), but the forecasted growth rates are generally too optimistic and lie in a narrow (10–30 percent) range whereas the actual growth rates have varied from –10 percent to 40 percent.

Analysts' usual optimism, their tendency to forecast in a narrow and comfortable range, and the business cycle prove to be the bane of their forecasts. Acceleration or deceleration in economic growth tends to catch analysts off-guard. The forecasts are most accurate in an environment of continued strong growth, such as the one the U.S. economy has been in since 1992. Therefore, although the quality of forecasts has improved since 1992, it will deteriorate if and when the U.S. economy slows down and reverts to its historical cyclical pattern.

Notes

1. I/B/E/S uses the "Compustat rule" to calendarize company-level data prior to aggregation. Data for fiscal years ending between January and May are included in the aggregate for the prior calendar year. Data for the fiscal years ending between June and December of the current calendar year are included in the current calendar-year aggregate (Calendar FY1). For example, data for a company with a fiscal year ending in March 1996 are in the 1995 aggregate; data for a company with a fiscal year ending August 1996 are in the 1996 aggregate. I/B/E/S applies a February "rollover"; that is, when the calendar year ends and a new calendar year begins, the data for Calendar FY1 should shift or roll over from the year just ended to the new year, but I/B/E/S lags the shift by one month. Therefore, the current calendar year is not considered Calendar FY1 until February. The rationale for the lag is, presumably, that a majority of the companies with fiscal years ending in December do not report by the end of January.
2. I/B/E/S calculates 12-month-forward estimates for a company by prorating the current and next fiscal year estimates using the formula [(a/12)(Current fiscal year EPS] + [(12 – a)]/[12(Next fiscal year EPS)], where a is the number of months remaining in the current year. I/B/E/S then aggregates 12-month-forward company estimates to the index level.
3. Net revisions are defined as (Number of estimates revised upward – Number of estimates revised downward)/Total estimates, over the preceding four weeks, in percentage terms.
4. I used industrial production as a measure of economic activity instead of GDP because of the monthly availability of production data. Using GDP produced qualitatively similar results.
5. This link between forecast errors and the business cycle contrasts with the findings of Dreman and Berry, who found that forecast errors are not meaningfully affected by the business cycle.

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Trends in analyst earnings forecast properties

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Abstract

Forecast dispersion, error, and optimism are computed using 120,022 quarterly observations from 1990 to 2001. Forecast dispersion, error, and optimism all decrease steadily over the sample period, with loss firms showing an especially striking decrease. By the end of the sample period, dispersion and error differences between profit and loss firms are relatively minor, optimism for loss firms is around an unbiased 50%, and pessimism dominates profit firms. Additionally, loss firm earnings appear more difficult to forecast. The reduction in dispersion, error, and optimism does not appear fully attributable to earnings management, earnings guidance, or earnings smoothing. The trends are consistent with increased litigation concerns.

JEL classification: D84; G14; G24
Keywords: Earnings forecasts; Analysts; Earnings management; Forecast dispersion; Forecast accuracy

1. Introduction

A major responsibility of analysts is to make earnings forecasts. Professionals, such as investment bankers, financial advisors, and stockbrokers, rely on these forecasts to make their decisions, as do many individual investors. The forecasts serve as critical inputs into stock valuation models. Earnings announcement period returns are influenced by the forecasts (e.g., Imhoff & Lobo, 1992), and forecast dispersion is even related to monthly or annual stock returns (Ang & Ciccone, 2001; Diether, Malloy, & Scherbina, 2002; Dische, 2002). Forecasts are now publicly available on many investment-related web sites, providing free access to millions of investors all over the world.

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For a long period of time, the ability of analysts to forecast earnings was questioned. Analysts were biased some argued, optimistic and unresponsive to earnings changes (Abarbanell & Bernard, 1992; DeBondt & Thaler, 1990). They tended to herd, making forecasts or recommendations similar to other analysts (Hong, Kubik, & Solomon, 2000; Olsen, 1996; Stickel, 1990; Trueman, 1994; Welch, 2000). They were better than time-series earnings estimates, but only slightly (Fried & Givoly, 1982; O'Brien, 1988).

Recent studies have found that analyst forecasts have changed, perhaps even improved. Analysts have reduced both the size of their forecast errors and their optimism (Brown, 1997; Matsumoto, 2002; Richardson, Teoh, & Wysocki, 2001). Unfortunately for the analysts, many attribute this trend, not to better forecast accuracy, but to increases in earnings guidance, management, or smoothing (e.g., Degeorge, Patel, & Zeckhauser, 1999; Matsumoto, 2002).

The purpose of this study is twofold, both to document trends in forecast properties and to differentiate among theories as to why the trends exist. Several trends are investigated; some revisited, some new: (1) the trends of dispersion, error, and optimism; (2) the trend of wrongly forecasted profits or losses; (3) the trend of naïve forecast performance versus analyst forecast performance; (4) the trend of earnings volatility; and (5) the trend of Street versus GAAP earning differences. In addition, the influence of Regulation FD on the trends is examined. Quarterly data is used during a 1990 to 2001 sample period. As previous research has shown that analysts have greater difficulty forecasting the earnings of firms with losses (Brown, 2001; Butler & Saraoglu, 1999; Ciccone, 2001; Dowen, 1996; Dreman & Berry, 1995), firms with profits and losses are separated and examined independently in much of the testing.[1]

There are several possible explanations for changes in forecast properties: legal liability (e.g., Skinner, 1994), earnings guidance (e.g., Matsumoto, 2002), earnings management (e.g., Degeorge et al., 1999), earnings smoothing (consistent with Bartov, 1993), or information flow improvements (consistent with Asthana, 2003). The testing investigates the validity of these reasons.

The results are quite remarkable. Forecast properties have undergone an extraordinary change, perhaps best called a transformation, during the sample period. Forecast dispersion and error both decrease throughout the sample period, with most of the decrease due to loss firm forecasts. Although analysts still do not forecast loss firms with the same degree of accuracy as profit firms, the differences in forecasting performance are steadily eroding.

Optimism also decreases as analysts moved from being optimistically biased to being pessimistically biased during the sample period. The pessimism associated with profit firms is astonishing. Near the end of the sample period, almost three quarters of the

[1] Several related studies exist. Brown (1997), Richardson et al. (2001), and Matsumoto (2002) all show a decreasing trend in signed earnings surprise or optimism, although they do not separate firms by profitability. Gu and Wu (2003) evaluate forecast differences between profit and loss firms but do not examine trends in performance. Dreman and Berry (1995) and Butler and Saraoglu (1999) do separate firms by profitability while examining trends, but both rely on sample periods ending in 1991. Brown (2001) uses the signed, earnings surprise of the last forecast made prior to the earnings release date to examine shifts in the trend of the median surprise for profit and loss subsamples.

quarterly forecasts for profit firms are pessimistic. Analysts still tend to be optimistic toward loss firms, but this optimism has decreased dramatically over the sample period, hovering around an unbiased 50% at the end of the period. The decrease in the optimistic biases is so pronounced that the still-lingering legend of analyst earnings optimism (e.g., Easterwood & Nutt, 1999; Gu & Wu, 2003) is clearly no longer true, even for loss firms. If anything, analysts have a new concern: earnings pessimism for profit firms.

Additional results show that analysts have gotten much better at predicting the sign of earnings when firms report losses. Moreover, forecasting loss firm earnings appears to be much more difficult than forecasting profit firm earnings. Given this difficulty, analysts actually seem to provide greater value to the market when forecasting for loss firms.

Finally, the results suggest that the trends in forecast properties are unlikely to be fully attributable to earnings guidance, management, or smoothing. Firms unlikely to manage earnings—those with negative surprises, earnings declines, and losses—experience similar reductions in dispersion and error as the sample of all firms. So do firms considered unlikely to be guiding firms toward a specific earnings target, those with high dispersion. Furthermore, Street versus GAAP earnings differences and earnings volatility do not affect the results. The trends in forecast properties are consistent with litigation concerns, especially those surrounding loss reporting. In addition, although not specifically tested, analysts, aided by new information technology, may have simply improved in their forecasting abilities.

2. Forecast property changes

One of the most prominent explanations for the changing trends in forecast properties centers on earnings management. In the financial press, managers are often thought to play an "earnings game," manipulating reported earnings (and hence the surprise) to reap various benefits: increased stock prices, favorable publicity, and bonuses (Vickers, 1999). Fox (1997) tells of a Microsoft 1997 quarterly earnings release in January, the 41st time in 42 consecutive quarters that Microsoft met or beat the Wall Street consensus. The earnings game is often considered dangerous: when played long-term prospects are sacrificed by concern with short-term profits. Corporate decisions are altered, accounting rules are stretched, and investors lose faith in both financial statements and stock prices (Collingwood, 2001).

Academics have intensively investigated the issue of earnings management. Burgstahler and Dichev (1997) and Degeorge et al. (1999) find that firms manage earnings to meet analyst expectations, avoid losses, and avoid earnings declines. These studies mention several reasons why executives manage earnings, including increased job security, increased bonuses, and bolstered investor interest. Furthermore, anecdotal evidence suggests that firms like the favorable publicity of positive surprises, profits, and earnings increases. Of the three objectives identified by Degeorge, Patel, and Zeckhauser, the positive profit objective proves predominant. However, missing a consensus earnings estimate can be very costly to a firm. For example, Skinner and Sloan (2002) find that, all else equal, the price decline after a negative surprise is greater than the price increase following a positive surprise.

Another way of managing earnings entails “smoothing” or making earnings less volatile through time (e.g., Bartov, 1993). There are several theories that attempt to explain this behavior. Healy (1985) and Holthausen, Larcker, and Sloan (1995) find smoothed earnings are related to management bonus arrangements. Degeorge et al. (1999) use these findings to argue that managers may reduce high earnings levels to make future earnings objectives easier to meet. Fudenberg and Tirole (1995) argue that managers will boost earnings in bad times to increase the probability of retaining their jobs. Trueman and Titman (1988) believe that firms smooth earnings to lower their perceived bankruptcy risk and thus lower their cost of debt.

A cheaper way of playing the earnings game involves forecast guidance. Firms guide analysts toward a pessimistic target and then beat that target (Matsumoto, 2002), an easy way to garner favorable publicity.

An additional perspective on earnings guidance is rooted in legal liability issues. Firms face scrutiny when reporting large, unexpected losses. The consequent stock price decrease angers investors, who then might sue the firm for damages, consistent with Skinner (1994, 1997). Kasznik and Lev (1995) provide support for this argument by showing that firms increased their tendency to warn investors of impending losses. By warning of losses, firms are not necessarily playing an earnings game. As such, guiding analysts toward pessimistic targets and warning analysts of losses, although related, are considered two distinct concepts in this study.

Simpler explanations also exist to explain forecasting trends. For example, an alternative viewpoint looks at data availability and the information revolution, consistent with Asthana (2003). Forecasting techniques might be improving, aided in part by more precise and timelier economic information. Communications channels between firm managers and analysts may be better. Perhaps even the recent proliferation of freely available financial information on the Internet makes analysts more careful as they strive to add value and provide information above and beyond what is known by individual investors.

3. Data and methodology

The First Call summary database is used to obtain the forecast properties. Quarterly forecasts are used to present all results. The results using annual forecasts are similar to the quarterly results and do not require separate analysis. The last mean forecast available prior to the fiscal period end is used as the consensus forecast. All conclusions are similar if median forecasts are used instead of the mean forecasts or if the last mean forecasts prior to the earnings release are used instead of the last mean forecasts prior to fiscal period end.

Forecast dispersion is defined as the standard deviation of the forecasts divided by the absolute value of the mean forecast. This measure requires at least two forecasts.[2] Forecast error is defined as the difference between the actual earnings and the mean forecasted

[2] Although the procedure sharply reduces the sample size, the results for dispersion are similar if only companies with five or more analysts are included.

earnings, divided by the actual earnings. The absolute value is taken to obtain the final error number. A "raw error" is also computed as the absolute value of the difference between actual and forecasted earnings (i.e., the error is not deflated).[3] A forecast is considered optimistic if the mean forecast is greater than the corresponding actual earnings. The error and optimism measures require at least one forecast.

Many studies deflate the forecast properties by the stock price rather than the deflators described above. Thus, as a check, trends in dispersion and error are reexamined using price at the beginning of the fiscal year as the deflator. These results are qualitatively similar to the presented results, although the trends are not quite as obvious.[4]

Forecast dispersion is sometimes thought to signify herding. With this interpretation, low dispersion would be undesirable as it suggests greater herding. However, in this study, low dispersion is considered a desirable property. At least two reasons suggest this is true: (1) firms with losses or earnings declines, potential candidates to hide bad information, tend to have highly dispersed forecasts in previous studies (Ciccone, 2001), and (2) the high positive correlation between dispersion and error.[5]

An important component of this research is the separation of firms with losses and profits. A loss is defined as when the actual earnings per First Call are less than zero. A profit is defined as when actual earnings are greater than or equal to zero. First Call earnings, frequently referred to as "Street" or "operating" earnings (among other names), are often different from earnings under generally accepted accounting principles or GAAP (Abarbanell & Lehavy, 2000; Bradshaw & Sloan, 2002). The results are similar if GAAP earnings are used to determine profitability. The Compustat database is used to obtain GAAP earnings.

To alleviate problems with small denominators, a firm with a divisor less than US$0.02 in absolute value terms has the problem divisor set to US$0.02. Two procedures are used to reduce the influence of large observations. Firms with dispersion or error numbers greater than 10 and firms with earnings per share greater than an absolute value of US$20 are eliminated from their respective sample. Combined, the two procedures eliminate a total of 220 quarterly observations with no effect on the conclusions.

The final sample includes the years 1990 through 2001, a 12-year or 48-quarter period.[6] The total sample includes 120,022 firm quarters: 94,194 with profits and 25,828 (21.5%) with losses. The number of observations varies by the forecast property being examined.

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[3] The raw error, often called the "earnings surprise" (although usually with the sign or direction of the error), is important because this number is often reported by the news media. It is important to note that "error" and "raw error" have two distinct meanings in this study.

[4] Using price as a deflator, average profit firm dispersion decreases from 0.0027 in the early (1990–1995) sample period to 0.0015 in the later sample period (1996–2001). Loss firm dispersion decreases from 0.0128 to 0.0069. Profit firm error decreases from 0.0052 to 0.0041, while loss firm error decreases from 0.0409 to 0.0333. All differences are significant with 99% confidence.

[5] To illustrate the latter point, the correlation between the dispersion and error is computed as 0.22 (0.24 if a log transform is performed). In a related test, every quarter each firm is placed into 1 of 10 portfolios based on its ranking of dispersion and 1 of 10 portfolios based on its ranking of error. The correlation between the group placement (1–10) is then computed. The correlation between the dispersion and error groupings is .47.

[6] The year 1990 contains considerably less sample firms than the other 11 years. Caution is thus recommended when evaluating the 1990 data.

The dispersion measure has the fewest number of observations: 84,919 quarterly observations.

Portfolio analyses are used to communicate the results in an easily accessible manner. The included tables present the results year-by-year and also during two sample periods: an ‘‘early’’ sample period from 1990 through 1995 and a ‘‘later’’ sample period from 1996 through 2001. Each period contains half the sample years. In addition, regression models controlling for size and book-to-market ratio are used to support the major conclusions reached.

4. Forecasting trends

Table 1 presents, by year, the forecast properties and maximum number of observations (recall there are sample size differences among the various properties). Dispersion, error, raw error, and optimism all steadily decrease throughout the sample period. The trend for optimism is interesting as the forecasts changed from being optimistic more than 50% of the time in the first couple of sample years to being optimistic less than 50% of the time after 1992. The amount of optimism continues to decrease during the sample period, reaching a low of 34.27% in 2000.

Table 1
Forecast dispersion, error, and optimism

	Quarterly forecasts				
	Maximum number of observations	Dispersion	Error	Raw error	Percent optimistic
All years	120,022	0.22	0.44	0.09	40.27
1990–1995	40,949	0.27	0.48	0.11	45.90
1996–2001	79,073	0.20	0.42	0.09	37.36
Difference		0.07*	0.06*	0.02*	8.54*
1990	1373	0.31	0.58	0.16	57.70
1991	2929	0.38	0.59	0.15	53.77
1992	6497	0.30	0.46	0.11	46.36
1993	8411	0.26	0.46	0.12	46.64
1994	10,249	0.25	0.46	0.10	43.33
1995	11,490	0.24	0.47	0.09	43.88
1996	14,002	0.23	0.44	0.09	39.27
1997	14,942	0.19	0.41	0.08	38.86
1998	15,184	0.20	0.41	0.08	38.71
1999	13,638	0.20	0.43	0.09	34.95
2000	12,314	0.17	0.42	0.10	34.27
2001	8993	0.21	0.42	0.09	37.46

This table reports mean analyst quarterly forecast properties over the sample period 1990 through 2001. Dispersion is defined as the standard deviation of the quarterly forecasts divided by the absolute mean forecast. Raw error is defined as the absolute value of the actual earnings less the forecasted earnings. Error is defined as the absolute value of the actual earnings less the forecasted earnings, divided by the absolute actual earnings. A firm’s forecast is considered optimistic if the mean forecast is greater than the corresponding actual earnings. As the sample size varies by the forecast property in question, the maximum number of observations is reported.

* Difference is significantly different from zero with 99% confidence.

Table 2 shows the same forecast properties after separating firms by profitability. The dispersion and error of loss firms is considerably greater than the dispersion and error of profit firms. This occurs in every sample year and, although not tabulated, in every sample quarter. However, loss firms show greater reductions in dispersion and error throughout the sample period. The average dispersion of loss firms decreases from a high of 1.12 in 1990 to 0.30 in 2000 and 0.33 in 2001. Thus, the typical forecast dispersion of a loss firm today is roughly a quarter of what it was just 10 years ago. The story is similar for forecast error. The mean forecast error of loss firms decreases from a high of 1.16 in 1990 to 0.63 in 2000 and 0.55 in 2001. The error reduction for profit firms is not nearly as large, decreasing from a high of 0.48 in 1991 to 0.33 in 2000 and 0.35 in 2001.

The first two charts in Fig. 1 show the forecast dispersion and error by year and profitability. The figure provides a nice illustration of the eroding dichotomous forecasting ability of analysts. Clearly, analysts are narrowing the gap in their performance between profit and loss firms.

Table 2 also presents statistics for the mean raw error. Similar to the previous results, improvement in the raw error numbers occurs regardless of profitability, but the improvement is especially large for loss firms. For example, the raw error of loss firms decreases by more than half, from an average of US$0.48 in 1991 to US$0.21 in 2000 and US$0.16 in 2001.

The last columns of Table 2 show the percentage of optimistic forecasts. In the early sample period, analysts are overwhelmingly optimistic toward loss firms, more than 75% of time. The optimism remains above 70% until 1997 when it drops to 67.66%. From

Table 2
Forecast dispersion, error, raw error, and optimism by profitability

	Dispersion		Error		Raw error		Percent optimistic (negative surprise)	
	Profit	Loss	Profit	Loss	Profit	Loss	Profit	Loss
All quarters	0.15	0.53	0.35	0.78	0.06	0.23	33.63	64.48
1990–1995	0.18	0.88	0.37	1.02	0.07	0.33	40.32	75.93
1996–2001	0.13	0.43	0.33	0.70	0.05	0.20	29.76	60.70
Difference	0.05*	0.45*	0.04*	0.32*	0.02*	0.13*	10.56*	15.23*
1990	0.19	1.12	0.47	1.16	0.10	0.49	52.97	85.42
1991	0.24	1.11	0.48	1.09	0.08	0.48	48.40	78.44
1992	0.21	0.94	0.37	0.95	0.07	0.34	40.91	76.43
1993	0.17	0.91	0.37	0.96	0.08	0.34	41.67	74.80
1994	0.17	0.80	0.36	0.99	0.06	0.30	37.82	73.54
1995	0.16	0.81	0.35	1.11	0.06	0.28	37.54	76.75
1996	0.15	0.70	0.34	0.86	0.05	0.26	32.06	70.90
1997	0.12	0.50	0.32	0.78	0.05	0.22	31.58	67.66
1998	0.13	0.47	0.32	0.71	0.04	0.19	30.68	65.21
1999	0.14	0.39	0.33	0.70	0.05	0.20	26.84	58.42
2000	0.13	0.30	0.33	0.63	0.05	0.21	26.63	51.97
2001	0.15	0.33	0.35	0.55	0.05	0.16	29.44	53.12

This table reports mean analyst quarterly forecast properties sorted by profitability over the sample period 1990 through 2001. A profit occurs when actual quarterly earnings are greater than or equal to zero. A loss occurs when actual quarterly earnings are less than zero. See Table 1 for variable definitions.

* Difference is significantly different from zero with 99% confidence.

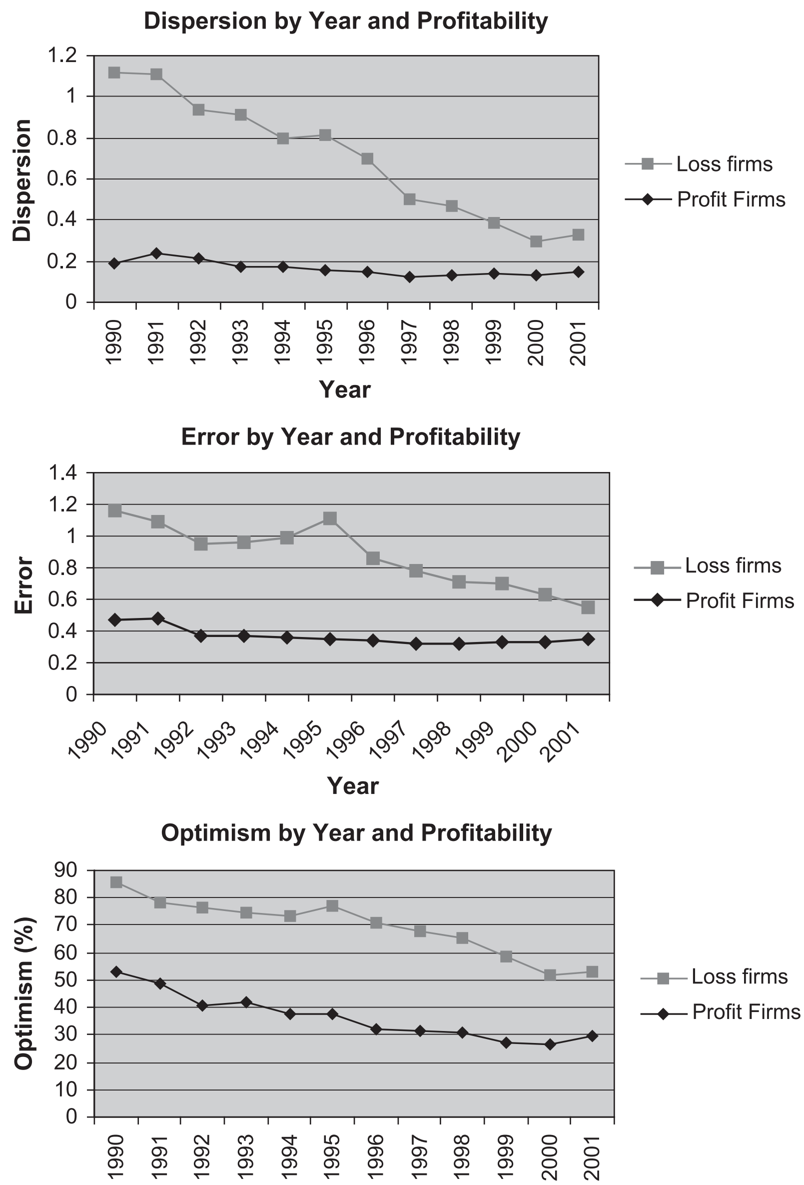

Fig. 1. Forecast properties by year and profitability.

there, the optimism continues to decrease, dropping to an almost unbiased 51.97% in 2000 and 53.12% in the 2001. For profit firms, optimism on average vanishes in 1991 and continues to decrease steadily throughout the sample period. By the end of the sample period, optimism is under 30%. The last chart in Fig. 1 illustrates this trend of decreasing optimism for both profit and loss firms.

Although the testing focuses on realized actual earnings to determine profitability, the results from Table 2 are repeated using expected earnings to determine profitability. Firms are resorted into profit and loss portfolios based on the mean forecast at fiscal year end. These results (not tabulated) are qualitatively similar to the Table 2 results, although average dispersion, error, and optimism are higher for expected profit firms (versus actual profit firms) and lower for expected loss firms. Optimism actually drops below 50% for expected loss firms during the last three sample years: 1999, 2000, and 2001. Related testing is performed on Table 6.

Regression models are utilized next to control for variables aside from profitability that influence forecasts. Previous studies have shown that size and growth prospects (growth indicated by book-to-market ratio) affect the information environment (e.g., Atiase, 1985; Ciccone, 2001).[7]

To test, two sets of regression models are used. The first set of regressions is employed to confirm the trend of lower dispersion and error during the sample period. These models use dispersion and error as the dependent variables and size, book-to-market ratio, a loss dummy variable, and year dummy variables as the independent variables. The Compustat database is used to gather the size and book-to-market ratio data. Size is defined as price times shares, computed at the beginning of the fiscal year. Book-to-market ratio is defined as beginning of fiscal year equity (Compustat item A216) divided by size. Logarithms of size and book-to-market ratio are used in the regressions. The loss dummy variable equals one if the actual First Call earnings are negative and zero otherwise. The year dummy variables equal one if the forecast is from the corresponding year and zero otherwise. The first year dummy variable corresponds to 1991, leaving 1990 as the base year. This specification is as follows for firm i during year t, quarter q.

$$\begin{aligned}\text{Forecast property}_{i,t,q} = {} & a + b_1 \ \log(\text{size})_{i,t} + b_2 \ \log(\text{b/m})_{i,t} \\ & + b_3 \ \text{loss dummy}_{i,t,q} + b_4 \ \text{year 1991 dummy}_{i,t} + \ldots \\ & + b_{14} \ \text{year 2001 dummy}_{i,t} + e_{i,t,q} \qquad (1)\end{aligned}$$

Table 3 presents the results of these regressions. Although size, book-to-market ratio, and especially losses affect the forecasts, the significant, negative values on the year dummy variables tend to increase in magnitude over the sample period. For example, using error as the dependent variable, the coefficient of the 1992 year dummy is -0.11 (indicating an average decrease of -0.11 relative to the 1990 base year), while that of the 2001 year dummy is -0.23 (indicating an average decrease of -0.23 relative to the 1990 base year). These results confirm the trends revealed in the portfolio results.

In the second set of regressions, models are employed annually from 1990 through 2001 to confirm the erosion of differences between profit and loss firm forecasts.

[7] The size of the analyst following is also included in separate regressions with no effect on the conclusions. Analyst following is not included in the presented results because of its strong correlation to size, thus blurring the relation between size and the forecast properties.

Table 3
Regression results using year dummy variables

	Dispersion		Error	
	Coefficient	*t* Value	Coefficient	*t* Value
Intercept	0.24	9.21	1.09	30.61
log (size)	0.01	2.17	− 0.04	− 22.61
log (book/market)	0.06	21.55	0.06	15.95
Loss dummy	0.42	82.48	0.43	61.21
1991	0.07	2.78	− 0.02	− 0.60
1992	0.00	0.21	− 0.11	− 3.71
1993	− 0.03	− 1.21	− 0.13	− 4.42
1994	− 0.04	− 1.99	− 0.13	− 4.47
1995	− 0.05	− 2.33	− 0.12	− 4.33
1996	− 0.05	− 2.45	− 0.15	− 5.34
1997	− 0.11	− 5.40	− 0.19	− 6.86
1998	− 0.11	− 5.44	− 0.19	− 6.82
1999	− 0.13	− 6.23	− 0.19	− 6.67
2000	− 0.15	− 7.61	− 0.20	− 7.31
2001	− 0.17	− 8.27	− 0.23	− 8.29
N	75,337		105,287	

This table reports the results of a regression model. Either forecast dispersion or error is the dependent variable. The independent variables are the logarithm of size (price times shares) in thousands, the logarithm of book-to-market value (equity/size), a loss dummy equal to one if the actual quarterly First Call earnings are below zero and equal to zero otherwise, and year dummy variables spanning 1991 through 2001 equal to one if the quarterly forecast is from the corresponding year. The regression model is below:

$$\text{Forecast property}_{i,t} = a + b_1\log(\text{size})_{i,t} + b_2\log(\text{b/m})_{i,t} + b_3 \text{ loss dummy}_{i,t} + b_4 \text{ year 1991 dummy}_{i,t} + \ldots + b_{14} \text{ year 2001 dummy}_{i,t} + e_{i,t}$$

Dispersion and error are the dependent variables, while size, book-to-market ratio, and a loss dummy variable are the independent variables. The annual model appears below:

$$\text{Forecast property}_{i,q} = a + b_1 \log(\text{size})_i + b_2\log(\text{b/m})_i + b_3 \text{ loss dummy}_{i,q} + e_{i,q} \quad (2)$$

The results of these regressions appear on Table 4. Once again, the portfolio results are confirmed. For example, using dispersion as the dependent variable, the coefficient on the loss dummy variable decreases sharply over the sample period, dropping from 0.83 and 0.86 in 1990 and 1991, respectively, to 0.20 in 2001.

Table 5 shows the percentage of analysts forecasting the wrong sign. In the early sample period using the annual earnings, analysts forecast profits for firms with actual losses 33.95% of the time. This number is far greater than the reverse. In the early sample period, analysts forecast losses for firms with actual profits just a little over 1% of the time. Although over the sample period, there is no improvement in predicting profits for actual profit firms (profit prediction actually gets worse), the improvement for loss firms is rather extraordinary. At the end of the sample period, profits are forecasted for loss firms only 14.24% of the time in 2000 and 12.20% of the time in 2001, consistent with the increasing tendency of firms to warn of losses.

Table 4
Annual regression results using loss dummy variables

Year	Dispersion									
	Coefficient				t Value				F value	R^2 (adjusted)
	Intercept	Size	B/M	Loss dummy	Intercept	Size	B/M	Loss dummy		
1990	− 0.14	0.03	0.12	0.83	− 0.76	2.22	3.41	12.94	65.43	0.21
1991	0.14	0.01	0.12	0.86	0.88	1.11	4.97	17.19	115.18	0.18
1992	0.10	0.01	0.11	0.73	1.80	0.96	6.86	22.20	189.14	0.14
1993	0.20	0.00	0.06	0.73	2.61	0.10	4.29	27.04	258.12	0.14
1994	0.20	0.00	0.07	0.63	2.93	0.31	6.51	27.26	268.99	0.12
1995	0.15	0.00	0.04	0.66	2.39	0.65	4.10	31.80	354.31	0.13
1996	0.37	− 0.01	0.04	0.62	6.81	− 3.34	5.02	35.40	455.72	0.14
1997	0.25	− 0.01	0.04	0.38	5.85	− 2.05	5.95	29.54	324.43	0.09
1998	0.13	0.00	0.05	0.34	3.08	1.08	6.67	28.82	299.31	0.08
1999	0.08	0.01	0.06	0.29	1.73	2.43	10.13	23.20	218.10	0.07
2000	0.16	− 0.00	0.04	0.22	3.66	− 0.09	7.17	18.48	126.99	0.05
2001	− 0.08	0.02	0.04	0.20	− 1.77	5.29	6.51	16.95	103.18	0.05

Year	Error									
	Coefficient				t Value				F value	R^2 (adjusted)
	Intercept	Size	B/M	Loss dummy	Intercept	Size	B/M	Loss dummy		
1990	0.77	− 0.02	0.09	0.51	3.09	− 0.88	1.93	5.80	14.98	0.04
1991	1.16	− 0.05	0.09	0.50	6.97	− 3.71	3.12	8.96	45.28	0.05
1992	0.81	− 0.03	0.07	0.60	7.77	− 3.71	4.01	17.03	118.41	0.06
1993	1.02	− 0.05	0.09	0.54	10.88	− 6.21	5.40	17.58	146.80	0.06
1994	1.18	− 0.06	0.07	0.58	13.82	− 8.91	4.86	21.00	213.69	0.07
1995	1.06	− 0.05	0.04	0.68	12.83	− 8.18	2.41	25.27	285.53	0.08
1996	1.13	− 0.06	0.04	0.54	16.23	− 10.77	3.72	24.18	287.19	0.07
1997	0.95	− 0.05	0.03	0.41	14.56	− 9.22	3.10	21.17	228.30	0.05
1998	0.86	− 0.04	0.08	0.35	13.78	− 7.35	7.46	19.78	214.93	0.05
1999	0.78	− 0.03	0.07	0.37	11.79	− 5.87	6.69	19.09	192.21	0.05
2000	0.76	− 0.03	0.06	0.35	11.29	− 5.70	7.11	18.84	168.52	0.04
2001	0.70	− 0.02	0.06	0.19	8.91	− 3.94	4.90	9.36	58.84	0.02

This table reports the results of an annual regression model, run every sample year from 1990 through 2001. Either forecast dispersion or error is the dependent variable. The independent variables are the logarithm of size (price times shares) in thousands, the logarithm of book-to-market value (equity/size), and a loss dummy equal to one if the actual quarterly First Call earnings are negative and zero otherwise. The regression model is below:

$$\text{Forecast property}_i = a + b_1 \log(\text{size})_i + b_2 \log(\text{b/m})_i + b_3 \text{ loss dummy}_i + e_i$$

To directly examine forecast performance when actual profitability differs from forecasted profitability, firms are separated into four portfolios based on actual versus expected profits or losses. For example, one portfolio includes firms with expected profits that report actual losses, while another includes firms with expected losses reporting actual losses. Mean dispersion and error are computed for each of the four portfolios. The results are presented in Table 6.

In an unsurprising result, firms with expected and actual profits have the lowest dispersion and error. Interestingly, however, firms with expected and actual losses have the

Table 5
Percentage of firms with wrong sign mean forecasts

	Quarterly forecasts	
	Forecasted loss, actual profit (%)	Forecasted profit, actual loss (%)
All years	1.79	23.31
1990–1995	1.22	33.95
1996–2001	2.11	19.80
Difference	−0.89*	14.15*
1990	0.89	44.79
1991	1.58	35.11
1992	1.38	30.79
1993	1.04	31.85
1994	1.18	32.15
1995	1.27	37.08
1996	1.72	29.57
1997	1.73	24.28
1998	1.86	21.42
1999	2.52	19.59
2000	2.49	14.24
2001	2.89	12.20

This table reports the percentage of analysts forecasting the wrong sign (e.g., forecasting a profit when an actual loss is eventually reported) over the sample period 1990 through 2001. All numbers are in percent.

*Difference is significantly different from zero with 99% confidence.

second lowest dispersion and error, while the two portfolios containing firms with actual profitability different from expected profitability have the highest dispersion and error. In addition, although error does decrease in the portfolio of expected loss, actual loss firms throughout the sample period, the trend is not nearly as clear and the differences not nearly as large compared with the Table 2 results. These results, combined with the results from Table 5, suggest that a large portion of the decrease in loss firm error comes from two sources: (1) improvement in the error of expected profit, actual loss firms and (2) the higher percentage of losses being predicted (i.e., less expected profit, actual loss firms).

The final testing in this section examines the error and optimism of the mean analyst forecast versus the error and optimism of a ‘‘naïve’’ forecast, the actual First Call earnings in the prior fiscal period.[8] This test addresses several important issues. It provides a measure of the amount of value that analysts provide over and above a forecasting method simple enough to be employed by even the most unsophisticated of individual investors. The test also provides a standard by which to measure earnings predictive difficulty. Firms with accurate naïve forecasts can be thought of as having earnings that are relatively easy to predict. Related to prediction difficulty, the test also somewhat controls for earnings

[8] For the tabulated quarterly results, the naïve model compares the current quarter earnings with the prior quarter earnings (e.g., third quarter 1992 compared with second quarter 1992). To control for earnings seasonality, the prior year quarterly earnings are also used to compute naïve forecasts (e.g., second quarter 1993 compared with second quarter 1992). However, because these naïve forecasts are less accurate than the naïve forecasts using the prior quarter earnings, the results are presented using the more accurate prior quarter naïve forecasts. (Using all sample firms, the average naïve error is 0.82 using prior year quarterly earnings and 0.72 using prior quarter earnings.) The results using the prior year naïve forecasts are similar although analyst superiority is greater.

Table 6
Dispersion and error by expected and actual profitability

Expected	Quarterly forecasts							
	Dispersion				Error			
	Profit	Profit	Loss	Loss	Profit	Profit	Loss	Loss
Actual	Profit	Loss	Profit	Loss	Profit	Loss	Profit	Loss
All years	0.13	0.93	1.07	0.42	0.31	1.97	2.38	0.42
1990–1995	0.16	1.17	1.37	0.74	0.35	2.06	2.59	0.50
1996–2001	0.12	0.82	0.98	0.35	0.29	1.91	2.31	0.40
Difference	0.04*	0.35*	0.39*	0.39*	0.06*	0.15*	0.28*	0.10*
1990	0.19	1.31	0.67	0.98	0.47	2.01	2.09	0.49
1991	0.23	1.30	0.99	1.01	0.44	1.97	2.90	0.62
1992	0.19	1.38	2.00	0.76	0.34	2.06	2.76	0.46
1993	0.16	1.24	1.33	0.76	0.35	2.03	2.44	0.46
1994	0.15	1.08	1.30	0.68	0.33	2.07	2.57	0.49
1995	0.14	1.04	1.26	0.69	0.32	2.12	2.55	0.51
1996	0.13	1.04	1.22	0.57	0.30	1.89	2.25	0.43
1997	0.11	0.84	1.00	0.40	0.28	1.94	2.42	0.41
1998	0.11	0.75	1.08	0.40	0.28	1.88	2.11	0.39
1999	0.12	0.73	0.94	0.32	0.28	1.90	2.38	0.41
2000	0.11	0.68	0.84	0.24	0.28	1.98	2.18	0.41
2001	0.13	0.77	0.77	0.27	0.29	1.93	2.54	0.37

This table reports mean analyst quarterly forecast properties sorted by expected and actual profitability over the sample period 1990 through 2001. An actual profit occurs when actual quarterly earnings are greater than or equal to zero, while an actual loss occurs otherwise. A forecasted profit occurs when mean forecasted earnings are greater than or equal to zero, while a forecasted loss occurs otherwise. See Table 1 for variable definitions.

* Difference is significantly different from zero with 99% confidence.

volatility or earnings management (see also next section). Firms with managed or less volatile earnings would probably have more accurate naïve forecasts.

Error, raw error, and optimism are computed using both the analyst forecasts and the naïve forecasts for all sample firms having the required prior period actual earnings information. The sample size is 103,778 firm-quarter observations: 82,203 with profits and 21,575 (20.8%) with losses.

Table 7 reports the results for two forecast properties: error and raw error. For each sample firm, the analyst forecast error is subtracted from the naïve forecast error. For example, if the naïve forecast error is 0.90 and the analyst forecast error is 0.40, then the difference is 0.50. The mean of these differences is computed and reported in the table. Note that in the table, positive numbers indicate analyst superiority, and the larger the difference, the more accurate analyst forecasts are versus naïve forecasts.

Several findings are important. Analyst forecasts are considerably more accurate in every sample year indicating that analysts provide a great deal of value in forecasting earnings versus a simple naïve model. However, they provide more value when forecasting the earnings of loss firms. For example, for all years, the difference between the naïve and analyst error is on average 0.26 for profit firms and 0.45 for loss firms.

Analysts have also slightly increased the value of their forecasting during the sample period, particularly for loss firms. For example, in the early sample period, the analysts are

Table 7
Differences between naïve and analyst forecasts: error and raw error

	Quarterly forecasts					
	Error differences (naïve error – analyst error)			Raw error (RE) differences (naïve RE – analyst RE)		
	All	Profit	Loss	All	Profit	Loss
All years	0.30	0.26	0.45	0.08	0.07	0.08
1990–1995	0.26	0.24	0.39	0.07	0.07	0.07
1996–2001	0.32	0.27	0.47	0.08	0.08	0.08
Difference	– 0.06*	– 0.03*	– 0.08*	– 0.01*	– 0.01*	– 0.01
1990	0.27	0.23	0.48	0.07	0.05	0.18
1991	0.19	0.17	0.32	0.08	0.08	0.11
1992	0.29	0.26	0.45	0.08	0.08	0.06
1993	0.26	0.24	0.38	0.05	0.05	0.06
1994	0.27	0.25	0.35	0.07	0.07	0.06
1995	0.26	0.24	0.40	0.08	0.08	0.08
1996	0.32	0.28	0.55	0.08	0.08	0.07
1997	0.30	0.27	0.46	0.08	0.08	0.07
1998	0.36	0.29	0.59	0.09	0.09	0.10
1999	0.33	0.30	0.44	0.09	0.09	0.08
2000	0.31	0.29	0.39	0.08	0.09	0.07
2001	0.25	0.17	0.38	0.08	0.08	0.08

This table reports the difference between naïve forecast errors and analyst forecast errors over the sample period 1990 through 2001. Analyst forecast error and raw error are defined as in Table 1. Naïve forecast raw error is defined as the absolute value of actual quarterly earnings less the previous quarter's actual earnings. Naïve forecast error deflates this number by the absolute actual quarterly earnings. The reported differences are computed as the naïve error less the analyst error. Thus, positive differences indicate analyst superiority (i.e., lower errors): the higher the difference, the greater the analyst superiority.

*Difference is significantly different from zero with 99% confidence.

superior by 0.39 in predicting error. In the later sample period, this superiority increases to 0.47.

Although not tabulated, naïve forecasts for loss firms are markedly less accurate versus naïve forecasts for profit firms. The mean quarterly naïve forecast error is 0.60 for profit firms and 1.22 for loss firms. The differences remain fairly stable across the sample period. This suggests that loss firm earnings are much more difficult to predict. Thus, considering both the inherent difficulties and the trends of reduced error, analysts seem to be doing an adequate job when forecasting loss firm earnings.

Table 8 presents the results for differences in optimism. With respect to the percentage of optimism, it is assumed that the goal when forecasting is to achieve a systematically unbiased 50%. Therefore, the comparison of analyst forecast optimism versus naïve forecast optimism is computed using 50% as a reference. For example, if analysts are optimistic 45% of the time and naïve forecasts are optimistic 65% of the time, then analyst forecasts are superior by 10% with respect to the 50% goal [(65% – 50%) – (50% – 45%) = 10%]. A positive sign indicates better analyst performance; a negative sign indicates better naïve performance.

The results are fascinating. Naïve forecasts for loss firms are primarily optimistic (63.75%) while naïve forecasts for profit firms are primarily pessimistic (35.58%). Thus,

Table 8
Differences between naïve and analyst forecasts: optimism

	Quarterly forecasts					
	Profit			Loss		
	Percent optimistic, analysts	Percent optimistic, naïve	Analyst superiority versus unbiased 50%	Percent optimistic, analysts	Percent optimistic, naïve	Analyst superiority versus unbiased 50%
All years	33.42	35.58	− 2.16	64.43	63.75	− 0.68
1990–1995	40.29	35.63	4.66	76.70	68.10	− 8.60
1996–2001	29.78	35.56	− 5.78	60.69	62.43	1.74
Difference	10.51*	0.07	− 10.44	16.01*	5.67*	10.34
1990	53.13	35.78	11.09	84.07	69.91	− 14.16
1991	51.88	37.62	10.50	78.77	68.49	− 10.28
1992	41.32	35.84	5.48	77.97	65.85	− 12.12
1993	41.90	36.01	5.89	75.00	66.67	− 8.33
1994	37.95	35.23	2.72	74.69	68.19	− 6.50
1995	37.75	35.29	2.46	77.92	70.13	− 7.79
1996	32.50	33.78	− 1.28	72.67	69.16	− 3.51
1997	31.95	33.86	− 1.91	67.54	64.96	− 2.58
1998	30.53	37.15	− 6.62	64.97	65.22	0.25
1999	26.86	35.30	− 8.44	58.83	60.38	1.55
2000	26.18	34.90	− 8.72	52.21	60.58	8.37
2001	29.11	40.99	− 11.88	51.36	55.75	4.39

This table reports the difference between naïve forecast optimism and analyst forecast optimism over the sample period 1990 through 2001. Optimism is present if the mean forecast is greater than the corresponding actual earnings. As 50% is considered the unbiased target, analyst superiority is determined using 50% as the benchmark. Positive numbers in the "analyst superiority versus unbiased 50%" column indicate analyst superiority, while negative numbers indicate naïve forecast superiority. The analyst superiority column is computed as follows:

$$\text{Analyst superiority} = (|\%\text{ optimistic naïve} - 50\%|) - (|\%\text{ optimistic analysts} - 50\%|)$$

*Difference is significantly different from zero with 99% confidence.

the optimism analysts show toward loss firms and the pessimism analysts show toward profit firms is perhaps a natural reflection of an easy starting point. For profit firms, in the early sample period, analysts are nearly unbiased. However, as analyst pessimism increases during the sample period for profit firms, analyst superiority with regard to systematic biases steadily changes to inferiority. As an example, analysts are superior relative to the 50% reference for profit firms by 11.09% in 1990 and 10.50% in 1991. However, these numbers decrease to − 8.72% in 2000 and − 11.88% in 2001, indicating a decline in analyst performance. In contrast, for loss firms, analysts move steadily from inferior performance to superior performance. Fig. 2 shows the trends graphically. Like the corresponding table, positive numbers in the figure indicate superior analyst performance.

5. Earnings management, smoothing, and guidance issues

The increase in forecast pessimism (positive surprises) and decrease in forecast error seen in this and other studies is consistent with earnings management, guidance, and

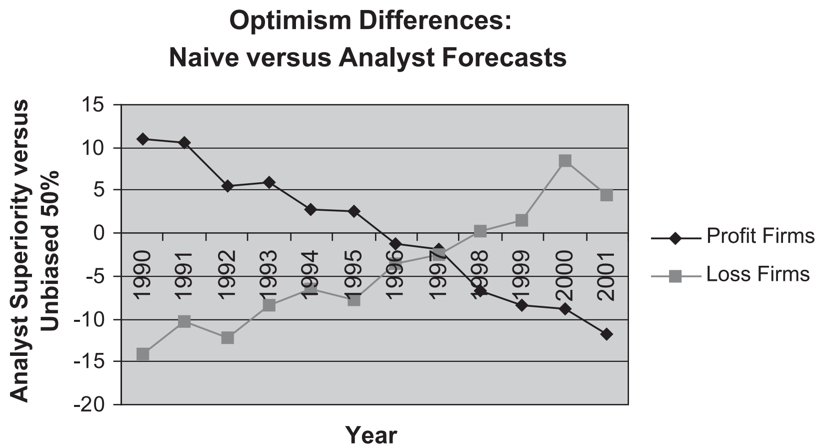

Fig. 2. Analyst versus naïve forecast differences in optimism by year. Note: positive numbers indicate analyst superiority; negative numbers indicate naïve superiority.

smoothing. Various tests are performed to see whether the trends are related to these issues and to differentiate among the potential explanations.

The first procedure examines the subset of firms that failed to meet all three incentives mentioned by Degeorge et al. (1999) when managing earnings: incentives of avoiding losses, avoiding earnings declines, and meeting analyst expectations. Thus, these firms are considered unlikely to be managing earnings as none of the incentives is reached.

Table 9 reports the results. Although the average dispersion, error, and raw error are all higher for this sample of firms versus the full loss firm subsample, similar degrees of improvement in each property are seen. As an example, the average error of these firms drops from 1.23 in the early sample period to 0.93 in the later sample period. This compares with the results for loss firms with either type of surprise from Table 2: 1.02 in the early sample period, decreasing to 0.70 in the later sample period.

To investigate smoothing, trends in earnings volatility are examined. If the decrease in forecasting performance is attributable to increased smoothing, earnings volatility should decrease as well. Earnings volatility is computed as the standard deviation of earnings from the eight most recent quarters. The sample of firms with eight quarters of earnings begins in 1992 and consists of 51,965 firms: 42,543 with profits and 9422 (18.1%) with losses. The trends in earnings volatility are reported in Table 10. Although loss firm earnings volatility decreases, profit firm volatility remains fairly stable across the sample period. Thus, earnings smoothing does not explain trends in profit firm forecasts. For loss firms, the magnitude of the decrease in earnings volatility is far less than the magnitude of the decrease in error and dispersion. Therefore, earnings volatility probably does not explain a large proportion of the trends in loss firm forecasts.

Related testing looks at forecasting trends in a set of firms considered unlikely candidates to smooth earnings, those firms with high earnings volatility. Thus, in each sample year, firms with high earnings volatility are separately analyzed. Both absolute and relative measures of high volatility are used. Absolute measures specify an arbitrary

Table 9
Forecast dispersion, error, and raw error: firms with optimistic forecasts (negative surprises), earnings declines, and losses

	Quarterly forecasts		
	Dispersion	Error	Raw error
All years	0.71	1.01	0.36
1990–1995	1.00	1.23	0.46
1996–2001	0.61	0.93	0.33
Difference	0.39*	0.30*	0.13*
1990	0.87	1.28	0.52
1991	1.20	1.27	0.65
1992	1.12	1.19	0.46
1993	1.03	1.14	0.52
1994	0.94	1.21	0.44
1995	0.93	1.31	0.39
1996	0.87	1.08	0.38
1997	0.66	0.99	0.34
1998	0.63	0.95	0.29
1999	0.54	0.94	0.33
2000	0.47	0.85	0.35
2001	0.50	0.74	0.25

This table reports mean analyst quarterly forecast properties for firms with optimistic forecasts, earnings declines, and losses over the sample period 1990 through 2001. An earnings decline is when actual quarterly earnings are less than the previous quarter's actual earnings. See Table 1 for the other variable definitions.

* Difference is significantly different from zero with 99% confidence.

earnings volatility number to which each firm's earnings volatility is compared, thus controlling for any changes in average volatility during the sample period. Quarterly earnings volatility is considered high if the standard deviation of the actual Street earnings is greater than US$0.50 per share over the prior eight quarters.[9] Under the relative measures of volatility, a firm is considered to have high earnings volatility if its volatility is in the top 10% during the year. Although the results are not tabulated, the same trends of decreasing dispersion, error, and optimism throughout the sample period still exist for the high earnings volatility sample of firms using either the absolute or relative volatility measures.

The next test investigates earnings guidance by isolating firms with high dispersion. These firms are often considered to have a greater disparity of opinion (e.g., Krishnaswami & Subramaniam, 1999) and are, therefore, unlikely to be guiding analysts toward a specific earnings target.

Similar to the volatility tests, absolute and relative measures are used. Under the absolute method, firms are considered to have high dispersion if their dispersion measure is greater than or equal to 0.50.[10] This sample contains 8225 firms (9.7% of the full dispersion sample), 4028 with profits and 4197 (51.0%) with losses. Under the relative measure, firms are considered to have high dispersion if their dispersion measure is in the top 10% during the relevant year.

[9] Other arbitrary cutoff points are employed with similar results.
[10] Other arbitrary cutoff points are employed with similar results.

Table 10
Earnings volatility by year

	Eight quarter earnings volatility		
	All	Profit	Loss
All years	0.17	0.14	0.28
1992–1996	0.17	0.14	0.36
1997–2001	0.16	0.14	0.25
Difference	0.01*	0.00	0.11*
1992	0.18	0.16	0.32
1993	0.18	0.15	0.35
1994	0.18	0.16	0.35
1995	0.18	0.14	0.43
1996	0.16	0.13	0.33
1997	0.16	0.14	0.29
1998	0.15	0.13	0.23
1999	0.16	0.14	0.24
2000	0.16	0.14	0.26
2001	0.18	0.15	0.26

This table reports mean quarterly earnings volatility over the sample period 1992 through 2001. Quarterly earnings volatility is defined as the standard deviation of actual earnings from the eight previous quarters. As 2 years of earnings are needed before the volatility can be computed, the sample period does not include 1990 and 1991.

*Difference is significantly different from zero with 99% confidence.

Table 11
Forecast error, raw error, and optimism by profitability: firms with dispersion greater than 0.50

	Quarterly forecasts								
	Error			Raw error			Percent optimistic		
	All	Profit	Loss	All	Profit	Loss	All	Profit	Loss
All years	1.09	1.14	1.04	0.23	0.13	0.33	64.61	39.95	88.28
1990–1995	1.21	1.24	1.17	0.30	0.19	0.42	69.24	49.36	90.93
1996–2001	1.01	1.07	0.96	0.19	0.08	0.28	61.76	33.51	86.81
Difference	0.20*	0.17*	0.21*	0.11*	0.11*	0.14*	7.48*	15.85*	4.12*
1990	1.35	1.60	1.09	0.55	0.37	0.74	73.85	58.82	90.32
1991	1.15	1.18	1.13	0.38	0.17	0.60	68.05	48.77	88.74
1992	1.11	1.13	1.09	0.32	0.21	0.45	66.73	47.71	90.00
1993	1.20	1.27	1.12	0.26	0.19	0.34	69.06	49.37	91.43
1994	1.23	1.21	1.25	0.30	0.21	0.40	67.97	48.56	90.12
1995	1.26	1.30	1.22	0.24	0.12	0.35	71.90	50.00	92.65
1996	1.12	1.13	1.11	0.24	0.11	0.38	66.83	41.83	91.40
1997	1.01	1.06	0.97	0.20	0.08	0.31	63.19	36.77	87.94
1998	0.97	1.03	0.93	0.17	0.07	0.26	64.15	35.50	86.82
1999	0.98	1.08	0.90	0.18	0.08	0.27	56.75	25.67	85.02
2000	1.02	1.09	0.96	0.16	0.08	0.22	56.10	29.21	80.94
2001	0.90	0.95	0.87	0.16	0.08	0.22	60.13	25.95	86.47

This table reports mean analyst quarterly forecast properties for firms with forecast dispersion greater than 0.50 over the sample period 1990 through 2001. See Table 1 for variable definitions.

*Difference is significantly different from zero with 99% confidence.

Table 11 presents the results using the absolute measure. (The results using the relative measure are similar.) There is a clear reduction in forecast error and raw error during the sample period for both profit and loss firms. Optimism also decreases dramatically for profit firms, starting around 50% in the first few sample years, but reaching below 30% for the last three sample years. Loss firms, however, are dominated by overwhelming optimism throughout the sample period (an average of 88.28%), the lack of improvement indicating a problem area that analysts should address. Thus, although analysts have reduced the size of their errors for firms with high dispersion, they still tend to overestimate the earnings of high dispersion, loss firms. This testing suggests that systematic profit firm pessimism occurs regardless of whether the forecasts are guided. However, the reduction of loss firm optimism occurs when firms warn analysts of the impending loss.

Overall, the improved forecasting ability of analysts occurs regardless of increases in earnings management, guidance, or smoothing. The trends are consistent with concerns of legal liability as most of the reduction in dispersion and error is due to loss firms. The trends are also consistent with improved analyst forecasting abilities. The increase in pessimism for profit firms may be partly attributed to an overreliance on the previous period's earnings.

6. GAAP versus Street earnings and Regulation FD

Another issue is related to the Street versus GAAP earnings debate. Abarbanell and Lehavy (2000) suggest that using forecast provider databases, such as First Call, to obtain earnings data might impact conclusions reached in earnings-related studies. First Call collects data based on the earnings that firms publicize to the market, often known as Street earnings, which may be different from GAAP earnings. Therefore, following the procedure of Brown (2001), the sample of firms in which GAAP earnings from Compustat equal Street earnings from First Call are examined separately. The earnings are considered equal if the absolute value of the difference is less than US$0.02 to control for rounding differences and materiality. The results (not shown) are similar to the previous results for the reduced sample. Moreover, the difference in Street versus GAAP earnings has not increased over the sample period (not shown).

Finally, the passage of Regulation FD in August 2000 and its subsequent implementation on October 23, 2000 might affect forecasts made during the surrounding time periods. To investigate this issue, the quarterly forecast properties from the beginning of 1999 through the end of 2001 are computed for only firms that have fiscal quarters on a March, June, September, December cycle. This provides a sample with three distinct, easily identifiable subperiods: (1) a pre-Regulation FD period, from the first quarter of 1999 through the second quarter of 2000; (2) a period during the implementation of Regulation FD, the third and fourth quarters of 2000; and (3) a post-Regulation FD period, the first quarter of 2001 through the fourth quarter of 2001. The second period, during the implementation, includes the quarter in which the regulation was passed.

Table 12
Forecast dispersion, error, raw error, and optimism surrounding implementation of regulation FD

Year: month	Profit firms				Loss firms			
	Dispersion	Error	Raw error	Percent optimistic	Dispersion	Error	Raw error	Percent optimistic
Pre								
1999: 3	0.15	0.35	0.05	27.35	0.39	0.66	0.15	56.36
1999: 6	0.13	0.33	0.05	26.49	0.40	0.67	0.16	57.89
1999: 9	0.14	0.34	0.05	27.96	0.41	0.66	0.19	56.41
1999: 12	0.15	0.34	0.06	25.42	0.37	0.74	0.28	59.95
2000: 3	0.13	0.35	0.05	23.89	0.34	0.59	0.17	50.55
2000: 6	0.13	0.32	0.05	24.49	0.28	0.64	0.19	49.63
During								
2000: 9	0.13	0.31	0.06	28.71	0.23	0.60	0.19	47.68
2000: 12	0.14	0.32	0.06	29.63	0.30	0.64	0.26	56.54
Post								
2001: 3	0.14	0.33	0.05	30.90	0.33	0.51	0.17	52.74
2001: 6	0.16	0.35	0.05	27.40	0.30	0.53	0.14	51.75
2001: 9	0.16	0.37	0.06	34.47	0.34	0.56	0.18	54.89
2001: 12	0.15	0.33	0.05	22.41	0.32	0.54	0.13	47.02

This table reports mean analyst quarterly forecast properties for the quarters surrounding the implementation of Regulation Free Disclosure (Reg FD). Reg FD was passed in August 2000 and implemented in October 2000. See Table 1 for variable definitions. Only firms with fiscal quarters ending in March, June September, and December are included in the sample.

After evaluating the results, presented in Table 12 for profit and loss subsamples, there are no identifiable differences in the forecast property trends during the three periods surrounding Regulation FD implementation regardless of whether the sample includes all firms, profit firms, or loss firms.

7. Conclusions

This study documents almost continuous reductions in analyst forecast dispersion, error, and optimism during the time period 1990 through 2001. The reductions, however, primarily come about due to staggering advances in forecasting loss firm earnings. At the end of the sample period, differences in forecasting performance between profit and loss firms are relatively small. Attempts are made to control for various issues that might affect the conclusions, such as earnings management, guidance, and smoothing, Street versus GAAP earnings, or Regulation FD. None of those issues can wholly explain the trends.

In addition, it appears that loss firm earnings are more difficult to predict. Given the prediction difficulties, the value provided to the market by analysts appears to be greater for loss firms versus profit firms.

While this study does not contradict prior studies showing increases in earnings management or guidance, it does shed additional light on the issue. Analysts are undoubtedly not as optimistic, their incentives to get investment banking clients or private information perhaps no longer as important as the notoriety they receive when they mislead investors.

Future studies can examine trends in analyst buy, sell, or hold recommendations, another area in which the media and academic research (and also the Securities and Exchange Commission) have criticized analysts. Analysts are known to frequently make buy recommendations but rarely make sell recommendations, often preferring to drop coverage of a firm rather than issue a sell recommendation (e.g., Barber, Lehavy, McNichols, & Trueman, 2001; McNichols & O'Brien, 1997; Stickel, 1995).

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Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets

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ABSTRACT

The returns earned by U.S. equities since 1926 exceed estimates derived from theory, from other periods and markets, and from surveys of institutional investors. Rather than examine historic experience, we estimate the equity premium from the discount rate that equates market valuations with prevailing expectations of future flows. The accounting flows we project are isomorphic to projected dividends but use more available information and narrow the range of reasonable growth rates. For each year between 1985 and 1998, we find that the equity premium is around three percent (or less) in the United States and five other markets.

THE EQUITY RISK PREMIUM LIES at the core of financial economics. Representing the excess of the expected return on the stock market over the risk-free rate, the equity premium is unobservable and has been estimated using different approaches and samples. The estimates most commonly cited in the academic literature are from Ibbotson Associates' annual reviews of the performance of various portfolios of U.S. stocks and bonds since 1926. Those estimates lie in the region of seven to nine percent per year, depending on the specific series examined. This historic evidence is objective and easy to interpret and has convinced many, especially academic financial economists, that the Ibbotson estimates are the best available proxies for the equity premium (Welch (1999)).[1] For discussion purposes, we use "eight percent"

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[1] The annualized distribution of monthly common stock returns over the 30-day T-bill rate has a mean of 9.12 percent and a standard deviation of 20.06 percent (from data in Table A-16, Ibbotson Associates (1999)). If these 73 observations are independent and identically distributed, the sample mean is a reasonable estimate for the equity premium, and the standard error of 2.35 percent associated with the sample mean allows an evaluation of other hypothesized values of the equity premium.

and "the Ibbotson estimate" interchangeably to represent the historic mean of excess returns earned by U.S. equities since 1926. (Unless noted otherwise, all amounts and rates are stated in nominal, not real, terms.)

Our objective is to show empirically that eight percent is too high an estimate for the equity premium in recent years. Rather than examine observed returns, we estimate for each year since 1985 the discount rate that equates U.S. stock market valuations with the present value of prevailing forecasts of future flows. Subtracting 10-year risk-free rates from these estimated discount rates suggests that the equity premium is only about three percent.[2] An examination of five other large stock markets (Canada, France, Germany, Japan, and the United Kingdom) provides similar results. Despite substantial variation in the underlying fundamentals across markets and over time, observing that every one of our 69 country-year estimates lies well below eight percent suggests that the Ibbotson estimate is too high for our sample period. Examination of various diagnostics (such as implied future profitability) confirms that the projections required to support an eight percent equity premium are unreasonable and inconsistent with past experience.

Some features of our study should be emphasized at the outset. As we only seek to establish a reasonable upper bound for the equity premium, we select long-term growth assumptions that exceed past experience and do not adjust for optimism in the analyst forecasts used.[3] Also, we use the simplest structure necessary to conduct our analysis. Our estimates refer to a long-term premium expected to hold over all future years (whereas historical estimates measure one-period premia), and we assume that the premium is constant over those future years (we do incorporate anticipated variation in risk-free rates). Finally, each annual estimate is conditional on the information available in that year; we do not consider an unconditional equity premium toward which those conditional premia might gravitate in the long run.

We are not the first to question the validity of the Ibbotson estimate. Mehra and Prescott (1985) initiated a body of theoretical work that has examined the so-called "equity premium puzzle." Their model indicates that the variance–covariance matrix of aggregate consumption and returns on stocks and bonds, when combined with reasonable risk-aversion parameters, implies equity premium estimates that are less than one percent. Despite subsequent efforts to bridge this gap (e.g., Abel (1999)), concerns remain about the validity of the Ibbotson estimate (see Kocherlakota (1996), Cochrane (1997), and Siegel and Thaler (1997) for summaries).

[2] Gebhardt, Lee, and Swaminathan (forthcoming) find similar results when estimating firm-specific discount rates, rather than the market-level discount rates considered in this paper.

[3] As described later, analyst optimism has declined systematically over time and a simple adjustment for mean bias is inappropriate. Bayesian adjustments to control for observed analyst optimism are not considered because we focus on an upper bound. In general, we do not use more complex econometric techniques and data refinements that are available to get sharper point estimates (e.g., Mayfield (1999), Vuolteenaho (1999), and Ang and Liu (2000)).

Surveys of institutional investors also suggest an equity premium substantially below eight percent (e.g., Burr (1998)), and there are indications that this belief has been held for many years (e.g., Benore (1983)).[4] Also, the weighted average cost of capital used in discounted cash flow valuations provided in analysts' research reports usually implies an equity premium below five percent. Current share prices appear systematically overpriced if an eight percent equity premium is used on reasonable projections of future flows. This overpricing is more evident when examining mature firms, where there is less potential for disagreement about growth opportunities.

To identify possible reasons why the Ibbotson estimate might overstate the equity premium in recent years, apply the Campbell (1991) decomposition of observed returns (in excess of the expected risk-free rate) for the market portfolio. The four components are: (1) the expected equity premium for that period; (2) news about the equity premium for future periods; (3) news about current and future period real dividend growth; and (4) news about the real risk-free rate for current and future periods. Here, news represents changes in expectations between the beginning and end of the current period (for current period dividend growth and risk-free rates, it represents the unexpected portion of observed values). Summing up both sides of this relation for each year since 1926 indicates that the average excess return observed would exceed the equity premium today if: (1) conditional one-year-ahead equity premia have declined; (2) the conditional long-term equity premium anticipated for future years has declined; (3) news about real dividend growth was positive on average; or (4) the expected real risk-free rate has declined.

The first and second reasons for why the Ibbotson estimate overstates the current equity premium highlight the potential pitfalls of estimating equity premia from observed returns. Holding aside news about dividends and risk-free rates, valuations would exceed expectations if the equity premium has declined (since present values increase when expected rates of return decline). That is, unexpected changes in the equity premium cause historical equity premium estimates to move in the opposite direction. Blanchard (1993) concludes that the equity premium has declined since 1926 to two or three percent by the early 1990s, and speculates that this decline is caused by a simultaneous decline in expected real rates of return on stocks and an increase in expected real risk-free rates. (This increase in expected real risk-free rates is another puzzle, but that puzzle is beyond the scope of this paper.) The remarkable run-up in stock prices during the 1990s, both domestically as well as internationally, is also consistent with a recent decline

[4] While many argue for an equity premium between two and three percent (e.g., Bogle (1999, p. 76)), some suggest that the premium is currently close to zero (e.g., Glassman and Hassett (1998), and Wien (1998)). Surveys of *individual* investors, on the other hand, suggest equity premia even higher than the Ibbotson estimate. For example, the *New York Times* (October 10, 1997, page 1, "High hopes of mutual fund investors"), reported an equity premium in excess of 16 percent from a telephone survey conducted by Montgomery Asset Management.

in the equity premium. Stulz (1999) argues that increased globalization has caused equity premia to decline in all markets.

Examination of historic evidence over other periods and markets suggests that the U.S. experience since 1926 is unusual. Siegel (1992) finds that the excess of observed annual returns for NYSE stocks over short-term government bonds is 0.6, 3.5, and 5.9 percent over the periods 1802 to 1870, 1871 to 1925, and 1926 to 1990, respectively. Jorion and Goetzmann (1999) examine the evidence for 39 equity markets going back to the 1920s, and conclude that the high equity premium observed in the United States appears to be the exception rather than the rule. Perhaps some stock markets collapsed and those markets that survived, like the U.S. exchanges, exhibit better performance than expected (see Brown, Goetzmann, and Ross (1995)). This evidence is consistent with the third reason for the high Ibbotson premium: since 1926, news about real dividend growth for U.S. stocks has been positive on average.

Partially in response to these limitations of inferring equity premia from observed returns, financial economists have considered forward-looking approaches based on projected dividends.[5] Informally, expected rates of return on the market equal the forward dividend yield plus expected growth in dividends (this dividend growth model is discussed in Section I). While dividend yields are easily measured, expected dividend growth in perpetuity is harder to identify. Proxies used for expected dividend growth include observed growth in earnings, dividends, or economy-wide aggregates (e.g., Fama and French (2000)). Unfortunately, the dividend growth rate that can be sustained in perpetuity is a hypothetical rate that is not necessarily anchored in any observable series, leaving considerable room for disagreement (see the Appendix for explanation).

We use a different forward-looking approach, labeled the abnormal earnings (or residual income) model, to mitigate problems associated with the dividend growth model.[6] Recognizing that dividends equal earnings less changes in accounting (or book) values of equity allows the stream of projected dividends to be replaced by the current book value of equity plus a function of future accounting earnings (details follow in Section I). While book values feature prominently in the model, the inclusion of future abnormal earnings makes it isomorphic to the dividend discount model. Relative to the dividend growth model, this approach makes better use of currently

[5] A related approach is to run predictive regressions of market returns or equity premium on dividend yields and other variables (e.g., Campbell and Shiller (1988)). We do not consider that approach because the declining dividend yields in recent years have caused predicted equity premium to turn negative (e.g., Welch (1999)).

[6] The approach appears to have been discovered independently by a number of economists and accountants over the years. Preinreich (1938) and Edwards and Bell (1961) are two early cites. More recently, a large body of analytical and empirical work has utilized this insight (e.g., Penman (1999)). Examples of empirical investigations include market myopia (Abarbanell and Bernard (1999)), explaining cross-sectional variation in returns (Liu and Thomas (2000)), and stock picking (Frankel and Lee (1998a, 1998b)).

available information to reduce the importance of assumed growth rates, and it narrows the range of allowable growth rates by focusing on growth in rents, rather than dividend growth.

If the equity premium is as low as our estimates suggest, required rates of return (used for capital budgeting, regulated industries, and investment decisions) based on the Ibbotson estimate are severely overstated. Second, a smaller equity premium reduces the importance of estimating beta accurately (because required rates of return become less sensitive to variation in beta) and increases the magnitude of beta changes required to explain abnormal returns observed for certain market anomalies. Finally, reducing substantially the magnitude of the equity premium puzzle to be explained might reinvigorate theory-based studies.

In Section I we develop the abnormal earnings approach used in this paper and compare it with the dividend growth model. Section II contains a description of the sample and methodology. The equity premium estimates for the United States are reported in Section III, and those for the five other markets are provided in Section IV. To confirm that our estimates are robust, we conducted extensive sensitivity analyses, which we believe represent an important contribution of our research effort. A summary of that investigation is reported in Section V (details are provided in Claus and Thomas (1999a)) and Section VI concludes.

I. Dividend Growth and Abnormal Earnings Models

The Gordon (1962) dividend growth model is described in equation (1). This relation implies that the expected rate of return on the stock market (k^*) equals the forward dividend yield (d_1/p_0) plus the dividend growth rate in perpetuity (g) expected for the market.

$$p_0 = \frac{d_1}{k^* - g} \Rightarrow k^* = \frac{d_1}{p_0} + g \tag{1}$$

where

p_0 = current price, at the end of year 0,
d_t = dividends expected at the end of future year t,
k^* = expected rate of return on the market, derived from the dividend growth model, and
g = expected dividend growth rate, in perpetuity.

The Gordon growth model is a special case of the general Williams (1938) dividend discount model, detailed in equation (2), where dividend growth is constrained to equal g each year.

$$p_0 = \frac{d_1}{(1+k^*)} + \frac{d_2}{(1+k^*)^2} + \frac{d_3}{(1+k^*)^3} + \dots \tag{2}$$

Research using the dividend growth model has often assumed that g equals forecasted earnings growth rates obtained from sell-side equity analysts, who provide earnings forecasts along with their buy/sell recommendations. These forecasts refer to earnings growth over the next "cycle," which is commonly interpreted to represent the next five years. Consequently, we refer to this earnings growth forecast as g_5. While most studies using g_5 as a proxy for g have focused on the U.S. market alone (e.g., Brigham, Shome, and Vinson (1985)), some have examined other major equity markets also (e.g., Khorana, Moyer, and Patel (1997)). Estimates of the equity premium based on the assumption that g equals g_5 are similar in magnitude to the Ibbotson estimate derived from historical data. For example, Moyer and Patel (1997) estimate the equity premium each year over their 11-year sample period (1985 to 1995) and generate a mean estimate of 9.38 (6.96) percent relative to the 1-year (30-year) risk-free rate.

However, others have balked at using g_5 as a proxy for g (e.g., Malkiel (1996), Cornell (1999)) because it appears unreasonably high at an intuitive level, and have stepped down assumed growth rates. Forecasted values of g_5 for the United States over our sample period, which are close to 12 percent in all years, exceed nominal growth in S&P earnings, which has been only 6.6 percent since the 1920s (*Wall Street Journal*, June 16, 1997, "As stocks trample price measures, analysts stretch to justify buying"). Also, the real growth rate implied by the nominal 12 percent earnings growth rate exceeds both forecast and realized growth in GDP (since 1970, forecasts of expected real growth in GDP have averaged 2.71 percent, and realized real growth has averaged 2.81 percent).

While we show that g_5 is systematically optimistic relative to realized earnings, it is difficult to infer reliably the level of that optimism from the relatively short time-series of forecast errors available (reliable data on analyst forecasts go back only about 15 years). Moreover, the incentives for analysts to make optimistic forecasts vary across firms and over time. For example, the literature on U.S. analysts' forecasts suggests that while analysts tended to make optimistic forecasts early in our sample period (to curry favor with management), more recently, management has tended to guide near-term analyst forecasts downward to be able to meet or beat them when announcing earnings.[7] Even if unbiased estimates of near-term earnings growth (g_5) were available, the Appendix describes why those estimates as well as observed growth rates are conceptually different from g, the hypothetical dividend growth that can be sustained in perpetuity.

[7] Results reported in Table VI offer clear evidence of such a decline in optimism for all horizons. Bagnoli, Beneish, and Watts (1999) document how recent analyst forecasts are systematically below reported earnings for their sample, and also below "whisper" forecasts that are generally viewed as representing the market's true earnings expectations. Matsumoto (1999) offers evidence in support of management guiding analyst forecasts downward, and also investigates factors that explain cross-sectional variation in this propensity to guide analysts.

The abnormal earnings model is an alternative that mitigates many of the problems noted above. Expected dividends can be related to forecasted earnings using equation (3) below, and that relation allows a conversion of the discounted dividends relation in equation (2) to the abnormal earnings relation in equation (4).

$$d_t = e_t - (bv_t - bv_{t-1}) \tag{3}$$

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \dots, \tag{4}$$

where

e_t = earnings forecast for year t,
bv_t = expected book (or accounting) value of equity at the end of year t,
$ae_t = e_t - k(bv_{t-1})$ = expected abnormal earnings for year t, or forecast accounting earnings less a charge for the cost of equity, and
k = expected rate of return on the market portfolio, derived from the abnormal earnings model.

Equation (3), also known as the "clean surplus" relation, requires that all items affecting the book value of equity (other than transactions with shareholders, such as dividends and share repurchases/issues) be included in earnings. Under U.S. accounting rules, almost all transactions satisfy the clean-surplus assumption. An examination of the few transactions that do not satisfy this relation suggests that these violations occur ex post, and are not anticipated in analysts' earnings forecasts (e.g., Frankel and Lee (1998b)). Since we construct future book values using equation (3), by adding forecast income to and subtracting forecast dividends from beginning book values, clean surplus is maintained and the dividend and abnormal earnings relations in equations (2) and (4) are isomorphic.

Equation (4) shows that the current stock price equals the current book value of equity plus the present value of future expected abnormal earnings. Abnormal earnings, a proxy for economic profits or rents, adjusts reported earnings by deducting a charge for equity capital. Note that the market discount rates estimated from the abnormal earnings and dividend growth approaches are labeled differently: k and k^*. Also, the standard transversality conditions apply to both models: in the limit as t approaches infinity, the present value of future price, p_t (difference between price and book value, $p_t - bv_t$) must tend to zero in equation (2) (in equation (4)).

Financial economists have expressed concerns about accounting earnings deviating from "true" earnings (and book values of equity deviating from market values), in the sense that accounting numbers are noisy and easily manipulated. However, the equivalence between equations (2) and (4) is not impaired by differences between accounting and economic numbers, nor is it affected by the latitude available within accounting rules to report different accounting numbers. As long as forecasted earnings satisfy the clean surplus relation in equation (3) in terms of expectations, equation (4) is simply an algebraic restatement of equation (2), subject to the respective transversality conditions mentioned above.

Since the I/B/E/S database we use does not provide analysts' earnings forecasts beyond year +5, we assume that abnormal earnings grow at a constant rate (g_{ae}) after year +5, to incorporate dates past that horizon. Equation (4) is thus adapted as follows.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_4}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right]. \tag{5}$$

The last, bracketed term is a terminal value that captures the present value of abnormal earnings after year +5. The terms before are derived from accounting statements (bv_0) and analyst forecasts (e_1 to e_5). Note that there are three separate growth rates in this paper and the different growth rates refer to different streams and periods and arise from different sources. The rate g refers to dividend growth in perpetuity and is assumed by the researcher; g_5 refers to growth in accounting earnings over the first five years and is provided by financial analysts; and g_{ae} refers to abnormal earnings growth past year +5 and is assumed by the researcher.

Whereas expected rates of return are typically viewed as being stochastic (Samuelson (1965)), k^* and k in equations (1) and (5) are nonstochastic discount rates. Barring a few recent exceptions (e.g., Ang and Liu (2000) and Vuolteenaho (1999)), the literature has assumed that expected rates of return can be approximated by discount rates. We make that assumption too. While equation (1) is designed to only reflect a flat k^*, equation (2) can be restated to incorporate predictable variation over time in discount rates. Similarly, equation (5) can be restated to incorporate nonflat discount rates, as shown in Claus and Thomas (1999a). We consider the case when the equity premium is assumed to remain flat but discount rates vary over future periods based on the term-structure of risk-free rates. This restated version of equation (5) is

$$p_0 = bv_0 + \sum_{t=1}^{\infty}\left[\frac{ae_t}{\prod_{s=1}^{t}(1+r_{fs}+rp)}\right], \tag{5a}$$

where

r_{fs} = forward one-year risk-free rate for year s,

rp = equity risk premium, assumed constant over all future years,

ae_t = expected abnormal earnings for year t, equals $e_t - bv_{t-1}(r_{ft} + rp)$ for years +1 through +5, and equals $ae_5(1 + g_{ae})^{t-5}$, from year +6 on.

While the abnormal earnings stream in equation (4) is equivalent to the corresponding dividend stream in equation (2), the abnormal earnings relation in equation (5) (and equation (5a)) offers the following advantages over the dividend growth model in equation (1). First, a substantial fraction of the "value profile" for the abnormal earnings model in equation (5) is fixed by numbers that are currently available and do not need to be assumed by the researcher (current book value and abnormal earnings for years +1 through +5). Value profile is a representation of the fraction of total value captured by each future year's flows. In contrast, the entire value profile for the dividend growth model is affected by the assumed growth rate, g. Since the fraction of value determined by assumed growth rates is lower for the abnormal earnings approach, those risk premium estimates are more reliable.

Second, in contrast to the potential for disagreement about a reasonable range for g, the rate at which rents can grow in perpetuity after year +5, g_{ae}, is less abstract and easier to gauge using economic intuition. For example, to obtain equity premia around 8 percent, rents at the market level would have to grow forever at about 15 percent, on average. It is unlikely that aggregate rents to U.S. equity holders would grow at such high rates in perpetuity because of factors such as antitrust actions, global competition, and pressure from other stakeholders. The historical evidence (e.g., Myers (1999)) is also at odds with such high growth rates in abnormal earnings.

Third, future streams for a number of value-relevant indicators, such as price-to-book ratios (P/B), price-to-earnings ratios (P/E), and accounting return on equity (*roe*), can also be projected under the abnormal earnings approach. This allows one to paint a more complete picture of the future for different assumed growth rates. Analysis of the levels of future P/B and profitability (excess of *roe* over k) implied by growth rates required to obtain equity premium estimates around eight percent are also inconsistent with past experience.

II. Data and Methodology

I/B/E/S provides the consensus of all available individual forecasts as of the middle (the Thursday following the second Friday) of each month. Forecasts and prices should be gathered soon after the prior year-end, as soon as equity book values (bv_0) are available. Rather than collect forecasts at different points in the year, depending on the fiscal year-end of each firm, we opted to collect data as of the same month each year for all firms to ensure that the risk-free rate is the same across each annual sample. Since most firms have December year-ends, and book values of equity can be obtained from the balance sheets that are required to be filed with the SEC within 90 days of the fiscal year-end, we collect forecasts as of April each year.[8] For

[8] For the few firm-years not filing within this 90-day deadline, the book value of equity can be inferred by the market by adding (subtracting) fourth quarter earnings (dividends) from the third quarter book value of equity.

firms with fiscal year-ends other than December, this procedure creates a slight upward bias in estimated equity premium, since the stock prices used (as of April) are on average higher than those near the prior year's fiscal year-end, when bv_0 was released. In addition to earnings forecasts, I/B/E/S also provides data for actual earnings per share, dividends per share, share prices, and the number of outstanding shares. Equity book values are collected from COMPUSTAT's Industrial Annual, Research, and Full Coverage Annual Files, for years up to and including 1997.

The sample includes firms with I/B/E/S earnings forecasts for years +1 and +2 (e_1 and e_2) and a five-year growth forecast (g_5) as well as share prices and shares outstanding as of the I/B/E/S cut off date each April. We also require nonmissing data for the prior year's book value, earnings, and dividends. Explicit forecasts for years +3, +4, and +5 are often unavailable, and are generated by projecting the growth rate g_5 on the prior year's earnings forecast: $e_t = e_{t-1}(1 + g_5)$.[9]

Earlier years in the I/B/E/S database, before 1985, were dropped because they provided too few firms with complete data to represent the overall market. From 1985 on, the number of firms with available data increases substantially. As shown in column 1 of Table I, the number of sample firms increases from 1,559 in 1985 to 3,673 in 1998. Comparison with the total number of firms and market capitalization of all firms on NYSE, AMEX, and Nasdaq each April indicates that, although our sample represents only about 30 percent of all such firms, it represents 90 percent or more of the total market capitalization. Overall, we believe our sample is fairly representative of the value-weighted market, and refer to it as "the market" hereafter.

Firm-level data are aggregated each year to generate market-level earnings, book values, dividends, and capitalization. Actual data for year 0 (the full fiscal year preceding each April when forecasts were collected) is provided in columns 2 through 6 of Table I. Forecasted and projected earnings for years +1 through +5 are reported in columns 7 through 11.

Table I reveals an interesting finding relating to dividend payouts: the ratio of market dividends to earnings is around 50 percent in most years (with a noticeable decline toward the end of the sample period).[10] We use this 50 percent payout ratio to project future dividends from earnings fore-

[9] If any of the explicit earnings forecasts for years +2, +3, +4, or +5 were negative, they were not used to project earnings for subsequent years. For about five percent of our sample, explicit earnings forecasts are available for all five years and do not need to be inferred using g_5. That subsample was investigated to confirm that projections based on five-year growth rates are unbiased proxies for the explicit forecasts for those years.

[10] Although this statistic is well known to macroeconomists, it is higher than average firm-level dividend payouts. Note, however, that aggregate earnings include many loss firms, especially in the early 1990s, when earnings were depressed because of write-offs and accounting changes. This results in a higher aggregate dividend payout than the average firm-level payout ratio, which is computed over profitable firms only (the payout ratio is meaningless for loss firms). Also, since the aggregate payout ratio is a value-weighted average dividend payout, it is more representative of large firms, which tend to have higher dividend payouts than small firms.

Table I

Market Capitalization, Book Values, Dividends, and Actual and Forecast Earnings for U.S. Stocks (1985 to 1998)

The market consists of firms on the I/B/E/S Summary files with forecasts for years +1, +2, and a five-year earnings growth estimate (g_5) as of April each year, and actual earnings per share, dividends per share, number of shares outstanding and share prices as of the end of the prior fiscal year (year 0). Book values of equity for year 0 are obtained from COMPUSTAT. When missing on the I/B/E/S files, forecasted earnings per share for years +3, +4, and +5 are determined by applying g_5, the forecasted five-year growth rate, to year +2 forecasted earnings. All per share numbers are multiplied by the number of shares outstanding to get amounts at the firm level, and these are added across firms to get amounts at the market level each year. All amounts, except for dividend payout, are in millions of dollars.

Forecast as of April	Number of Firms	Actual Values for Year 0					Forecast Earnings for Years +1 to +5				
		Earnings	Dividends	Payout	Book Value	Market Value	Year +1	Year +2	Year +3	Year +4	Year +5
	1	2	3	4	5	6	7	8	9	10	11
1985	1,559	154,858	71,134	46%	1,191,869	1,747,133	180,945	205,294	228,208	254,181	283,706
1986	1,613	155,201	73,857	48%	1,214,454	2,284,245	178,024	203,677	226,018	251,313	280,035
1987	1,774	146,277	81,250	56%	1,323,899	2,640,743	186,319	220,178	244,174	271,432	302,529
1988	1,735	167,676	86,237	51%	1,430,672	2,615,857	222,497	246,347	273,204	303,642	338,262
1989	1,809	229,070	97,814	43%	1,541,231	2,858,585	261,278	284,616	315,204	349,721	388,776
1990	1,889	228,216	107,316	47%	1,636,069	3,143,879	257,657	295,321	328,803	366,798	410,028
1991	1,939	218,699	108,786	50%	1,775,199	3,660,296	241,760	294,262	328,513	367,521	412,073
1992	2,106	202,275	113,962	56%	1,911,383	4,001,756	252,109	308,567	344,742	386,098	433,552
1993	2,386	247,988	127,440	51%	2,140,668	4,918,359	295,862	356,086	397,969	445,840	501,081
1994	2,784	290,081	129,186	45%	2,168,446	5,282,046	339,694	402,689	450,559	505,315	568,179
1995	2,965	365,079	147,575	40%	2,670,725	6,289,760	444,593	518,600	579,954	650,120	730,648
1996	3,360	446,663	175,623	39%	3,182,952	8,207,274	512,921	588,001	659,732	742,244	837,577
1997	3,797	547,395	201,017	37%	3,679,110	10,198,036	614,932	709,087	800,129	905,787	1,029,061
1998	3,673	526,080	178,896	34%	3,412,303	12,908,495	577,297	682,524	775,707	884,529	1,012,294

casts, as well as to project future book values (using equation (3)). The validity of this assumption is not critical; however, varying the payout ratio between 25 and 75 percent has little impact on the estimated discount rate (results available upon request).

Both short- and long-term risk-free rates have been used in studies that estimate discount rates from flows that extend over many future periods. While one-month or one-year rates are appropriate when inferring the equity premium from historic returns (observed return less risk-free yield for that period), for studies based on forecasted flows, the maturity of risk-free rates used should match that of the future flows (Ibbotson Associates (1999)). Although we allow for expected variation in risk-free rates when estimating the risk premium, using equation (5a), we find almost identical results using a constant risk-free rate in equation (5) equal to the long-term rate. In essence, the shape of the yield curves over our sample period is such that the forward rates settle rather quickly at the long-term rate, and the impact of discounting flows from earlier years in the profile at rates lower than the long-term rate is negligible. For the sensitivity analyses, we find it convenient to use the constant rate structure of equation (5), rather than the varying rate structure of equation (5a). We selected the 10-year risk-free rate for the constant risk-free rate because it is the longest maturity for which data could be obtained for all country-years in our sample. To allow comparisons with other studies that use 30-year risk-free rates, we note that the mean 30-year risk-free rate in April for each year of our U.S. sample period is 31 basis points higher than the mean 10-year risk-free rate we use.

For years beyond year +5, abnormal earnings are assumed to grow at the expected inflation rate, g_{ae}. As explained in the Appendix, the expected nominal inflation rate is higher than values of g_{ae} assumed in the literature, and is an upper bound for expected growth in abnormal earnings. We derive the expected inflation rate from the risk-free rate, based on the assumption that the real risk-free rate is approximately three percent.[11] Since we recognize that this assumption is only an educated guess, we consider in Section V.D other values of g_{ae} also. Fortunately, our estimated risk premium is relatively robust to variation in the assumed growth rate, g_{ae}, since a lower proportion of current market value is affected by g_{ae} in equations (5) and (5a), relative to the impact of g in equation (1).

III. Results

Since k appears in both the numerators (ae_t is a function of k) and denominators of the terms on the right-hand side of equation (5), the resulting

[11] The observed yields on recently issued inflation-indexed government bonds support this assumption. Although estimates of the real risk-free rate vary through time, and have historically been lower than three percent, more recently, the excess of the long-term risk-free rate over inflation forecasts has risen to three or four percent (e.g., Blanchard (1993), and discussion by Siegel).

equation is a polynomial in k with many possible roots. Empirically, however, only one root is real and positive (see Botosan (1997)). We search manually for the value of k that satisfies the relation each year, with the first iteration being close to the risk-free rate. The equity risk premium estimate (rp) that satisfies the valuation relation in equation (5a) is also estimated iteratively.

Table II provides the results of estimating rp, k, and k^*. The annual estimates for rp (in column 13) lie generally between three and four percent and are much lower than the historic Ibbotson estimate. Also, there is little variation over time: each annual estimate is remarkably close to the mean value of 3.39 percent. The annual estimates for k (in column 9) vary between a high of 14.38 percent in 1985 and a low of 8.15 percent in 1998. The corresponding risk-free rates (10-year Government T-bond yields) reported in column 8 vary with the estimated ks, between 11.43 percent in 1985 and 5.64 percent in 1998. As a result, the estimated equity premia (in column 11), equal to k less r_f, exhibit little variation around the time-series mean of 3.40 percent.

While the equation (5a) equity premium estimates (rp) derived from non-flat risk-free rates are in concept more accurate than those derived by subtracting 10-year risk-free rates from the flat k estimated from equation (5), the numbers reported in column 11 are very similar to those reported in column 13. We only consider the equation (5) estimates hereafter because (a) the magnitudes of the discount rates and their relation to risk-free rates are more transparent for the risk premium estimates based on constant risk-free rates, and (b) forward one-year rates for different maturities are not available for the other five markets,.

To understand better the relative magnitudes of the terms in equation (5), we report in the first seven columns of Table II the fraction of market values represented by each term. The fraction represented by book value (column 1) has generally declined over our sample period, from 68.2 percent in 1985 to 26.4 percent in 1998. To compensate, the fraction represented by terminal value (column 7) has increased from 26.6 percent in 1985 to 60 percent in 1998. The fraction represented by abnormal earnings for years +1 to +5 has also increased.

Column 10 of Table II contains our estimates for k^*, the market discount rate based on the dividend growth model described by equation (1), when dividends are assumed to grow in perpetuity at the five-year growth in earnings forecast (g_5). Since g_5 is not available at the aggregate level, we use the forecast growth in aggregate earnings from year +4 to +5 (see column 16 of Table V) to identify g_5 at the market level. To maintain consistency with prior research using the dividend growth model, we estimate d_1 by applying the earnings growth forecast for year 1 on prior year dividends ($d_1 = d_0 * e_1/e_0$). Our estimates for k^* are almost identical to those reported by Moyer and Patel (1997).[12] Note that these estimates of k^* are much larger than the

[12] Similar results are expected because the underlying data is taken from the same source, with minor differences in samples and procedures; for example, they use the S&P 500 index whereas we use all firms with available data.

Table II

Implied Expected Rate of Return on the Market (k and k^*) and Equity Risk Premium (rp and $k - r_f$) for U.S. Stocks (1985 to 1998)

The market is an aggregate of firms on the I/B/E/S Summary files with forecasts for years +1, +2, and a five-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0) are obtained from COMPUSTAT. When missing, forecasted earnings for years +3, +4, and +5 are determined by applying g_5, the forecasted five-year growth rate, to year +2 forecasted earnings. The implied discount rate that satisfies the valuation relation in equation (5) below is k. Abnormal earnings (ae_t) equal reported earnings less a charge for the cost of equity (= beginning book value of equity $*$ k). Assuming that 50 percent of earnings are retained allows the estimation of future book values from current book values and forecast earnings. The terminal value represents all abnormal earnings beyond year +5. Those abnormal earnings are assumed to grow at a constant rate, g_{ae}, which is assumed to equal the expected inflation rate, and is set equal to the current 10-year risk-free rate less 3 percent. The expected rate of return on the market is also estimated using equation (1), and is labeled k^*. Equation (1) is derived from the dividend growth model, and dividend growth in perpetuity, g, is assumed to equal the five-year earnings growth rate, g_5. Subtracting r_f from the discount rates k and k^* generates equity premium estimates. The equity premium (rp) is also estimated using equation (5a), which is based on the same information used in equation (5), except that the constant discount rate k is replaced by forward one-year risk-free rates at different maturities (r_{fs}) plus a constant risk premium (rp). All amounts, except for rates of return, are in millions of dollars.

$$k^* = \frac{d_1}{p_0} + g \tag{1}$$

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \tag{5}$$

$$p_0 = bv_0 + \sum_{t=1}^{\infty}\left[\frac{ae_t}{\prod_{s=1}^{t}(1+r_{fs}+rp)}\right] \tag{5a}$$

Forecast as of April	Book Value as Percent of Market Value	Percent of Market Value Represented by Present Value of											
		ae_1	ae_2	ae_3	ae_4	ae_5	Terminal Value	10-year r_f	k from (5)	k^* from (1)	$k - r_f$	$k^* - r_f$	rp from (5a)
	1	2	3	4	5	6	7	8	9	10	11	12	13
1985	68.2%	0.5%	0.9%	1.1%	1.3%	1.5%	26.6%	11.43%	14.38%	16.14%	2.95%	4.71%	2.88%
1986	53.2%	1.6%	2.0%	2.1%	2.3%	2.4%	36.3%	7.30%	11.28%	14.90%	3.98%	7.60%	4.03%
1987	50.1%	1.3%	1.9%	2.1%	2.2%	2.3%	40.0%	8.02%	11.12%	15.08%	3.10%	7.06%	3.25%
1988	54.7%	1.7%	1.8%	1.9%	2.0%	2.2%	35.7%	8.72%	12.15%	15.52%	3.43%	6.80%	3.58%
1989	53.9%	2.0%	2.0%	2.0%	2.1%	2.2%	35.7%	9.18%	12.75%	14.85%	3.57%	5.67%	3.54%
1990	52.0%	1.6%	2.0%	2.1%	2.2%	2.3%	37.8%	8.79%	12.33%	15.41%	3.54%	6.62%	3.56%
1991	48.5%	1.1%	1.9%	2.0%	2.2%	2.4%	41.8%	8.04%	11.05%	15.16%	3.01%	7.12%	2.96%
1992	47.8%	1.1%	1.9%	2.1%	2.3%	2.5%	42.4%	7.48%	10.57%	15.55%	3.09%	8.07%	3.06%
1993	43.5%	1.7%	2.3%	2.5%	2.7%	2.9%	44.4%	5.97%	9.62%	15.12%	3.65%	9.15%	3.76%
1994	41.1%	2.1%	2.6%	2.8%	2.9%	3.1%	45.5%	5.97%	10.03%	15.02%	4.06%	9.05%	3.53%
1995	42.5%	2.1%	2.6%	2.7%	2.8%	3.0%	44.3%	7.06%	11.03%	14.96%	3.97%	7.90%	4.02%
1996	38.8%	2.2%	2.5%	2.6%	2.8%	3.0%	48.2%	6.51%	9.96%	14.96%	3.45%	8.45%	3.50%
1997	36.1%	2.2%	2.5%	2.6%	2.8%	3.0%	50.8%	6.89%	10.12%	13.88%	3.23%	6.99%	3.25%
1998	26.4%	2.1%	2.5%	2.7%	3.0%	3.2%	60.0%	5.64%	8.15%	13.21%	2.51%	7.57%	2.53%
Mean								7.64%	11.04%	14.98%	3.40%	7.34%	3.39%

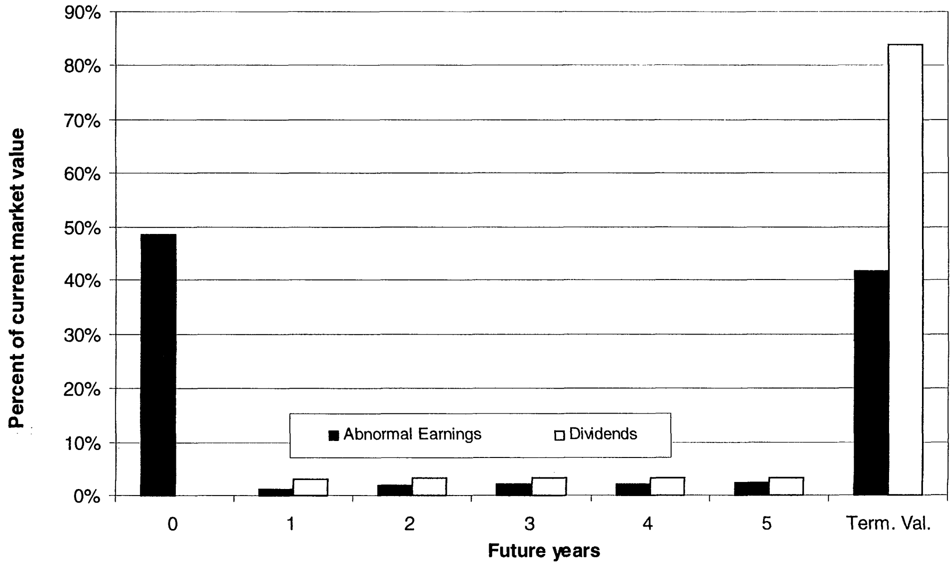

Figure 1. Comparison of value profile for abnormal earnings versus dividends, for abnormal earnings approach for U.S. stocks as of April, 1991. Based on the data in Table II, for the abnormal earnings approach described by equation (5), abnormal earnings are assumed to grow at 5.04 percent, the anticipated inflation rate, past year +5, and the resulting market discount rate (k) is 11.05 percent. For the abnormal earnings profile, the fractions represented by book value, abnormal earnings in years +1 through +5, and the terminal value are shown by the solid columns. For the dividend profile corresponding to those abnormal earnings projections, the fractions of current market capitalization that are represented by dividends in years +1 through +5 and the terminal value are shown by the hollow columns.

corresponding values of k, and the implied equity premium estimates reported in column 12 ($k^* - r_f$) are about twice those in column 11 ($k - r_f$). The mean equity premium of 7.34 percent in column 12 of Table II is approximately the same as the Ibbotson estimate. Note also the larger variation in column 12, around this mean, relative to the variation in columns 11 and 13.

The results in Table II can be used to illustrate two primary advantages of the abnormal earnings model over the dividend growth model. First, the abnormal earnings approach uses more available "hard" data (current book value and forecast abnormal earnings for years +1 to +5) to reduce the emphasis on "softer" growth assumptions (g_{ae}) used to build terminal values. Figure 1 contains a value profile for the terms in equation (5), using data for 1991. This year was selected because it represents a "median" profile: the terminal value is a smaller (larger) fraction of total value for years before (after) 1991. Recall from Table II that our estimate for k in 1991 is 11.05 percent. The terminal value is based on abnormal earnings growing at an anticipated inflation rate of 5.04 percent (g_{ae} is three percent less than the risk-free rate of 8.04 percent). The value profile for the abnormal earnings model, represented by the solid columns in Figure 1, shows that approximately 50 percent of the total value is captured by current book value, 10 percent is spread over the abnormal earnings for the next five years, and about 40 percent remains in the terminal value. This last term is the only one affected by our growth assumption. In contrast, for the dividend growth model in equation (1), the dividend growth rate (g), which is assumed to equal the five-year analyst forecast for earnings growth (g_5 = 12.12 percent), is the primary determinant of the estimated k^* (= 15.16 percent).

To offer a different perspective on why growth assumptions are more influential for projected dividends, relative to abnormal earnings, we converted the abnormal earnings profile in Figure 1 to an isomorphic value profile for dividends, represented by the hollow columns in Figure 1. (Note that these dividends refer to the flows underlying k, from the abnormal earnings model, and are different from the flows underlying k^*, the dividend growth model estimate.) The year +5 terminal value for the dividend profile in Figure 1 corresponds to a dividend growth in perpetuity of 6.8 percent.[13] Even though the abnormal earnings and dividend profiles in Figure 1 correspond to the same underlying projections, the terminal value for the dividend profile represents almost 85 percent of total value. As a result, assumed dividend growth rates have a larger impact on estimated discount rates, relative to abnormal earnings growth rate assumptions. For example, doubling the assumed value of g_{ae} to 10 percent increases the estimated discount rate by only about two percentage points. In contrast, increasing the dividend growth assumption by one percentage point raises the estimated discount rate by almost the same amount.[14]

The second major benefit of the abnormal earnings approach is that we can narrow the range of reasonable growth assumptions (g_{ae}), relative to the assumed growth rate for dividends (g). Since g is a hypothetical rate, it is not easy to determine whether 12.12 percent (the value of g underlying our 1991 estimate for k^*) is more or less reasonable than the 6.8 percent dividend growth in perpetuity (after year +5) implied by our abnormal earnings model projections. Fortunately, restating implied dividend growth rates in terms of terminal growth in abnormal earnings makes it easier to see why some dividend growth assumptions are unreasonable. The assumption that dividends grow at 12.12 percent implies that abnormal earnings past year +5 would need to grow in perpetuity at about 15 percent per year in equa-

[13] This dividend growth rate is obtained by using equation (1) on projected market value in year +5, rather than current market values (p_0) and the dividend in year six is the dividend in year +5 (= 50 percent of the earnings forecast for year +5) times the unknown growth rate. That is, solve for g in the relation $p_5 = d_5(1 + g)/(k - g)$.

[14] Note that in equation (1), changes in g increase k^* by exactly the same amount. For the dividend value profile in Figure 1, however, dividends for years +1 to +5 have been fixed by forecasted earnings and dividend payout assumptions. Therefore, increases in the dividend growth rate underlying the terminal value increase the estimated discount rate by a slightly smaller amount.

tion (5). This abnormal earnings growth rate corresponds to a real growth in rents of 10 percent (assumed long-term inflation rate is 5.04 percent), which is clearly an unreasonably optimistic assumption.

In sum, our estimates of the equity risk premium using the abnormal earnings approach are considerably lower than the Ibbotson rate, even though we believe the analyst forecasts we use, as well as the terminal growth assumptions we make, are optimistic. Adjusting for such optimism would lower our estimates further. While our estimates from the dividend growth approach are much closer to the Ibbotson rate, we believe they are biased upward because the assumed growth rate ($g = g_5$) is too high an estimate for dividend growth in perpetuity. The estimates from the abnormal earnings approach are more reliable because we use more available information to reduce the importance of assumed growth rates, and we are better able to reject growth rates as being infeasible by projecting rents rather than dividends. Additional benefits of using the abnormal earnings approach are illustrated in Section V.

IV. Equity Premium Estimates from Other Markets

Other equity markets offer a convenient opportunity to validate our domestic results. As long as the different markets are integrated with the United States and are of similar risk, those markets' estimates should proxy for the equity premium in the United States. We replicated the U.S. analysis on five other important equity markets with sufficient data to generate reasonably representative samples of those markets. Only a summary of our results is provided here; details of those analyses are in Claus and Thomas (1999b). The six markets exhibit considerable diversity in performance and underlying fundamentals over our sample period. This across-market variation increases the likelihood that the estimates we obtain from each market offer independent evidence.

As with the U.S. data, earnings forecasts, actual earnings per share, dividends per share, share prices, and the number of outstanding shares are obtained from I/B/E/S. Book values of equity as of the end of year 0 are collected from COMPUSTAT and Global Vantage for Canada and from Datastream for the remaining four countries. Unlike I/B/E/S and COMPUSTAT, Datastream drops firms that are no longer active. While such deletions are less frequent outside the United States, only surviving firms are included in our sample. Fortunately, no bias is created in this study since we equate market valuations with contemporaneous forecasts, and do not track performance.[15] Therefore, even if the surviving firms (included in our sample) performed systematically better or worse than firms that were dropped, our equity premium estimates are unbiased as long as market prices and earnings forecasts in each year are efficient and incorporate the same information.

[15] Note that there is no "backfilling" in our sample, where prior years' data for successful firms are entered subsequently.

All data are denominated in local currency. Currency risk is not an issue here, since it is present in the required rates of returns for both equities and government bonds. Thus the difference between the two rates should be comparable across countries.

We find that analysts' forecasts in these five markets exhibit an optimism bias, similar to that observed in the United States. We considered other potential sources of measurement error in the forecasts, but are confident that any biases created by these errors are unlikely to alter our equity premium estimates much. For example, in Germany, earnings could be computed in as many as four different ways: GAAP per International Accounting Standards, German GAAP, DVFA, and U.S. GAAP.[16] I/B/E/S employees indicated that they have been more successful at achieving consistency in recent years (all forecasts are on a DVFA basis), but they are not as certain about earlier years in their database. While differences in basis between forecast and actual items would affect analyst bias, they do not affect our estimates of market discount rates. Differences in basis across analysts contaminate the consensus numbers used, but the estimated market discount rates are relatively insensitive to changes in the near-term forecasts used.

To select the month of analysis for each country, we followed the same logic as that for the U.S. analysis. December was the most popular fiscal year-end for all countries except for Japan, where it was March. We then identified the period after the fiscal year-end by which annual earnings are required to be disclosed. This period differs across countries (see Table 1 in Alford et al. (1993)): it is three months for Japan and the United States, four months for France, six months for Canada and the United Kingdom, and eight months for Germany. We selected the month following the reporting deadline as the "sure to be disclosed" month to collect forecasts for any given year.

To include a country-year in our sample, we required that the total market value of all firms in our sample exceed 35 percent of the market value of "primary stock holdings" for that country, as defined by Datastream. Although we used a low hurdle to ensure that our sample contained contiguous years for all countries, a substantially greater proportion of the Datastream Market Index than our minimum hurdle is represented for most country-years.

The equity-premium estimates using the abnormal earnings and dividend growth approaches as well as the prevailing risk-free rates for different country-year combinations with sufficient data are reported in Table III. The number of years with sufficient firms to represent the overall market was highest for Canada (all 14 years between 1985 and 1998), and lowest for Japan (8 years). As with the U.S. sample, we use a 50 percent aggregate

[16] The German financial analyst society, Deutsche Vereinigung für Finanzanalyse (DVFA), has developed a system used by analysts (and often by firms) to adjust reported earnings data to provide a measure that is closer to permanent or core earnings. The adjustment process uses both reported financial information as well as firms' internal records. GAAP refers to Generally Accepted Accounting Principles or the accounting rules under which financial statements are prepared in different domiciles.

Table III

Implied Equity Premium Using Abnormal Earnings and Dividend Growth Approaches ($k - r_f$ and $k^* - r_f$) for International Stocks (1985 to 1998)

The market is an aggregate of firms on the I/B/E/S Summary files with forecasts for years +1, +2, and a five-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding, and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0) are obtained from COMPUSTAT, Global Vantage, and Datastream. Forecasted earnings for years +3, +4, and +5 are determined by applying g_5, the forecasted 5-year growth rate, to year +2 forecasted earnings. All amounts are measured in local currencies. r_f is the 10-year government bond yield. The implied discount rate that satisfies the valuation relation in equation (5) below is k. Abnormal earnings (ae_t) equal reported earnings less a charge for the cost of equity (= beginning book value of equity $* k$). Assuming that 50% of earnings are retained allows the estimation of future book values from current book values and forecast earnings. The terminal value represents all abnormal earnings beyond year +5. Those abnormal earnings are assumed to grow at a constant rate, g_{ae}, which is assumed to equal the expected inflation rate, and is set equal to r_f less 3 percent. The expected rate of return on the market is also estimated using equation (1), and is labeled k^*. Equation (1) is derived from the dividend growth model, and dividend growth in perpetuity, g, is assumed to equal the five-year earnings growth rate, g_5.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \quad (5)$$

$$k^* = \frac{d_1}{p_0} + g \quad (1)$$

Year	Canada			France			Germany			Japan			U.K.		
	r_f	$k - r_f$	$k^* - r_f$	r_f	$k - r_f$	$k^* - r_f$	r_f	$k - r_f$	$k^* - r_f$	r_f	$k - r_f$	$k^* - r_f$	r_f	$k - r_f$	$k^* - r_f$
1985	10.50%	4.41%	7.45%												
1986	8.82%	2.93%	6.64%												
1987	9.16%	1.56%	4.53%	8.72%	2.06%	6.06%									
1988	9.66%	2.83%	4.67%	9.35%	4.00%	3.90%	6.78%	3.43%	4.59%						
1989	9.29%	3.08%	3.66%	8.76%	3.64%	6.11%	6.83%	3.87%	5.48%				10.16%	3.17%	7.24%
1990	10.69%	1.51%	2.97%	9.66%	3.04%	4.23%	8.99%	1.10%	3.23%				11.39%	2.57%	5.06%
1991	10.08%	0.75%	3.71%	8.81%	2.94%	4.41%	8.42%	1.03%	4.72%	6.72%	−0.95%	0.38%	10.49%	2.47%	7.27%
1992	8.18%	0.42%	6.36%	8.74%	2.26%	5.81%	7.89%	2.16%	5.03%	5.38%	−0.86%	−0.34%	9.12%	2.77%	8.69%
1993	7.32%	1.69%	6.59%	7.18%	2.31%	10.57%	6.14%	0.70%	4.19%	4.45%	−1.05%	4.36%	7.64%	3.29%	10.75%
1994	9.29%	1.65%	7.67%	6.82%	1.70%	8.24%	7.26%	1.30%	8.77%	4.24%	−1.04%	4.56%	8.63%	2.87%	8.50%
1995	7.93%	2.71%	6.77%	7.80%	2.06%	10.04%	6.70%	2.22%	9.84%	2.80%	1.12%	9.50%	8.44%	3.02%	8.59%
1996	7.69%	2.69%	6.89%	6.39%	2.38%	12.26%	6.41%	2.14%	8.40%	3.17%	0.79%	7.82%	7.92%	3.34%	8.43%
1997	6.35%	2.28%	7.10%	5.66%	2.28%	9.69%	5.68%	2.28%	11.56%	2.47%	1.65%	9.46%	7.02%	2.53%	7.81%
1998	5.36%	2.68%	7.44%	5.02%	2.53%	13.44%				1.65%	1.99%	10.89%	5.84%	2.09%	6.77%
Mean	8.59%	2.23%	5.89%	7.74%	2.60%	7.90%	7.11%	2.02%	6.58%	3.86%	0.21%	5.83%	8.66%	2.81%	7.91%
S.D.	1.55%	1.04%	1.62%	1.51%	0.68%	3.27%	1.04%	1.03%	2.82%	1.67%	1.31%	4.27%	1.68%	0.40%	1.49%

dividend payout ratio to generate future dividends and book values, and assume that abnormal earnings grow at the expected inflation rate, which is assumed to be three percent less than the prevailing risk-free rate. For the few years when r_f in Japan is below three percent, we set $g_{ae} = 0$.

The equity premium values based on the abnormal earnings approach $(k - r_f)$ generally lie between two and three percent, except for Japan, where the estimates are considerably lower (and even negative in the early 1990s). Finding that none of the almost 70 estimates of $k - r_f$ reported in Tables II and III are close to the Ibbotson estimate suggests strongly that that historical estimate is too high. In contrast, the equity premium estimates based on the dividend growth approach with dividends growing in perpetuity at the five-year earnings growth forecast (g_5) are considerably higher, similar to the pattern observed in the United States. The dividend growth estimates are very close to those reported in Khorana et al. (1997), which uses a similar approach and a similar sample.

Repeating the sensitivity analyses conducted on the United States (described in Section V) on these five markets produced similar conclusions. The abnormal earnings estimates generate projections that are consistent with experience, but the dividend growth estimates are biased upward and generate projections that are too optimistic because the five-year earnings growth forecast (g_5) is too high an estimate for dividend growth in perpetuity. The values of g_5 suggest mean real dividend growth rates in perpetuity that range between 6.09 percent for Canada and 8.25 percent for Japan. These real rates exceed historic real earnings growth rates, and are at least twice as high as the real GDP growth rates forecast for these countries.

The results observed for Japan are unusual and invite speculation. While our results suggest that the equity premium in Japan increased during the sample period, from about -1 percent in the early 1990s to 2 percent in the late 1990s, these results are also consistent with a stock market bubble that has gradually burst. That is, early in our sample period, prices were systematically higher than the fundamentals (represented by analysts' forecasts) would suggest, and have gradually declined to a level that is supported by analysts' forecasts. Note that our sample excludes the peak valuations in the late 1980s before the crash. Perhaps the implied equity premium in that period would be even more negative than the numbers we estimate for the early 1990s. Regardless of whether the poor performance of Japanese equities in the 1990s is due to correction of an earlier mispricing, it is useful to contrast the inferences from a historic approach with those from a forward-looking approach such as ours: the former would conclude that equity premia have fallen in Japan during the 1990s, whereas our approach suggests the opposite.

V. Sensitivity Analyses

This section summarizes our analysis of U.S. equity data designed to gauge the robustness of our conclusion that the equity premium is much lower than historic estimates. We begin by considering two relations for P/B and P/E ratios that allow us to check whether our projections under the dividend growth and abnormal earnings models are reasonable. Next, we document the extent of analyst optimism in our data. Finally, we consider the sensitivity of our risk premium estimates to the assumed abnormal earnings growth rate (g_{ae}).[17]

A. P/B Ratios and the Level of Future Profitability

The first relation we examine is that between the P/B ratio and future levels of profitability (e.g., Penman (1999)), where future profitability is the excess of the forecast market accounting rate of return (roe_t) over the required rate of return, k.

$$\frac{p_0}{bv_0} = 1 + \frac{roe_1 - k}{(1+k)} + \frac{roe_2 - k}{(1+k)^2}\left(\frac{bv_1}{bv_0}\right) + \frac{roe_3 - k}{(1+k)^3}\left(\frac{bv_2}{bv_0}\right) + \dots, \tag{6}$$

where $roe_t = e_t/bv_{t-1}$ is the accounting return on equity in year t.

This relation indicates that the P/B ratio is explained by expected future profitability ($roe_t - k$).[18] Firms expected to earn an accounting rate of return on equity equal to the cost of capital should trade currently at book values ($p_0/bv_0 = 1$). Similarly, the P/B ratio expected in year +5 (p_5/bv_5), which is determined by the assumed growth in abnormal earnings after year +5 (g_{ae}), should be related to profitability beyond year +5. To investigate the validity of our assumed growth rates, we examine the profiles of future P/B ratios and profitability levels to check if they are reasonable and related to each other as predicted by equation (6). Future book values are generated by adding projected earnings and subtracting projected dividends (assuming a 50 percent payout) to the prior year's book value. Similarly, projected market values are obtained by growing the prior year's market value at the discount rate (k) less projected dividends.

Table IV provides data on current and projected values of P/B ratios and profitability. Current market and book values are reported in columns 1 and 2, and projected market and book values in year +5 are reported in columns

[17] We also examined Value Line data for the DOW 30 firms for two years: 1985 and 1995 (details in Claus and Thomas (1999a)). Value Line provides both dividend forecasts (over a four- or five-year horizon) and a projected price. This price is, in effect, a terminal value estimate, which obviates the need to assume dividend growth in perpetuity. Unfortunately, those risk premium estimates appear to be unreliable: The estimated discount rate is 20 percent (8.5 percent) for 1985 (1995). These results are consistent with Value Line believing that the DOW 30 firms are undervalued (overvalued) in 1985 (1995); that is, current price does not equal the present value of forecast dividends and projected prices. This view is supported by their recommendations for the proportion to be invested in equity: it was 100 percent through the 1980s, and declined through the 1990s (it is currently at 40 percent).

[18] The growth in book value terms in equation (6), bv_t/bv_0, which add a multiplicative effect, have been ignored in the discussion because of the built-in correlation with $roe_t - k$. Higher roe_t results in higher e_t, which in turn causes higher growth in bv_t because dividend payouts are held constant at 50 percent for all years.

Table IV

Price-to-Book Ratios (p_t/bv_t), Forecast Accounting Return on Equity (roe_t) and Expected Rates of Return (k) for U.S. Stocks (1985 to 1998)

To examine the validity of assumptions underlying k, which is the implied discount rate that satisfies the valuation relation in equation (5), current price-to-book ratios are compared with estimated future returns on equity (roe_t) to examine fit with equation (6) below. The market is an aggregate of firms on the I/B/E/S Summary files with forecasts for years +1, +2, and a five-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding, and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0) are obtained from COMPUSTAT. When missing, forecasted earnings for years +3, +4, and +5 are determined by applying g_5 to year +2 forecasted earnings. Assuming that 50 percent of earnings are retained allows the estimation of future book values from current book values and forecast earnings. Return on equity (roe_t) equals forecast earnings scaled by beginning book value of equity (bv_{t-1}). Market and book value amounts are in millions of dollars.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \quad (5)$$

$$\frac{p_0}{bv_0} = 1 + \frac{roe_1 - k}{(1+k)} + \frac{roe_2 - k}{(1+k)^2}\left(\frac{bv_1}{bv_0}\right) + \ldots \quad (6)$$

Forecasts as of April	Year 0 Equity Values		Year +5 Equity Values		Price/Book Ratio		Forecast Accounting Return on Equity						k from Eq. (5)
	Market Value (p_0)	Book Value (bv_0)	Market Value (p_5)	Book Value (bv_5)	In Year 0 (p_0/bv_0)	In Year 5 (p_5/bv_5)	In Year 1 (roe_1)	In Year 2 (roe_2)	In Year 3 (roe_3)	In Year 4 (roe_4)	In Year 5 (roe_5)	In Year 6 (roe_6)	
	1	2	3	4	5	6	7	8	9	10	11	12	13
1985	1,747,133	1,191,869	2,676,683	1,768,036	1.5	1.5	15%	16%	16%	17%	17%	17%	14.38%
1986	2,284,245	1,214,454	3,197,490	1,783,987	1.9	1.8	15%	16%	16%	17%	17%	17%	11.28%
1987	2,640,743	1,323,899	3,727,459	1,936,215	2.0	1.9	14%	16%	16%	16%	17%	17%	11.12%
1988	2,615,857	1,430,672	3,779,033	2,122,648	1.8	1.8	16%	16%	16%	17%	17%	17%	12.15%
1989	2,858,585	1,541,231	4,200,867	2,341,029	1.9	1.8	17%	17%	17%	18%	18%	18%	12.75%
1990	3,143,879	1,636,069	4,589,685	2,465,373	1.9	1.9	16%	17%	17%	18%	18%	18%	12.33%
1991	3,660,296	1,775,199	5,181,184	2,597,264	2.1	2.0	14%	16%	16%	17%	17%	17%	11.05%
1992	4,001,756	1,911,383	5,574,848	2,773,918	2.1	2.0	13%	15%	16%	16%	17%	17%	10.57%
1993	4,918,359	2,140,668	6,595,210	3,139,088	2.3	2.1	14%	16%	16%	17%	17%	17%	9.62%
1994	5,282,046	2,168,446	7,336,322	3,301,664	2.4	2.2	16%	17%	18%	18%	19%	18%	10.47%
1995	6,289,760	2,670,725	8,837,148	4,132,682	2.4	2.1	17%	18%	18%	19%	19%	19%	11.03%
1996	8,207,274	3,182,952	11,206,787	4,853,189	2.6	2.3	16%	17%	18%	18%	19%	18%	9.96%
1997	10,198,036	3,679,110	14,103,523	5,708,609	2.8	2.5	17%	18%	18%	19%	20%	19%	10.12%
1998	12,908,495	3,412,303	16,838,377	5,378,478	3.8	3.1	17%	18%	19%	20%	21%	20%	8.15%
Mean					2.2	2.1	15%	17%	17%	18%	18%	18%	11.04%

3 and 4. These values are used to generate current and year +5 P/B ratios, reported in columns 5 and 6. Columns 7 through 12 contain the forecasted accounting rate of return on equity for years 1 to 6, which can be compared with the estimated market discount rate, k, reported in column 13, to obtain forecasted profitability.

The current P/B ratio has been greater than 1 in every year in the sample period, and has increased steadily over time, from 1.5 in 1985 to 3.8 in 1998. Consistent with equation (6), all forecasted *roe* values for years 1 through 6 in Table IV exceed the corresponding values of k. Increases in the P/B ratio over the sample period are mirrored by corresponding increases in forecast profitability ($roe_t - k$) in years +1 through +5 as well as forecast profitability in the posthorizon period (after year +5), as measured by the implied price-to-book ratio in year +5. Finally, the tendency for P/B ratios to revert gradually over the horizon toward one (indicated by the year +5 values in column 6 being smaller than the year 0 values in column 5) is consistent with intuition (e.g., Nissim and Penman (1999)).

We also extended our investigation to years beyond year +5 for the assumptions underlying the abnormal earnings estimates, and find that the pattern of projections for P/B and *roe* remain reasonable. In contrast, those projections for the assumptions underlying the dividend growth model estimates suggest that the underlying growth rates are unreasonably high. To provide an illustrative example of those results, we contrast in Figure 2 the patterns for future *roe* and P/B that are projected for the dividend growth and abnormal earnings approaches for 1991. The *roe* levels are marked off on the left scale, and P/B ratios are shown on the right scale. Recall that the market discount rates estimated for the abnormal earnings and dividend growth approaches are 11.05 percent (k) and 15.16 percent (k^*) and the corresponding terminal growth rates for abnormal earnings and dividends are 5.04 percent and 12.12 percent.

The projections for the abnormal earnings method (indicated by bold lines) continue to remain reasonable. The P/B ratio always exceeds one, but it trends down over time. Consistent with P/B exceeding one, the *roe* is always above the 11.05 percent cost of capital, and trends toward it after year +5. Note that the optimistic analyst forecasts cause *roe* projections to climb for years +1 through +5, but the subsequent decline in *roe* is because the profitability growth implied by g_{ae} (our assumed growth in abnormal earnings past year +5) is lower than that implied by g_5.

The results for the dividend growth approach illustrate the benefits of using projected accounting ratios to validate assumed growth rates. The profitability (*roe*) is actually below the cost of equity of 15.16 percent (k^*), for the first three years, even though the P/B ratio is greater than one. Thereafter, the profitability keeps increasing, to a level above 20 percent by year +15. Both the high level of profitability and its increasing trend are not easily justified, especially when they are observed repeatedly for every year in our sample. Similarly, the increasing pattern for P/B, which is projected to increase from about two to about three by year +15, is hard to justify.

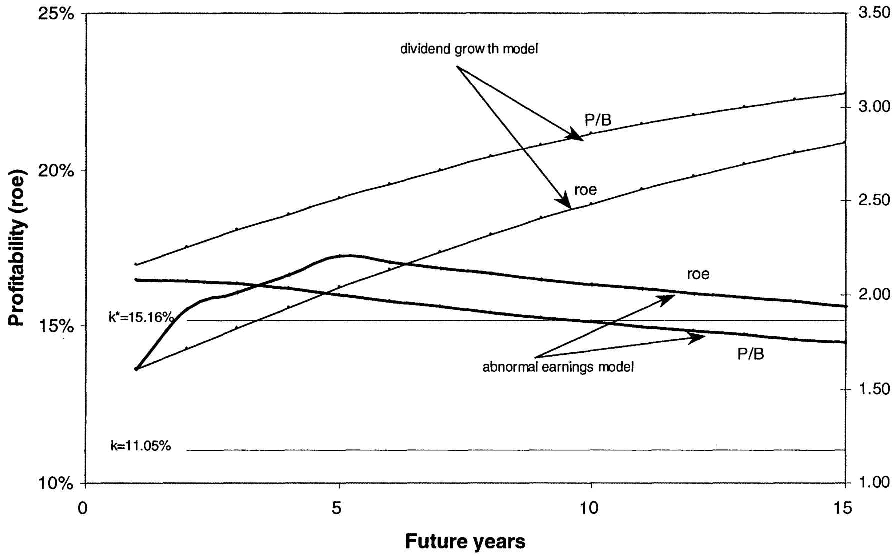

Figure 2. Pattern of future price-to-book (P/B) ratios and profitability, measured as excess of accounting return on equity (*roe*) over estimated discount rates (k^* and k), for dividend growth and abnormal earnings approaches for U.S. stocks as of April, 1991. For the dividend growth model described by equation (1) in Table II, dividends are assumed to grow at the consensus five-year earnings growth rate of 12.12 percent, and future *roe* is compared with the estimated market discount rate of 15.16 percent (k^*). For the abnormal earnings model described by equation (5) in Table II, abnormal earnings are assumed to grow at an anticipated inflation rate of 5.04 percent, and *roe* is compared with the estimated market discount rate of 11.05 percent (k). Projected P/B ratios are shown for both models.

These projections are, however, consistent with an estimated discount rate that is too high. Since near-term analysts' forecasts of profitability are below this discount rate, future levels of profitability have to be unreasonably high to compensate.

B. P/E Ratios and Forecast Growth in Profitability

The second relation we use to check the validity of our assumptions regarding g_{ae} is the price–earnings ratio, described by equation (7) (see derivation in Claus and Thomas, 1999a). Price–earnings ratios are a function of the present value of future changes in abnormal earnings, multiplied by a capitalization factor ($= 1/k$).

$$\frac{p_0}{e_1} = \frac{1}{k}\left[1 + \frac{\Delta ae_2}{e_1(1+k)} + \frac{\Delta ae_3}{e_1(1+k)} + \dots\right], \tag{7}$$

where $\Delta ae_t = ae_t - ae_{t-1}$ is the change in expected abnormal earnings over the prior year.

The price–earnings ratio on the left-hand side deviates slightly from the traditional representation in the sense that it is a "forward" price–earnings ratio, based on expected earnings for the upcoming year, rather than a "trailing" price–earnings ratio (p_0/e_0), which is based on earnings over the year just concluded. The relation between future earnings growth and forward price–earnings ratios is simpler than that for trailing price–earnings ratios.[19] Therefore, we use only the forward price–earnings ratio here and refer to it simply as the P/E ratio.

The results reported in Table V describe P/E ratios and growth in abnormal earnings derived from analysts' forecasts for the market. The first four columns provide market values and the corresponding upcoming expected earnings for year 0 and year +5. These numbers are used to generate the current and year +5 P/E ratios reported in columns 5 and 6, which can be compared to the values of $1/k$ reported in column 18.[20] According to equation (7), absent growth in abnormal earnings, the P/E ratio should be equal to $1/k$, and the P/E ratio should be greater (less) than $1/k$ for positive (negative) expected growth in abnormal earnings. Forecast growth rates in abnormal earnings for years +2 through +6 are reported in columns 7 through 11. To maintain equivalence with the terms in equation (7), growth in abnormal earnings is scaled by earnings expected for year +1 (e_1) and then discounted.

To understand the relations among the numbers in the different columns, consider the row corresponding to 1991. The market P/E ratio of 15.1 is higher than the inverse of the discount rate ($1/k = 9.0$). That difference of 6.1 is represented by the sum of the present value of the abnormal earnings growth terms in future years, scaled by e_1 (this sum needs to be multiplied by $1/k$ as shown in equation (7)). These growth terms decline from 13 percent in year 2 to 2 percent in year 6, and continue to decline thereafter. By year +5, the market P/E is expected to fall (to 11.7), since some of the growth in abnormal earnings (represented by the amounts in columns 7 through 11) is expected to have already occurred by then. Turning to the other sample years, the P/E ratios in year 0 (column 5) have generally increased through the sample period, and so have the values of $1/k$. Consistent with P/E ratios exceeding $1/k$ in every year, abnormal earnings are forecast to exhibit positive growth for all cells in columns 7 to 11. Also, the P/E ratios in year +5 are forecast to decline, relative to the corresponding year 0 P/E values, because of the value represented by the amounts in columns 7 to 11.

[19] Since the numerator of the P/E ratio is an ex-dividend price (p_0), the payment of a large dividend (d_0) would reduce p_0 without affecting trailing earnings (e_0), thereby destroying the relation between p_0 and e_0. This complication does not arise when expected earnings for the upcoming period (e_1) is used instead of e_0.

[20] If the numbers in Table V appear to be not as high as the trailing P/E ratios commonly reported in the popular press, note that forward P/E ratios are generally smaller than trailing P/E ratios for the following reasons. First, next year's earnings are greater than current earnings because of earnings growth. Second, current earnings contain one-time or transitory components that are on average negative, whereas forecast earnings focus on core or continuing earnings.

For purposes of comparison with other work, we also report in columns 12 through 17 of Table V the growth in forecast earnings (as opposed to growth in abnormal earnings) for years +1 through +6. Forecasted growth in earnings declines over the horizon, similar to the pattern exhibited by growth in abnormal earnings. Note the similarity in the pattern of earnings growth for all years in the sample period: the magnitudes of earnings growth estimates appear to settle at around 12 percent by year +5, before dropping sharply to values around 7 percent in the posthorizon period (year +6). Again, this decline occurs because the earnings growth implied by g_{ae} (our assumed growth in abnormal earnings past year +5) is lower than g_5.

The results in Table V confirm the predictions derived from equation (7) as well as the intuitive links drawn in the literature. As with the results for P/B ratios, the trends for P/E ratios and growth in abnormal earnings exhibit no apparent discrepancies that might suggest that the assumptions underlying our abnormal earnings model are unreasonable.

C. Bias in Analyst Forecasts

We considered a variety of biases that may exist in the I/B/E/S forecasts, but found only the well-known optimism bias to be noteworthy (details provided in Claus and Thomas (1999a)).[21] We compute the forecast error for each firm in our sample, representing the median consensus forecast as of April less actual earnings, for different forecast horizons (year +1, +2, . . . +5) for each year between 1985 and 1997. Table VI contains the median forecast errors (across all firms in the sample for each year), scaled by share price. In general, forecasted earnings exceed actual earnings, and the extent of optimism increases with the horizon.[22] There is, however, a gradual reduction in optimism toward the end of the sample period.

Since the forecast errors in Table VI are scaled by price, comparing the magnitudes of the median forecast errors with the inverse of the trailing P/E ratios (or E/P ratios) is similar to a comparison of forecast errors with earnings levels. While the trailing E/P ratios for our sample vary between 5 and 9 percent, the forecast errors in Table VI vary between values that are in the neighborhood of 0.5 percent for year +1 to around 3 percent in year +5. Comparing the magnitudes of year +5 forecast errors with the implied E/P ratios indicates that forecasted earnings exceed actual earnings by as

[21] I/B/E/S removes one-time items (typically negative) from reported earnings. That is, the level of optimism would have been even higher if we had used reported numbers instead of actual earnings according to I/B/E/S.

[22] In addition to increasing with forecast horizon, the optimism bias is greater for certain years where earnings were depressed temporarily. The higher than average dividend payouts observed in Table I for 1987 and 1992 indicate temporarily depressed earnings in those years, and the forecast errors are also higher than average for those years. For example, the two largest median year +2 forecast errors are 1.86 and 1.81 percent, and they correspond to two-year out forecasts made in 1985 and 1990.

Table V

Forward Price-to-Earnings Ratios (p_t/e_{t+1}) and Growth in Forecast Abnormal Earnings and Earnings for U.S. Stocks (1985 to 1998)

To examine the validity of assumptions underlying k, which is the implied discount rate that satisfies the valuation relation in equation (5), current and forecast forward price-to-earnings ratios are compared with growth in forecast abnormal earnings to examine fit with equation (7) below. The market is an aggregate of firms on the I/B/E/S Summary files with forecasts for years +1, +2, and a five-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding, and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0) are obtained from COMPUSTAT. Abnormal earnings (ae_t) equal reported earnings less a charge for the cost of equity (= beginning book value of equity $*$ k). Future market values are projected for each year by multiplying beginning market values by $(1 + k)$ and subtracting dividends. When missing, forecasted earnings for years +3, +4, and +5 are determined by applying g_5 to year +2 forecasted earnings. Assuming that 50 percent of earnings are retained allows the estimation of future book values from current book values and forecast earnings. Market equity values and earnings amounts are in millions of dollars.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \quad (5)$$

$$\frac{p_0}{e_1} = \frac{1}{k}\left[1 + \frac{\Delta ae_2}{e_1(1+k)} + \frac{\Delta ae_3}{e_1(1+k)^2} + \ldots\right] \quad (7)$$

Forecasts as of April	Year 0 Values		Year +5 Values		Forward P/E Ratio		PV of *ae* Growth (Δae_t), Scaled by e_1					Growth in Forecast Earnings						1/*k* from Eq. (5)
	Market Value (p_0)	Earnings (e_1)	Market Value (p_5)	Earnings (e_6)	In Year 0 (p_0/e_1)	In Year 5 (p_5/e_6)	+2	+3	+4	+5	+6	+1	+2	+3	+4	+5	+6	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1985	1,747,133	180,945	2,676,683	308,308	9.7	8.7	5%	3%	3%	3%	1%	17%	13%	11%	11%	12%	9%	7.0
1986	2,284,245	178,024	3,197,490	299,896	12.8	10.7	7%	4%	5%	5%	1%	15%	14%	11%	11%	11%	7%	8.9
1987	2,640,743	186,319	3,727,459	324,573	14.2	11.5	10%	5%	5%	5%	1%	27%	18%	11%	11%	11%	7%	9.0
1988	2,615,857	222,497	3,781,766	364,583	11.8	10.4	4%	4%	4%	4%	1%	33%	11%	11%	11%	11%	8%	8.2
1989	2,858,585	261,278	4,200,867	420,673	10.9	10.0	2%	3%	3%	4%	1%	14%	9%	11%	11%	11%	8%	7.8
1990	3,143,879	257,657	4,589,685	442,911	12.2	10.4	7%	4%	4%	4%	1%	13%	15%	11%	12%	12%	8%	8.1
1991	3,660,296	241,760	5,181,184	442,291	15.1	11.7	13%	5%	6%	6%	2%	11%	22%	12%	12%	12%	7%	9.0
1992	4,001,756	252,109	5,574,848	463,780	15.9	12.0	14%	6%	6%	6%	2%	25%	22%	12%	12%	12%	7%	9.5
1993	4,918,359	295,862	6,595,210	531,812	16.6	12.4	13%	6%	7%	7%	1%	19%	20%	12%	12%	12%	6%	10.4
1994	5,282,046	339,694	7,174,214	604,559	15.5	11.9	11%	6%	6%	7%	1%	17%	19%	12%	12%	12%	6%	10.0
1995	6,289,760	444,593	8,837,148	783,736	14.1	11.3	9%	5%	6%	6%	2%	22%	17%	12%	12%	12%	7%	9.1
1996	8,207,274	512,921	11,206,787	893,185	16.0	12.5	8%	6%	7%	7%	2%	15%	15%	12%	13%	13%	7%	10.0
1997	10,198,036	614,932	14,103,523	1,100,714	16.6	12.8	8%	7%	7%	8%	2%	19%	16%	11%	12%	12%	7%	9.9
1998	12,908,495	577,297	16,838,377	1,069,786	22.4	15.7	12%	9%	10%	11%	2%	19%	16%	11%	12%	12%	7%	12.3
Mean					14.6	11.6	9%	5%	6%	6%	1%	19%	16%	11%	12%	12%	7%	9.2

Table VI

Optimism Bias in I/B/E/S Forecasts for U.S. Stocks: Median Forecast Errors for Forecasts Made Between 1985 and 1997

The following table represents the median of all forecast errors scaled by share price for each year examined. The forecast error is calculated for each firm as of April each year, and equals the median consensus forecasted earnings per share minus the actual earnings per share, scaled by price. The year when the forecasts were made is listed in the first row, while the first column lists the horizon of that forecast. For each year and horizon combination, we report the median forecast error and the number of firms in the sample. To interpret the Table, consider the values of 0.78 percent and 1,680 reported for the +1/1985 combination., in the top left-hand corner of the table. This means that the median value of the difference between the forecasted and actual earnings for 1986 was 0.78 percent of price, and that sample consisted of 1,680 firms with available forecast errors. The results confirm that analyst forecasts are systematically positively biased and that this bias increases with the forecast horizon; however, the extent of any such bias has been declining steadily over time.

		Year Forecast Was Made													
		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Mean
Forecast	Median	0.78%	0.65%	0.37%	0.07%	0.44%	0.58%	0.39%	0.17%	0.15%	0.03%	0.04%	0.00%	0.00%	0.28%
Year +1	Obs.	1,680	1,707	1,878	1,815	1,868	1,932	1,959	2,176	2,492	2,710	2,895	3,261	3,462	
Forecast	Median	2.05%	1.40%	0.79%	0.99%	1.74%	1.88%	1.21%	0.87%	0.58%	0.34%	0.32%	0.27%	—	1.04%
Year +2	Obs.	1,545	1,572	1,732	1,701	1,757	1,815	1,896	2,084	2,287	2,594	2,694	2,852	—	
Forecast	Median	2.84%	0.99%	1.44%	2.22%	2.78%	2.39%	1.50%	0.95%	0.63%	0.54%	0.45%	—	—	1.52%
Year +3	Obs.	1,406	1,449	1,596	1,576	1,634	1,744	1,826	1,936	2,159	2,396	2,346	—	—	
Forecast	Median	2.63%	2.04%	2.80%	3.19%	3.17%	2.83%	1.54%	0.91%	0.77%	0.60%	—	—	—	2.05%
Year +4	Obs.	1,285	1,344	1,492	1,474	1,586	1,696	1,724	1,825	2,024	2,132	—	—	—	
Forecast	Median	3.54%	3.44%	3.86%	3.59%	3.43%	2.91%	1.36%	0.94%	0.74%	—	—	—	—	2.65%
Year +5	Obs.	1,201	1,260	1,411	1,432	1,528	1,621	1,618	1,704	1,815	—	—	—	—	

much as 50 percent at that horizon. These results suggest that our equity premium estimates are biased upward because we do not adjust for the considerable optimism in earnings forecasts for years +1 to +5. They also suggest that we are justified in dropping assumed growth rates for earnings past year +5 (column 17 versus column 16 in Table V).

D. Impact of Variation in the Assumed Growth Rate in Abnormal Earnings Beyond Year +5 (g_{ae})

We begin by considering two alternative cases for g_{ae}: three percent less and three percent more than our base case, where g_{ae} is assumed to equal the expected inflation rate. As mentioned in the Appendix, our base growth rate of $g_{ae} = r_f - 3\%$ is higher than any rate assumed in the prior abnormal earnings literature. Adding another three percent to the growth rate, which would require rents to grow at a three percent real rate in perpetuity, raises the level of optimism further. Dropping three percent from the base case, in the lower growth scenario, would be equivalent to assuming a very low nominal growth rate in abnormal earnings, and would be only slightly more optimistic than the assumptions in much of the prior abnormal earnings literature.

For the higher (lower) growth rate scenario, corresponding to $g_{ae} = r_f$ ($g_{ae} = r_f - 6\%$), the average risk premium over the 14-year sample period increases (decreases) to a mean of 4.66 (2.18), from a mean of 3.40 percent for the base case. Even for the high growth rate in abnormal earnings, the increase in the estimated risk premium is modest, and leaves it substantially below the traditional estimates of the risk premium. While increasing (decreasing) the growth rate increases (decreases) the terminal value, it also reduces (increases) the present value of that terminal value because of the higher (lower) discount rate it engenders.

We also considered a synthetic market portfolio each year constructed to have no expected future abnormal earnings, to avoid the need for an assumed abnormal earnings growth rate beyond year +5. As described in equation (6), portfolios with P/B = 1 should exhibit no abnormal earnings; that is, the roe_t should on average equal k for this synthetic market. The last term in equation (5), representing the terminal value of abnormal earnings beyond year +5, is set to zero and the estimates for k obtained iteratively each year. The mean estimate for $k - r_f$ from this synthetic market is 2.20 percent, which is slightly lower than the mean risk premium of 3.40 percent in Table II. Note that a lower discount rate is not expected for the synthetic market, since it has a beta close to one each year and has a lower P/B than the market. (Low P/B firms are expected to generate higher returns (e.g., Gebhardt, Lee, and Swaminathan (forthcoming).) The higher discount rates observed for the assumptions underlying our abnormal earnings model support our view that the analyst forecasts we use and our assumption that the terminal growth in abnormal earnings equals expected inflation ($g_{ae} = r_f - 3\%$) are both optimistic.

VI. Conclusion

Barring some notable exceptions (e.g, Siegel (1992 and 1998), Blanchard (1993), Malkiel (1996), and Cornell (1999)), academic financial economists generally accept that the equity premium is around eight percent, based on the performance of the U.S. market since 1926. We claim that these estimates are too high for the post-1985 period that we examine, and the equity premium is probably no more than three percent. Our claim is based on estimates of the equity premium obtained for the six largest equity markets, derived by subtracting the 10-year risk-free rate from the discount rate that equates current prices to forecasted future flows (derived from I/B/E/S earnings forecasts). Growth rates in perpetuity for dividends and abnormal earnings need to be much higher than is plausible to justify equity premium estimates of about eight percent. Not only are such growth rates substantially in excess of any reasonable forecasts of aggregate growth (e.g., GDP), the projected streams for various indicators, such as price-to-book and price-to-earnings ratios, are also internally contradictory and inconsistent with intuition and past experience.

We agree that the weight of the evidence provided by the historical performance of U.S. stock markets since 1926 is considerable. Yet there are reasons to believe that this performance exceeded expectations, because of potential declines in the equity premium, good luck, and survivor bias. While projecting dividends to grow at earnings growth rates forecast by analysts provides equity premium estimates as high as eight percent, we show that those growth forecasts exhibit substantial optimism bias and need to be adjusted downward. In addition to our results, theory-based work, historical evidence from other periods and other markets, and surveys of institutional investors all suggest that the equity premium is much lower than eight percent. Overall, we believe that an eight percent equity premium is not supported by an analysis that compares current market prices with reasonable expectations of future flows for the markets and years that we examine.

Appendix: Assumed Growth Rates in Perpetuity for Dividends (g) and Abnormal Earnings (g_{ae})

While the conceptual definition of g is clear—it is the dividend growth rate that can be sustained in perpetuity, given current capital and future earnings[23]—determining this rate from fundamentals is not easy. To illustrate, take two firms that are similar in every way, except that they have announced different dividend policies in the current period, which results in a higher expected forward dividend yield (d_1/p_0) for one firm than the other, say 7 percent and 1 percent. What can be said about g for the two firms?

[23] Assuming too high a rate would cause the capital to be depleted in some future period, and assuming too low a rate would cause the capital to grow "too fast."

Examination of equation (1) indicates that g for the low dividend yield firm must be 6 percent higher than g for the higher dividend yield firm, assuming they both have the same discount rate (k^*). If k^* equals 10 percent, for example, the value of g for the two firms must be 3 percent and 9 percent. These two values of g are substantially different from each other, even though the two firms are not.

In addition to being a hypothetical rate, g need not be related to historic or forecasted near-term growth rates for earnings or dividends. Dividend payout ratios can change over time because of changes in the investment opportunity set available and the relative attractiveness of cash dividends versus stock buybacks. Since changes in dividend payout affect the dividend yield, which in turn affects g, historic growth rates may not be relevant for g. Also, if dividend policies are likely to change over time, g need not be related to g_5 (the growth rate forecast for earnings over the next five years), a rate that is frequently used to proxy for g. Various scenarios can be constructed for the two firms in the example above to obtain similar historic and/or near-term forecast growth rates and yet have substantially different values for g.

Despite the difficulties noted above, both historic and forecast rates for aggregate dividends, earnings, and other macroeconomic measures (such as GDP) have been used as proxies for g. We note that these proxies create additional error. First, it is important to hold the unit of investment constant through the period where growth is measured. In particular, any growth created at the aggregate level by the issuance/retirement of equity since the beginning of the period should be ignored. Second, profits from all activities conducted outside the publicly traded corporate sector that are included in the macroeconomic measures should be deleted, and all overseas profits relating to this sector that are excluded from some macroeconomic measures should be included.

To control for the unit of investment problem, we use forecasted growth in per-share earnings rather than aggregate earnings, and to mitigate the problems associated with identifying g, we focus on growth in rents (abnormal earnings), g_{ae}, rather than dividends. To understand the benefits of switching to g_{ae}, it is important to describe some features of abnormal earnings. Expected abnormal earnings would equal zero if book values of equity reflected market values.[24] If book values measure input costs fairly, but do not include the portion of market values that represent economic rents (not yet earned), abnormal earnings would reflect those rents. However, the magnitude of such rents at the aggregate market level is likely to be small, and any rents that emerge are likely to be dissipated over time for the usual reasons (antitrust actions, global competition, etc.). As a result, much of the

[24] That is, if market prices are efficient and book values are marked to market values each period, market (book) values are expected to adjust each period so that no future abnormal returns (abnormal earnings) are expected.

earlier literature using the abnormal earnings approach has assumed zero growth in abnormal earnings past the "horizon" date.[25]

Returning to the two-firm example, shifting the focus from growth in dividends to growth in rents removes much of the confusion caused by transitory changes in dividend payouts and dividend yields: these factors should have no impact on growth in rents, since the level of and growth in rents are determined by economic factors such as monopoly power. That is, even though the two firms have different forecasted earnings and dividends, the forecasted abnormal earnings and growth in abnormal earnings should be identical.

We believe, however, that the popular assumption of zero growth in abnormal earnings may be too pessimistic because accounting statements are conservative and understate input costs: assets (liabilities) tend to be understated (overstated) on average. For example, many investments (such as research and development, advertising, and purchased intangibles) are written off too rapidly in many domiciles. As a result, abnormal earnings tend to be positive, even in the absence of economic rents. Growth in abnormal earnings under conservative accounting is best understood by examining the behavior of the excess of *roe* (the accounting rate of return on the book value of equity) over *k* (the discount rate). Simulations and theoretical analyses (e.g., Zhang (2000)) of the steady-state behavior of the accounting rate of return under conservative accounting suggest two important determinants: the long-term growth in investment and the degree of accounting conservatism. These analyses also suggest that *roe* approaches *k*, but remains above it in the long-term.

Even though a decline in the excess of *roe* over *k* should cause the magnitude of abnormal earnings to fall over time, a countervailing factor is the growth in investment, which increases the base on which abnormal earnings are generated. We assume as a first approximation that the latter effect is greater than the former, and that abnormal earnings increase in perpetuity at the expected inflation rate. Since we recognize that this assumption is an approximation, we elected to err on the side of choosing too high a growth rate to ensure that our equity premium estimates are not biased downward. Also, we conduct sensitivity analyses to identify the impact on our equity premium estimates of varying the assumed growth rate within a reasonable range.

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Rational Asset Prices

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ABSTRACT

The mean, covariability, and predictability of the return of different classes of financial assets challenge the rational economic model for an explanation. The unconditional mean aggregate equity premium is almost seven percent per year and remains high after adjusting downwards the sample mean premium by introducing prior beliefs about the stationarity of the price–dividend ratio and the (non)-forecastability of the long-term dividend growth and price–dividend ratio. Recognition that idiosyncratic income shocks are uninsurable and concentrated in recessions contributes toward an explanation. Also borrowing constraints over the investors' life cycle that shift the stock market risk to the saving middle-aged consumers contribute toward an explanation.

A central theme in finance and economics is the pursuit of a *unified* theory of the *rate of return* across different classes of financial assets. In particular, we are interested in the *mean*, *covariability*, and *predictability* of the return of financial assets. At the macro level, we study the short-term risk-free rate, the term premium of long-term bonds over the risk-free rate, and the aggregate equity premium of the stock market over the risk-free rate. At the micro level, we study the premium of individual stock returns and of classes of stocks, such as the small-capitalization versus large-capitalization stocks, the "value" versus "growth" stocks, and the past losing versus winning stocks.

The neoclassical rational economic model is a *unified* model that views these premia as the reward to risk-averse investors that *process information rationally* and *have unambiguously defined preferences over consumption* that typically (but not necessarily) belong to the von Neumann–Morgenstern class. Naturally, the theory allows for market incompleteness, market imperfections, informational asymmetries, and learning. The theory also allows for differences among assets for liquidity, transaction costs, tax status, and other institutional factors.

The cause of much anxiety over the last quarter of a century is evidence interpreted as failure of the rational economic paradigm to explain the price level and the rate of return of financial assets both at the macro and micro

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levels. A celebrated example of such evidence, although by no means the only one, is the failure of the *representative-agent* rational economic paradigm to account for the large average premium of the aggregate return of stocks over short-term bonds and the small average return of short-term bonds from the last quarter of the 19th century to the present. Dubbed the "Equity Premium Puzzle" by Mehra and Prescott (1985), it has generated a cottage industry of rational and behavioral explanations of the level of asset prices and their rate of return.

Another example is the large increase in stock prices in the early and middle 1990s, which Federal Reserve Chairman Alan Greenspan decried as "Irrational Exuberance" even before the unprecedented further increase in stock prices and price–dividend ratios in the late 1990s.

My objective is to revisit some of this evidence and explore the extent to which the rational economic paradigm explains the price level and the rate of return of financial assets over the past 100+ years, both at the macro and micro levels.

In Section I, I reexamine the statistical evidence on the size of the unconditional mean of the aggregate equity return and premium. First, I draw a sharp distinction between *conditional*, *short-term forecasts* of the mean equity return and premium and *estimates of the unconditional mean*. I argue that the currently low conditional short-term forecasts of the return and premium do not lessen the burden on economic theory to explain the large unconditional mean equity return and premium, as measured by their sample average over the past 130 years. Second, I argue that even though one may introduce one's own strong prior beliefs and adjust downwards the sample-average estimate of the premium, the unconditional mean equity premium is at least 6 percent per year and the annual Sharpe ratio is at least 32 percent. These numbers are large and call for an economic explanation.

In Section II, I discuss limitations of the current theory to explain empirical regularities. I argue that per capita consumption growth covaries too little with the return of most classes of financial assets and this implies that the observed aggregate equity return, the long-term bond return, and the observed returns of various subclasses of financial assets are *too large*, *too variable*, and *too predictable*.

In the remaining sections, I revisit and examine the extent to which we can explain the asset returns by relaxing the assumptions of complete consumption insurance, perfect markets, and time-separable preferences. As the reader will readily observe—and I offer my apologies—my choice of issues is eclectic and mirrors in part my own research interests.

In Section III, I show that idiosyncratic income shocks concentrated in periods of economic recession play a key role in generating the mean equity premium, the low risk-free rate, and the predictability of returns. I argue that insufficient attention has been paid to the fact that the annual aggregate labor income exceeds annual dividends by a factor of over 20. Labor income is by far the single most important source of household savings and consumption. The shocks to labor income are uninsurable and persistent and arrive with greater frequency during economic contractions. Idiosyncratic income shocks go a long way toward explaining the unconditional moments of asset returns and the predictability of returns. The construct of per capita consumption is largely irrelevant in explaining the behavior of asset returns because idiosyncratic income shocks are averaged out in per capita consumption.

In Section IV, I show that borrowing constraints over the life cycle play an important role in simultaneously addressing the above issues *and* the demand for bonds. I argue that insufficient attention has been paid to the consumers' life cycle consumption and savings decisions in a market with borrowing constraints. These considerations are important in addressing the limited participation of consumers in the capital markets, the irrelevance of the construct of per capita consumption, and the demand for short-term bonds by consumers with moderate risk aversion, given that equities earn on average a large premium over short-term bonds.

In Section V, I discuss the role of limited market participation. In Section VI, I discuss the role of habit persistence in addressing the same class of issues. In Section VII, I conclude that the observed asset returns do not support the case for abandoning the rational economic theory as our null hypothesis. Much more remains to be done to fully exploit the ramifications of the rational asset-pricing paradigm.

I. How Large Is the Equity Premium?

The average premium of the arithmetic rate of return of the S&P Composite Index over the risk-free rate, measured over the last 130 years, is almost *7 percent* and the annual Sharpe ratio is 36 percent. If the equity premium is a stationary process, then the average premium is an unbiased estimate of the *unconditional* mean equity premium. One may introduce one's own prior beliefs and shave about 1 percent off the premium. The premium and the Sharpe ratio are still large and challenge economic theory for an explanation.

In Table I, I report the sample mean of the annual arithmetic aggregate equity return and of the equity premium. I proxy the aggregate equity return with the S&P Composite Index return. I proxy the annual risk-free rate with the rolled-over return on three-month Treasury bills and certificates. The reported real return is CPI-adjusted for inflation. Over the period 1872 to 2000, the sample mean of the real equity return is 8.9 percent and of the premium is 6.9 percent. Over the period 1926 to 2000, the sample mean of the equity return is 9.7 percent and that of the premium is 9.3 percent. Over the postwar period 1951 to 2000, the sample mean of the equity return is 9.9 percent and that of the premium is 8.7 percent. These sample means are large. Siegel (1998, 1999), Ibbotson Associates (2001), Ibbotson and Chen (2001), Dimson, Marsh, and Staunton (2002), Fama and French (2002), Mehra and Prescott (2002), and several others report the sample means of the equity return and premium in the United States and other countries and conclude that they are large. Some differences arise based on the proxy used for the risk-free rate.

Table I

The Equity Return and Premium

This table shows the sample mean and standard deviation of the annualized real arithmetic return on the S&P Composite Index total return series, the sample mean of the real risk-free rate, and the sample mean of the equity premium. The arithmetic rate of return on equity from the beginning to the end of year t is defined as $R_{t+1} = (P_{t+1} + D_{t+1} - P_t)/P_t$, where P_t is the real price of the aggregate equity at the beginning of year t and D_{t+1} is the aggregate real dividend from the beginning to the end of year t. All returns and premia are in percent. Real returns are CPI adjusted. The table also displays the mean annual growth, $(100/T)\{\ln(P_{T+1}/X_{T+1}) - \ln(P_1/X_1)\}$, of the price/$X$ ratio, where X is the dividends, earnings, book equity, or National Income. The pre-1926 S&P Index price series, the CPI series, the earnings series, and the dividends series are obtained from Shiller's database. The S&P Composite Index returns series post-1926 is obtained from the Ibbotson database. For years prior to 1926, the returns are calculated from the S&P 500 Index and dividend series, assuming no dividend reinvestment. The book equity series is obtained from Davis, Fama, and French (2000) and Vuolteenaho (2000). The National Income is obtained from the Bureau of Labor Statistics. The risk-free rate series is the one constructed by Mehra and Prescott (2002) and is based on an annual average nominal return on three-month Treasury certificates and bills.

	1872–2000	1872–1950	1951–2000	1926–2000
Sample mean S&P return	8.87	8.24	9.87	9.70
Std of return	18.49	19.28	17.32	20.33
Sample mean risk-free rate	2.00	2.54	1.15	0.40
Sample mean premium	6.87	5.69	8.72	9.30
Std of premium	19.19	20.23	17.45	20.50
Sharpe ratio	0.36	0.28	0.50	0.45
Mean annual growth of				
Price/dividends	1.18	−0.22	3.39	1.81
Price/earnings	0.71	−0.57	2.73	1.28
Price/book equity	1.18	−0.11	3.18	2.26
Price/national income	NA	NA	1.27	NA

I draw a sharp distinction between *conditional, short-term forecasts of the mean equity return and premium* and *estimates of the unconditional mean*. The conditional forecasts of the mean equity return and premium at the end of the 20th century and the beginning of the 21st are substantially lower than the estimates of the unconditional mean by at least three measures. First, based on evidence that price–dividend and price–earnings ratios forecast aggregate equity returns and that the values of these ratios prevailing at the beginning of the 21st century are well above their historic averages, Campbell and Shiller (1998) and Shiller (2000) forecast a *conditional* equity premium well below its sample average.[1] Second, Claus and Thomas (2001)

[1] Shiller (1984), Campbell and Shiller (1988a, 1988b), and Fama and French (1988) provide early evidence that the aggregate price–dividend and price–earnings ratios forecast aggregate equity returns. Goyal and Welch (1999) argue that the out-of-sample evidence is less convincing. I do not review here the debates and extensions relating to this literature. In the following paragraphs and in Appendix A, I argue that the forecastability results provide little, if any, guidance to my primary goal in this section, the estimation of the unconditional mean equity return.

calculate the expected aggregate equity premium to be a little above 3 percent in the period 1985 to 1998, based on analysts' earnings forecasts. Third, Welch (2001) reports that the mean forecast among finance and economics professors for the one-year conditional equity premium is 3.5 percent in 2001, down from 6 percent in 1997. These findings are important in their own right and relevant in asset allocation.

However, the currently low conditional, short-term forecasts of the equity premium do not necessarily imply that the unconditional estimate of the mean premium is lower than the sample average. Therefore, the low conditional forecasts do not necessarily lessen the burden on economic theory to explain the large sample average of the equity return and premium over the past 130 years.

The predictability of aggregate equity returns by the price–dividend and price–earnings ratios raises the possibility that use of these financial ratios may improve upon the estimates of the *unconditional* mean equity return (and premium) that are based on the sample mean, an approach pursued earlier by Fama and French (2002).[2] Over the period 1872 to 2000, the price–dividend ratio increased by a factor of 4.6 and the price–earnings ratio by a factor of 2.5. Over the period 1926 to 2000, the price–dividend ratio increased by a factor of 3.9 and the price–earnings ratio increased by a factor of 2.6.[3] One may consider adjusting downwards the sample-mean estimate of the unconditional mean return on equity, but it is unclear by how much.

The size of the adjustment ought to relate to the perceived cause of the increase of these financial ratios. In the year 1998, 52 percent of the U.S. adult population held equity either directly or indirectly, compared to 36 percent of the adult population in 1989. This equitization has been brought about by the increased accessibility of information on the stock market, electronic trading, the growth of mutual funds, the growth of defined-contribution pension plans, and demographic changes. Other regime shifts include the advent of the technology/media/telecoms "new economy" and changes in the taxation of dividends and capital gains. Explanations of the price increase that rely on economic models that are less than fully rational include cultural and psychological factors and tap into the rich and burgeoning literature on behavioral economics and finance.[4]

How does one process this information and adjust the sample mean estimate of the unconditional mean return and premium? To address this issue, I denote by $v_t \equiv \ln(P_t/X_t)$ the logarithm of the ratio of the price to the

[2] The estimators employed in Fama and French (2002) and in this section are discussed in Appendix A.

[3] The increase in these financial ratios should be interpreted with caution. The increase in the price–dividend ratio is due in part to an increase in share repurchases and a decrease in the fraction of dividend-paying firms.

[4] I do not provide a systematic review of the offered explanations. Heaton and Lucas (1999), Shiller (2000), and McGrattan and Prescott (2001) provide lucid accounts of a number of these explanations in the context of both rational economic models and models that deviate from full rationality.

normalizing variable X_t, where the normalizing variable stands for the aggregate dividends, earnings, book equity, National Income, or some combination of these and other economic variables.[5] I choose the normalizing variable X_t in a way that I can plausibly assert that the log financial ratio is stationary. Over the sample period of length T years, the mean annual (geometric) growth of the financial ratio P_t/X_t is given by $(v_{T+1} - v_1)/T$. I define the *adjusted* estimator of the unconditional mean of the annual aggregate real equity return as the sample mean return, less some fraction beta of the sample mean annual growth of the financial ratio, $\hat{R}_{SAMPLE} - \beta(v_{T+1} - v_1)/T$. If the equity return and the log financial ratio are stationary processes, then the adjusted estimator is unbiased for any value of beta.[6] However, the assumption of stationarity alone is insufficient to determine the value of beta.

The beta of the most efficient (mean squared error) adjusted estimator is equal to the slope coefficient of the regression of the sample mean return on the sample mean growth of the financial ratio, $(v_{T+1} - v_1)/T$. Since I have only one sample (of length T), I cannot run such a regression and must rely on information *outside the sample* and/or prior beliefs about the underlying economic model. In Appendix A, I present a set of sufficient conditions that imply that the beta of the most efficient estimator within this class of adjusted estimators is equal to one, when the adjustment is based on the price–dividend ratio. In addition to stationarity, the other main conditions are that the price–dividend ratio does not forecast the *long-run* growth in dividends *and* the *long-run* dividend growth does not forecast the price–dividend ratio. Adoption of the stationarity and (non)forecastability conditions requires strong prior beliefs.

In Table I, I report the mean annual growth of various financial ratios. Over the period 1951 to 2000, the mean annual growth of the price–dividend ratio is 3.4, the price–earnings ratio is 2.7, the price–book equity ratio is 3.2, and the price–National Income ratio is 1.3. Even if I subtract the entire mean annual growth of the price–earnings ratio from the sample mean, the adjusted estimate of the unconditional mean premium is 6.0 percent and is large. The corresponding estimate over the 1926 to 2000 period is 8.0 percent.

An alternative approach is to consider the longer sample period 1872 to 2000. Over this period, the mean annual growth of the price–dividend ratio and price–earnings ratio is 1.2 percent and 0.7 percent, respectively. Thus, this type of adjustment is largely a nonissue over the full sample. Essentially, the change in the financial ratios is "amortized" over 129 years and makes little difference in the estimate. Over the full period 1872 to 2000, the sample mean equity premium is 6.9 percent and the annual Sharpe ratio is

[5] The ratio of the stock market value to the National Income is discussed in Mehra (1998).

[6] A caveat is in order: Without additional assumptions, it is unclear what optimality properties (beyond unbiasedness) are associated with this class of estimators. Neither least squares, nor maximum likelihood, nor Bayesian methods motivate this class of estimators without further assumptions.

36 percent. Any adjustment with the average growth of the financial ratios still leaves the unconditional mean premium large and in need of an economic explanation.

II. Limitations of the Current Theory

The neoclassical rational-expectations economic model parsimoniously links the returns of all assets to the per capita consumption growth through the Euler equations of consumption (see Merton (1973), Rubinstein (1976), Lucas (1978), and Breeden (1979)). According to the theory, the risk premia of financial assets are explained by their covariance with per capita consumption growth. However, per capita consumption growth covaries too little with the returns of most classes of financial assets and this creates a whole class of asset-pricing puzzles: the aggregate equity return, the long-term bond return, and the returns of various subclasses of financial assets are too large, too variable, and too predictable. Attempts to leverage the low covariability typically backfire, implying that the observed risk-free rate is too low and has too low variance. I discuss in some depth the aggregate equity puzzle because it exemplifies many of the problems that arise in attempting to explain the premium of any subclass of financial assets.

The covariance of the per capita consumption growth with the aggregate equity return is *positive.* The rational model explains why the aggregate equity premium is positive. However, the covariance is typically one order of magnitude lower than what is needed to explain the premium. Thus, the equity premium is a *quantitative* puzzle.[7]

The equity premium puzzle is *robust.* One may address the problem by testing the Euler equations of consumption or by calibrating the economy. Either way, it is a puzzle. In calibrating an exchange economy, the model cannot generate the first and second unconditional moments of the equity returns. In testing and rejecting the Euler equations of consumption, one abstracts from the market clearing conditions. The rejections tell us that variations in the assumptions on the supply side of the economy do not resolve the puzzle.

The challenge is a *dual puzzle* of the equity premium that is too high and the risk-free rate that is too low relative to the predictions of the model. In calibrating an economy, the strategy of increasing the risk aversion coefficient in order to lever the effect of the problematic low covariance of consumption growth with equity returns increases the predicted risk-free rate

[7] Grossman and Shiller (1981), Hansen and Singleton (1982), Ferson and Constantinides (1991), Hansen and Jagannathan (1991), and many others test and reject the Euler equations of consumption. Mehra and Prescott (1985) calibrate an economy to match the process of consumption growth. They demonstrate that the unconditional mean annual premium of the aggregate equity return over the risk-free rate is, at most, 0.35 percent. This is too low, no matter how one estimates the unconditional mean equity premium. Weil (1989) stresses that the puzzle is a dual puzzle of the observed too high equity return and too low risk-free rate.

and aggravates the risk-free-rate puzzle. In testing the Euler equations of consumption, the rejections are strongest when the risk-free rate is included in the set of test assets.

Several generalizations of essential features of the model have been proposed to mitigate its poor performance. They include alternative assumptions on preferences,[8] modified probability distributions to admit rare but disastrous market-wide events,[9] incomplete markets,[10] and market imperfections.[11] They also include a better understanding of data problems such as limited participation of consumers in the stock market,[12] temporal aggregation,[13] and the survival bias of the U.S. capital market.[14] Many of these generalizations contribute in part toward our better understanding of the economic mechanism that determines the pricing of assets. I refer the reader to the excellent reviews in the textbooks by Campbell, Lo, and MacKinlay (1997) and Cochrane (2001), and in the articles by Cochrane and Hansen (1992), Kocherlakota (1996), Cochrane (1997), Campbell (2001, 2002), and Mehra and Prescott (2002).

III. Idiosyncratic Income Shocks and Incomplete Markets

A. *The Role of Idiosyncratic Income Shocks*

In economic recessions, investors are exposed to the double hazard of stock market losses and job loss. Investment in equities not only fails to hedge the risk of job loss but also accentuates its implications. Investors require a hefty equity premium in order to be induced to hold equities. In sum, this is the argument that I formalize below and address the predictability of asset returns and their unconditional moments.

The observed correlation of per capita consumption growth with stock returns is low. Over the years, I have grown skeptical of how meaningful an economic construct *aggregate* (as opposed to *disaggregate*) consumption is,

[8] For example, Abel (1990), Constantinides (1990), Epstein and Zin (1991), Ferson and Constantinides (1991), Benartzi and Thaler (1995), Campbell and Cochrane (1999), Anderson, Hansen, and Sargent (2000), Bansal and Yaron (2000), and Boldrin, Christiano, and Fisher (2001).

[9] The merits of this explanation are discussed in Mehra and Prescott (1988) and Rietz (1988).

[10] For example, Bewley (1982), Mehra and Prescott (1985), Mankiw (1986), Constantinides and Duffie (1996), Heaton and Lucas (1996), Storesletten, Telmer, and Yaron (2001), Brav, Constantinides, and Geczy (2002), and Krebs (2002).

[11] For example, Aiyagari and Gertler (1991), Danthine, Donaldson, and Mehra (1992), He and Modest (1995), Bansal and Coleman (1996), Heaton and Lucas (1996), Daniel and Marshall (1997), and Constantinides, Donaldson, and Mehra (2002a).

[12] Mankiw and Zeldes (1991), Brav and Geczy (1995), Attanasio, Banks, and Tanner (2002), Brav et al. (2002), and Vissing-Jorgensen (2002).

[13] Heaton (1995), Lynch (1996), and Gabaix and Laibson (2001).

[14] See Brown, Goetzmann, and Ross (1995). However, Jorion and Goetzmann (1999, Table 6) find that the average real capital gain rate of a U.S. equities index exceeds the average rate of a global equities index that includes both markets that have and have not survived by merely one percent per year.

and how hard we should push aggregate or per capita consumption to explain returns. At a theoretical level, aggregate consumption is a meaningful economic construct if the market is complete or effectively so.[15] In a complete market, heterogeneous households are able to equalize, state by state, their marginal rate of substitution. The equilibrium in a heterogeneous-household, full-information economy is isomorphic in its pricing implications to the equilibrium in a representative-household, full-information economy, if households have von Neumann–Morgenstern preferences.[16] The strong assumption of market completeness is indirectly built into asset pricing models in finance and neoclassical macroeconomic models through the assumption of the existence of a representative household.

Bewley (1982), Mehra and Prescott (1985), and Mankiw (1986) suggest the potential of enriching the asset-pricing implications of the representative-household paradigm, by relaxing the assumption of complete markets.[17] Constantinides and Duffie (1996) find that incomplete markets substantially enrich the implications of the representative-household model. Their main result is a proposition demonstrating, by construction, the existence of household income processes, consistent with given aggregate income and dividend processes, such that equilibrium equity and bond price processes match the given equity and bond price processes.

The theory requires that the idiosyncratic income shocks must have three properties in order to explain the returns on financial assets. First, they must be *uninsurable*. If the income shocks can be insured, then the household consumption growth is equal, state by state, to the aggregate consumption growth, and household consumption growth cannot do better than aggregate consumption growth in explaining the returns. Second, the income shocks must be *persistent*. If the shocks are transient, then households can smooth their consumption by borrowing or by drawing down their savings.[18] Third, the income shocks must be *heteroscedastic*, with *countercyclical* conditional variance.

A good example of a major uninsurable income shock is job loss. Job loss is *uninsurable* because unemployment compensation is inadequate. Layoffs have *persistent* implications on household income, even though the laid-off

[15] The market is effectively complete when all households have preferences that imply one-fund or two-fund separation.

[16] See Negishi (1960), Constantinides (1982), and Mehra and Prescott (1985, an unpublished earlier draft).

[17] There is an extensive literature on the hypothesis of complete consumption insurance. See Cochrane (1991), Mace (1991), Altonji, Hayashi, and Kotlikoff (1992), and Attanasio and Davis (1997).

[18] Aiyagari and Gertler (1991) and Heaton and Lucas (1996) find that consumers facing *transient* shocks come close to the complete-markets rule of complete risk sharing even with transaction costs and/or borrowing costs, *provided that the supply of bonds is not restricted to an unrealistically low level.*

workers typically find another job quickly.[19] Layoffs are *countercyclical* as they are more likely to occur in recessions.

The first implication of the theory is an explanation of the countercyclical behavior of the equity risk premium: The risk premium is highest in a recession because the stock is a poor hedge against the uninsurable income shocks, such as job loss, that are more likely to arrive during a recession.

The second implication is an explanation of the unconditional equity premium puzzle: Even though per capita consumption growth is poorly correlated with stocks returns, investors require a hefty premium to hold stocks over short-term bonds because stocks perform poorly in recessions, when the investor is most likely to be laid off.

Since the proposition demonstrates the existence of equilibrium in frictionless markets, it implies that the Euler equations of household (but not necessarily of per capita) consumption must hold. Furthermore, *since the given price processes have embedded in them whatever predictability of returns by the price–dividend ratios, dividend growth rates, and other instruments that the researcher cares to ascribe to returns, the equilibrium price processes have this predictability built into them by construction.*

B. Empirical Evidence and Generalizations

Brav et al. (2002) provide empirical evidence of the importance of uninsurable idiosyncratic income risk on pricing. They estimate the RRA coefficient and test the set of Euler equations of *household* consumption on the premium of the value-weighted and the equally weighted market portfolio return over the risk-free rate, and on the premium of value stocks over growth stocks.[20] They do not reject the Euler equations of *household* consumption with RRA coefficient between two and four, although they reject the Euler equations of per capita consumption with any value of the RRA coefficient. A RRA coefficient between two and four is economically plausible.

Open questions remain that warrant further investigation. According to the theory in Constantinides and Duffie (1996), periods with frequent and large uninsurable idiosyncratic income shocks are associated with both dispersed cross-sectional distribution of the household consumption growth and low stock returns. An interesting empirical question is *which moments* of the

[19] The empirical evidence is sensitive to the model specification. Heaton and Lucas (1996) model the income process as *univariate* and provide empirical evidence from the Panel Study on Income Dynamics (PSID) that the idiosyncratic income shocks are transitory. Storesletten et al. (2001) model the income process as *bivariate* and provide empirical evidence from the PSID that the idiosyncratic income shocks have a highly persistent component that becomes more volatile during economic contractions. Storesletten, Telmer, and Yaron (2000) corroborate the latter evidence by studying household consumption over the life cycle.

[20] In related studies, Jacobs (1999) studies the PSID database on food consumption; Cogley (2002) and Vissing-Jorgensen (2002) study the CEX database on broad measures of consumption; Jacobs and Wang (2001) study the CEX database by constructing synthetic cohorts; and Ait-Sahalia, Parker, and Yogo (2001) instrument the household consumption with the purchases of certain luxury goods.

cross-sectional distribution of the household consumption growth capture the dispersion. Brav et al. (2002) find that, in addition to the mean and variance, the *skewness* of the cross-sectional distribution is important in explaining the equity premium.

Krebs (2002) provides a theoretical justification as to why it is possible that neither the variance nor the skewness, but higher moments of the cross-sectional distribution are important in explaining the equity premium. He extends the Constantinides and Duffie (1996) model that has only *lognormal* idiosyncratic income shocks by introducing *rare* idiosyncratic income shocks that drive consumption close to *zero*. In his model, the conditional variance and skewness of the idiosyncratic income shocks are nearly constant over time. Despite this, Krebs demonstrates that the original proposition of Constantinides and Duffie remains valid, that is, there exist household income processes, consistent with given aggregate income and dividend processes, such that equilibrium equity and bond price processes match the given equity and bond price processes. Essentially, he provides a theoretical justification as to why it may be hard to empirically detect the rare but catastrophic shocks in the low-order cross-sectional moments of household consumption growth. In Appendix B, I present an example based on Krebs (2002).

A promising direction for future research is to address the relation between the equity return and the higher-order cross-sectional moments of household consumption with Monte Carlo methods. Another promising direction is to instrument the hard-to-observe time-series changes in the cross-sectional distribution with Labor Bureau statistics.

IV. The Life Cycle and Borrowing Constraints

A. Borrowing Constraints over the Life Cycle

Borrowing constraints provide an endogenous partial explanation for the limited participation of young consumers in the stock market. Constantinides et al. (2002a) construct an overlapping-generations exchange economy in which consumers live for three periods. In the first period, a period of human capital acquisition, the consumer receives a relatively low endowment income. In the second period, the consumer is employed and receives wage income subject to large uncertainty. In the third period, the consumer retires and consumes the assets accumulated in the second period. The key feature is that the bulk of the *future* income of the young consumers is derived from their wages forthcoming in their middle age, while the *future* income of the middle-aged consumers is derived primarily from their savings in equity and bonds.

The young would like to invest in equity, given the observed large equity premium. However, they are unwilling to decrease their current consumption in order to save by investing in equity, because the bulk of their lifetime income is derived from their wages forthcoming in their middle age. They would like to borrow, but the borrowing constraint prevents them from doing so. Human capital alone does not collateralize major loans in modern economies for reasons of moral hazard and adverse selection. The model explains why many consumers do not participate in the stock market in the early phase of their life cycle.

The future income of the middle-aged consumers is derived from their current savings in equity and bonds. Therefore, the risk of holding equity and bonds is concentrated in the hands of the middle-aged saving consumers. This concentration of risk generates the high equity premium and the demand for bonds, in addition to the demand for equity, by the middle-aged.[21] The model recognizes and addresses *simultaneously*, at least in part, the *equity premium*, the *limited participation* in the stock market, and the *demand for bonds*.

The model serves as a useful laboratory to address a range of economic issues. Campbell et al. (2001), and Constantinides, Donaldson, and Mehra (2001) address the cost of Social Security reform. Storesletten et al. (2001) explore the interaction of life-cycle effects and the uninsurable wage income shocks and find that the interaction plays an important role in explaining asset returns. Heaton and Lucas (1999) explore whether changes in market participation patterns account for the recent rise in stock prices and find that they do not.

B. Utility of Wealth—An Old Folks' Tale

The low covariance of the growth rate of aggregate consumption with equity returns is a major stumbling block in explaining the mean aggregate equity premium and the cross section of the asset returns, in the context of a representative-consumer economy with time separable preferences. Mankiw and Shapiro (1986) find that the market beta often explains asset returns better than the consumption beta does. Over the years, a number of different economic models have been proposed that effectively increase the covariance of equity returns with the growth rate of aggregate consumption, by proxying the growth rate of aggregate consumption with the aggregate stock market return in the Euler equations of consumption.[22]

I present an old folks' tale, introduced in Constantinides, Donaldson, and Mehra (2002a, 2002b), that accomplishes this goal without introducing Epstein–Zin (1991) preferences or preferences defined directly over wealth.

[21] See also the discussion in the related papers by Bodie, Merton, and Samuelson (1992), Jagannathan and Kocherlakota (1996), Bertaut and Haliassos (1997), Cocco, Gomes, and Maenhout (1999), and Storesletten et al. (2001).

[22] Friend and Blume (1975) explain the mean equity premium with low RRA coefficient by assuming a single-period economy in which the end-of-period consumption inevitably equals the end-of-period wealth. Epstein and Zin (1991) introduce a recursive preference structure that emphasizes the timing of the resolution of uncertainty. Even though the preferences are defined over consumption alone, the stock market return enters directly in the Euler equations of consumption. Bakshi and Chen (1996) introduce a set of preferences defined over consumption and wealth—the spirit of capitalism—that also have the effect of introducing the stock market return in the Euler equations of consumption.

Old folks who are rich enough to be nontrivial investors in the capital markets care about their wealth just as much as younger folks do, even though the state of their health and their medical expenses account for their consumption patterns better than fluctuations of their wealth do. This simple observation takes us a long way toward understanding why the stock market return does a better job than the growth of aggregate consumption does in explaining asset returns.

In the context of an overlapping-generations economy, the major investors in the market are the middle-aged households at the saving phase of their life cycle. These households save with the objective to maximize the utility of their "consumption" in their middle and old age. The insight here is that "consumption" of the old consists of two components, direct consumption, c_D; and the "joy of giving," c_B, in the form of *inter vivos* gifts and *post mortem* bequests. Since the old households' direct consumption is constrained by the state of their health, the correlation between the direct consumption of the old and the stock market return is *low*, a prediction that is borne out empirically. Therefore, the balance of the old households' wealth, c_B, is *a fortiori* highly correlated with the stock market return. In terms of a utility function of consumption at the old age, $u(c_D) + v(c_B)$, that is separable over direct consumption and bequests, the model predicts an Euler equation of consumption with marginal utility at the old age given by $v'(c_B)$ and not by $u'(c_D)$, where c_B is proxied by the stock market value.

This model remains to be tested. Nevertheless, it reinforces the general point that per capita consumption measures neither the total consumption of the marginal investor in the stock market nor that part of the marginal investor's consumption that is unconstrained by health and medical considerations.

V. Limited Stock Market Participation

Limited stock market participation is another potential culprit in understanding why models of per capita consumption do a poor job in explaining returns. Whereas we understood all along that many households whose consumption is counted in the measure of per capita consumption do not hold stocks, it took a paper by Mankiw and Zeldes (1991) to point out that the emperor has no clothes.[23] Even though 52 percent of the U.S. adult population held stock either directly or indirectly in 1998, compared to 36 percent in 1989, stockholdings remain extremely concentrated in the hands of the wealthiest few. Furthermore, wealthy entrepreneurs may be inframarginal in the stock market if their wealth is tied up in private equity.

[23] Since then, several papers have studied the savings and portfolio composition of households, stratified by income, wealth, age, education, and nationality. See Blume and Zeldes (1993), Haliassos and Bertaut (1995), Heaton and Lucas (1999, 2000), Poterba (2001), and the collected essays in Guiso, Haliassos, and Jappelli (2001).

Mankiw and Zeldes (1991) calculate the per capita food consumption of a subset of households, designated as *asset holders* according to a criterion of asset holdings above some threshold. They find that the implied RRA coefficient decreases as the threshold is raised. Brav and Geczy (1995) confirm their result by using the nondurables and services per capita consumption, reconstructed from the Consumer Expenditure Survey (CEX) database. Attanasio et al. (2002), Brav et al. (2002), and Vissing-Jorgensen (2002) find some evidence that per capita consumption growth can explain the equity premium with a relatively high value of the RRA coefficient, once we account for limited stock market participation. However, Brav et al. point out that the statistical evidence is weak and the results are sensitive to experimental design.

Limited stock market participation is a fact of life and empirical tests of the Euler equations of consumption should account for it. However, my interpretation of the empirical results is that recognition of limited stock market participation alone is insufficient to explain the returns on assets. Essentially, *the subset of households that are marginal in the stock market are still subject to uninsurable idiosyncratic income risk and we should take that into account also in attempting to explain asset returns.*

VI. Habit Persistence

Habit persistence has a long tradition in economic theory, dating back to Marshall (1920) and Duesenberry (1949). It is the property of preferences that an increase in consumption increases the marginal utility of consumption at adjacent dates relative to the marginal utility of consumption at distant ones. Building on earlier work by Ryder and Heal (1973) and Sundaresan (1989), I demonstrate in Constantinides (1990) that habit persistence can, in principle, reconcile the high mean equity premium with the low variance of consumption growth and with the low covariance of consumption growth with equity returns. Habit persistence lowers the intertemporal elasticity of substitution in consumption, given the risk aversion. The mean equity premium is equal to the covariance of consumption growth with equity returns, divided by this elasticity. Therefore, given the risk aversion, habit persistence lowers the elasticity and raises the mean equity premium.[24]

There are several interesting variations of the above class of preferences. Pollak (1970) discusses a model of *external* habit persistence in which the consumer does not take into account the effect of current consumption on future preferences. Abel (1990) and Campbell and Cochrane (1999) address

[24] Ferson and Constantinides (1991) test the special case of the linear habit model in which the habit depends only on the *first* lag of own consumption and report that the habit model performs better than the time-separable model and that the habit persistence parameter is economically and statistically significant. See also Hansen and Jagannathan (1991) and Heaton (1995).

the equity premium in the context of models with external habit persistence. In particular, the latter introduce a *nonlinear* specification of habit, reverse-engineered to keep the variability of the interest rate low. The large average equity premium, the predictability of long-horizon returns, and the behavior of equity prices along the business cycle are induced by a volatile RRA coefficient that has the value of 80 in the steady state and much higher still in economic recessions. Calibrated with the actual history of aggregate consumption, the model hits the aggregate price–dividend ratio in a number of periods but misses it in the 1950s and 1990s.

A promising direction for future research is to endogenize the currently ad hoc specification of the nonlinear habit. Another direction is to address the predictability of asset returns and their behavior along the business cycle in a model that benefits from the added flexibility of the nonlinear specification of habit but keeps risk aversion low and credible with the specification of habit to be *internal*.

Empirical tests of consumption-based models that incorporate habit persistence and aimed at explaining asset returns produce mixed results.[25] It is hardly surprising that the results on both the habit and the external habit persistence models are mixed. The National Income and Product Accounts (NIPA) per capita consumption series is an imperfect proxy of the consumption of investors that are marginal in the capital markets, given the earlier-identified problems of incomplete consumption insurance, limited participation of households in the capital markets, borrowing constraints, and the exclusion of bequests from the definition of consumption. Both NIPA per capita consumption and consumption surplus over habit have low covariance with asset returns. Nonlinear refinements in the definition of habit do not remedy the problem of low covariance with asset returns. Habit persistence may well gain in empirical relevance in explaining asset returns, once we correctly measure the consumption of the unconstrained marginal investors in the capital markets.

Habit persistence is already gaining ground as an ingredient of economic models addressing a diverse set of economic problems beyond asset pricing, including the consumption–saving behavior and the home-equity puzzle. Habit persistence is a sensible property of preferences. It is also a property that allows for the separate specification of the RRA coefficient and the intertemporal elasticity of substitution within the class of von Neuman–Morgenstern preferences.

[25] Ferson and Harvey (1992) report positive results for the linear external habit model. Wachter (2001) reports that long lags of consumption growth predict the short-term interest rate, as implied by the nonlinear external habit model. Li (2001) reports that in both the linear and the nonlinear external habit models, the surplus consumption over habit has limited success in explaining the time series of the premia of stock and bond portfolios. Menzly, Santos, and Veronesi (2001) develop an external habit model and report that it helps explain the cross section of asset returns.

VII. Concluding Remarks

I examine the observed asset returns and conclude that the evidence does not support the case for abandoning the rational economic model. I argue that the standard model is greatly enhanced by relaxing some of its assumptions. In particular, I argue that we go a long way toward addressing market behavior by recognizing that consumers face uninsurable and idiosyncratic income shocks, for example, the loss of employment. The prospect of such events is higher in economic downturns and this observation takes us a long way toward understanding both the unconditional moments of asset returns and their variation along the business cycle.

I also argue that life-cycle considerations are important and often overlooked in finance. Borrowing constraints become important when placed in the context of the life cycle. The fictitious representative consumer that holds all the stock market and bond market wealth does not face credible borrowing constraints. Young consumers, however, do face credible borrowing constraints. I trace their impact on the equity premium, the demand for bonds—Who holds bonds if the equity premium is so high?—and on the limited participation of consumers in the capital markets.

Finally, I argue that relaxing the assumption of convenience that preferences are time separable drives a wedge between the preference properties of risk aversion and intertemporal elasticity of substitution, within the class of von Neumann–Morgenstern preferences. Further work along these lines may enhance our understanding of the price behavior along the business cycle with credibly low risk-aversion coefficient.

I believe that the integration of the notions of *incomplete markets*, the *life cycle*, *borrowing constraints*, and other sources of *limited stock market participation* is a promising vantage point from which to study the prices of asset and their returns both theoretically and empirically within the class of rational asset-pricing models.

At the same time, I believe that specific deviations from rationality in the agents' choices and in the agents' processing of information potentially enhance the realism and economic analysis of certain phenomena on a case-by-case basis.[26] However, several examples of apparent deviation from rationality may be reconciled with the rational economic paradigm, once we recognize that rational investors have incomplete knowledge of the fundamental structure of the economy and engage in learning.[27] In any case, the collection of these deviations from rationality does not yet amount to a new economic paradigm that challenges the rational economic model.

It has been more than 60 years since Keynes (1936) wrote about animal spirits, and 15 since Shiller (1984) wrote about noise traders and DeBondt and Thaler (1985) wrote about stock market overreaction. I have yet to see an *unambiguously articulated* set of principles that emerges from the kalei-

[26] Barberis and Thaler (2002) and Hirshleifer (2001) provide excellent reviews of this literature.

[27] Brav and Heaton (2002) provide excellent discussion of these issues.

doscope of these clinical investigations and that is put forth as an alternative to the rational economic paradigm. Serious scholars are keenly aware of this criticism and hard at work to address it. Until such a paradigm is put forth *and* is empirically vindicated, the rational economic paradigm remains our principal guide to economic behavior.

Appendix A.
Estimation of the Unconditional Mean Return on Equity

I define the adjusted estimator of the unconditional mean of the annual aggregate arithmetic real return on equity as

$$\hat{R}_x \equiv T^{-1} \sum_{t=1}^{T} R_{t+1} - \beta T^{-1}(v_{T+1} - v_1) = \hat{R}_{SAMPLE} - \beta T^{-1}(v_{T+1} - v_1). \quad \text{(A1)}$$

The term $v_t \equiv \ln(P_t/X_t)$ is the logarithm of the price of aggregate equity, normalized with the variable X_t, where X_t stands for the aggregate dividends, earnings, book equity, National Income, or some other economic variable.

I assume that R_t and v_t are stationary processes. Then $E[v_{T+1} - v_1] = 0$ and $\hat{R}_x$ is an *unbiased* estimator of the unconditional mean equity return. Note that the assumption of stationarity alone does not determine the value of the parameter beta that provides the most efficient estimator of the unconditional mean equity return. The variance of the estimator $\hat{R}_x$ is

$$\begin{aligned} \operatorname{var}(\hat{R}_x) &= \operatorname{var}(\hat{R}_{SAMPLE}) - 2\beta \operatorname{cov}(\hat{R}_{SAMPLE}, T^{-1}(v_{T+1} - v_1)) \\ &\quad + \beta^2 \operatorname{var}(T^{-1}(v_{T+1} - v_1)) \end{aligned} \quad \text{(A2)}$$

and is minimized when beta is set equal to

$$\beta^* = \frac{\operatorname{cov}(\hat{R}_{SAMPLE}, T^{-1}(v_{T+1} - v_1))}{\operatorname{var}(T^{-1}(v_{T+1} - v_1))}. \quad \text{(A3)}$$

The beta of the most efficient (mean squared error) estimator is equal to the slope coefficient of the regression of $\hat{R}_{SAMPLE}$ on $T^{-1}(v_{T+1} - v_1)$.

Since I have only one sample of length T, I cannot run such a regression and must rely on information *outside the sample* and/or prior beliefs about the underlying economic model. Essentially, within the sample of length T, I can examine the high-frequency behavior of the joint time series R_t and v_t, but I need to assert my prior beliefs on how these findings relate to the behavior of the joint time series at the T-year frequency.

For example, consider the case in which v_t stands for the log price–dividend ratio. Since a high price–dividend ratio forecasts *in-sample* low long-horizon returns, it is a plausible prior belief that it also forecasts low T-horizon returns, $\operatorname{cov}(\hat{R}_{SAMPLE}, v_1) < 0$, for $T = 50$ years (1951 to 2000) or

$T = 129$ years (1872 to 2000). It is also a plausible prior belief that periods of high returns are not followed by low price–dividend ratios, that is, it is plausible to believe that $\text{cov}(\hat{R}_{SAMPLE}, v_{T+1}) \gtrsim 0$. Then equation (A3) implies that the beta of the most efficient estimator is positive.

I present a set of sufficient (but not necessary) conditions that imply that the beta of the most efficient estimator in the class $\hat{R}_x$ equals one. Let v_t stand for the log price–dividend ratio and assume the following: (1) the returns and the price–dividend ratio are stationary, (2) the price–dividend ratio does not forecast the growth in dividends, (3) dividend growth does not forecast the price–dividend ratio, (4) the price–dividend ratio does not forecast the difference in the conditional variance of the capital gain rate and the dividend growth rate, and (5) the difference in the conditional variance of the capital gain rate and the dividend growth rate does not forecast the price–dividend ratio. To prove the claim, I use a Taylor-series expansion:

$$\Delta v_{t+1} = \Delta P_{t+1}/P_t - \Delta D_{t+1}/D_t - k_{t+1} \tag{A4}$$

where

$$k_{t+1} \equiv (\Delta P_{t+1}/P_t)^2/2 - (\Delta D_{t+1}/D_t)^2/2$$

and write the sample mean of the arithmetic return as

$$\begin{aligned}\hat{R}_{SAMPLE} &\equiv T^{-1}\sum_{t=1}^{T}\{D_{t+1}/P_t + \Delta P_{t+1}/P_t\} \\ &= T^{-1}\sum_{t=1}^{T}\{D_{t+1}/P_t + \Delta D_{t+1}/D_t + k_{t+1} + \Delta v_{t+1}\} \\ &= T^{-1}\sum_{t=1}^{T}\{D_{t+1}/P_t + \Delta D_{t+1}/D_t + k_{t+1}\} + T^{-1}(v_{T+1} - v_1).\end{aligned} \tag{A5}$$

I substitute the value of $\hat{R}_{SAMPLE}$ from equation (A5) into equation (A3) and obtain the result that the variance of the estimator is minimized when the value of beta is one:

$$\begin{aligned}\beta^* = {} & \frac{\text{cov}\left(\sum_{t=1}^{T} D_{t+1}/P_t, (v_{T+1} - v_1)\right)}{\text{var}(v_{T+1} - v_1)} + \frac{\text{cov}\left(\sum_{t=1}^{T} \Delta D_{t+1}/D_t, v_{T+1}\right)}{\text{var}(v_{T+1} - v_1)} \\ & - \frac{\text{cov}\left(\sum_{t=1}^{T} \Delta D_{t+1}/D_t, v_1\right)}{\text{var}(v_{T+1} - v_1)} + \frac{\text{cov}\left(\sum_{t=1}^{T} k_{t+1}, (v_{T+1} - v_1)\right)}{\text{var}(v_{T+1} - v_1)} + 1 \\ = {} & 1.\end{aligned} \tag{A6}$$

The first term in equation (A6) is approximately zero because the stationarity of the price–dividend ratio implies

$$\operatorname{cov}\left(\sum_{t=1}^{T} D_{t+1}/P_t, v_{T+1}\right) \approx \operatorname{cov}\left(\sum_{t=1}^{T} D_{t+1}/P_t, v_1\right). \tag{A7}$$

The second term in equation (A6) is zero because, by assumption, the dividend growth rate does not forecast the price–dividend ratio. The third term is zero because, by assumption, the price–dividend ratio does not forecast the dividend growth. Finally, the fourth term is zero because, by assumption, the price–dividend ratio does not forecast and is not forecasted by the difference of the conditional variance of the capital gain rate and the dividend growth rate.

Thus, when X_t stands for the dividends and conditions (1)–(5) hold, the minimum variance estimator in the class of estimators given by equation (A1) is

$$\begin{aligned} \hat{R}_D &= \hat{R}_{SAMPLE} - T^{-1}(v_{T+1} - v_1) \\ &= T^{-1}\sum_{t=1}^{T}\{D_{t+1}/P_t + \Delta D_{t+1}/D_t\} + T^{-1}\sum_{t=1}^{T} k_{t+1}. \end{aligned} \tag{A8}$$

Fama and French (2002) report adjusted estimates of the unconditional mean return (and premium) based on the fundamentals dividends and earnings. Specifically, their estimate of the expected stock return based on the dividend growth model is equivalent to $T^{-1}\sum_{t=1}^{T}\{D_{t+1}/P_t + \Delta D_{t+1}/D_t\}$ and their biased-adjusted estimate is equivalent to $T^{-1}\sum_{t=1}^{T}\{D_{t+1}/P_t + \Delta D_{t+1}/D_t\} + T^{-1}\sum_{t=1}^{T} k_{t+1}$. Ibbotson and Chen (2001) also report adjusted estimates of the unconditional mean return (and premium) based on dividends, income, earnings, payout ratio, book equity, and National Income.

Appendix B.
Extension of the Constantinides and Duffie (1996) Model

I illustrate an extension of the Constantinides and Duffie (1996) model along the lines of Krebs (2002). The extension provides theoretical justification as to why it may be hard to detect empirically in the low-order cross-sectional moments of household consumption growth the rare but catastrophic shocks that play a major role in driving asset prices.

The ith household's consumption, $c_{i,t}$, follows the process

$$\frac{c_{it}}{c_{i,t-1}} = \frac{c_t}{c_{t-1}} X_{i,t}\eta_{i,t}. \tag{B1}$$

The random variables $\{\eta_{i,t}\}$ have the following properties: Distinct subsets of $\{\eta_{i,t}\}$ are independent; for all i and t; $\eta_{i,t}$ is independent of $c_{t-1}, c_t, c_{i,t-1}, X_{i,t}$, and the asset prices; and $E[\eta_{i,t}] = 1$. Since the random variables $\{\eta_{i,t}\}$ are independent of the asset prices, they do not contribute to the equity premium. One may choose to view them as observation error, but does not have to.

In the Constantinides and Duffie (1996) model, the idiosyncratic income shocks are lognormal: $X_{i,t} = e^{b_t \epsilon_{i,t} - b_t^2/2}$ with $\epsilon_{i,t}$ normal and $\eta_{i,t} \equiv 1$. The conditional variance, b_t^2, explains the risk premia because it is modeled as countercyclical and correlated with the stock returns. Whereas Brav et al. (2002) find that the pricing kernel $I^{-1}\sum_{i=1}^{I}(c_{i,t}/c_{i,t-1})^{-\alpha}$ goes a long way toward explaining the equity premium and the value-versus-growth premium, they also find little evidence that the conditional variance, b_t^2, is correlated with stock returns, or indeed whether the time series of this variance has any discernible pattern relative to the business cycle. I build this feature in the model by choosing a binomial distribution for $X_{i,t}$.

I assume that the random variables $\{X_{it}\}$ have the following properties: Distinct subsets of $\{X_{it}\}$ are independent; for all i and t, X_{it} is independent of $c_{t-1}, c_t, c_{i,t-1}$ and $X_{i,t-1}$; and X_{it} has the following binomial distribution:

$$
\begin{aligned}
X_{i,t} &= \frac{1 - y_t^{-\alpha^{-1}} \pi^{1+\alpha^{-1}}}{1-\pi}, \quad \text{with probability } 1-\pi \\
&= y_t^{-\alpha^{-1}} \pi^{\alpha^{-1}}, \quad \text{with probability } \pi,
\end{aligned}
\tag{B2}
$$

where $0 < \pi \ll 1$, and α is the constant RRA coefficient. The variable $y_t, y_t > 0$ is defined shortly. Since

$$
E\left[\frac{c_{it}}{c_{i,t-1}} \middle| y_t, \frac{c_t}{c_{t-1}}\right] = \frac{c_t}{c_{t-1}}, \tag{B3}
$$

arguments along the lines in Constantinides and Duffie (1996) identify c_t as the per capita consumption.

The time-t expectation of the ith household's marginal rate of substitution, conditional on $\{c_t/c_{t-1}, y_t\}$, is

$$
\begin{aligned}
&E\left[e^{-\rho}\left(\frac{c_{it}}{c_{i,t-1}}\right)^{-\alpha} \middle| \frac{c_t}{c_{t-1}}, y_t\right] \\
&\quad = e^{-\rho}\left(\frac{c_t}{c_{t-1}}\right)^{-\alpha}\{(1-\pi)^{1+\alpha}(1 - y_t^{-\alpha^{-1}}\pi^{1+\alpha^{-1}})^{-\alpha} + y_t\} E[\eta_{i,t}^{-\alpha}] \\
&\quad \approx e^{-\rho}\left(\frac{c_t}{c_{t-1}}\right)^{-\alpha}(1 + y_t) E[\eta_{i,t}^{-\alpha}], \quad \text{for } \pi \ll 1.
\end{aligned}
\tag{B4}
$$

I define the variable y_t implicitly with the equation

$$e^{-\rho}\left(\frac{c_t}{c_{t-1}}\right)^{-\alpha}(1+y_t)E[\eta_{i,t}^{-\alpha}] = M_t, \tag{B5}$$

where M_t is the pricing kernel that supports the given joint process of aggregate income, asset prices, and dividends. By construction, it follows that any individual household's marginal rate of substitution, $e^{-\rho}(c_{it}/c_{i,t-1})^{-\alpha}$, supports the given joint process of aggregate income, asset prices, and dividends.

Finally, I demonstrate that the variance, skewness, and higher moments of the cross-sectional distribution of the households' consumption growth need not bear any relationship to asset returns and the business cycle. This is despite the fact that each individual household's marginal rate of substitution supports the given joint process of aggregate income, asset prices, and dividends.

The Nth central moment, $N \geq 1$, of the households' logarithmic consumption growth is the sum of the Nth central moments of $\ln(c_t/c_{t-1})$, $\ln(X_{i,t})$, and $\ln(\eta_{i,t})$, given the assumed independence of $c_t/c_{t-1}, X_{i,t}$, and $\eta_{i,t}$. It is easily shown that

$$\lim_{\pi\to 0} E[(\ln X_{i,t})^N] = 0, \quad N \geq 1. \tag{B6}$$

If the probability of the idiosyncratic consumption shocks is sufficiently low, $\pi \ll 1$, the central moments of the households' consumption growth are driven by the corresponding central moments of the per capita consumption growth and $\eta_{i,t}$. These moments need not bear any pattern relating to the business cycle and need not be correlated in any particular way with the asset returns. Despite this, each individual household's marginal rate of substitution supports the given joint process of aggregate income, asset prices, and dividends. The illustration explains why it may be empirically difficult or infeasible to detect the idiosyncratic consumption shocks in the cross-sectional moments of household consumption growth.

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THE WALL STREET JOURNAL.

Analysts: Still Coming Up Rosy --- Over-Optimism on Growth Rates Is Rampant, and the Estimates Help to Buoy Market's Valuation

By Ken Brown. **Wall Street Journal**. (Eastern edition).New York, N.Y.: Jan 27, 2003. pg. C.1

WALL STREET IS pretty downcast these days, what with a $1.5 billion settlement pending with regulators over stock-research conflicts, continuing layoffs at big securities firms and a stock market that is teetering yet again -- not to mention a cold snap that could freeze the thumbs of Blackberry users.

Yet stock analysts are unshaken in their optimistic, if delusional, belief that most of the companies they cover will have above-average, double-digit growth rates during the next several years. That is, of course, highly unlikely. Historically, corporate earnings have grown at about the same rate as the economy over time, and few expect the economy to grow at a double-digit rate any time soon.

But analysts refuse to bend to reality. Of the companies in the Standard & Poor's 500-stock index, analysts expect 345 of them to boost their earnings more than 10% a year during the next three to five years, and 123 companies to grow more than 15%, according to Multex, a stock-market-data firm.

"Hope springs eternal," says Mark Donovan, who manages Boston Partners Large Cap Value Fund. "You would have thought that, given what happened in the last three years, people would have given up the ghost. But in large measure they have not."

These overly optimistic growth estimates also show that, even with all the regulatory focus on too-bullish analysts allegedly influenced by their firms' investment-banking relationships, a lot of things haven't changed: Research remains rosy and many believe it always will.

In some ways, these high estimated growth rates underpin the market's current valuation, which remains pricey by historical standards. Investors expect to pay a higher price for stocks that are growing strongly. So if people realize these long-term growth-rate numbers are largely fictional, then a pillar of support for the market's valuation -- the S&P 500 currently trades at a price-to-earnings ratio of 18.5 based on 2002 earnings -- could go out of the stock market, sending prices lower.

The long-term growth figures come from the earnings estimates Wall Street analysts post for the companies they cover. Besides issuing buy and sell recommendations and predicting earnings during the next few quarters, analysts typically estimate how quickly the companies' earnings will grow during the next few years. Such long-term growth-rate numbers, which are imprecise by nature, give a hint of how analysts feel about companies' future prospects.

A long-term growth-rate number is often used by investors to determine whether a stock is cheap or expensive. Online auctioneer eBay Inc., for example, trades at a price-to-earnings ratio of 88 based on the past year's earnings. Some investors take solace in the fact that the company is expected to expand earnings 40% a year, but even with that growth, it would take until 2006 for the company's price-to-earnings ratio to fall to 22, assuming the stock price remained stalled at today's level.

These rosy figures come on top of three years of little or no growth for many companies. For example, Charles Schwab Corp. hasn't grown at all since 2000 as it has struggled with the stock-market collapse. But analysts, on average, still expect the company will expand its earnings 18% a year during the next several years. While that doesn't justify the company's price-to-earnings ratio of 33, it does give some hope to shareholders that the company one day indeed could resume its old growth rate.

Not surprisingly, the glow is rosiest in the technology sector. Of the 91 tech companies in the S&P 500, analysts expect 82 to grow faster than 10% a year, and 18 to grow better than 20% a year, meaning tech companies account for more than half of the index's 35 top growers.

To be sure, many of these companies could actually meet those growth expectations, if only because earnings have been in such a slump they are bound to rebound at some point. Analysts expect Schwab, for example, to earn 40 cents a share in 2003, up from the 29 cents it earned last year. If the analysts are right, that would be a healthy 38% jump in earnings.

But some also concede that their growth rates are optimistic. Guy Moszkowski, who covers Schwab for Salomon Smith Barney, and whose long-term growth estimate of 18% matches the consensus, concedes that this figure might be optimistic in the years after the expected short-term earnings pop. "If we can get enough of a recovery in the market that they can achieve that 40 cents in earnings, then they'll be on the way to establishing a kind of mid-teens growth track," he says. "But I think it's really hard to make the case they can do much better than that."

Mark Constant, who covers the company for Lehman Brothers and has a 15%-a-year growth estimate, also says the company probably won't reach his target. "I've always characterized it in print as an optimistic growth rate," he says.

If it were true that analysts were expecting a rebound following the current slump and ratcheting up their expectations accordingly, they might now be able to argue that they aren't being overly optimistic. The truth is, however, they have been growing increasingly pessimistic since the tech-stock bubble burst. Back in mid 2000, when earnings had been soaring for years, analysts were predicting that earnings for the S&P 500 would continue growing 15% a year, according to Morgan Stanley. Now, they are predicting 12% annual earnings growth for these same companies.

You can't blame analysts for everything,though. Companies themselves are guilty of being overly optimistic as well. "I think there's an immense amount of inertia in the system. That's the problem," says Steve Galbraith, Morgan Stanley's chief investment strategist. "One of the things people are struggling with are creative ways of reducing your guidance without reducing your guidance."

The problem, he adds, is that many companies set their growth expectations a decade ago, when interest rates and inflation were higher than today. Growth rates are measured in nominal terms, meaning inflation gives them a boost. With virtually no inflation and interest rates near zero, it is harder for companies to post double-digit growth. "I do think this is something that corporate America broadly is wrestling with: How do we ratchet down expectations that we set 10 years ago when things were different?" he says.

The danger comes from companies that can't face the reality that their growth has slowed. "Where I think clients should get concerned is where a company is claiming they're a 15% grower and they're setting their capital expenditures accordingly," Mr. Galbraith says. If the market is pricing in that level of growth, then the company will likely keep investing in itself in an attempt to keep returns high. The danger of that: Companies could be throwing away capital that could be given back to investors in the form of dividends or share buybacks.

Every chief financial officer who took Corporate Finance 101 knows that the bigger the portion of earnings a company reinvests in its business, the faster it conceivably can grow. Sending cash out to investors reduces the amount the company can invest in itself, ultimately lowering its potential growth rate.

But there are signs -- including Microsoft Corp.'s plan to pay a dividend -- that executives are starting to realize that reinvesting all their excess cash in their own business might not produce the highest returns. "It hasn't gotten quite that far, but I think it's going to get there," says Jeff van Harte, who manages Transamerica Premier Equity fund. "It just takes a long time to change attitudes. Some companies are forever lost."

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Economic Growth and Equity Investing

Bradford Cornell

The performance of equity investments is inextricably linked to economic growth. Nonetheless, few studies on investing have explicitly taken research on economic growth into account. This study bridges that gap by examining the implications for equity investing of both theoretical models and empirical results from growth theory. The study concludes that over the long run, investors should anticipate real returns on common stock to average no more than about 4 percent.

The performance of equity investments is inextricably linked to economic growth. Earnings, the source of value for equity investments, are themselves driven by economic activity. Unless corporate profits rise as a percentage of GDP, which cannot continue indefinitely, earnings growth is constrained by GDP growth. This dynamic means that the same factors that determine the rate of economic growth also place bounds on earnings growth and, thereby, the performance of equity investments. Despite these well-known facts, few studies on equity investing have explicitly taken the literature on economic growth into account. This observation is not meant to imply that research connecting economic growth with equity returns is sparse. Numerous contributions in that area include several provocative pieces by Arnott and Bernstein (2002), Arnott and Asness (2003), and Bernstein and Arnott (2003). Nonetheless, rarely has this research been expressly tied to the literature on the theory of economic growth. By bridging that gap, further insight can be gained into the relationship between economic growth and equity returns and forecasts regarding future returns can be placed on a more solid foundation.

Economic Growth: Theory and Data

The focus of economic growth theory is explaining expansion in the standard of living as measured by real per capita GDP. In the neoclassical model of economic growth, originally developed by Solow (1956), per capita GDP growth over the long run is entirely attributable to exogenous technological innovation.[1] This conclusion may surprise those not steeped in growth theory, given the intuitive thinking that output per capita can always be increased by simply adding more capital. Although adding capital does increase output per capita, it does so at a declining rate. Consequently, rational producers stop adding capital when the marginal product of capital drops to its marginal cost. When the economy reaches that point, it is said to be in a steady state. Once the economy reaches the steady state growth path, the ratio of capital to labor (C/L) remains constant and per capita GDP growth ceases unless the production function changes so as to increase the marginal product of capital.

The source of change in the production function is technological innovation. By increasing the marginal product of capital, technological progress breaks the deadlock imposed by diminishing returns and makes further growth in per capita output profitable. So long as the technological innovation continues, so too does the growth in per capita GDP.

This conclusion is not limited to such early models as Solow's, in which the rate of technological change is exogenous. Following Romer (1990), a variety of growth models have been developed in which the amount of investment in R&D—and thus the rate of technological progress—is endogenous. Even in these more sophisticated models, however, the declining marginal product of capital ensures that long-run per capita growth is bounded by the rate of technological progress. The word "bounded" is important because the ability of a society to exploit modern technology effectively is not a foregone conclusion. For example, from 1960 to 2005, all the countries of sub-Saharan Africa, with the exception of South Africa, experienced little or no growth. This failure of certain poor countries to grow is one of the fundamental mysteries of economics, but it is not a relevant consideration here.[2] Virtually the entire global stock

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market capitalization is concentrated in a relatively few highly developed countries. For those countries, the impediments to effective adoption of technology have proved to be minor, at least to date.

Before turning to the data on economic growth, I need to address one remaining issue. The conclusion that growth is attributable exclusively to technological innovation is based on the assumption that the economy has reached the steady state. If the capital stock is below the steady state—and thus the marginal product of capital exceeds its marginal cost—room still exists for the deepening of capital. In that situation, a country's growth rate can exceed the steady state growth rate because it is spurred by capital deepening, as well as by technological innovation. As C/L rises toward its steady state value, the growth rate converges to the steady state level that is attributable to technological change.

The capital stock of a country may be below its steady state level for a variety of reasons. An obvious example is warfare. Another is the opening of a previously closed society. Whatever the reason, growth theory predicts that a country with a C/L below the steady state level will grow more rapidly during a period of capital deepening. Growth theorists refer to this "catch-up" as convergence.

Convergence is important to bear in mind when analyzing historical growth rates with the goal of forecasting future growth. If the historical sample includes growth rates of countries that are in the process of converging to a steady state, the historical growth rates will exceed the future rates that will apply once the steady state has been achieved.

Convergence also helps explain why long-run growth rates for a particular country are remarkably constant. To illustrate, **Figure 1** plots the log of real per capita GDP in the United States from 1802 through 2008. The long-run average growth rate of 1.8 percent is also shown. Over this period, even the largest downturns (associated with the U.S. Civil War and the Great Depression) appear only as temporary dips in a remarkably smooth progression. That smooth progression is attributable in part to the fact that accelerations in economic growth, associated with capital accumulation, followed the dips, which were tied to a drop in the capital stock below its steady state level.

With that background, **Table 1** presents Barro and Ursúa's (2008) update of Maddison's (2003) compilation of information on world economic growth from 1923 to 2006. The starting point in Table 1 is 1923, the first year for which Barro and Ursúa had data for all the countries in their sample. Extending the sample backward for those countries with longer time series available does not affect the essential nature of the findings. Table 1 also reports growth rates for a shorter sample period (beginning in 1960) to take into account the possibility of nonstationarity in the data.

Figure 1. Logarithm of Real per Capita GDP, 1802–2008

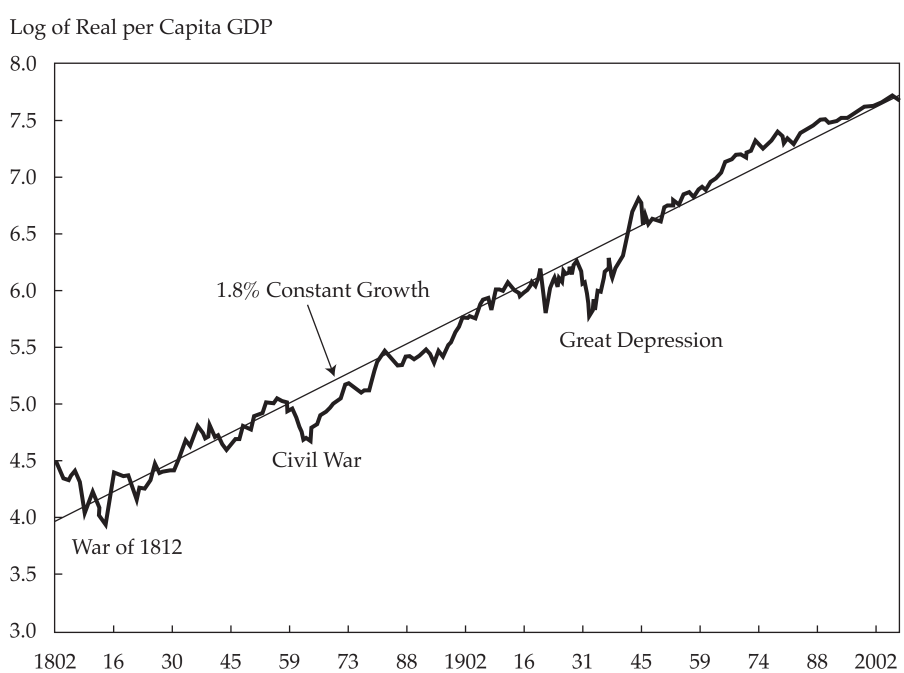


Table 1. Real Growth Rates in per Capita GDP, 1923–2006

Country	1923–2006	1960–2006
A. Mature Economies		
Australia	1.85%	2.16%
Austria	2.53	2.76
Belgium	2.11	2.62
Canada	2.22	2.27
Denmark	1.97	2.11
France	2.28	2.51
Germany	2.41	2.23
Italy	2.57	2.98
Japan	3.11	3.86
Netherlands	2.01	2.35
Spain	2.30	3.42
Sweden	2.50	2.25
Switzerland	1.63	1.51
United Kingdom	1.95	2.15
United States	1.42	1.14
Average	2.19%	2.42%
B. Developing and More Recently Developed Economies		
Argentina	1.10%	1.16%
Brazil	2.68	2.34
Chile	1.95	2.47
Colombia	2.18	2.24
Egypt	1.45	3.09
Finland	2.91	2.92
Greece	2.77	3.23
Iceland	3.24	2.87
India	1.74	2.88
Indonesia	1.81	3.08
S. Korea	3.55	5.72
Malaysia	1.91	2.14
Mexico	2.70	4.16
New Zealand	1.51	1.36
Norway	2.86	3.01
Peru	1.44	0.97
Philippines	1.32	1.46
Portugal	2.75	3.43
S. Africa	1.53	1.01
Singapore	3.33	5.72
Sri Lanka	1.93	3.06
Taiwan	3.78	6.24
Turkey	2.75	2.40
Uruguay	2.19	2.24
Venezuela	2.54	0.45
Average	2.32%	2.79%

Source: Barro and Ursúa (2008).

The results are reported in terms of compound growth rates. The following example illustrates why using compound growth rates is preferable to using averages of annual growth rates. Suppose that the ratio of corporate profits to GDP is stationary but not constant. In particular, assume (as the data will later show) that corporate profits are more variable than GDP. In that case, even though the compound growth rates of the two variables must converge in the long run, the arithmetic mean of annual growth rates for corporate profits will exceed that for GDP because of the variance effect.[3] The higher mean growth rate in earnings is illusory, however, because it fails to take into account the mean reversion in earnings growth that must occur for the ratio to be stationary.

The results reported in Table 1 are divided into two groups. The first group comprises mature economies that were already developed before World War II. These countries, which account for virtually the entire global stock market capitalization, are the focus of this study. The second group consists of economies that were developed more recently or are still considered developing. Results for the second group are presented for completeness and to provide perspective on the impact of convergence.

Consistent with the hypothesis that a common rate of technological advance is driving growth in all the developed countries, the results for the first group are remarkably homogeneous. Virtually all the growth rates for the full sample are close to the average of 2.19 percent. The exceptions are the United States, on the low end, and Japan, on the high end. The former's rate of 1.42 percent reflects the fact that the United States was the closest to steady state growth in 1923, after emerging from World War I relatively unscathed. The higher growth rate for Japan reflects convergence. At the start of the sample period, Japan was a relatively undeveloped country whose capital stock was below the steady state level. Convergence is also evident in the shorter sample period, beginning in 1960. The European countries and Japan, whose capital stocks were damaged in World War II, grew more rapidly than the United States, Switzerland, and Australia, all of which avoided war-related domestic destruction.

The results for the second group are more heterogeneous, reflecting the fact that growth in some countries (e.g., Peru and Venezuela) has stalled for reasons not fully understood whereas others (e.g., South Korea and Taiwan) have experienced rapid convergence. Despite the heterogeneity, however, the average growth rates of 2.32 percent for the sample period beginning in 1923 and 2.79 percent for the sample period beginning in 1960 are close to the averages for the first group of countries.

The averages reported in Table 1 are simple averages. If the growth rates for the first group of countries are weighted by market capitalization, the average falls to about 2 percent in both periods because of the predominant role of the United States. Giving the United States a higher weight is reasonable not only because of its large market capitalization but also because its economy is closest to steady state growth. Given the long period of time since World War II, to assume that all the countries in the first group will eventually converge to steady state growth is reasonable. Therefore, they are more likely to grow at rates comparable to the U.S. historical rate than at their own historical rates. This likelihood suggests that 2 percent real per capita growth, which exceeds the recent U.S. growth rate by 0.5 percent, is the most that investors can reasonably expect in the long run. Furthermore, although growth could be stalled by a catastrophe, such as another world war, the speed of technological innovation has proved almost impossible to accelerate meaningfully. In the remainder of this article, therefore, I will use 2 percent as the estimate of future per capita GDP growth. This number should be thought of as an achievable, but not necessarily expected, outcome.

In addition to the possibility of a catastrophe are two other reasons why 2 percent may prove to be an optimistic growth forecast. First, national income accounting does not deduct costs associated with pollution and environmental degradation in the calculation of GDP. Although these costs have been a tiny fraction of GDP in the past, concern that they are growing rapidly is widespread. If that concern is justified, properly accounting for these costs will reduce the future growth rate of per capita GDP. Second, whether the historical rate of technological innovation is sustainable is far from clear. Weil (2009, p. 260) noted that the rate of growth of real per capita GDP attributable to technological progress remained largely constant from 1950 to 2005, but over the same period, the number of researchers in the G–20 countries grew from 251,000 to 2.6 million. This finding suggests a declining marginal product of research as making and applying new discoveries become more difficult. If this trend continues, it could lead to falling rates of growth in per capita GDP.

Population Growth

Business opportunities depend on total economic activity, not per capita output. To see why, consider a hypothetical example of an economy for which technological innovation—and thus productivity growth—is zero but which is experiencing 5 percent population growth. Companies that provide goods and services in this economy will, on average, experience 5 percent growth in real revenues. Assuming that their margins remain constant, this rate translates into 5 percent growth in real earnings. Of course, in a dynamic economy, existing companies could lose business to start-ups, which could result in dilution for existing investors (which is a separate issue addressed later in the article). For companies in the aggregate, real earnings should be tied to real GDP, as data presented later in the article reveal to be the case.

Converting per capita growth to aggregate growth requires an estimate of population growth. Fortunately, population growth rates change even more slowly and are more predictable than growth rates of real per capita GDP.

Data on population growth for the sample countries are reported in **Table 2**. The first column presents historical growth rates from 2000 to 2007 taken from the U.S. Central Intelligence Agency's *2008 World Fact Book*. The second column presents United Nations (2007) forecasts of population growth rates from 2005 to 2010. That the two columns are very similar reflects the slowly changing nature of population growth.

The data in Table 2 are consistent with the widely documented fact that population growth is negatively correlated with per capita GDP.[4] The average population growth rate for the first group of countries is less than half that for the second group. Even for the second group, however, both the average historical growth rate and the average projected growth rate are less than 1 percent. Presumably, as per capita GDP continues to rise, these growth rates will continue to decline.

On the basis of the data presented in Table 2, population growth can be expected to add no more than 1 percent to the growth rate in per capita GDP. In fact, an assumption of a zero long-run future growth rate for the developed countries would not be unreasonable. Given real per capita growth of 2 percent, this assumption implies that investors cannot reasonably expect long-run future growth in real GDP to exceed 3 percent.

Earnings and GDP

The fundamental source of value for equity investors is earnings, not GDP. That long-run real GDP growth is reasonably bounded at 3 percent does not necessarily mean that the same is true of earnings, which depends on whether the ratio of earnings to GDP (E/GDP) is stationary. To test that hypothesis requires data on aggregate earnings.

Two primary measures of aggregate earnings are used in the United States. The first measure is derived from the national income and product accounts (NIPAs), produced by the U.S. Department

Table 2. Historical and Projected Population Growth Rates, 2000–2010

Country	Historical 2000–2007	Projected 2005–2010
A. Mature Economies		
Australia	1.22%	1.01%
Austria	0.06	0.36
Belgium	0.11	0.24
Canada	0.83	0.90
Denmark	0.30	0.90
France	0.57	0.49
Germany	–0.04	–0.07
Italy	0.00	0.13
Japan	–0.14	–0.02
Netherlands	0.44	0.21
Spain	0.10	0.77
Sweden	0.16	0.45
Switzerland	0.33	0.38
United Kingdom	0.28	0.42
United States	0.88	0.97
Average	0.34%	0.48%
B. Developing and More Recently Developed Economies		
Argentina	1.07%	1.00%
Brazil	1.23	1.26
Chile	0.91	1.00
Colombia	1.41	1.27
Egypt	1.68	1.76
Finland	0.11	0.29
Greece	0.15	0.21
Iceland	0.78	0.84
India	1.58	1.46
Indonesia	0.18	1.16
S. Korea	0.27	0.33
Malaysia	1.74	1.69
Mexico	1.14	1.12
New Zealand	0.97	0.90
Norway	0.35	0.62
Peru	1.26	1.15
Philippines	1.99	1.72
Portugal	0.31	0.37
S. Africa	0.83	0.55
Singapore	1.14	1.19
Sri Lanka	0.94	0.47
Taiwan	0.24	0.36
Turkey	1.01	1.26
Uruguay	0.49	0.29
Venezuela	1.50	1.67
Average	0.94%	0.96%

Sources: Central Intelligence Agency (2008) and the United Nations (2007).

of Commerce's Bureau of Economic Analysis. The NIPAs contain an estimate of aggregate corporate profits that is based on data collected from corporate income tax returns. The second measure of aggregate earnings is derived by Standard & Poor's from data collected from corporate financial reports. Because the two measures are not identical, distinguishing what is included in each measure before using the data is important.

The NIPA profit measure is designed to provide a time series of the income earned from the current production of all U.S. corporations. The sample is not limited to publicly traded companies. The tax rules on which the NIPAs are based are designed to expedite the timely and uniform completion of corporate tax returns. For that reason, all corporations use a highly uniform set of rules for tax accounting.

Because the NIPAs are designed to measure economic activity connected with current production, the NIPA definition of corporate profits includes only receipts arising from current production less associated expenses. The NIPA definition, therefore, excludes transactions that reflect the acquisition or sale of assets or liabilities. Dividend receipts from domestic corporations are excluded to avoid a double counting of profits. For the same reason, bad-debt expenses and capital losses are also excluded.

The Standard & Poor's estimate of aggregate earnings is derived from reported financial statements. Rather than being based on a unified set of tax rules, financial accounting is based on GAAP, which is designed to allow management to tailor financial statements so as to reveal information that is useful to a particular company. Furthermore, financial accounting provides for depreciation and amortization schedules that allow companies to attempt to match expenses with the associated stream of income.

The aggregate earnings data available from Standard & Poor's are for the companies in the S&P 500 Index. Each year's data consist of the aggregate GAAP after-tax earnings for the 500 companies in the S&P 500 for that year. Thus, the sample of companies in the aggregate is constantly changing as the index is updated. Because the S&P 500 earnings reflect a shifting sample of corporations, the series of reported earnings can be discontinuous over time. Fortunately, given the size of the index, these discontinuities are small and have little impact on estimated earnings growth.

The differences between financial and tax accounting create two dissimilarities between the measures of earnings for the same company.[5] First, intertemporal differences arise because of the timing of revenue, and expense recognition often differs between the two systems. The best example is depreciation because tax rules generally allow for more rapid depreciation than companies choose to report under GAAP. Second, permanent differences exist because the revenues and expenses recognized under the two systems are not the same. Although important in the short run, these differences tend to cancel out over long horizons, and thus, the long-run growth rates in the two measures are similar. For example, the average growth rate in NIPA real corporate profits from 1947 to 2008 was 3.23 percent, as compared with a growth rate of 3.17 percent in S&P 500 real aggregate earnings.

As an aid in examining the behavior of E/GDP, **Figure 2** plots after-tax corporate profits from the NIPAs as a fraction of GDP for 1947–2008. The figure reveals no overall trend. The fraction is approximately the same at the end as at the beginning, and thus, the growth rate of corporate profits is almost identical to that of GDP. The same is largely true of S&P 500 aggregate earnings as a fraction of GDP, which is plotted in **Figure 3** (normalized to start at 8.23 percent to facilitate comparison with Figure 2). The fraction for the S&P 500 earnings is smaller because the S&P 500 measure is less comprehensive than the NIPA measure. Unlike the NIPA data, the S&P 500 ratio exhibits a slight downward trend, reflecting the fact that as the economy has grown, the S&P 500 companies have become a progressively smaller fraction of total earnings. Therefore, the data are generally consistent with the hypothesis that over the long run, aggregate earnings are a stationary fraction of GDP. Certainly, no evidence exists of a persistent increase in the ratio, no matter which measure of earnings is chosen. This observation implies that the long-run growth rates of GDP place a limit on the long-run growth rates of earnings.

Although the data largely support the hypothesis that E/GDP is stationary, it is far from constant. Figure 2 shows that corporate profits vary between 3 percent and 11 percent of GDP. The variability of the ratio for S&P 500 earnings is even greater. This variability suggests that when earnings are low relative to GDP, they grow more quickly; the reverse is true when earnings are relatively high. This mean reversion in the growth rate of earnings maintains the stationarity of E/GDP.

Note that in an efficient market, the mean reversion in earnings growth would have no impact on stock returns because it would be impounded into current prices. Campbell and Shiller (1998), however, provided evidence that long-run average earnings are, in fact, predictive of future stock returns. Specifically, when the ratio of price to average earnings over the previous 10 years is high, future stock returns tend to be low; the reverse is true when the ratio is low. This finding suggests that the market does not fully account for the mean-reverting nature of long-run earnings growth.

Figure 2. Corporate Profits as a Percentage of GDP, 1947–2008

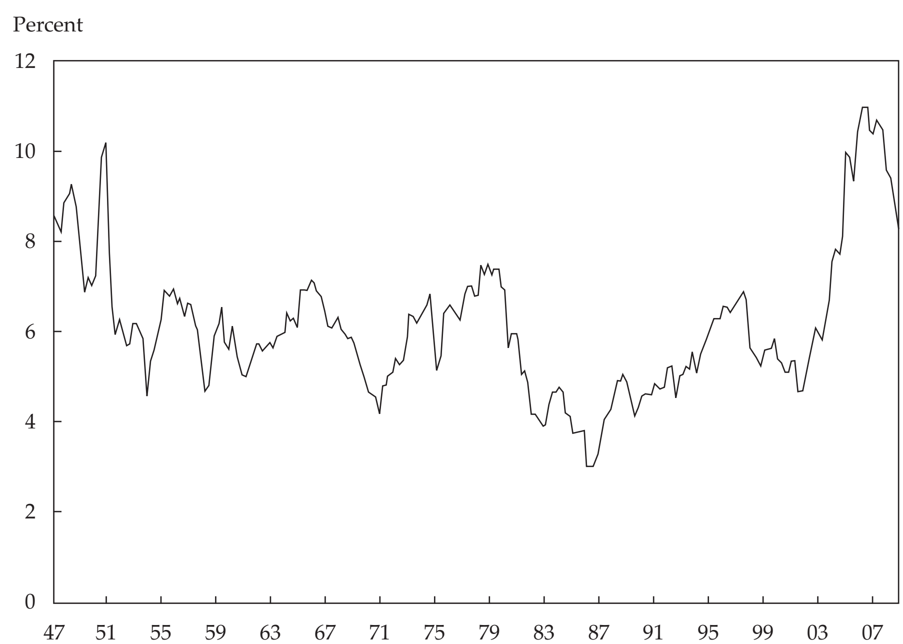
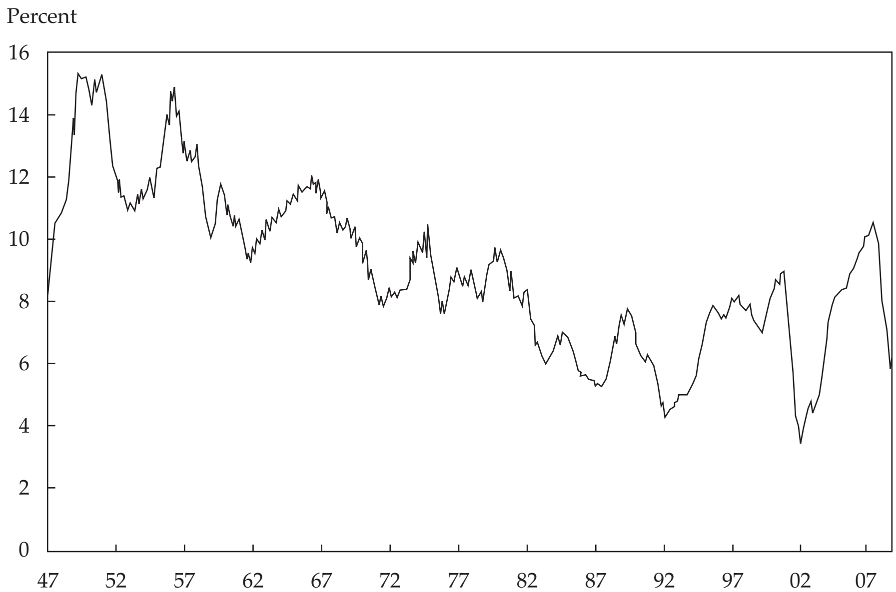


Figure 3. S&P 500 Earnings as a Percentage of GDP, 1947–2008



That the ratio of aggregate earnings to GDP is stationary implies that investors can expect aggregate real earnings growth to match, but not exceed, real GDP growth in the long run. Unfortunately, the same is not true of the earnings to which current investors have a claim. Two reasons explain this discrepancy. First, an investor's pro rata portion of a company's earnings will be affected by the company's share issuances and repurchases. If this dilution (or accretion) is ongoing, growth in aggregate earnings and earnings per share will diverge. Second and more important, current investors do not participate in the earnings of new businesses unless they dilute their current holdings to purchase shares in start-ups. Therefore, start-ups drive a wedge between the growth in aggregate earnings and the growth in the earnings to which current investors have a claim.

To illustrate the second effect, consider a simple example in which all companies in the economy are identical and earn $10 a share per period. Furthermore, assume that each company has a market value of $100 a share and has 1,000 shares outstanding. All earnings are paid out, so the values of the companies remain constant. Finally, assume that at the outset only two companies are in the economy, so aggregate earnings are $20,000. A current investor who holds 1 percent of each company has a pro rata share of aggregate earnings of $200. Now assume that the economy grows and a third company is started. As a result, aggregate earnings rise to $30,000, but the current investor does not participate in that growth and thus still holds 1 percent of the first two companies with rights to earnings of $200. If the current investor wanted to add the third company to the portfolio without investing new cash, the investor would have to dilute the portfolio's holdings in the first two companies. After the dilution, the investor would hold 0.67 percent of each of the three companies and would thus still have rights to earnings of $200. Therefore, the growth in earnings experienced by the current investor does not match the growth in aggregate earnings.

Bernstein and Arnott (2003) suggested an ingenious procedure for estimating the combined impact of both effects on the rate of growth of earnings to which current investors have a claim. They noted that total dilution on a marketwide basis can be measured by the ratio of the proportionate increase in market capitalization to the value-weighted proportionate increase in stock price. More precisely, net dilution for each period is given by the equation

$$\text{Net dilution} = \frac{1+c}{1+k} - 1, \tag{1}$$

where c is the percentage capitalization increase and k is the percentage increase in the value-weighted price index. Note that this dilution measure holds exactly only for the aggregate market portfolio. For narrower indices, the measure can be artificially affected if securities are added to or deleted from the index.

To account for the impact of dilution, the Bernstein–Arnott measure was estimated by using monthly data for the entire universe of CRSP stocks from 1926 to 2008. Using CRSP data for this purpose presents one problem. The CRSP universe was expanded twice during the sample period: in

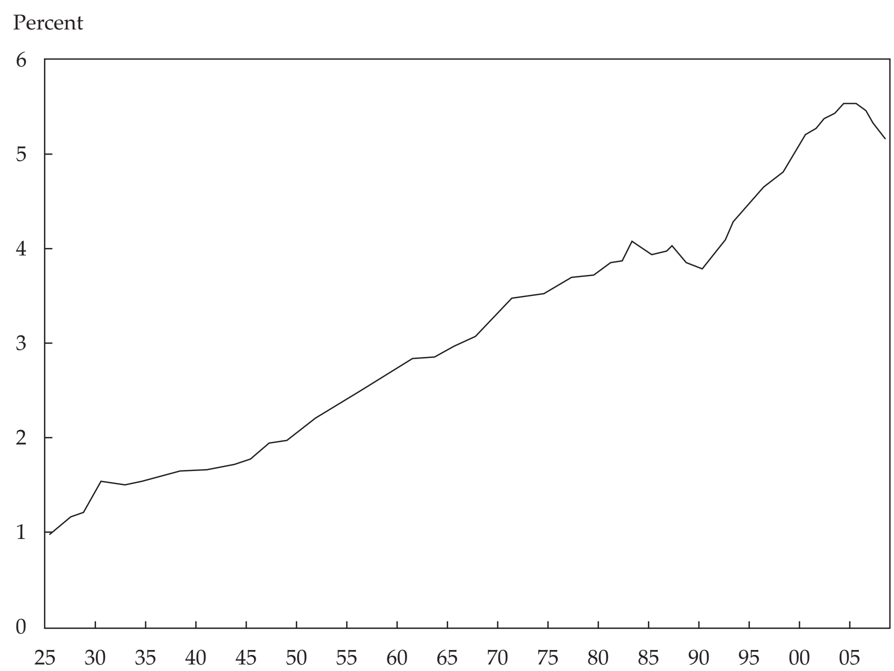
July 1962, when Amex stocks were added, and in July 1972, when NASDAQ stocks were added. Both these additions caused a significant increase in market capitalization unaccompanied by a corresponding increase in the value-weighted price. To eliminate the impact of these artificial discontinuities, I set the estimate of net dilution at zero for both July 1962 and July 1972.

Figure 4 plots the compounded estimate of net dilution from 1926 to 2008. It rises continuously except for downturns in the early 1990s and in 2006–2008. The average rate of dilution over the entire period is 2 percent. The primary source of dilution is the net creation of new shares as new companies capitalize their businesses with equity. The impact of start-ups is not surprising in light of the fact that more than half of U.S. economic growth comes from new enterprises, not from the growth of established businesses. Given the continuing importance of start-ups, the rate of dilution is highly unlikely to subside unless the rate of innovation slows. If the rate of innovation slows, however, GDP growth will also decline. Consequently, to conclude that the rate of growth of earnings, net of dilution, will remain largely constant is reasonable. Therefore, to estimate the growth rate of earnings to which current investors have a claim, approximately 2 percent must be deducted from the growth rate of aggregate earnings.

Putting the pieces together, we can see that growth theory predicts that current investors should count on long-run growth in real earnings of no more than 1 percent. This rate equals real growth of 3 percent in aggregate earnings, adjusted downward by 2 percent to account for dilution.

Arnott and Bernstein (2002) and Bernstein and Arnott (2003, p. 49) observed that "earnings and dividends grow at a pace very similar to that of per capita GDP." This observation correctly summarizes U.S. economic history, but it may not be true for other countries and it may not hold for the United States in the future. In terms of my analysis, the reason that earnings and dividends mirror per capita GDP is that population growth and dilution have both been about 2 percent between 1870 and 2008. Consequently, these two terms cancel each other out when we move from estimated growth in real per capita GDP to estimated growth in real earnings per share. But there is no theoretical reason why this cancellation should necessarily occur. For instance, population growth in Western Europe has fallen essentially to zero. If the United States were to follow suit but dilution were to continue at about 2 percent a year, growth in real earnings would be 2 percentage points *less* than growth in per capita GDP. In short, the Arnott–Bernstein observation is a shortcut that has historically held in the United States but is not a necessary condition. Therefore, a more complete analysis that takes into

Figure 4. The Impact of Dilution on Investor Earnings, 1926–2008



account both population growth and dilution is generally preferable. I do not present that analysis here because of limitations on dilution data for countries other than the United States.

Implications of Economic Growth Theory for Expected Stock Returns

The story thus far is that economic growth places a limit on the long-run growth of real earnings per share available to investors. On the basis of the data I have analyzed here, that limit is what many investors might consider a relatively anemic 1 percent. The next step is to explore the implications of that limitation for future returns on common stocks.

By definition, the rate of return on stock in period t is given by

$$R_t = \frac{D_t}{P_{t-1}} + GP_t, \tag{2}$$

where D_t is the dividend for year t, P_{t-1} is the price at the end of year $t - 1$, and $GP_t = (P_t - P_{t-1})/P_{t-1}$. Following Fama and French (2002), we can write Equation 2 in terms of long-run average values, denoted by A(), as

$$A(R_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GP_t). \tag{3}$$

Equation 3 states that the long-run average return equals the average dividend yield plus the average capital gain.

Equation 3 holds *ex ante* as well as *ex post*. It implies that the long-run future average return equals the future average dividend yield plus the future average capital gain. Assuming that the earnings-to-price ratio is stationary, the long-run average earnings growth rate, $A(GE_t)$, can be substituted for the average capital gain rate, giving

$$A(R_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GE_t). \tag{4}$$

My preceding analysis implies that $A(GE_t)$ in Equation 4 should be no more than about 1 percent in the future. In addition, as of December 2008, the current dividend yield was 3.1 percent and the previous 50-year average was 3.3 percent. Because the two are nearly equal, substituting either into Equation 4 as a proxy for the future average yield suggests that investors should not expect long-run real returns on common stocks to go much beyond 4 percent. Note that this calculation does not need to be adjusted for repurchases because the impact of repurchases is already accounted for in the dilution calculation. An adjustment is required only if future repurchases are expected to exceed their past average.

Equation 4 can also be used to approximate the equity risk premium. Because the real return on short-term government securities has averaged about 1 percent over the last 80 years, Equation 4 implies that the equity risk premium measured with respect to short-term government securities is approximately equal to the expected average dividend yield. Using either the current yield or the past average yield translates this number into a long-run average equity risk premium of just more than 3 percent. If the premium is measured with respect to longer-maturity government securities with greater expected real returns, the equity premium is commensurately less. This result is markedly less than the average historical risk premium measured over the 1926–2008 period that is commonly referenced. It is consistent, however, with a long-running body of empirical work that shows the *ex ante* risk premium to be significantly smaller than the historical average.[6]

Thus far, all the results have been stated in terms of compound growth rates. For many purposes, however, the object of interest is the annual expected return. For example, discounted-cash-flow valuations typically require annual estimates of the discount rate. To convert compound growth rates, which are geometric averages, into arithmetic averages requires taking the variance effect into account. This step can be well approximated by adding one-half of the annual variance of returns to the compound growth rate.

Because earnings are volatile, the variance effect adds about 1 percent to the compound growth rates. This result means that growth theory predicts that future annual real returns on common stocks should average no more than about 5 percent and that the annual equity risk premium for short-term government securities is about 4 percent.

Using annual data, we can tie the growth theory analysis to the long-run performance of company investments. If a company retains a fraction, b, of its earnings and invests those funds at a real rate of return, k, then basic finance theory teaches that the earnings per share will grow at the rate $(b)(k)$. Growth theory predicts that the annual long-run average growth in real earnings per share is about 2 percent, taking into account both dilution and the variance effect. From 1960 to 2008, companies in the S&P 500 retained, on average, 54 percent of their earnings. Solving for k, this retention ratio implies a real return on corporate investments of about 4 percent.

One possible adjustment might be made to the foregoing results. Recall that the dilution calculation was based on the assumption of a stable repurchase rate throughout the sample period. In fact, repurchases accelerated following the passage, in 1982, of U.S. SEC Rule 10b-18, which greatly reduced the legal risk associated with repurchases. More specifically, a pronounced trend toward repurchases as the preferred form of marginal payout to shareholders took place. Brav, Graham, Harvey, and Michaely (2005) reported that following the SEC ruling, managers began behaving as if a significant capital market penalty were associated with cutting dividends but not with reducing repurchases. Accordingly, dividends are set conservatively and repurchases are used to absorb variations in total payout. To the extent that this reliance on repurchases is expected to continue, the estimated 2 percent dilution effect might be too large and growth rates would have to be adjusted upward. Most of the 2 percent dilution, however, is associated not with the actions of existing companies but with start-ups that finance their businesses with new equity. Therefore, the adjustment in the overall rate of future dilution should not be large.

International Considerations

Thus far, I have limited my analysis to the United States. This restriction is an obvious shortcoming because most major corporations are becoming increasingly global. Although a detailed examination of international data is beyond the scope of this article, several general conclusions can be drawn. First, the data presented in Table 2 suggest that real per capita GDP growth rates for the other developed countries should be comparable to the U.S. growth rate in the future. Second, for the other developed countries, population growth rates are forecasted to be lower. As a result, the implied limitations on earnings growth remain largely unchanged and are perhaps even lower when other developed countries are included in the sample. Third, with respect to the developing countries—particularly India and China, which are the most important by virtue of their size—convergence predicts that they will experience higher growth rates in real per capita GDP than the United States. In addition, most developing countries are forecasted to have comparable or higher population growth rates than the United States. These forecasts suggest that companies doing business in the developing world will experience higher rates of earnings growth than they achieve in the developed world. Nonetheless, as those countries develop, both real GDP and population growth rates should decline. Furthermore, the fraction of total earnings attributable to business in the developing world is relatively small for most companies. Therefore, if a complete analysis were done on a global basis, the earnings bounds derived from U.S. data and the related predictions regarding stock returns would be unlikely to be markedly affected.

Conclusion

The long-run performance of equity investments is fundamentally linked to growth in earnings. Earnings growth, in turn, depends on growth in real GDP. This article demonstrates that both theoretical research and empirical research in development economics suggest relatively strict limits on future growth. In particular, real GDP growth in excess of 3 percent in the long run is highly unlikely in the developed world. In light of ongoing dilution in earnings per share, this finding implies that investors should anticipate real returns on U.S. common stocks to average no more than about 4–5 percent in real terms. Although more work needs to be done before equally definitive predictions can be made with respect to international equities, the basic outlook appears to be quite similar.

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This article qualifies for 1 CE credit.

Notes

1. For details on the Solow model and more recent elaborations, see Barro and Sala-i-Martin (2004).
2. Hall and Jones (1999) described the problem in detail and offered an intriguing solution.
3. As a first-order approximation, the annual arithmetic mean equals the compound growth rate plus one-half the standard deviation of the annual growth rates.
4. See, for example, Weil (2009, ch. 4).
5. For further details on the relationship between reported earnings and NIPA profits, see Mead, Moulton, and Petrick (2004).
6. Contributions in this area include those of Rozeff (1984); Ross, Brown, and Goetzmann (1995); Claus and Thomas (2001); Fama and French (2002); and Cornell and Moroz (forthcoming).

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Historical Results II

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The basic investment and constant-growth models, used with some justifiable simplifying assumptions about the U.S. market, indicate that the earnings growth rate cannot be greater than the GNP growth rate because of political forces and that the expected return, or cost of capital, in the long run should unconditionally be about 1.5 times the dividend-to-price ratio plus GNP growth. Adding reasonable assumptions about inflation produces a finding that equity risk premiums cannot be more than 3 percent (300 bps) because earnings growth is constrained by the real growth rate of the economy, which has been in the 1.5–3.0 percent range. In a consideration of today's market valuation, three reasons for the high market valuations seem possible: (1) stocks are simply seen as less risky, (2) valuation of equities is fundamentally determined by taxation, or (3) equity prices today are simply a mistake. A research question that remains and is of primary interest is the relationship between aggregate stock market earnings and GNP.

The very basic investment and constant-growth models from introductory finance courses can be used to interpret the long-run unconditional historical data on returns. So, let's begin with the basic model:

$$\frac{E_{t+1}}{E_t} = 1 + [(b)(ROE)],$$

where

E = earnings
b = the retention rate
ROE = return on equity

So that, with investment at time t denoted by I_t,

$$ROE = \frac{E_{t+1} - E_t}{I_t}$$

and

$$b = \frac{I_t}{E_t};$$

therefore, the growth rate of earnings is

$$(b)(ROE) = \frac{E_{t+1} - E_t}{E_t}.$$

This model implies that the growth rate in earnings is the retention rate times the return on equity, $(b)(ROE)$. In discussing the models, I would like to stress an important point: If you are interpreting the growth in earnings as being the retention rate times the return on equity, you have to be very careful when you are working with historical data. For example, does the retention rate apply only to dividends or to dividends and other payouts, such as share repurchases? The distinction is important because those proportions change in the more recent period. And if you make that distinction, you have to make a distinction between aggregate dividends and per share dividends because the per share numbers and the aggregate numbers will diverge. In working with the historical data, I have attempted to correct for that aspect.

Figure 1. S&P 500 Earnings and Dividends to GNP, 1950–July 2001

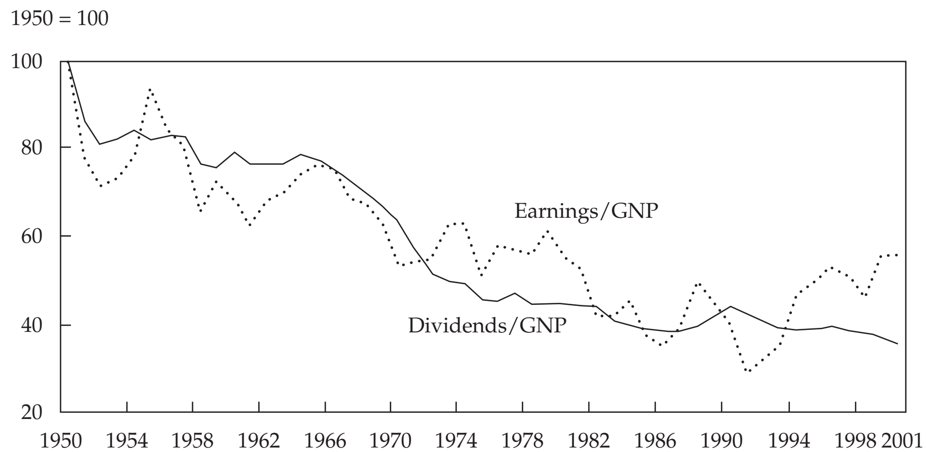

Table 1 gives the arithmetic average data for growth rates in GNP, earnings, and dividends for two periods: 1951–2000 and 1972–2000. (I used the 1972–2000 period because it mirrors the same period shown in Figure 1.) The earnings growth rates are so much more volatile than the dividend growth rates. And because of the volatility effect on arithmetic averages, GNP and earnings exhibit very similar growth rates from the early 1970s to the present. Dividends (and Table 1 shows the growth rate of actual dividends, not payouts) have grown much less than earnings for two reasons: First, dividends are less volatile, and second, dividend substitution is occurring. Corporations are not providing shareholders the same constant fraction of earnings (in the form of dividends) that they were in the past.

Despite the 1972–2000 data, it seems to me that earnings are not going to grow as fast as or faster than GNP in the future. This notion seems to be consistent with long-term historical data, and it fits my view of how politics works on the economy. If you accept that notion, it has immediate implications for the future.

Table 1. Historical Growth Rates of GNP, Earnings, and Dividends: Two Modern Periods

Period/Measure	GNP	Earnings	Dividends
1951–2000			
Mean	3.21 %	2.85 %	1.07 %
Standard deviation	2.89	14.29	4.13
1972–2000			
Mean	2.62 %	3.79 %	0.96 %
Standard deviation	2.94	15.72	3.58

Note: Growth rates for earnings and dividends are based on aggregate data.

First, under any reasonable underlying assumptions about inflation, equity risk premiums cannot be much more than 3 percent (300 bps) because the earnings growth rate is constrained unconditionally in the long run by the real growth rate of the economy, which has been in the range of 1.5–3.0 percent. Second, as **Table 2** shows, for an S&P level of about 1,000, you simply cannot have an equity risk premium any higher than 2 percent, 2.5 percent, or (at most) 3 percent.

Table 2. Value of the S&P 500 Index Given Various Real (Earnings or GNP) Growth Rates and Equity Risk Premiums

Real Growth Rate	Equity Risk Premium						
	2.0 %	2.5 %	3.0 %	4.0 %	5.0 %	6.0 %	7.0 %
1.5 %	845	724	634	507	423	362	317
2.0 %	1,014	845	724	563	461	390	338
2.5 %	1,268	1,014	845	634	507	423	362
3.0 %	1,690	1,268	1,014	724	563	461	390

Assumptions: Inflation = 3 percent; long-term risk-free rate = 5.5 percent; payout = 1.5(S&P 500 dividend). The S&P 500 dividend used in the calculation was $16.90, so $P = 1.5(\$16.90)/(k - g)$, where k = 5.5 percent (the risk-free rate minus 3 percent inflation plus the risk premium) and g = real growth rate.

What simplifying assumptions can be made to work with the unconditional data? I have made some relatively innocuous simplifying assumptions. First, that b should adjust until the cost of capital equals the ROE at the margin. To be very conservative, therefore, I will assume that the ROE equals the cost of capital, or expected returns, in the aggregate. The problem that arises is: What if the retention rate times the cost of capital (that is, the minimal expected return on equity), bk, is greater than GNP growth? The second assumption deals with this possibility: I assume bk cannot be greater than GNP growth because political forces will come into play that will limit the ROE if earnings start to rise as a fraction of GNP.

The relationship between aggregate earnings and GNP is one of the research questions that I have been unable to find interesting papers on—perhaps because I have not searched well enough—but I want to bring up the subject to this group. It seems to me that if aggregate earnings start to rise, and Robert Shiller mentioned several reasons why it can happen [see the "Current Estimates and Prospects for Change" session], then tax rates can change, antitrust regulation can change (one of Microsoft's problems probably was that it was making a great deal of money, which is an indication that some type of regulation may be necessary), labor regulation can change, and so forth. And these variables can change *ex post* as well as *ex ante*. So, once a company starts making superior returns using a particular technology, the government may step in *ex post* and limit those returns. The critical research question is how earnings relate to GNP.

The constant-growth model is

$$P = \frac{D}{k-g}$$

or

$$k = \frac{D}{p} + g,$$

where

P = price
D = dividends
k = cost of capital
g = growth rate

What I am going to do is just an approximation because I am going to work with aggregate, not per share, data. I am going to assume that total payouts are 1.5 times dividends.[1] Payouts will probably be lower in the future, but if I work with aggregate payouts, then g should be the growth rate in aggregate potential payouts, which I will characterize as earnings.

One of the implications of the simplifying assumptions I have made, and it relates to the data that Jeremy Siegel just produced ["Historical Results I"], is that the expected returns on stocks should be equal to the earnings-to-price ratio. (In the more complicated equations, you have situations in which the ROE is not exactly equal to expected returns, but for my long-run data, the simplifying assumption that earnings yield equals the expected ROE is fine.) So, with these assumptions,

$$\begin{aligned} P &= \frac{D}{k-g} \\ &= \frac{D}{k-bk} \\ &= 1-(b)\left(\frac{E}{1-b}\right)(k) \\ &= \frac{E}{k} \end{aligned}$$

or

$$k = \frac{E}{P}.$$

A further implication is that if g is constrained to be close to the growth of GNP, then it is reasonable to substitute GNP growth for g in the constant-growth model. The implication of this conclusion is that the expected return, or cost of capital, in the long run should unconditionally be about 1.5 times the dividend-to-price ratio plus GNP growth:

$$k = 1.5\frac{D}{P} + \text{GNP growth}.$$

With this background, we can now look at some of the data.

Earnings and GNP

Figure 1 allows a comparison of dividends/GNP and (after-tax) earnings/GNP for 1950 through July 2001.[2] The data begin in 1950 because Fama believed that the data before then were unreliable. Figure 1 shows that, historically, earnings have declined as a fraction of GNP in this period. My assumption that earnings keep up with GNP works from about 1970 on, but I am looking at the picture in Figure 1 in order to make that conclusion. The ratio of earnings to GNP depends on a lot of things: the productivity of labor, capital, the labor-to-capital ratio, taxes, and (as I said earlier) a host of political forces. Figure 1 shows that earnings have, at best, kept up with GNP.

[1] This choice is based on recent findings by Jagannathan, Stephens, and Weisbach (2000) that we are seeing significant payouts today.

[2] These data were provided by Eugene Fama, who attributed them to Robert Shiller.

Valuation

Why is the market so high? As an aside, and this concern is not directed toward our topic today of the equity risk premium, but I think it is an interesting question: Why is the market where it is today relative to where it was on September 10 or September 9 or just before the events of September 11, 2001? The market then and now is at about the same level. Almost every economist and analyst has said that the September 11 attacks accelerated a recession, that they changed perceptions of risk, and so forth. It is curious to me that such a situation does not seem to be reflected in market prices.

But in general, why is the market so high? I believe three possible explanations exist. One idea, and I consider it a "rational" theory, is that stocks are simply seen as less risky than in the past. I do not know whether the behavioral theories are rational or not, in the sense that prices are high because of behavioral phenomena that are real and are going to persist. If so, then those phenomena—as identified by Jeremy Siegel and Richard Thaler [see the "Theoretical Foundations" session]—are also rational. In that case, the market is not "too high"; it is not, in a sense, a mistake. It is simply reflecting characteristics of human beings that are not fully explained by economic theories.

Another rational explanation has been given less attention but is the subject of a recent paper by McGrattan and Prescott (2001). It is that the valuation of equities is fundamentally determined by taxation. McGrattan and Prescott argue that the move toward holding equities in nontaxable accounts has led to a drop in the relative tax rate on dividends. Therefore, stock prices should rise relative to the valuation of the underlying capital and expected returns should fall. This effect is a rational tax effect.

Both this theory and the theory that stocks are now seen as less risky say that the market is high because it should be high and that, looking ahead, equities are going to have low expected returns, or low risk premiums—about 2 percent—but that investors have nothing to worry about.

The final explanation, which I attribute to John Campbell and Robert Shiller, focuses on the view that equity prices today are simply a mistake. (I suppose mistakes are a behavioral phenomenon, but presumably, they are not as persistent as an underlying psychological condition.) Now, when people realize they have made a mistake, they attempt to correct the behavior. And those corrections imply a period of *negative* returns from the U.S. equity market before the risk premium can return to a more normal level.

Closing

To close, I want to repeat that, to me, the fundamental historical piece of data that needs more explanation is the relationship between the aggregate behavior of earnings and GNP—what it has been in the past and what it can reasonably be going forward. This relationship is interesting, and I look forward to hearing what all of you have to say about it. In my view, it is the key to unlocking the mystery of the equity risk premium's behavior.

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Economic Growth and Equity Investing

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The performance of equity investments is inextricably linked to economic growth. Nonetheless, few studies on investing have explicitly taken research on economic growth into account. This study bridges that gap by examining the implications for equity investing of both theoretical models and empirical results from growth theory. The study concludes that over the long run, investors should anticipate real returns on common stock to average no more than about 4 percent.

The performance of equity investments is inextricably linked to economic growth. Earnings, the source of value for equity investments, are themselves driven by economic activity. Unless corporate profits rise as a percentage of GDP, which cannot continue indefinitely, earnings growth is constrained by GDP growth. This dynamic means that the same factors that determine the rate of economic growth also place bounds on earnings growth and, thereby, the performance of equity investments. Despite these well-known facts, few studies on equity investing have explicitly taken the literature on economic growth into account. This observation is not meant to imply that research connecting economic growth with equity returns is sparse. Numerous contributions in that area include several provocative pieces by Arnott and Bernstein (2002), Arnott and Asness (2003), and Bernstein and Arnott (2003). Nonetheless, rarely has this research been expressly tied to the literature on the theory of economic growth. By bridging that gap, further insight can be gained into the relationship between economic growth and equity returns and forecasts regarding future returns can be placed on a more solid foundation.

Economic Growth: Theory and Data

The focus of economic growth theory is explaining expansion in the standard of living as measured by real per capita GDP. In the neoclassical model of economic growth, originally developed by Solow (1956), per capita GDP growth over the long run is entirely attributable to exogenous technological innovation.[1] This conclusion may surprise those not steeped in growth theory, given the intuitive thinking that output per capita can always be increased by simply adding more capital. Although adding capital does increase output per capita, it does so at a declining rate. Consequently, rational producers stop adding capital when the marginal product of capital drops to its marginal cost. When the economy reaches that point, it is said to be in a steady state. Once the economy reaches the steady state growth path, the ratio of capital to labor (C/L) remains constant and per capita GDP growth ceases unless the production function changes so as to increase the marginal product of capital.

The source of change in the production function is technological innovation. By increasing the marginal product of capital, technological progress breaks the deadlock imposed by diminishing returns and makes further growth in per capita output profitable. So long as the technological innovation continues, so too does the growth in per capita GDP.

This conclusion is not limited to such early models as Solow's, in which the rate of technological change is exogenous. Following Romer (1990), a variety of growth models have been developed in which the amount of investment in R&D—and thus the rate of technological progress—is endogenous. Even in these more sophisticated models, however, the declining marginal product of capital ensures that long-run per capita growth is bounded by the rate of technological progress. The word "bounded" is important because the ability of a society to exploit modern technology effectively is not a foregone conclusion. For example, from 1960 to 2005, all the countries of sub-Saharan Africa, with the exception of South Africa, experienced little or no growth. This failure of certain poor countries to grow is one of the fundamental mysteries of economics, but it is not a relevant consideration here.[2] Virtually the entire global stock

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market capitalization is concentrated in a relatively few highly developed countries. For those countries, the impediments to effective adoption of technology have proved to be minor, at least to date.

Before turning to the data on economic growth, I need to address one remaining issue. The conclusion that growth is attributable exclusively to technological innovation is based on the assumption that the economy has reached the steady state. If the capital stock is below the steady state—and thus the marginal product of capital exceeds its marginal cost—room still exists for the deepening of capital. In that situation, a country's growth rate can exceed the steady state growth rate because it is spurred by capital deepening, as well as by technological innovation. As C/L rises toward its steady state value, the growth rate converges to the steady state level that is attributable to technological change.

The capital stock of a country may be below its steady state level for a variety of reasons. An obvious example is warfare. Another is the opening of a previously closed society. Whatever the reason, growth theory predicts that a country with a C/L below the steady state level will grow more rapidly during a period of capital deepening. Growth theorists refer to this "catch-up" as convergence.

Convergence is important to bear in mind when analyzing historical growth rates with the goal of forecasting future growth. If the historical sample includes growth rates of countries that are in the process of converging to a steady state, the historical growth rates will exceed the future rates that will apply once the steady state has been achieved.

Convergence also helps explain why long-run growth rates for a particular country are remarkably constant. To illustrate, **Figure 1** plots the log of real per capita GDP in the United States from 1802 through 2008. The long-run average growth rate of 1.8 percent is also shown. Over this period, even the largest downturns (associated with the U.S. Civil War and the Great Depression) appear only as temporary dips in a remarkably smooth progression. That smooth progression is attributable in part to the fact that accelerations in economic growth, associated with capital accumulation, followed the dips, which were tied to a drop in the capital stock below its steady state level.

With that background, **Table 1** presents Barro and Ursúa's (2008) update of Maddison's (2003) compilation of information on world economic growth from 1923 to 2006. The starting point in Table 1 is 1923, the first year for which Barro and Ursúa had data for all the countries in their sample. Extending the sample backward for those countries with longer time series available does not affect the essential nature of the findings. Table 1 also reports growth rates for a shorter sample period (beginning in 1960) to take into account the possibility of nonstationarity in the data.

Figure 1. Logarithm of Real per Capita GDP, 1802–2008

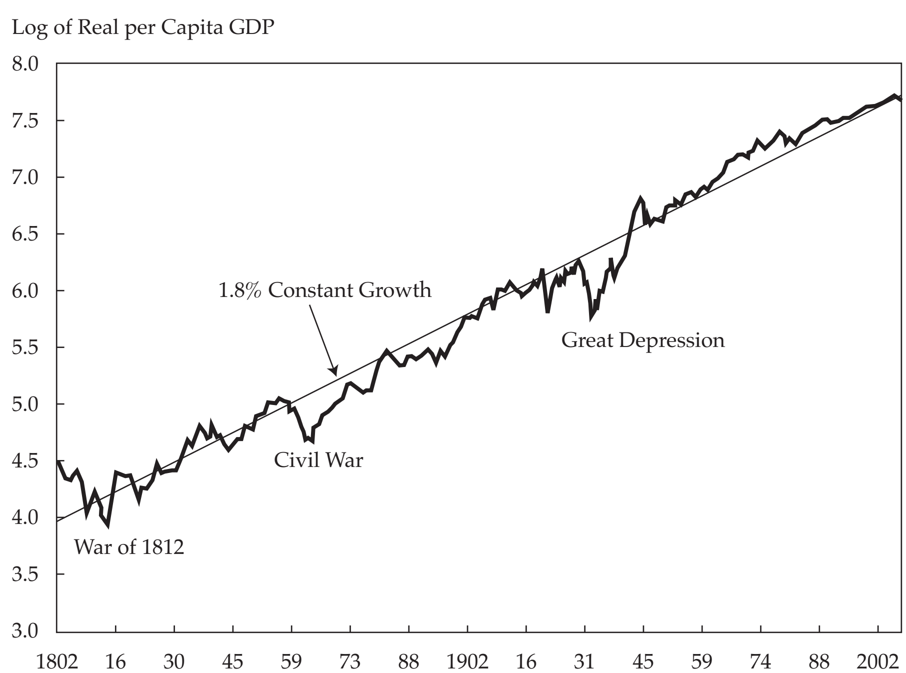


Table 1. Real Growth Rates in per Capita GDP, 1923–2006

Country	1923–2006	1960–2006
A. Mature Economies		
Australia	1.85%	2.16%
Austria	2.53	2.76
Belgium	2.11	2.62
Canada	2.22	2.27
Denmark	1.97	2.11
France	2.28	2.51
Germany	2.41	2.23
Italy	2.57	2.98
Japan	3.11	3.86
Netherlands	2.01	2.35
Spain	2.30	3.42
Sweden	2.50	2.25
Switzerland	1.63	1.51
United Kingdom	1.95	2.15
United States	1.42	1.14
Average	2.19%	2.42%
B. Developing and More Recently Developed Economies		
Argentina	1.10%	1.16%
Brazil	2.68	2.34
Chile	1.95	2.47
Colombia	2.18	2.24
Egypt	1.45	3.09
Finland	2.91	2.92
Greece	2.77	3.23
Iceland	3.24	2.87
India	1.74	2.88
Indonesia	1.81	3.08
S. Korea	3.55	5.72
Malaysia	1.91	2.14
Mexico	2.70	4.16
New Zealand	1.51	1.36
Norway	2.86	3.01
Peru	1.44	0.97
Philippines	1.32	1.46
Portugal	2.75	3.43
S. Africa	1.53	1.01
Singapore	3.33	5.72
Sri Lanka	1.93	3.06
Taiwan	3.78	6.24
Turkey	2.75	2.40
Uruguay	2.19	2.24
Venezuela	2.54	0.45
Average	2.32%	2.79%

Source: Barro and Ursúa (2008).

The results are reported in terms of compound growth rates. The following example illustrates why using compound growth rates is preferable to using averages of annual growth rates. Suppose that the ratio of corporate profits to GDP is stationary but not constant. In particular, assume (as the data will later show) that corporate profits are more variable than GDP. In that case, even though the compound growth rates of the two variables must converge in the long run, the arithmetic mean of annual growth rates for corporate profits will exceed that for GDP because of the variance effect.[3] The higher mean growth rate in earnings is illusory, however, because it fails to take into account the mean reversion in earnings growth that must occur for the ratio to be stationary.

The results reported in Table 1 are divided into two groups. The first group comprises mature economies that were already developed before World War II. These countries, which account for virtually the entire global stock market capitalization, are the focus of this study. The second group consists of economies that were developed more recently or are still considered developing. Results for the second group are presented for completeness and to provide perspective on the impact of convergence.

Consistent with the hypothesis that a common rate of technological advance is driving growth in all the developed countries, the results for the first group are remarkably homogeneous. Virtually all the growth rates for the full sample are close to the average of 2.19 percent. The exceptions are the United States, on the low end, and Japan, on the high end. The former's rate of 1.42 percent reflects the fact that the United States was the closest to steady state growth in 1923, after emerging from World War I relatively unscathed. The higher growth rate for Japan reflects convergence. At the start of the sample period, Japan was a relatively undeveloped country whose capital stock was below the steady state level. Convergence is also evident in the shorter sample period, beginning in 1960. The European countries and Japan, whose capital stocks were damaged in World War II, grew more rapidly than the United States, Switzerland, and Australia, all of which avoided war-related domestic destruction.

The results for the second group are more heterogeneous, reflecting the fact that growth in some countries (e.g., Peru and Venezuela) has stalled for reasons not fully understood whereas others (e.g., South Korea and Taiwan) have experienced rapid convergence. Despite the heterogeneity, however, the average growth rates of 2.32 percent for the sample period beginning in 1923 and 2.79 percent for the sample period beginning in 1960 are close to the averages for the first group of countries.

The averages reported in Table 1 are simple averages. If the growth rates for the first group of countries are weighted by market capitalization, the average falls to about 2 percent in both periods because of the predominant role of the United States. Giving the United States a higher weight is reasonable not only because of its large market capitalization but also because its economy is closest to steady state growth. Given the long period of time since World War II, to assume that all the countries in the first group will eventually converge to steady state growth is reasonable. Therefore, they are more likely to grow at rates comparable to the U.S. historical rate than at their own historical rates. This likelihood suggests that 2 percent real per capita growth, which exceeds the recent U.S. growth rate by 0.5 percent, is the most that investors can reasonably expect in the long run. Furthermore, although growth could be stalled by a catastrophe, such as another world war, the speed of technological innovation has proved almost impossible to accelerate meaningfully. In the remainder of this article, therefore, I will use 2 percent as the estimate of future per capita GDP growth. This number should be thought of as an achievable, but not necessarily expected, outcome.

In addition to the possibility of a catastrophe are two other reasons why 2 percent may prove to be an optimistic growth forecast. First, national income accounting does not deduct costs associated with pollution and environmental degradation in the calculation of GDP. Although these costs have been a tiny fraction of GDP in the past, concern that they are growing rapidly is widespread. If that concern is justified, properly accounting for these costs will reduce the future growth rate of per capita GDP. Second, whether the historical rate of technological innovation is sustainable is far from clear. Weil (2009, p. 260) noted that the rate of growth of real per capita GDP attributable to technological progress remained largely constant from 1950 to 2005, but over the same period, the number of researchers in the G–20 countries grew from 251,000 to 2.6 million. This finding suggests a declining marginal product of research as making and applying new discoveries become more difficult. If this trend continues, it could lead to falling rates of growth in per capita GDP.

Population Growth

Business opportunities depend on total economic activity, not per capita output. To see why, consider a hypothetical example of an economy for which technological innovation—and thus productivity growth—is zero but which is experiencing 5 percent population growth. Companies that provide goods and services in this economy will, on average, experience 5 percent growth in real revenues. Assuming that their margins remain constant, this rate translates into 5 percent growth in real earnings. Of course, in a dynamic economy, existing companies could lose business to start-ups, which could result in dilution for existing investors (which is a separate issue addressed later in the article). For companies in the aggregate, real earnings should be tied to real GDP, as data presented later in the article reveal to be the case.

Converting per capita growth to aggregate growth requires an estimate of population growth. Fortunately, population growth rates change even more slowly and are more predictable than growth rates of real per capita GDP.

Data on population growth for the sample countries are reported in **Table 2**. The first column presents historical growth rates from 2000 to 2007 taken from the U.S. Central Intelligence Agency's *2008 World Fact Book*. The second column presents United Nations (2007) forecasts of population growth rates from 2005 to 2010. That the two columns are very similar reflects the slowly changing nature of population growth.

The data in Table 2 are consistent with the widely documented fact that population growth is negatively correlated with per capita GDP.[4] The average population growth rate for the first group of countries is less than half that for the second group. Even for the second group, however, both the average historical growth rate and the average projected growth rate are less than 1 percent. Presumably, as per capita GDP continues to rise, these growth rates will continue to decline.

On the basis of the data presented in Table 2, population growth can be expected to add no more than 1 percent to the growth rate in per capita GDP. In fact, an assumption of a zero long-run future growth rate for the developed countries would not be unreasonable. Given real per capita growth of 2 percent, this assumption implies that investors cannot reasonably expect long-run future growth in real GDP to exceed 3 percent.

Earnings and GDP

The fundamental source of value for equity investors is earnings, not GDP. That long-run real GDP growth is reasonably bounded at 3 percent does not necessarily mean that the same is true of earnings, which depends on whether the ratio of earnings to GDP (E/GDP) is stationary. To test that hypothesis requires data on aggregate earnings.

Two primary measures of aggregate earnings are used in the United States. The first measure is derived from the national income and product accounts (NIPAs), produced by the U.S. Department

Table 2. Historical and Projected Population Growth Rates, 2000–2010

	Historical	Projected
Country	2000–2007	2005–2010
A. Mature Economies		
Australia	1.22%	1.01%
Austria	0.06	0.36
Belgium	0.11	0.24
Canada	0.83	0.90
Denmark	0.30	0.90
France	0.57	0.49
Germany	–0.04	–0.07
Italy	0.00	0.13
Japan	–0.14	–0.02
Netherlands	0.44	0.21
Spain	0.10	0.77
Sweden	0.16	0.45
Switzerland	0.33	0.38
United Kingdom	0.28	0.42
United States	0.88	0.97
Average	0.34%	0.48%
B. Developing and More Recently Developed Economies		
Argentina	1.07%	1.00%
Brazil	1.23	1.26
Chile	0.91	1.00
Colombia	1.41	1.27
Egypt	1.68	1.76
Finland	0.11	0.29
Greece	0.15	0.21
Iceland	0.78	0.84
India	1.58	1.46
Indonesia	0.18	1.16
S. Korea	0.27	0.33
Malaysia	1.74	1.69
Mexico	1.14	1.12
New Zealand	0.97	0.90
Norway	0.35	0.62
Peru	1.26	1.15
Philippines	1.99	1.72
Portugal	0.31	0.37
S. Africa	0.83	0.55
Singapore	1.14	1.19
Sri Lanka	0.94	0.47
Taiwan	0.24	0.36
Turkey	1.01	1.26
Uruguay	0.49	0.29
Venezuela	1.50	1.67
Average	0.94%	0.96%

Sources: Central Intelligence Agency (2008) and the United Nations (2007).

of Commerce's Bureau of Economic Analysis. The NIPAs contain an estimate of aggregate corporate profits that is based on data collected from corporate income tax returns. The second measure of aggregate earnings is derived by Standard & Poor's from data collected from corporate financial reports. Because the two measures are not identical, distinguishing what is included in each measure before using the data is important.

The NIPA profit measure is designed to provide a time series of the income earned from the current production of all U.S. corporations. The sample is not limited to publicly traded companies. The tax rules on which the NIPAs are based are designed to expedite the timely and uniform completion of corporate tax returns. For that reason, all corporations use a highly uniform set of rules for tax accounting.

Because the NIPAs are designed to measure economic activity connected with current production, the NIPA definition of corporate profits includes only receipts arising from current production less associated expenses. The NIPA definition, therefore, excludes transactions that reflect the acquisition or sale of assets or liabilities. Dividend receipts from domestic corporations are excluded to avoid a double counting of profits. For the same reason, bad-debt expenses and capital losses are also excluded.

The Standard & Poor's estimate of aggregate earnings is derived from reported financial statements. Rather than being based on a unified set of tax rules, financial accounting is based on GAAP, which is designed to allow management to tailor financial statements so as to reveal information that is useful to a particular company. Furthermore, financial accounting provides for depreciation and amortization schedules that allow companies to attempt to match expenses with the associated stream of income.

The aggregate earnings data available from Standard & Poor's are for the companies in the S&P 500 Index. Each year's data consist of the aggregate GAAP after-tax earnings for the 500 companies in the S&P 500 for that year. Thus, the sample of companies in the aggregate is constantly changing as the index is updated. Because the S&P 500 earnings reflect a shifting sample of corporations, the series of reported earnings can be discontinuous over time. Fortunately, given the size of the index, these discontinuities are small and have little impact on estimated earnings growth.

The differences between financial and tax accounting create two dissimilarities between the measures of earnings for the same company.[5] First, intertemporal differences arise because of the timing of revenue, and expense recognition often differs between the two systems. The best example is depreciation because tax rules generally allow for more rapid depreciation than companies choose to report under GAAP. Second, permanent differences exist because the revenues and expenses recognized under the two systems are not the same. Although important in the short run, these differences tend to cancel out over long horizons, and thus, the long-run growth rates in the two measures are similar. For example, the average growth rate in NIPA real corporate profits from 1947 to 2008 was 3.23 percent, as compared with a growth rate of 3.17 percent in S&P 500 real aggregate earnings.

As an aid in examining the behavior of E/GDP, **Figure 2** plots after-tax corporate profits from the NIPAs as a fraction of GDP for 1947–2008. The figure reveals no overall trend. The fraction is approximately the same at the end as at the beginning, and thus, the growth rate of corporate profits is almost identical to that of GDP. The same is largely true of S&P 500 aggregate earnings as a fraction of GDP, which is plotted in **Figure 3** (normalized to start at 8.23 percent to facilitate comparison with Figure 2). The fraction for the S&P 500 earnings is smaller because the S&P 500 measure is less comprehensive than the NIPA measure. Unlike the NIPA data, the S&P 500 ratio exhibits a slight downward trend, reflecting the fact that as the economy has grown, the S&P 500 companies have become a progressively smaller fraction of total earnings. Therefore, the data are generally consistent with the hypothesis that over the long run, aggregate earnings are a stationary fraction of GDP. Certainly, no evidence exists of a persistent increase in the ratio, no matter which measure of earnings is chosen. This observation implies that the long-run growth rates of GDP place a limit on the long-run growth rates of earnings.

Although the data largely support the hypothesis that E/GDP is stationary, it is far from constant. Figure 2 shows that corporate profits vary between 3 percent and 11 percent of GDP. The variability of the ratio for S&P 500 earnings is even greater. This variability suggests that when earnings are low relative to GDP, they grow more quickly; the reverse is true when earnings are relatively high. This mean reversion in the growth rate of earnings maintains the stationarity of E/GDP.

Note that in an efficient market, the mean reversion in earnings growth would have no impact on stock returns because it would be impounded into current prices. Campbell and Shiller (1998), however, provided evidence that long-run average earnings are, in fact, predictive of future stock returns. Specifically, when the ratio of price to average earnings over the previous 10 years is high, future stock returns tend to be low; the reverse is true when the ratio is low. This finding suggests that the market does not fully account for the mean-reverting nature of long-run earnings growth.

Figure 2. Corporate Profits as a Percentage of GDP, 1947–2008

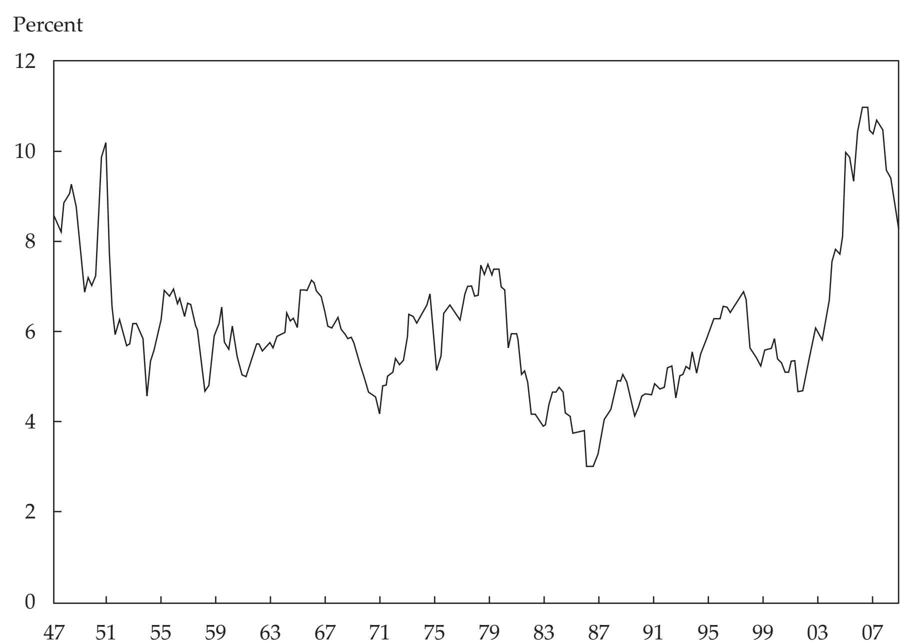
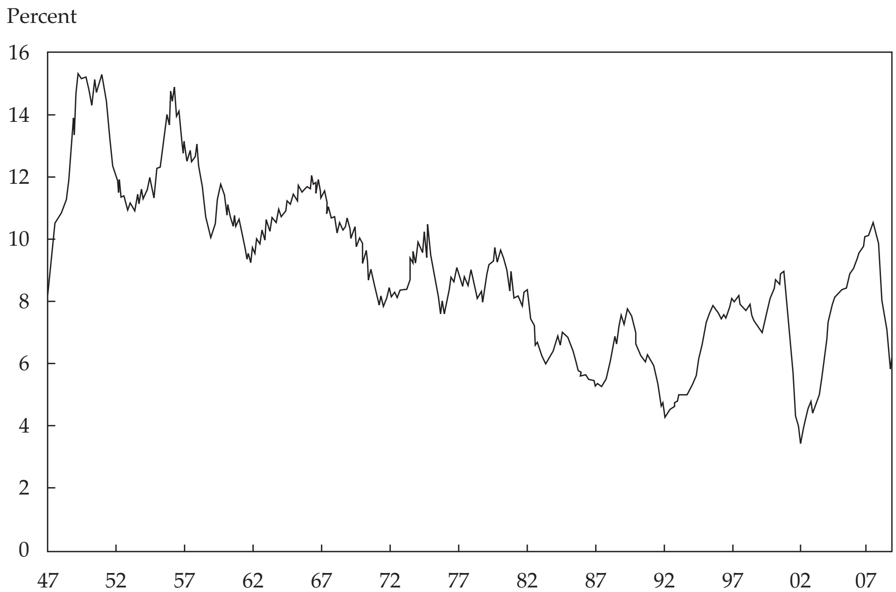


Figure 3. S&P 500 Earnings as a Percentage of GDP, 1947–2008



That the ratio of aggregate earnings to GDP is stationary implies that investors can expect aggregate real earnings growth to match, but not exceed, real GDP growth in the long run. Unfortunately, the same is not true of the earnings to which current investors have a claim. Two reasons explain this discrepancy. First, an investor's pro rata portion of a company's earnings will be affected by the company's share issuances and repurchases. If this dilution (or accretion) is ongoing, growth in aggregate earnings and earnings per share will diverge. Second and more important, current investors do not participate in the earnings of new businesses unless they dilute their current holdings to purchase shares in start-ups. Therefore, start-ups drive a wedge between the growth in aggregate earnings and the growth in the earnings to which current investors have a claim.

To illustrate the second effect, consider a simple example in which all companies in the economy are identical and earn $10 a share per period. Furthermore, assume that each company has a market value of $100 a share and has 1,000 shares outstanding. All earnings are paid out, so the values of the companies remain constant. Finally, assume that at the outset only two companies are in the economy, so aggregate earnings are $20,000. A current investor who holds 1 percent of each company has a pro rata share of aggregate earnings of $200. Now assume that the economy grows and a third company is started. As a result, aggregate earnings rise to $30,000, but the current investor does not participate in that growth and thus still holds 1 percent of the first two companies with rights to earnings of $200. If the current investor wanted to add the third company to the portfolio without investing new cash, the investor would have to dilute the portfolio's holdings in the first two companies. After the dilution, the investor would hold 0.67 percent of each of the three companies and would thus still have rights to earnings of $200. Therefore, the growth in earnings experienced by the current investor does not match the growth in aggregate earnings.

Bernstein and Arnott (2003) suggested an ingenious procedure for estimating the combined impact of both effects on the rate of growth of earnings to which current investors have a claim. They noted that total dilution on a marketwide basis can be measured by the ratio of the proportionate increase in market capitalization to the value-weighted proportionate increase in stock price. More precisely, net dilution for each period is given by the equation

$$\text{Net dilution} = \frac{1+c}{1+k} - 1, \tag{1}$$

where c is the percentage capitalization increase and k is the percentage increase in the value-weighted price index. Note that this dilution measure holds exactly only for the aggregate market portfolio. For narrower indices, the measure can be artificially affected if securities are added to or deleted from the index.

To account for the impact of dilution, the Bernstein–Arnott measure was estimated by using monthly data for the entire universe of CRSP stocks from 1926 to 2008. Using CRSP data for this purpose presents one problem. The CRSP universe was expanded twice during the sample period: in

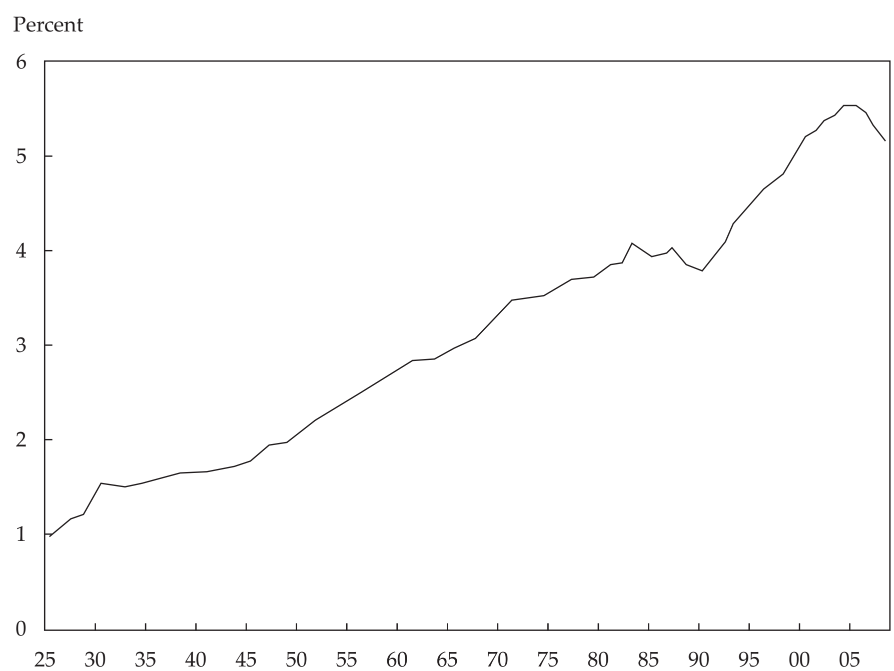
July 1962, when Amex stocks were added, and in July 1972, when NASDAQ stocks were added. Both these additions caused a significant increase in market capitalization unaccompanied by a corresponding increase in the value-weighted price. To eliminate the impact of these artificial discontinuities, I set the estimate of net dilution at zero for both July 1962 and July 1972.

Figure 4 plots the compounded estimate of net dilution from 1926 to 2008. It rises continuously except for downturns in the early 1990s and in 2006–2008. The average rate of dilution over the entire period is 2 percent. The primary source of dilution is the net creation of new shares as new companies capitalize their businesses with equity. The impact of start-ups is not surprising in light of the fact that more than half of U.S. economic growth comes from new enterprises, not from the growth of established businesses. Given the continuing importance of start-ups, the rate of dilution is highly unlikely to subside unless the rate of innovation slows. If the rate of innovation slows, however, GDP growth will also decline. Consequently, to conclude that the rate of growth of earnings, net of dilution, will remain largely constant is reasonable. Therefore, to estimate the growth rate of earnings to which current investors have a claim, approximately 2 percent must be deducted from the growth rate of aggregate earnings.

Putting the pieces together, we can see that growth theory predicts that current investors should count on long-run growth in real earnings of no more than 1 percent. This rate equals real growth of 3 percent in aggregate earnings, adjusted downward by 2 percent to account for dilution.

Arnott and Bernstein (2002) and Bernstein and Arnott (2003, p. 49) observed that "earnings and dividends grow at a pace very similar to that of per capita GDP." This observation correctly summarizes U.S. economic history, but it may not be true for other countries and it may not hold for the United States in the future. In terms of my analysis, the reason that earnings and dividends mirror per capita GDP is that population growth and dilution have both been about 2 percent between 1870 and 2008. Consequently, these two terms cancel each other out when we move from estimated growth in real per capita GDP to estimated growth in real earnings per share. But there is no theoretical reason why this cancellation should necessarily occur. For instance, population growth in Western Europe has fallen essentially to zero. If the United States were to follow suit but dilution were to continue at about 2 percent a year, growth in real earnings would be 2 percentage points *less* than growth in per capita GDP. In short, the Arnott–Bernstein observation is a shortcut that has historically held in the United States but is not a necessary condition. Therefore, a more complete analysis that takes into

Figure 4. The Impact of Dilution on Investor Earnings, 1926–2008



account both population growth and dilution is generally preferable. I do not present that analysis here because of limitations on dilution data for countries other than the United States.

Implications of Economic Growth Theory for Expected Stock Returns

The story thus far is that economic growth places a limit on the long-run growth of real earnings per share available to investors. On the basis of the data I have analyzed here, that limit is what many investors might consider a relatively anemic 1 percent. The next step is to explore the implications of that limitation for future returns on common stocks.

By definition, the rate of return on stock in period t is given by

$$R_t = \frac{D_t}{P_{t-1}} + GP_t, \tag{2}$$

where D_t is the dividend for year t, P_{t-1} is the price at the end of year $t-1$, and $GP_t = (P_t - P_{t-1})/P_{t-1}$. Following Fama and French (2002), we can write Equation 2 in terms of long-run average values, denoted by A(), as

$$A(R_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GP_t). \tag{3}$$

Equation 3 states that the long-run average return equals the average dividend yield plus the average capital gain.

Equation 3 holds *ex ante* as well as *ex post*. It implies that the long-run future average return equals the future average dividend yield plus the future average capital gain. Assuming that the earnings-to-price ratio is stationary, the long-run average earnings growth rate, $A(GE_t)$, can be substituted for the average capital gain rate, giving

$$A(R_t) = A\left(\frac{D_t}{P_{t-1}}\right) + A(GE_t). \tag{4}$$

My preceding analysis implies that $A(GE_t)$ in Equation 4 should be no more than about 1 percent in the future. In addition, as of December 2008, the current dividend yield was 3.1 percent and the previous 50-year average was 3.3 percent. Because the two are nearly equal, substituting either into Equation 4 as a proxy for the future average yield suggests that investors should not expect long-run real returns on common stocks to go much beyond 4 percent. Note that this calculation does not need to be adjusted for repurchases because the impact of repurchases is already accounted for in the dilution calculation. An adjustment is required only if future repurchases are expected to exceed their past average.

Equation 4 can also be used to approximate the equity risk premium. Because the real return on short-term government securities has averaged about 1 percent over the last 80 years, Equation 4 implies that the equity risk premium measured with respect to short-term government securities is approximately equal to the expected average dividend yield. Using either the current yield or the past average yield translates this number into a long-run average equity risk premium of just more than 3 percent. If the premium is measured with respect to longer-maturity government securities with greater expected real returns, the equity premium is commensurately less. This result is markedly less than the average historical risk premium measured over the 1926–2008 period that is commonly referenced. It is consistent, however, with a long-running body of empirical work that shows the *ex ante* risk premium to be significantly smaller than the historical average.[6]

Thus far, all the results have been stated in terms of compound growth rates. For many purposes, however, the object of interest is the annual expected return. For example, discounted-cash-flow valuations typically require annual estimates of the discount rate. To convert compound growth rates, which are geometric averages, into arithmetic averages requires taking the variance effect into account. This step can be well approximated by adding one-half of the annual variance of returns to the compound growth rate.

Because earnings are volatile, the variance effect adds about 1 percent to the compound growth rates. This result means that growth theory predicts that future annual real returns on common stocks should average no more than about 5 percent and that the annual equity risk premium for short-term government securities is about 4 percent.

Using annual data, we can tie the growth theory analysis to the long-run performance of company investments. If a company retains a fraction, b, of its earnings and invests those funds at a real rate of return, k, then basic finance theory teaches that the earnings per share will grow at the rate $(b)(k)$. Growth theory predicts that the annual long-run average growth in real earnings per share is about 2 percent, taking into account both dilution and the variance effect. From 1960 to 2008, companies in the S&P 500 retained, on average, 54 percent of their earnings. Solving for k, this retention ratio implies a real return on corporate investments of about 4 percent.

One possible adjustment might be made to the foregoing results. Recall that the dilution calculation was based on the assumption of a stable repurchase rate throughout the sample period. In fact, repurchases accelerated following the passage, in 1982, of U.S. SEC Rule 10b-18, which greatly reduced the legal risk associated with repurchases. More specifically, a pronounced trend toward repurchases as the preferred form of marginal payout to shareholders took place. Brav, Graham, Harvey, and Michaely (2005) reported that following the SEC ruling, managers began behaving as if a significant capital market penalty were associated with cutting dividends but not with reducing repurchases. Accordingly, dividends are set conservatively and repurchases are used to absorb variations in total payout. To the extent that this reliance on repurchases is expected to continue, the estimated 2 percent dilution effect might be too large and growth rates would have to be adjusted upward. Most of the 2 percent dilution, however, is associated not with the actions of existing companies but with start-ups that finance their businesses with new equity. Therefore, the adjustment in the overall rate of future dilution should not be large.

International Considerations

Thus far, I have limited my analysis to the United States. This restriction is an obvious shortcoming because most major corporations are becoming increasingly global. Although a detailed examination of international data is beyond the scope of this article, several general conclusions can be drawn. First, the data presented in Table 2 suggest that real per capita GDP growth rates for the other developed countries should be comparable to the U.S. growth rate in the future. Second, for the other developed countries, population growth rates are forecasted to be lower. As a result, the implied limitations on earnings growth remain largely unchanged and are perhaps even lower when other developed countries are included in the sample. Third, with respect to the developing countries—particularly India and China, which are the most important by virtue of their size—convergence predicts that they will experience higher growth rates in real per capita GDP than the United States. In addition, most developing countries are forecasted to have comparable or higher population growth rates than the United States. These forecasts suggest that companies doing business in the developing world will experience higher rates of earnings growth than they achieve in the developed world. Nonetheless, as those countries develop, both real GDP and population growth rates should decline. Furthermore, the fraction of total earnings attributable to business in the developing world is relatively small for most companies. Therefore, if a complete analysis were done on a global basis, the earnings bounds derived from U.S. data and the related predictions regarding stock returns would be unlikely to be markedly affected.

Conclusion

The long-run performance of equity investments is fundamentally linked to growth in earnings. Earnings growth, in turn, depends on growth in real GDP. This article demonstrates that both theoretical research and empirical research in development economics suggest relatively strict limits on future growth. In particular, real GDP growth in excess of 3 percent in the long run is highly unlikely in the developed world. In light of ongoing dilution in earnings per share, this finding implies that investors should anticipate real returns on U.S. common stocks to average no more than about 4–5 percent in real terms. Although more work needs to be done before equally definitive predictions can be made with respect to international equities, the basic outlook appears to be quite similar.

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This article qualifies for 1 CE credit.

Notes

1. For details on the Solow model and more recent elaborations, see Barro and Sala-i-Martin (2004).
2. Hall and Jones (1999) described the problem in detail and offered an intriguing solution.
3. As a first-order approximation, the annual arithmetic mean equals the compound growth rate plus one-half the standard deviation of the annual growth rates.
4. See, for example, Weil (2009, ch. 4).
5. For further details on the relationship between reported earnings and NIPA profits, see Mead, Moulton, and Petrick (2004).
6. Contributions in this area include those of Rozeff (1984); Ross, Brown, and Goetzmann (1995); Claus and Thomas (2001); Fama and French (2002); and Cornell and Moroz (forthcoming).

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Chapter 2

Evaluating the Historical Record

Primitive peoples, with no knowledge of modern science, express confidence in the proposition that the sun will rise tomorrow. The reason is that the historical record is unambiguous on this point. Ask whether it will rain tomorrow, though, and doubt arises. Because of random variation in weather, the historical record is a good deal more ambiguous. Rain today does not necessarily mean rain tomorrow.

With respect to the equity premium, the confidence that can be placed in the assumption that the future will be like the past depends on two related characteristics of the historical data: how accurately the historical premium can be measured and the extent to which the measured premium depends on the choice of the sample period. Before those questions can be addressed, however, there is the issue of how the average returns that go into the premium should be computed in the first place.

Computing the Average Premium: Arithmetic versus Geometric

The historical equity risk premium equals the difference between the average return on equities and the average return on treasury

securities calculated over a specified time period. It can be seen in Table 1.2, for instance, that over the full sample period between 1926 and 1997, the average return on stocks was 13.0% and the average return on treasury bills was 3.8%, so the equity risk premium over bills was 9.2%. Those are arithmetic averages. They are computed in the standard way: Add up all the annual returns and divide by the numbers of years (in this case, 72).

Although it is familiar, the arithmetic average has a peculiar property. As an illustration, suppose that an investor earns returns of 10%, 20%, –25%, and 15% in 4 consecutive years. The arithmetic average of the four returns is 5%. Now consider an investor who starts with $100. If he or she earns 10%, 20%, –25%, and 15% in each of 4 years, his or her ending wealth will be $113.85. However, if that investor earns 5% per year for 4 years, he or she will end up with $121.55. This is a general problem. Investors who earn the arithmetic average of a series of returns wind up with more money than investors who earn the series of returns that are being averaged.

The geometric average solves this problem. By definition, the geometric average is the constant return an investor must earn every year to arrive at the same final value that would be produced by a series of variable returns. The geometric average is calculated using the formula

$$\text{Geometric Average} = (\text{Final Value}/\text{Initial Value})^{1/n} - 1$$

where n is the number of periods in the average. When the formula is applied to the preceding example, the results are as follows:

$$\text{Geometric Average} = (113.85/100)^{1/4} - 1 = 3.29\%$$

An investor who earns 3.29% for 4 years will end up with $113.85.

There are four properties of arithmetic and geometric averages that are worth noting:

- The geometric average is always less than or equal to the arithmetic average. For instance, in Table 1.2 the arithmetic average stock return is 13.0%, but the geometric average is only 11.0%. (The geometric averages are reported at the bottom of the path of wealth columns in Table 1.2.)
- The more variable the series of returns, the greater the difference between the arithmetic and geometric average. For example, the returns for common stock are highly variable. As a result, the arithmetic average exceeds the geometric average by 200 basis points. For treasury bonds, whose returns are less variable, the difference between the two averages is only 40 basis points.
- For a given sample period, the geometric average is independent of the length of the observation interval.[1] The arithmetic average, however, tends to rise as the observation interval is shortened. For instance, the arithmetic average of monthly returns for the S&P 500 (calculated on an annualized basis by compounding the monthly arithmetic average) over the period between 1926 and 1997 is 13.1%, compared with the 13.0% average of annual returns.
- The difference between the geometric averages for two series does not equal the geometric average of the difference. Consider, for instance, stock returns and inflation. Table 1.2 reveals that the geometric average stock return is 11.0% and the average inflation rate is 3.1%, for a difference of 7.9%. However, Table 1.3 shows that the geometric average real return on common stock was 7.7%. This discrepancy does not arise for arithmetic averages, where the mean difference always equals the difference of the means.

With respect to the equity risk premium, the manner in which the average is calculated makes a significant difference. When compared with treasury bills over the full 1926-to-1997 period, the arithmetic average risk premium is 9.2%, whereas the geometric average premium is only 7.2%. Which average is the more appropriate choice? That depends on the question being asked. Assuming that the returns being averaged are largely independent and that the future is like the past, the best estimate of expected returns over a given future holding period is the arithmetic average of past returns over the same holding period. For instance, if the goal is to estimate future stock-market returns on a year-by-year basis, the appropriate average is the annual arithmetic risk premium. On the other hand, if the goal is to estimate what the average equity risk premium will be over the next 50 years, the geometric average is a better choice. Because the ultimate goal in this book is to arrive at reasonable forward-looking estimates of the equity risk premium, both arithmetic and geometric averages are employed where they are useful.

It is worth reiterating that projection of any past average is based on the implicit assumption that the future will be like the past. If the assumption is not reasonable, both the arithmetic and geometric averages will tend to be misleading.

How Accurately Can the Historical Risk Premium Be Measured?

The accuracy with which the historical risk premium can be measured depends on the variability of the observations from which the average is calculated. In an assessment of the impact of that variability, the best place to start is with an expanded version of Table 1.2 that includes monthly returns for the four asset classes over the period between 1926 and 1997. Given this expanded data set, one way to assess the variability of the ex-post risk premium, defined as the difference between the observed returns for stocks and the related treasury securities, is to plot one histogram for stocks versus bonds and another for stocks versus bills. Each bar on the histogram represents the fraction of the 864 monthly

[1] This follows immediately from the fact that the geometric average depends only on the initial and final values of the investment.

WILEY FRONTIERS IN FINANCE

THE EQUITY RISK PREMIUM

The Long-Run Future of the Stock Market

BRADFORD CORNELL

Chapter 6

The Equity Risk Premium and the Long-Run Outlook for Common Stocks

So that there is no suspense, here is the bottom line: The future will not be as bright as the past. The data of Ibbotson Associates showed that over the period from 1926 to 1997, the average equity risk premium was 7.4% over treasury bonds and 9.2% over treasury bills. Investors cannot reasonably expect equities to produce such large premiums going forward. Instead, premiums are much more likely to be on the order of 300 to 400 basis points lower. Reasonable forward-looking ranges for the future equity risk premium in the long run are 3.5% to 5.5% over treasury bonds and 5.0% to 7.0% over treasury bills.

This relatively pessimistic conclusion is based on two considerations. The first is an overall assessment of the empirical data and theoretical arguments presented in Chapters 1 through 4. The second is the analysis of the level of stock prices presented in Chapter 5. Although forecasting future stock returns, even over the long run, is hazardous at best, when all the evidence is taken into account, the conclusion that the future will be less rosy than the past has strong support.

Investment Banking Relationships and Analyst Affiliation Bias: The Impact of Global Settlement on Sanctioned and Non-Sanctioned Banks

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Abstract

We examine the impact of the Global Analyst Research Settlement on analyst affiliation bias in stock recommendations. Using a comprehensive measure of investment bank-firm relationships, including equity and debt underwriting and M&A advising, we find that affiliation bias is substantially reduced, but not eliminated, for analysts employed by banks named in the settlement. In contrast, we find strong evidence of analyst affiliation bias both before and after the Global Settlement for analysts at non-sanctioned banks. The results hold after controlling for shifts in the recommendation schemes used by investment banks and are robust to alternative empirical specifications.

JEL classification: G10, G24, G34, L14

Keywords: Analysts, Recommendations, Investment Banking, Investment Banking Relationships

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1. INTRODUCTION

Conflicts of interest within investments banks and other financial institutions have been the subject of numerous academic studies (see Mehran and Stulz 2007 for a discussion). One particular conflict that has received significant attention from both regulators and academics is analyst affiliation bias. Specifically, prior research provides strong evidence that analysts are overly optimistic when their employers have equity underwriting relationships with the covered firms. Early in the 2000s, several attempts to reduce conflicts of interest were implemented in the securities industry, culminating in the 2003 Global Analyst Research Settlement (Global Settlement). In particular, a major purpose of the Global Settlement reached between the SEC, NYSE, NASD, New York Attorney General, and North American Securities Administrators Association and 12 of the largest investment banks was to reduce the conflicts of interest between the investment banking and research departments within the major banks.[1] Subsequent research suggests that investment banks changed their behavior following the Global Settlement[2], but provides little evidence on affiliation bias for analysts employed by sanctioned and non-sanctioned banks nor on relationships beyond the well-studied equity underwriting relationship. In this study, we use a broad measure of investment banking relationships, including equity and debt underwriting and mergers and acquisitions (M&A) advising, to examine analyst affiliation bias for a large sample of sanctioned and non-sanctioned investment banks (IBs) in the periods before and after the Global Settlement and contemporaneous regulatory changes.

Sell-side financial analysts provide buy/sell recommendations and earnings forecasts for a set of covered firms. In general, analysts are compensated and earn a reputation based on the quality of the information they provide. Despite these incentives to produce accurate information, however, analysts can also face pressure to issue optimistic or biased coverage. In particular, the financial services firms that employ analysts also compete for lucrative underwriting and M&A advisory mandates and may seek to

[1] The original settlement in April 2003 named ten investment banks, including Bear Stearns, CSFB, Goldman Sachs, Lehman Brothers, J.P. Morgan, Merrill Lynch, Morgan Stanley, Citigroup (Salomon Smith Barney), UBS Warburg, and U.S. Bancorp Piper Jaffray. Similar settlements with Deutsche Bank and Thomas Weisel were added later. We refer to these banks (including other name variations of the same banks) as "sanctioned" banks.

[2] See, for example, Kadan, Madureira, Wang, and Zach (2009).

use biased coverage as one means of winning potential clients. As a result, analysts face a conflict between their role in providing quality information to financial markets (and the associated reputational concerns) and the motivations of their employers to win future investment banking business.

Following prior research, we define an affiliated analyst as one whose employer also has an investment banking relationship with the covered firm. Existing research suggests that affiliated analysts tend to produce optimistic (i.e., upward biased) recommendations and earnings forecasts relative to unaffiliated analysts (see, for example, Dugar and Nathan 1995, Lin and McNichols 1998). This research focuses primarily on affiliation through equity underwriting relationships, with a particular emphasis on affiliation at the time of an equity issue.[3] However, equity underwriting is only one of many services that investment banks provide to firms. In the fourth quarter of 2013, for example, equity underwriting accounted for only 36% of total investment banking revenues at Goldman Sachs, compared to 34% for financial advising and 30% for debt underwriting. This suggests that investment banking relationships may have an impact beyond that evidenced through equity underwriting.[4]

To better understand the impact of investment banking relationships on analyst behavior, we examine the individual equity, debt, and M&A components of the relationship, as well as the overall investment banking relationship. We expect the results to be strongest for the overall relationship for two reasons. First, since equity, debt, and M&A transactions are discrete observations of the firm-bank relationship, viewing all of these transactions together allows us to observe the relationship at more points in time, better capturing the ongoing nature of the relationship. Second, we expect investment banking relationships that span multiple functional areas to put more pressure on analysts than narrow relationships.

To analyze affiliation bias, we study recommendations on a large sample of U.S. non-financial firms between 1998 and 2009 by analysts whose employers are either sanctioned investment banks or top

[3] One exception is Ljungqvist, Marston, Starks, Wei, and Yan (2007) who control for both equity and debt underwriting affiliations. This study is discussed in more detail below.
[4] The importance of firm-wide relationships may also change over time. For example, Corwin and Stegemoller (2014) find that the tendency of firms to use the same investment bank in multiple functional areas (i.e., equity underwriting, debt underwriting, or M&A advising) has increased significantly over time.

non-sanctioned banks. Our main variable of interest is the analyst's relative recommendation, defined as the difference between the analyst recommendation (with strong buy=5 and strong sell=1) and the median recommendation across all analysts covering the stock. Following Ljungqvist et al. (2007), we construct this variable at the end of each quarter, using the most recent recommendation by each analyst during the preceding twelve months. In our main tests, we regress this variable on proxies for investment banking relationships and a set of control variables shown in prior literature to have an association with analyst recommendations. Our primary relationship variable is an indicator variable equal to one if, during the prior three years, the firm hired the investment bank as a lead or co-manager on an equity or debt deal or as an advisor on an M&A transaction. However, we also provide tests using a continuous measure of relationships, defined as the proportion of a firm's total transaction value during a three-year window for which the investment bank acted as a lead manager, co-manager, or advisor. We define these relationship variables separately for equity, debt, and M&A transactions, as well as for the combined set of transactions across all types.

Consistent with prior research, we find strong evidence of analyst affiliation bias prior to the Global Settlement in 2003. For banks named in the Global Settlement (sanctioned banks), this bias is evident for all individual transaction types and for the overall relationship measure. For non-sanctioned banks in the period prior to the Global Settlement, we find mixed evidence of an affiliation bias based on individual transaction type relationship measures, but strong evidence of an affiliation bias based on the overall relationship measure. This evidence is consistent with our prediction that the overall measure better captures the ongoing nature of the investment banking relationship. The more striking results appear during the period following the Global Settlement. During this period, there remains evidence of an affiliation bias for sanctioned banks, but the bias is substantially reduced from the pre-Global Settlement effect. In contrast, non-sanctioned banks continue to exhibit strong analyst affiliation bias even after the Global Settlement. This bias is evident across all types of transactions and for the overall relationship measure. These results suggest that while the Global Settlement was successful at reducing analyst affiliation bias for the banks named in the settlement, conflicts of interest persist, especially for non-sanctioned investment banks.

Our results are robust to several alternative specifications and robustness checks. While our main results are based on relationship indicator variables, we find similar results based on continuous measures of relationships. The results are also robust to alternative fixed effects specifications, including firm, analyst, and investment bank fixed effects. Most importantly, our results are not driven by the shift of many investment banks from a five-tier to a three-tier recommendation scheme following the Global Settlement (Kadan et al. 2009). We find similar results when we repeat our analysis on a relative recommendation variable based on a three-tier recommendation scheme.

As an alternative specification, we use logistic regressions to examine the impact of investment banking relationships on the likelihood of issuing a buy or strong buy and the likelihood of issuing a sell or strong sell. Consistent with the relative recommendation results, this analysis suggests that prior to the Global Settlement, analysts at both sanctioned and non-sanctioned banks were significantly more likely to issue a buy or strong buy recommendation and significantly less likely to issue a sell or strong sell recommendation when affiliated with the firm through an investment banking relationship. After the Global Settlement, the bias for sanctioned banks is reduced, but remains significant. For non-sanctioned banks, the bias is significant both before and after the Global Settlement. For both groups of banks, the logit results suggest that a significant affiliation bias remains following the Global Settlement, with the effect being substantially larger for non-sanctioned banks.

As a final test, we examine whether incorporating lending data has an impact on the measurement of analyst affiliation bias. We find only weak evidence that lending relationships have an incremental effect on the measurement of analyst affiliation bias. Thus, affiliation bias appears to be best captured through the equity, debt, and M&A relationships. We assert that an overall measure, incorporating equity underwriting, debt underwriting, and M&A advising, is better able to capture investment banking relationships and their effects than measures based on any one type of transaction.

In summary, our findings suggest that conflicts of interest within investment banks have not been completely eliminated by the Global Settlement and contemporary regulatory changes. Our results suggest that the Global Settlement reduced, but did not eliminate, analyst affiliation bias in recommendations from banks named in the Global Settlement. Further, for large banks not named in the Global Settlement, we find strong evidence of a continued affiliation bias in the post-Global Settlement period. This suggests that our findings are driven by the punitive and bank-specific requirements imposed by the Global Settlement, rather than the broader regulatory changes that accompanied the settlement.

The remainder of the paper is organized as follows. Section 2 summarizes the literature related to analyst affiliation bias, provides background information on the Global Settlement, and describes our main hypothesis. In Section 3, we describe our data and sample construction. Section 4 presents our main results related to analyst affiliation bias and Section 5 examines the incremental impact of lending relationships. Section 6 concludes.

2. BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1. Analyst Affiliation Bias

Sell-side financial analysts have been widely studied as proxies for the market's expectations. At the same time, however, analysts' recommendations, target prices, and forecasts have been shown to be optimistic (Beneish 1991; Bradshaw 2004; La Porta 1996). In particular, prior research provides strong evidence of a link between analyst optimism (or bias) and investment banking relationships between covered firms and the banks that employ analysts. Dugar and Nathan (1995) find that recommendations and earnings forecasts are more optimistic for analysts who also have an investment banking relationship with the covered firm than for non-affiliated analysts and Lin and McNichols (1998) show that analysts employed by lead and co-managing underwriters issue growth forecasts and recommendations on the issuing firms that are significantly more favorable than those made by unaffiliated analysts. Further, Dechow, Hutton, and Sloan (2000) provide evidence that analysts employed by lead managers of equity offerings make more optimistic long-term growth forecasts around equity offerings and O'Brien, McNichols, and Lin (2005) conclude that investment banking relationships increase analysts' reluctance to reveal negative news.

Prior studies also point to factors that appear to mitigate analyst affiliation bias. Cowen, Groysberg, and Healy (2006) find that the bias is lower for bulge bracket investment banks than for lower-tier banks, suggesting that the reputational concerns of bulge bracket banks outweigh the benefits of biased analyst coverage. Ljungqvist et al. (2007) argue that, because analysts rely on institutional investors for trading commissions and ratings, they will be less likely to produce biased coverage on affiliated stocks that are also highly visible to institutional investors. Their results confirm that relative recommendations are negatively related to the presence of institutional investors.

Other research examines the impact of analyst bias on investors and the post-recommendation performance of covered firms. De Franco, Lu, and Vasvari (2007) examine the investor consequences of analysts' misleading behavior in the period prior to the Global Settlement. Using a sample of 50 firm-events identified in the Global Settlement in which analysts' private beliefs differed from their public disclosures, they provide evidence that these events are associated with selling by sophisticated investors and a wealth transfer from individuals to institutions. Michaely and Womack (1999) report that in the month following the post-IPO quiet period, affiliated analysts issue more buy recommendations for the IPO firm than do unaffiliated analysts, and the IPOs recommended by affiliated analysts substantially under-perform IPOs recommended by unaffiliated analysts. Similarly, Barber, Lehavy, and Trueman (2007) find that the "buy" and "strong buy" ratings of IB-employed analysts tend to underperform those of other analysts.

Research also examines whether analyst coverage affects the investment bank's ability to win future business from the covered firm. Bradshaw, Richardson, and Sloan (2006) surmise that all analysts bias their recommendations and forecasts in an attempt to win underwriting business. Ljungqvist, Marston, and Wilhelm (2006) find little evidence that optimistic analyst coverage affects an investment bank's likelihood of winning future lead underwriting mandates. However, Ljungqvist, Marston, and

Wilhelm (2009) show that optimistic analyst coverage does increase the likelihood of winning future co-managing appointments, which in turns leads to an increased likelihood of future lead mandates.

Existing research focuses primarily on affiliation through equity underwriting relationships. However, some recent research extends the analysis of affiliation bias to other areas. Ljungqvist et al. (2007) examine both equity and debt underwriting relationships and find that affiliation bias is stronger with respect to equity relationships. Kolasinski and Kothari (2006) investigate affiliation bias in analyst recommendations issued around M&A deals. They find that analysts affiliated with acquirer advisors upgrade acquirer stocks around M&A deals and target-affiliated analysts issue optimistic coverage on acquirers after exchange ratios (for all-stock deals) have been set.

2.2. The Global Settlement

During 2000, the securities industry attempted to reduce investment banking conflicts of interest, with the Securities Industries Association endorsing best practices around research and investment banking and the Association for Investment Management and Research (since renamed CFA Institute) releasing a white paper titled "Preserving the Integrity of Research." In 2002, the Sarbanes-Oxley Act (SOX) amended the Securities and Exchange Act of 1934 with the creation of Section 15D, which required the NYSE and the NASD to adopt rules designed to address research analysts' conflicts of interest. To comply with SOX, in 2002 the NYSE amended its Rule 351 (Reporting Requirement) and Rule 472 (Communication with the Public), while the NASD released Rule 2711 (Research Analysts and Research Report).[5] These rules were approved by the SEC in May 2002.

In 2001, following allegations of research tainted by investment banking conflicts of interest, the

[5] NYSE Rule 472 (Communication with the Public) requires that research reports be approved by a supervisory analyst, that research analysts not be subject to the supervision of any member of the investment banking department, that research analysts not purchase issuer securities prior to an IPO, that an IB not distribute research regarding an issuer 40 calendar days following an IPO offering in which the IB acted as a manager or co-manager, that an IB not issue a favorable research report in return for business, that analysts not receive compensation for investment banking business, and that the above be disclosed in the analyst's research reports. NYSE Rule 351(f) requires an annual letter of attestation by the investment bank that it is in compliance with Rule 472. Similarly, NASD Rule 2711 (Research Analysts and Research Report) restricts relationships between investment banking and research departments and restricts the review of research reports by the subject company. It also prohibits analyst compensation based upon investment banking services, prohibits the promise of favorable research, imposes a 40 (10) day quiet period for research following an IPO (SEO), restricts personal trading by analysts in their covered stocks, and requires additional disclosures in research reports as well as additional supervisory procedures at the investment bank.

New York Attorney General began investigating Merrill Lynch and, subsequently, several other large investment banks. This investigation culminated in April 2003 with the Global Analyst Research Settlement reached by the SEC, NYSE, NASD, New York Attorney General, and North American Securities Administrators Association with ten of the largest investment banks – Bear Stearns, CSFB, Goldman, Lehman, J.P. Morgan, Merrill Lynch, Morgan Stanley, Citigroup (Salomon Smith Barney), UBS Warburg, and U.S. Bancorp Piper Jaffray (with Deutsche Bank and Thomas Weisel added later).[6] The Global Settlement required the payment of $875 million in penalties and disgorgement, $432.5 million to fund independent research, and $80 million to fund investor education. In addition, the settlement made numerous structural reforms including the physical separation of investment banking and research departments, the inability to compensate research analysts based upon investment banking revenues, and the prohibition of research analysts taking part in investment banking pitches and roadshows.

Subsequent research suggests that these regulatory changes affected the behavior of analysts within investment banks. Kadan, Madureira, Wang, and Zach (2009) find that the overall informativeness of recommendations (measured using absolute price reactions) declined following the Global Settlement. They also document that sanctioned banks shifted their stock recommendations from a 5-tier scale to a 3-tier scale. Barniv, Hope, Myring, and Thomas (2009) and Chen and Chen (2009) both document that the mapping between analysts' forecasts and target prices improved following the regulatory changes of the early 2000s. Clarke, Khorana, Patel, and Rau (2011) investigate market reactions to independent, affiliated, and unaffiliated analysts before and after the Global Settlement. They find that affiliated (independent) analysts issued fewer (more) strong buys following the settlement, with recommendation upgrades by affiliated analysts being more informative in the post-period. Moreover, Guan, Lu, and Wong (2012) find that forecasts by research firms are more optimistic than those of brokerage firms, syndicate firms, and investment banks following the regulatory changes in the early 2000s, but that forecast

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[6] See http://www.sec.gov/news/press/2003-54.htm for the April 2003 press release and http://www.sec.gov/news/press/2003-144.htm for the SEC's October 2003 approval of Global Settlement.

accuracy and recommendation profitability for research firms are not significantly different from those of investment banks after the reforms.

Despite these behavior changes, there is some evidence that the Global Settlement may not have eliminated analyst affiliation bias. Using data from 1994 through 2008, Malmendier and Shanthikumar (2014) distinguish between strategic and non-strategic distortions in analyst behavior. Consistent with their expectations for strategic behavior, they find that affiliated analysts tend to issue more positive recommendations, but similar or more negative forecasts, than unaffiliated analysts.[7] In a recent survey of sell-side analysts, Brown, Call, Clement, and Sharp (2014) report that analysts view the generation of investment banking business as an important driver of their compensation and feel pressure from their research management to issue optimistic forecasts and/or recommendations. Recent actions by FINRA against Citigroup and Goldman Sachs also provide evidence of analyst involvement in IPO road shows and of analysts tipping selected clients, even after the Global Settlement.

2.3. Hypothesis

We contribute to the literature on analyst affiliation bias by examining the differential impact of the Global Settlement and contemporaneous regulatory changes on affiliation bias for sanctioned and non-sanctioned banks. We also provide a detailed analysis of the link between affiliation bias and the equity, debt, and M&A components of investment banking relationships. Our primary hypothesis is that analyst affiliation bias was eliminated following the Global Settlement. However, by separating sanctioned and non-sanctioned banks, we are able to examine two variations of this hypothesis. If the Global Settlement and concurrent regulatory changes imposed on the industry eliminated the conflicts of interest within investment banks that lead to analyst affiliation bias, we expect the bias to be eliminated for both sanctioned and non-sanctioned banks. However, if the principal effects of the Global Settlement

[7] Although not the main subject of our analysis, we also examined the relation between investment banking relationships and the bias and accuracy of analyst earnings forecasts. We define bias and accuracy by comparing each analyst's most recent forecast to actual earnings, where bias and accuracy are scaled by the standard deviation of forecasts across all analysts following the stock and normalized by subtracting the consensus (median) level of bias/accuracy. We find some evidence of optimistic forecasts by GS banks in the period prior to Global Settlement, but little evidence of a link between investment banking relationships and forecasts for GS banks in the post period or for non-sanctioned banks in either the pre or post period. We find little evidence of a consistent relation between analyst affiliation and forecast accuracy for either class of banks.

result from the punitive aspects or bank-specific requirements of the settlement, we expect affiliation bias to be eliminated only for sanctioned banks. We test these alternative versions of the hypothesis below.

3. Data and Sample Characteristics

To construct our sample, we use two main data sources. First, we use SDC to identify all equity, debt, and M&A activity by a large sample of U.S. firms, allowing us to measure the relationships between firms and their investment banks. Second, we use I/B/E/S data to identify the stock recommendations of sell-side analysts and the brokerage firms for which the analysts work. Together, these two datasets allow us to provide a detailed examination of the link between analyst recommendations and investment banking relationships both before and after the Global Settlement.

3.1. Sample Firms and Investment Banking Activity

We begin with the sample of all U.S. firms with listed common stock (CRSP share codes 10 or 11) between 1996 and 2009. After eliminating financials, utilities, and government agencies, the resulting sample includes 8,322 unique firms. For these firms, we then use the Securities Data Company (SDC) database to collect information on all public and private issues of equity and debt by the firm and any M&A transactions in which the firm is either the acquirer or the target. Firms are identified based on PERMCO in the CRSP data and based on CIDGEN in the SDC data. Firms are matched between the two databases using Cusip and, where possible, Ticker. To provide meaningful analysis of investment banking relationships, we exclude transactions for which either the transaction value or the identity of the underwriter/advisor is missing.

To identify affiliation through investment banking relationships, we focus on the most important investment banks in the sample. To identify these banks, we begin with the full sample of banks identified as lead or co-managing underwriters in the equity and debt samples or as advisors in the M&A sample.[8] We then compute market share ranks on an annual basis for each transaction type (equity, debt, and M&A). Finally, we compute each bank's average market share rank in each transaction type category

[8] Investment bank names are cleaned to eliminate multiple variations of the same investment bank name and to adjust for mergers and acquisitions among investment banks.

across all years during which the bank appears in the sample and limit our analysis to those investment banks with an average market share rank of 25 or higher in at least one transaction type category. In cases where one of the top 25 banks reflects the merger of two or more predecessor banks, all predecessor banks are also included. As shown in Table A2 in the Appendix, the resulting sample includes 57 different investment bank names during the sample period, with 48 active at the beginning of the sample period and 28 active at the end of the sample period.[9]

3.2. Analyst Recommendations

To test analyst affiliation bias, we focus on analyst stock recommendations, one of the analysts' primary and most visible outputs. We collect recommendations data, including the identity of the broker employing the analyst, from I/B/E/S. We then link the recommendations to the sample of CRSP firms using CUSIPs and hand-match the broker names in I/B/E/S to the sample investment banks using the I/B/E/S broker translation file.

Following Ljungqvist et al. (2007) we examine recommendations at a quarterly frequency. For each calendar quarter end and each firm in our sample, we select the most recent recommendation issued during the preceding 12 months by each analyst covering the stock. We code recommendations as 1 (strong sell) through 5 (strong buy). We then define each analyst's relative recommendation, *RelRec*, by subtracting the consensus (i.e., median) recommendation across all analysts covering the firm in the same one-year window.[10] Finally, we limit our sample to stocks covered by at least one analyst employed by a sample investment bank. The resulting sample includes 216,242 quarterly observations, involving 4,628 analysts and 5,111 sample stocks.

3.3 Variable Construction and Sample Characteristics

Our main empirical tests examine the relation between the relative recommendations of analysts

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[9] For clarity following large investment bank mergers, we assign a new name to the combined bank. For example, we refer to the combination of Citibank and Salomon Smith Barney as Citigroup Salomon Smith Barney and the combination of UBS Warburg and Paine Webber as UBS Paine Webber. The 28 ultimate banks considered here compares to 16 studied in Ljungqvist et al. (2006) and Ljungqvist et al. (2007). Lehman and Merrill Lynch are eliminated from the sample because their recommendations are excluded from the I/B/E/S database for all or part of our sample period.

[10] In order to compute relative recommendations, our sample is restricted to firms that are followed by two or more analysts. As discussed in Section 3 below, we also provide robustness tests based on a redefined three-point recommendation scale. Our main conclusions are robust to this alternative specification.

(*RelRec*) and investment banking relationships between the analyst's firm and the covered stock, after controlling for firm, analyst, and investment bank characteristics that have been shown to affect recommendations. Our empirical model closely follows that in Ljungqvist et al. (2007), with several important differences. First, we examine investment banking relationships across a wider set of transaction types, including equity, debt, and M&A transactions. Second, we define relationships both within specific functional areas and across all functional areas. Finally, we examine affiliation bias both before and after the Global Settlement, allowing for differences between investment banks named in the Global Settlement and other banks. Table A1 in the Appendix contains all variable definitions.

Summary statistics for our sample of quarterly observations are provided in Panel A of Table 1. Consistent with previous research, we find that analysts primarily issue "buy" or "strong buy" recommendations, giving a mean (median) analyst recommendation across our sample of 3.6 (4.0). As noted earlier, our main variable of interest is the relative recommendation of the analyst (*RelRec*), defined as the difference between the analyst's recommendation and the consensus (i.e., median) recommendation across all analysts following the stock. *RelRec* has a range from -4 to +3, with a mean (median) of 0.0025 (0.0000) across our sample observations.

To proxy for investment banking relationships, we examine each firm's equity, debt, and M&A transactions during the 36 months preceding each quarter end. We then define relationship dummy variables (*IBRel*) for each investment bank-firm pair that equal one if the investment bank acted as lead or co-managing underwriter on an equity or debt issue, or as an advisor on an M&A transaction. While the majority of our tests are based on these relationship dummy variables, we also analyze continuous relationship variables based on the proportion of each firm's equity, debt, and M&A transaction value for which the bank acted as lead or co-managing underwriter, or advisor.

We define relationship measures both by transaction type (equity, debt, or M&A) and across all combined transactions (overall relationship).[11] We expect affiliation bias to be better captured by overall relationships than by type-specific relationships for two reasons. First, equity, debt, and M&A transactions are discrete measures of what is likely an ongoing relationship. Thus, the use of multiple transaction types will better capture the ongoing nature of any underlying relationship. Second, if there is any pressure placed on the analyst to produce optimistic coverage, then this pressure will only be magnified when the investment banking relationship spans multiple functional areas.

To illustrate the potential benefits of the overall relationship measure, Figure 1 plots the time series of relationships between Convergys Corp. and Citi-Salomon-Smith, based on 36-month windows. Convergys used this bank as a lead equity underwriter on their August 1998 IPO, as a lead debt underwriter in September 2000 and December 2004, and as an M&A advisor in April 2001. When we incorporate all three transaction types, we are able to capture the ongoing nature of the relationship between Convergys and Citi-Salomon-Smith over the entire period from 1998 through 2007. However, when we define relationships based on any individual transaction type (equity, debt, or M&A) the relationship measure is spotty and only covers sub-periods from August 1998 through December 2007.

Summary statistics for our type-specific and overall relationship measures are provided in the second section of Table 1. Across all quarterly observations, the mean transaction type-specific relationship ranges from 2.43% for M&A transactions to 3.24% for equity transactions. Incorporating all transaction types, the mean overall relationship is 5.90%. In untabulated results, we find that the proportion of quarterly observations with no relationship equals 87.2% for the overall relationship measure, compared to 93.5% for equity, 93.6% for debt, and 96.3% for M&A. This provides one indication that the overall relationship measure may better identify ongoing relationships in cases where type-specific relationship measures do not.

Our remaining control variables are motivated by prior literature and closely follow the specification in Ljungqvist et al. (2007). To control for investment bank characteristics, we define two

[11] For the overall relationship variable, we measure at each quarter end date the proportion of a firm's combined equity, debt, and M&A transaction value during the preceding 36 months for which each investment bank acted as lead underwriter, co-managing underwriter, or adviser, and an indicator variable for whether this value is greater than zero.

continuous variables and a set of indicator variables. We define investment bank size (*IB_Size*), as the number of analysts employed by the investment bank during quarter *t*, based on I/B/E/S recommendations.[12] Investment bank market share, *IB_MktShare*, is the proportion of total deal value across all firms during the previous 12 months for which the investment bank acted as a lead or co-managing underwriter or M&A advisor. Like the relationship measures, *IB_MktShare* is defined by transaction type (equity, debt, or M&A) and across all combined transactions (overall). As shown in Table 1, the mean (median) number of analysts employed by an investment bank is 89 (85) and investment bank market shares average 4.55%, 4.77%, and 4.38% for equity, debt, and M&A, respectively. We also define two indicator variables, *IB_GS* and *IB_NonGS*, to distinguish between those investment banks sanctioned in the Global Settlement (including subsequent name variations of the same banks) and other non-sanctioned banks, respectively. Based on this categorization, 57% of our quarterly observations are from sanctioned banks and 43% from non-sanctioned banks. Appendix Table A2 lists the sample investment banks in each category.

We define six analyst-level characteristics. Four of these variables are defined directly from the I/B/E/S recommendations data. *Seniority* is the number of years since the analyst first appeared in I/B/E/S and *Seasoning* is the number of years since the analyst initiated coverage on the particular stock. *NFollow* is the number of firms followed by the analyst during the quarter and *JobMove* is an indicator variable that equals 1 if the analyst changed employers during the quarter. Following Hong and Kubik (2003) and Ljungqvist et al. (2007), we define relative forecast accuracy (*RelAccuracy*) based on the analyst's average earnings forecast accuracy across all followed stocks.[13] Finally, *AllStar* is an indicator variable that equals 1 if the analyst is a ranked as an All-Star by *Institutional Investor* magazine during year *t-1*,

[12] Ljungqvist et al. measure investment bank size as the number of registered representatives employed by the IB.

[13] For each analyst following each firm, we first estimate the absolute value of the difference between the analyst's most recent forecast of fiscal-year earnings and actual earnings, scaled by prior year price. We then rescale such that the most accurate analyst following the firm scores 1 and the least accurate analyst scores 0. Finally, each analyst's relative forecast accuracy is defined as their mean score across all stocks followed over years *t*-2 through *t*. See Appendix Table A1 for a more complete description.

and 0 otherwise. For the mean (median) observation in our sample the analyst has seniority of 5.4 (4.9) years, seasoning of 2.3 (1.4) years, and follows 11 (10) stocks. The mean and median values of relative accuracy are 41.23% and 40.96%, respectively. Finally, 18.9% of the recommendation observations in our sample are issued by All-Star analysts and 3.2% by analysts that changed employers during the quarter.

Our last set of control variables is related to firm characteristics. *ANF* is the number of analysts issuing recommendations for the firm during the previous 12 months, based on I/B/E/S recommendations. *MV* is the firm's market value of equity at the end of the prior calendar year, as defined by CRSP. *InstHoldings* is the percentage of shares held by institutional investors at the end of the quarter, based on Thomson Reuters' 13F filings. Lastly, *Proceeds* is the total value of transaction by the firm during the previous 36 months, defined for each transaction type (equity, debt, or M&A) and across all combined transactions (overall). Across all observations in our sample, mean (median) values are 11 (1) for analyst following, $9.6 ($1.9) billion for market capitalization, and 62% (70%) for institutional holdings. Three-year proceeds average $77 million, $428 million, and $1,055 million for equity, debt, and M&A, respectively. Across quarterly observations with non-zero proceeds, these averages increase to $300 million, $1,145 million, and $2,981 million.

Panel B of Table 1 provides mean values of all variables for the subsamples of observations involving sanctioned and non-sanctioned banks. As expected, sanctioned banks tend to be larger and have higher market shares than non-sanctioned banks. For example, the mean values of *IB_Size* (i.e., number of analysts) and equity market share are 116.2 and 7.2% for sanctioned banks, compared to 52.1 and 1.01% for non-sanctioned banks. Other categories of market share and measures of investment banking relationships provide similar results. Analyst and firm characteristics also differ significantly between the two groups of banks, though the differences are smaller economically than the differences in bank size and market share. Analysts employed by sanctioned banks are more likely to be ranked as All Stars, have higher seniority and seasoning, and follow more stocks than analysts employed by non-sanctioned banks.

In addition, analysts employed by sanctioned banks tend to follow larger stocks, with higher institutional ownership and more equity, debt, and M&A activity. While forecast bias and accuracy are similar across the two groups of analysts, recommendations and relative recommendations tend to be higher for analysts at non-sanctioned banks, on average. As a result, we control for differences between sanctioned and non-sanctioned banks in our analysis to follow. Despite the observed differences described above, non-sanctioned banks and the firms that hire them are involved in a significant fraction of equity, debt, and M&A activity over our sample period and account for a large fraction (43%) of the quarterly analyst observations in our data.

To highlight the relation between investment banking relationships and analyst recommendations, Figure 2 plots the frequency of various recommendations for sanctioned and non-sanctioned banks across the entire sample of quarterly observations. Frequencies are further categorized by whether or not the analyst was affiliated with the covered firm, where affiliation is defined based on the overall investment banking relationship over the previous 36 months. Results for the period prior to the Global Settlement are provided in Panel A and results for the period following Global Settlement are provided in Panel B.

The plots on the left show frequencies based on a 5-tier recommendation scale. From these graphs, it is clear that Sell and Strong Sell recommendations are rare in the period before the Global Settlement. While negative recommendations are more common in the post period, they remain relatively rare. Most importantly, the graph shows that affiliated analysts are more likely to issue Strong Buy recommendations and less likely to issue Hold or Sell recommendations than unaffiliated analysts. Although the bias is reduced in the period after the Global Settlement, it does not appear to be eliminated for either sanctioned or non-sanctioned banks, and remains particularly strong for non-sanctioned banks.

Kadan et al. (2009) note that, following the Global Settlement, many large investment banks shifted from 5-tier to 3-tier recommendation schemes. This shift is also evident in our data. For example, from 1998-2001, Deutsche Bank’s investment recommendations included the five categories: Strong Buy, Buy, Hold, Underperform, and Sell. In contrast, from 2004-2009, Deutsche Alex Brown’s investment recommendations included the three categories: Buy, Hold, and Sell. To ensure that our results are robust to this shift in recommendation schemes, we reassign all recommendations to a 3-tier scale. Frequencies based on this redefined scale are shown on the right side of Figure 2. The results from this redefined scale are consistent with those from the 5-tier scale, with affiliated analysts being less likely to issue Sell or Hold recommendations and more likely to issue Buy recommendations.

The results in Figure 2 suggest that analyst affiliation bias persists following the Global Settlement. However, these frequencies do not control for other factors that may affect analyst recommendations. In the next section, we therefore analyze analyst recommendations in a multivariate framework.

4. Results

In this section, we describe our main results related to analyst affiliation bias. Using the quarterly data described above, we estimate variations of the following general model specification:

$$\begin{aligned} RelRec_{ijkt} &= \alpha + \beta_1 \times IB\_GS + \beta_2 \times IB\_NonGS + \beta_3 \times IBRel_{jkt} \times IB\_GS + \beta_4 \times IBRel_{jkt} \times IB\_NonGS \\ &+ \sum_{i=1}^{I} \delta_i \times AnalystChar_i + \sum_{j=1}^{J} \gamma_j \times IBChar_j + \sum_{k=1}^{K} \lambda_k \times StockChar_k + \varepsilon_{ijkt}, \end{aligned} \tag{1}$$

where $IBRel_{jkt}$ indicates an investment banking relationship between investment bank *j* and firm *k* during the 36 months ending in quarter *t*, and the remaining variables represent controls for analyst, investment bank, and stock characteristics. Our main tests are based on a comparison of the relationship interaction terms involving *IB_GS* and *IB_NonGS*, which are dummy variables that distinguish between investment banks that were and were not sanctioned in the Global Settlement, respectively. To examine the impact of the Global Settlement on analyst affiliation bias, we provide two sets of analysis. In the full period analysis, we interact the relationship variables with a dummy variable equal to one for all quarters after the Global Settlement and zero otherwise. We also provide separate analyses for the sub-periods 1998-2001 and 2003-2009. Following Kadan et al. (2009), we define the implementation date for the Global Settlement as September 2002, but because the investigations related to investment banking conflicts of interest were ongoing during 2002, we exclude 2002 from the sub-period analysis. Our general specifications also include year and firm fixed effects.

4.1 Relative Recommendations and Investment Banking Relationships

The full period regression results are presented in Table 2. *P*-values based on robust standard errors clustered by firm are reported below the coefficients. Examining the coefficients on the control variables, we see that relative recommendations are lower for large investment banks and for analysts that cover a large number of stocks, and higher for more experienced analysts and for stocks followed by a large number of analysts. Investment bank market share is positively related to relative recommendations for equity, M&A, and overall relationships, but negatively related for debt relationships. The coefficient signs for investment bank market share, for analyst All-Star ranking, seasoning, and number of firms followed, and for the firm's analyst following are generally consistent with results reported in Ljungqvist et al. (2007), but the negative coefficient on investment bank size differs from their results.[14] Consistent with expectations, the coefficient on the post-Global Settlement dummy variable indicates that relative recommendations dropped in the post period. As in Table 1, there is also evidence that non-sanctioned banks tend to have higher recommendations than sanctioned banks, especially in the post-Global Settlement period.

Turning to the results for investment banking relationships, we find strong evidence that both sanctioned and non-sanctioned banks exhibited significant affiliation bias in the pre-Global Settlement period. This result holds for each type-specific relationship (equity, debt, and M&A), as well as for the overall relationship. However, the post-GS interaction terms point to significant differences between sanctioned and non-sanctioned banks in the period following the Global Settlement. For sanctioned banks, the interaction terms suggest that analyst affiliation bias is significantly reduced in the post-Global Settlement period. In particular, the combined post-Global Settlement effects listed at the bottom of the table show that analyst affiliation bias is insignificant in the post period for equity relationships, and marginally significant for debt and M&A relationships. The results for overall relationships point to

[14] In our analysis of the sub-period from 1998-2001 (Table 3 Panel A), we obtain a positive and significant coefficient on investment bank size, consistent with Ljungqvist et al.'s (2007) results for the 1994-2000 sample period.

statistically significant affiliation bias for sanctioned banks in the period after the Global Settlement, but the magnitude of the effect is substantially reduced from the pre period. Based on the coefficients on the overall relationship variable (0.160) and the post-GS interaction term (-0.129), affiliation bias is reduced by approximately 81% in the post Global Settlement period for sanctioned banks.

The results for non-sanctioned banks provide a sharp contrast. For these investment banks, analyst affiliation bias is not reduced significantly in the period following the Global Settlement. The results provide strong evidence of a continued analyst affiliation bias in the period following the Global Settlement for non-sanctioned banks, regardless of whether relationships are measured based on equity, debt, or M&A transactions, or across all combined transactions. Based on the coefficients on the overall relationship variable (0.171) and the post-GS interaction term (-0.010), affiliation bias is reduced by only 5.9% in the post Global Settlement period for non-sanctioned banks and this reduction is statistically insignificant.

To better understand the effects of analyst affiliation bias in the periods before and after the Global Settlement, we estimate models using two sub-periods: 1998-2001 and 2003-2009. The results are presented in Panels A and B of Table 3, respectively. As in Table 2, the results for the first sub-period point to significant analyst affiliation bias for both sanctioned and non-sanctioned banks. For sanctioned banks, the coefficient on *IBRel* is positive and significant for all type-specific and overall relationships. For non-sanctioned banks, the coefficient is positive and insignificant for equity and debt relationships, positive and marginally significant for M&A, and significantly positive for the overall relationship measure. . Equality of coefficients between sanctioned and non-sanctioned banks cannot be rejected for any of the relationships measures in the pre-settlement sub-period.

The results for the second sub-period (Panel B) confirm the findings from Table 2. For sanctioned banks, the coefficient on *IBRel* is positive but insignificant for equity relationships, positive and marginally significant for debt and M&A, and significantly positive for overall relationships. However, as in Table 2, the impact of investment banking relationships on relative recommendations is substantially reduced for sanctioned banks in the post-Global Settlement period. For non-sanctioned banks, significant analyst affiliation bias remains in the post-Global Settlement period, regardless of the relationship measure used. Indeed, the coefficients uniformly increase in the second sub-period for non-sanctioned banks. Equality of coefficients between sanctioned and non-sanctioned banks is rejected in the second sub-period for equity (*p*-value=0.002), M&A (0.014), and overall relationships (0.000), but is not rejected for debt relationships (0.145).

The results from Tables 2 and 3 suggest that overall investment banking relationships better capture analyst affiliation bias than relationship measures based solely on equity, debt, or M&A transactions. As noted earlier, this may reflect that relationships spanning multiple functional areas put more pressure on analysts to produce optimistic recommendations or it may be the result of the overall measure better capturing the continuous nature of the underlying investment banking relationship. In unreported results, we examine whether any of the type-specific relationship measures have incremental explanatory power when included in the regression with the overall measure. In each case, the effects of type-specific relationships are subsumed by the overall relationship measure. Given these results, we focus on overall investment banking relationships throughout the rest of the paper.

The specifications described in Tables 2 and 3 follow prior literature by including firm fixed effects. To examine the robustness of the results to this choice and to the specification of the relationship measure, Table 4 reports results from alternative specifications incorporating analyst and investment bank fixed effects using both the indicator and continuous relationship measures. Results for the sub-periods before and after the Global Settlement are provided in Panels A and B, respectively. The first column in each panel of Table 4 repeats the overall relationship specification from Table 3. Comparing this specification to those based on alternative fixed effects and continuous relationship measures shows that the main results are robust to these alternative specifications. For both continuous and discrete measures of investment banking relationships, the results point to significant analyst affiliation bias in the first sub-period, regardless of specification. In the second sub-period, the results become somewhat weaker after incorporating investment bank fixed effects, but remain significant, especially for non-sanctioned banks. Interestingly, results for sanctioned banks are statistically significant based on relationship dummy variables, but insignificant based on continuous relationship measures.

In unreported results, we estimated two other robustness checks. First, we re-estimated the basic model for the subsets of sanctioned and non-sanctioned banks. Second, we re-estimated the model for the subset of firms covered by at least one affiliated and one non-affiliated analyst. In all cases, the findings are consistent with the overall results reported above.

Taken together, the results in Tables 2 through 4 provide strong evidence of analyst affiliation bias in the period following the Global Settlement for at least some investment banks. While this bias is substantially reduced in the post-Global Settlement period for investment banks named in the settlement, it remains significant when measured based on overall investment banking relationships. The coefficients from Table 2 suggest an 81% reduction in the magnitude of the bias for sanctioned banks when measured with the overall relationship. For the banks not named in the Global Settlement, analyst affiliation bias remains large and significant even after the Global Settlement. These results suggest that the reduction in affiliation bias is driven by the punitive and bank-specific requirements of the Global Settlement, rather than the broader regulatory changes that accompanied the settlement.

4.2. Relative Recommendations based on a 3-Tier System

Kadan et al. (2009) point out that, following the Global Settlement, many brokerages shifted from 5-tier to 3-tier recommendation scales, with all ten of the original Global Settlement banks adopting 3-tier scales in 2002 or soon thereafter. If only sanctioned banks shifted to this new recommendation scale or if the shift differs by bank type, it is possible that our measure of relative recommendations is inflated for non-sanctioned banks relative to sanctioned banks. To ensure that our results are not driven by this shift in recommendation scales, we re-estimate our main regressions after redefining all recommendations based on a 3-tier scale. Specifically, we redefine I/B/E/S recommendations such that a 3 represents a Strong Buy or Buy and a 1 represents a Sell or Strong Sell, and recalculate relative recommendations accordingly.

Table 5 reports regression results based on this redefined relative recommendation variable, with results for the sub-periods before and after the Global Settlement reported in Panels A and B, respectively. For completeness, we provide results based on transaction type relationships (equity, debt, and M&A), as well as overall relationships. For both sub-periods, the results are generally consistent with the main results presented in Tables 2 and 3. In the first sub-period, there is evidence of analyst affiliation bias for sanctioned banks based on all relationship measures. For non-sanctioned banks, there is evidence of analyst affiliation bias based on M&A and overall relationships, but insignificant results based on equity and debt relationships.

In the second sub-period, the impact of analyst affiliation is reduced for sanctioned banks, though it remains statistically significant for all relationship measures. For non-sanctioned banks, we again find strong evidence of analyst affiliation bias in the post-settlement period based on both transaction type and overall relationship measures. Thus, our results are not driven by the shift of some investment banks from a 5-tier to a 3-tier recommendation scale.

4.3. Logit Models for Buy/Sell Recommendations

As an alternative test, we follow Kadan et al. (2009) in estimating logit models for the likelihood of buy/strong buy recommendations and the likelihood of sell/strong sell recommendations, where we focus on affiliation effects and differences between sanctioned and non-sanctioned banks. The models follow the specification described in equation (1). However, we define two alternative dependent variables. The first is an indicator variable equal to one if the analyst issues a buy or strong buy recommendation and zero otherwise. The second is an indicator variable equal to one if the analyst issues a sell or strong sell recommendation and zero otherwise. The logit framework has two advantages over the regression specifications presented earlier. First, like the analysis in Table 5, the dependent variables in the logit models are defined based on a 3-tier recommendation scale and are therefore robust to a shift in recommendation scales by some investment banks. Second, the dependent variables in the logit model are defined directly from I/B/E/S recommendations and are therefore unaffected by the definition of "consensus" ranking used in the construction of *RelRec*.

Table 6 presents the results from the logit models for both the full period and the pre/post Global Settlement sub-periods. Again, the findings point to significant analyst affiliation bias. In the models for buy/strong buy recommendations, the results suggest that both sanctioned and non-sanctioned banks are significantly more likely to issue buy or strong buy recommendations when affiliated with the covered firm through an investment banking relationship. For sanctioned banks, this effect is strongest during the first sub-period, but remains statistically significant even after the Global Settlement. For non-sanctioned banks, affiliation bias is statistically significant and similar in magnitude both before and after the Global Settlement.

The logit results for sell/strong sell recommendations point to symmetric effects in terms of pessimistic recommendations, although the results appear to be driven primarily by the period after the Global Settlement. Specifically, during the post-Global Settlement period, both sanctioned and non-sanctioned banks are less likely to issue sell or strong sell recommendations when affiliated with the firm through an investment banking relationship.

The results from the logit models are largely consistent with those based on relative recommendations and suggest that analysts tend to issue more optimistic (or less pessimistic) recommendations on firms with which their employer has an investment banking relationship.

5. The Impact of Lending Activity on Analyst Affiliation Bias

The passage of the Gramm-Leach-Bliley Act in 1999 led to a substantial increase in the role of commercial banks in investment banking and more direct ties between lending and underwriting relationships. For example, Ljungqvist et al. (2006), Drucker and Puri (2005), Yasuda (2005), and Bharath, Dahiya, Saunders, and Srinivasan (2007) find that lending relationships increase the likelihood of a bank being awarded future debt and equity underwriting business, and Corwin and Stegemoller (2014) identify important links between lending and the cross-functional nature of investment banking relationships. In this section, we examine whether lending relationships have any incremental impact on analyst affiliation bias, after controlling for investment banking relationships based on equity, debt, and M&A transactions.[15]

To examine lending relationships, we use Dealscan data to collect the sample of syndicated loans involving our sample firms. We match CRSP firms to Dealscan data using the link table provided by Michael Roberts and Wharton Research Data Services (see Chava and Roberts (2008)). For each loan, we identify the loan amount and all lenders identified as having lead arranger credit. Notably, the Dealscan data include both loans and revolving credit line agreements. We believe credit lines are an important part of a lending relationship, regardless of whether or not the loan is drawn down. However, the fact that these loans may not be drawn down suggests that the total loan values in Dealscan will not be comparable to the transaction values in the equity, debt, and M&A datasets.

To integrate the lending and investment banking datasets, we hand match lender names to our sample of large investment banks. Following the construction of the investment banking variables, we calculate investment bank market share, firm loan proceeds, and firm-lender relationships at the end of each quarter. For each investment bank in our sample, we calculate lending market share based on all loans over the prior twelve months. For each firm in our sample, we calculate lending proceeds as the sum of all loans received over the preceding 36 months. Finally, for each firm-investment bank pair, we calculate the lending relationship as the proportion of the firm's total loan value over the preceding 36 months for which the investment bank was assigned lead arranger credit and we calculate a revised "overall" relationship measure combining lending with equity, debt, and M&A transaction values.

Summary statistics for the lending variables are provided in Panel A of Table 7. Across all quarterly observations in our sample, the lending relationship has a mean value of 2.82% and the overall relationship incorporating lending has a mean value of 5.84%. Investment bank market share has a mean (median) value of 4.56% (0.74%) based on lending alone and 4.58% (2.05%) based on the combined values of lending, equity, debt, and M&A transactions. The average value of three-year lending proceeds

[15] Although they do not analyze recommendations, Chen and Martin (2011) examine the relation between earnings forecast accuracy and lending relationships. They find that forecast accuracy improves after a firm borrows from an affiliated bank, suggesting that lending provides affiliated analysts with an informational advantage over other analysts.

for the firms in our sample is $964.1 million across all observations and $1,818.3 million across observations with positive lending proceeds.

Table 7 describes coefficients from regressions of relative recommendations on the set of control variables and investment banking relationship variables, after incorporating lending, with results for the pre and post-Global Settlement sub-periods in Panels B and C, respectively. To conserve space, coefficients on control variables are not included. The table provides results from four different specifications. The first specification includes only lending relationship indicators. This specification suggests that lending relationships have a positive impact on analyst affiliation bias in the 1998-2001 sub-period, but an insignificant effect after 2002. In the second specification, we include the lending relationship indicator in addition to the overall relationship indicator based on equity, debt, and M&A transactions. This regression suggests that lending may have some incremental impact on affiliation bias beyond that captured by the investment banking relationship, but the impact is again strongest during the first sub-period.

In the third specification, we again include the overall relationship indicator based on combined equity, debt, and M&A transactions, but we add an interaction with the lending relationship indicator. The results from this specification suggest that the affiliation bias associated with investment banking relationships is magnified in cases where there is also a lending relationship, especially during the first sub-period. Finally, in the fourth specification, we provide results based on the redefined overall relationship indicator that incorporates equity, debt, M&A, and lending transactions. This combined measure produces results that are similar to those from the overall relationship measure without lending, with affiliation bias being significant for non-sanctioned banks in both sub-periods and strongest for sanctioned banks in the first sub-period.

The results in Table 7 provide weak evidence that lending leads to incremental affiliation bias effects beyond those captured by investment banking relationships, at least during the first sub-period. However, unlike the main results based on equity, debt, and M&A relationships, the findings in Table 7 are sensitive to the inclusion of alternative fixed effects. In untabulated results, we find that when either analyst or investment bank fixed effects are included in these models, the incremental effects of lending become insignificant. Thus, there is limited evidence of any incremental impact of lending relationships on analyst affiliation bias in the period after the Global Settlement.

6. Conclusion

Previous research provides strong evidence of conflicts of interest between investment banking and research departments within large investment banks. In particular, research shows that analysts tend to issue optimistic recommendations on firms with which their employer has an equity underwriting relationship. One of the major purposes of the 2003 Global Analyst Research Settlement reached between the SEC, NYSE, NASD, New York Attorney General, and North American Securities Administrators Association and 12 of the largest investment banks was to reduce these conflicts of interest. In this study, we use a comprehensive measure of relationships between investment banks and firms to examine the impact of the Global Settlement on analyst affiliation bias.

Our data include all equity, debt, and M&A transactions by U.S. firms, allowing us to analyze a more comprehensive measure of investment banking relationships than has been studied in prior literature. In general, we find evidence of analyst affiliation bias for each individual type of investment banking relationship. However, our results suggest that an overall measure spanning all functional areas does a better job of capturing investment banking relationships and the related affiliation bias.

To better understand the impact of the Global Settlement and contemporaneous regulatory changes on analyst behavior, we separate analysts employed by investment banks named in the Global Settlement (sanctioned banks) and other top investment banks (non-sanctioned banks). Consistent with prior research, our results provide strong evidence of analyst affiliation bias for both groups of banks in the period prior to the Global Settlement. Following the Global Settlements, affiliation bias is substantially reduced, but not eliminated, for those banks named in the Global Settlement. In contrast, we find strong evidence of analyst affiliation bias for non-sanctioned banks even after the Global Settlement.

These findings suggest that the Global Settlement and related regulatory changes were only partially successful in mitigating conflicts of interest between investment banking and analyst research. In particular, the impact appears limited to the subset of sanctioned banks, suggesting that the decline in analyst affiliation bias is driven by the punitive aspects or bank-specific requirements of the Global Settlement more than the broader regulatory changes imposed on the industry.

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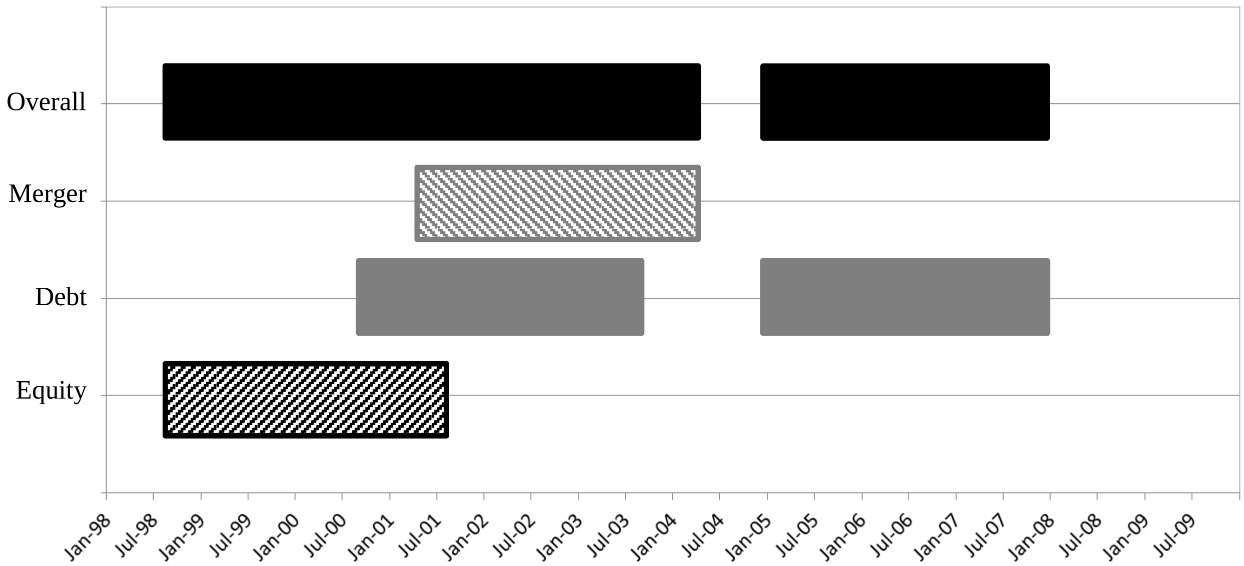
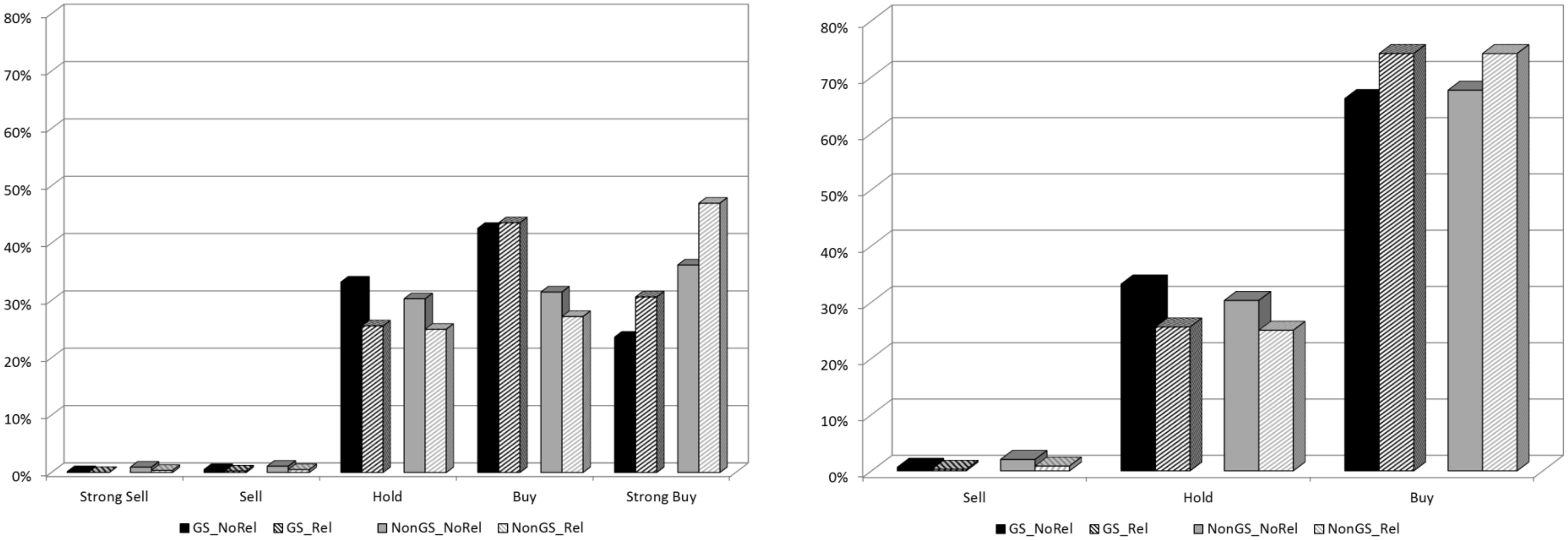


Figure 1 – Relationship Illustration for Convergys Corp and Citi Salomon Smith

This figure provides an illustration of our measures of investment banking relationships. We define a firm-bank pair as having a relationship if at any point during the preceding 36 months, the firm had an equity, debt, or M&A transaction for which the investment bank served as a lead or co-managing underwriter or M&A advisor. Equity, debt, and M&A relationships are defined based only on transactions within each category. The overall relationship is defined based on transactions across all three categories.

Panel A: Pre-Global Settlement



Panel B: Post-Global Settlement

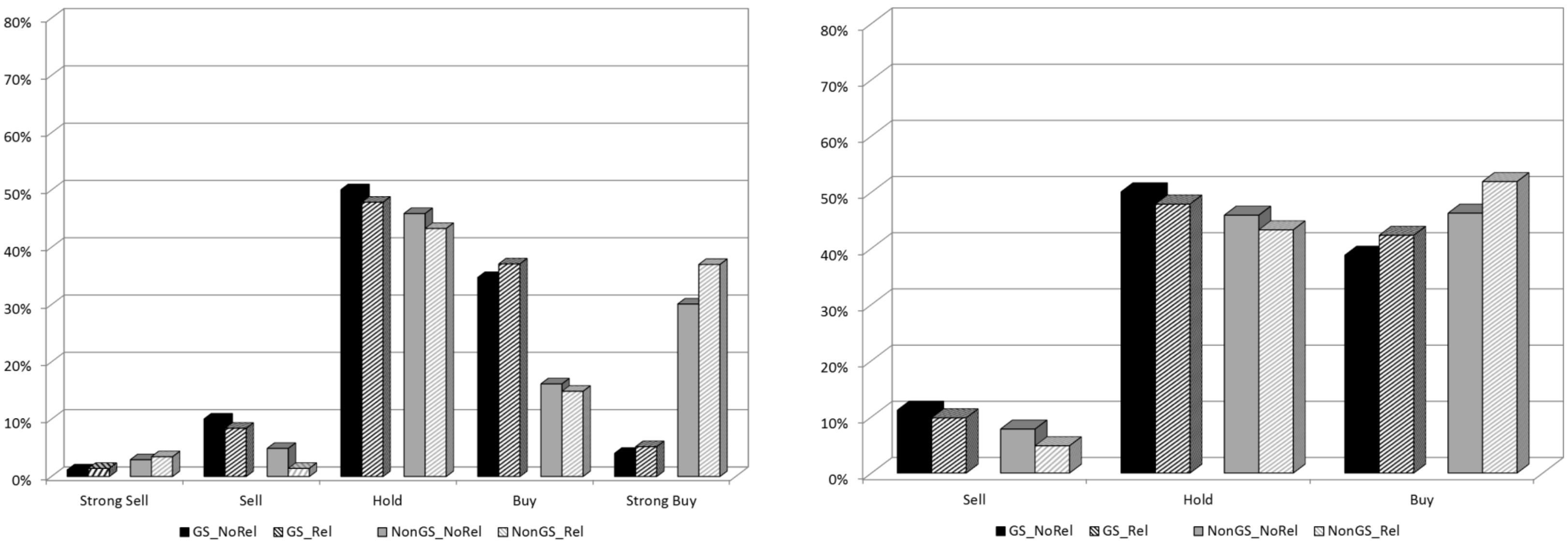


Figure 2 – Recommendation Frequency Before and After Global Settlement

The figure plots recommendation frequencies for our sample of quarterly data, where frequencies are classified on both a five-tier and a three-tier scale. Analysts are classified as being affiliated with either a Global Settlement bank or a non-Global Settlement bank and firm-analyst observations are separated into those that are associated with an investment bank relationship and those that are not, based on the overall investment banking relationship.

Table 1 – Summary Statistics

This table provides descriptive statistics for the variables used in this study. Variable definitions are contained in Appendix Table A1. Panel A provides summary statistics for the full sample, including 216,242 quarterly observations. The non-zero proceeds variables are based on 55,221 observations for equity, 80,823 observations for debt, 76,491 observations for M&A, and 140,997 observations for all combined transactions (overall). Panel B provides mean values for the subsamples of observations related to sanctioned and Non-sanctioned bank analysts. The *p*-value in the last column of Panel B is from a test of difference in means across sanctioned and Non-sanctioned banks based on analysis of variance.

Panel A: Full Sample Summary Statistics					
	Mean	Median	Min	Max	Std. Dev.
Recommendation and Forecast Measures:					
Analyst Recommendation	3.61	4.00	1.00	5.00	0.91
Relative Recommendation	0.0025	0.00	-4.00	3.00	0.80
Adjusted Forecast Bias	-0.0351	0.00	-9.24	5.57	0.96
Adjusted Forecast Accuracy	0.0437	0.00	-9.11	5.34	0.87
IB Relationship Measures:					
IBRel_Equity (%)	3.24	0.00	0.00	1.00	15.51
IBRel_Debt (%)	2.72	0.00	0.00	1.00	13.03
IBRel_Merger (%)	2.43	0.00	0.00	1.00	14.14
IBRel_Overall (%)	5.90	0.00	0.00	1.00	19.49
IB Characteristics:					
IB_Size	88.74	85.00	1.00	250.00	49.65
IB_MktShare_Equity (%)	4.55	2.81	0.00	22.11	4.84
IB_MktShare_Debt (%)	4.77	2.13	0.00	21.64	5.63
IB_MktShare_Merger (%)	4.38	1.70	0.00	34.13	5.67
IB_MktShare_Overall (%)	4.47	2.18	0.00	23.06	5.17
Analyst Characteristics:					
RelAccuracy (%)	41.23	40.96	0.00	100.00	10.33
AllStar	0.19	0.00	0.00	1.00	0.39
Seniority	5.43	4.92	0.00	16.18	3.47
Seasoning	2.33	1.39	0.00	16.18	2.46
NFollow	10.96	10.00	1.00	103.00	7.22
JobMove	0.03	0.00	0.00	1.00	0.18
Firm/Stock Characteristics:					
ANF	10.02	9.00	2.00	51.00	6.18
InstHoldings (%)	62.10	69.81	0.00	100.00	29.44
MV	9,592.51	1,886.44	0.76	602,432.92	28,686.62
Proceeds_Equity	76.61	0.00	0.00	12,189.10	312.10
Proceeds_Debt	427.87	0.00	0.00	34,879.74	1,335.85
Proceeds_Merger	1,054.52	0.00	0.00	153,653.35	5,672.22
Proceeds_Overall	1,575.53	152.30	0.00	178,009.68	6,477.18
$Proceeds\_Equity^{+}$	300.01	139.20	0.70	12,189.10	560.73
$Proceeds\_Debt^{+}$	1,144.78	491.25	3.00	34,879.74	1,988.39
$Proceeds\_Merger^{+}$	2,981.15	591.59	0.95	153,653.35	9,231.15
$Proceeds\_Overall^{+}$	2,416.34	498.18	0.70	178,009.68	7,893.76

Table 1 – continued

Panel B: Sanctioned vs. Non-Sanctioned Banks			
	Sanctioned Banks	Non-Sanctioned Banks	*p*-value for difference
N	123,708	92,534	-
Recommendation and Forecast Measures:			
Analyst Recommendation	3.48	3.78	0.000
Relative Recommendation	-0.0777	0.1098	0.000
Adjusted Forecast Bias	-0.0395	-0.0293	0.013
Adjusted Forecast Accuracy	0.0442	0.0430	0.739
IB Relationship Measures:			
IBRel_Equity (%)	4.42	1.67	0.000
IBRel_Debt (%)	4.46	0.81	0.000
IBRel_Merger (%)	3.45	1.07	0.000
IBRel_Overall (%)	8.32	2.67	0.000
IB Characteristics:			
IB_Size	116.15	52.09	0.000
IB_MktShare_Equity (%)	7.20	1.01	0.000
IB_MktShare_Debt (%)	7.35	1.31	0.000
IB_MktShare_Merger (%)	7.20	0.60	0.000
IB_MktShare_Overall (%)	7.24	0.78	0.000
Analyst Characteristics:			
RelAccuracy (%)	41.05	41.47	0.000
AllStar	0.28	0.06	0.000
Seniority	5.48	5.37	0.000
Seasoning	2.46	2.16	0.000
NFollow	11.49	10.25	0.000
JobMove	0.03	0.04	0.000
Firm/Stock Characteristics:			
ANF	10.12	9.88	0.000
InstHoldings (%)	63.18	60.66	0.000
MV	10,253.75	8,708.50	0.000
Proceeds_Equity	81.28	70.37	0.000
Proceeds_Debt	479.30	359.12	0.000
Proceeds_Merger	1,131.00	952.27	0.000
Proceeds_Overall	1,708.67	1,397.54	0.000
Proceeds_Equity^{+}	343.35	251.06	0.000
Proceeds_Debt^{+}	1,195.89	1,063.66	0.000
Proceeds_Merger^{+}	3,102.64	2,806.65	0.000
Proceeds_Overall^{+}	2,593.51	2,173.63	0.000

Table 2 – Full Period Regressions for Relative Recommendations

This table provides the results from estimating regressions of relative recommendations on investment bank relationship measures, investment bank characteristics, analyst characteristics, and stock characteristics for the full sample period 1998 to 2009. Columns 1 through 3 respectively use equity, debt, and M&A investment banking relationship measures while column 4 uses an overall relationship measure. *p*-values based on robust standard errors are presented in parentheses below the coefficients, where standard errors are clustered by firm. Each model contains year and firm fixed effects. *GS* and *NonGS* refer to sanctioned and non-sanctioned banks, respectively. Variable definitions are contained in Appendix Table A1.

	Equity Relationship	Debt Relationship	M&A Relationship	Overall Relationship
Intercept	0.168	0.263	0.162	0.169
	(.001)	(.000)	(.002)	(.001)
Post	-0.134	-0.139	-0.143	-0.122
	(.000)	(.000)	(.000)	(.000)
IB Relationship Measures:				
IBRel_GS	0.122	0.129	0.108	0.160
	(.000)	(.000)	(.000)	(.000)
IBRel_GS*Post	-0.121	-0.102	-0.068	-0.129
	(.000)	(.000)	(.024)	(.000)
IBRel_NonGS	0.171	0.162	0.172	0.171
	(.000)	(.004)	(.001)	(.000)
IBRel_NonGS*Post	-0.030	-0.055	-0.023	-0.010
	(.590)	(.390)	(.748)	(.789)
IB Characteristics:				
Ln(IB_Size)	-0.044	-0.084	-0.042	-0.048
	(.000)	(.000)	(.000)	(.000)
IB_MktShare	-0.573	0.735	-0.650	-0.548
	(.000)	(.000)	(.000)	(.000)
IB_NonGS	0.019	0.064	0.011	0.028
	(.071)	(.000)	(.296)	(.009)
IB_NonGS*Post	0.200	0.198	0.205	0.187
	(.000)	(.000)	(.000)	(.000)
Analyst Characteristics:				
RelAccuracy	-0.010	-0.004	-0.008	-0.008
	(.707)	(.878)	(.760)	(.778)
AllStar	-0.013	-0.034	-0.013	-0.018
	(.153)	(.000)	(.156)	(.038)
Ln(Seniority)	0.023	0.023	0.023	0.023
	(.000)	(.000)	(.000)	(.000)
Ln(Seasoning)	0.010	0.013	0.010	0.010
	(.084)	(.033)	(.101)	(.088)
Ln(NFollow)	-0.045	-0.037	-0.043	-0.043
	(.000)	(.000)	(.000)	(.000)
JobMove	-0.006	-0.004	-0.007	-0.004
	(.565)	(.698)	(.499)	(.717)
Stock Characteristics:				
Ln(ANF)	0.048	0.046	0.047	0.048
	(.000)	(.000)	(.000)	(.000)
Ln(MV)	0.005	0.005	0.006	0.005
	(.325)	(.297)	(.267)	(.329)
Ln(Proceeds)	-0.001	0.000	-0.001	0.000
	(.670)	(.905)	(.505)	(.783)
InstHoldings	-0.165	-0.201	-0.196	-0.157
	(.467)	(.375)	(.386)	(.489)

Table 2 - continued

Combined Post Effects:				
GS Banks	0.001	0.028	0.041	0.031
	(.951)	(.087)	(.038)	(.009)
Non-GS Banks	0.142	0.107	0.150	0.161
	(.000)	(.019)	(.001)	(.000)
Adjusted R^2	.051	.052	.051	.052
N	216,242	216,242	216,242	216,242

Table 3 – Sub-period Regressions for Relative Recommendations

This table provides the results from estimating regressions of relative recommendations on investment bank relationship measures, investment bank characteristics, analyst characteristics, and stock characteristics. Results for the sub-periods before (1998-2001) and after (2003-2009) Global Settlement period are provided in Panels A and B, respectively. Columns 1 through 3 respectively use equity, debt, and M&A investment banking relationship measures while column 4 uses an overall relationship measure. *p*-values based on robust standard errors are presented in parentheses below the coefficients, where standard errors are clustered by firm. Each model contains year and firm fixed effects. *GS* and *NonGS* refer to sanctioned and non-sanctioned banks, respectively. Variable definitions are contained in Appendix Table A1.

	Equity Relationship	Debt Relationship	M&A Relationship	Overall Relationship
	Panel A: 1998 – 2001			
Intercept	-0.272	-0.214	-0.265	-0.237
	(.003)	(.022)	(.004)	(.011)
IB Relationship Measures:				
IBRel_GS	0.072	0.121	0.063	0.119
	(.005)	(.000)	(.022)	(.000)
IBRel_NonGS	0.050	0.097	0.136	0.106
	(.294)	(.122)	(.029)	(.003)
IB Characteristics:				
Ln(IB_Size)	0.065	0.031	0.058	0.052
	(.000)	(.002)	(.000)	(.000)
IB_MktShare	-0.223	1.126	0.236	0.259
	(.043)	(.000)	(.032)	(.027)
IB_NonGS	0.104	0.156	0.120	0.129
	(.000)	(.000)	(.000)	(.000)
Analyst Characteristics:				
RelAccuracy	0.049	0.062	0.052	0.053
	(.284)	(.178)	(.260)	(.253)
AllStar	-0.013	-0.053	-0.027	-0.036
	(.363)	(.000)	(.054)	(.011)
Ln(Seniority)	-0.007	-0.006	-0.008	-0.008
	(.554)	(.607)	(.539)	(.501)
Ln(Seasoning)	0.054	0.051	0.053	0.052
	(.000)	(.000)	(.000)	(.000)
Ln(NFollow)	-0.049	-0.037	-0.045	-0.043
	(.000)	(.000)	(.000)	(.000)
JobMove	-0.039	-0.040	-0.037	-0.033
	(.008)	(.007)	(.012)	(.023)
Stock Characteristics:				
Ln(ANF)	0.036	0.035	0.036	0.038
	(.008)	(.010)	(.009)	(.006)
Ln(MV)	-0.004	-0.004	-0.004	-0.005
	(.664)	(.648)	(.670)	(.631)
Ln(Proceeds)	0.000	-0.003	-0.001	-0.005
	(.989)	(.405)	(.593)	(.171)
InstHoldings	-0.845	-0.855	-0.852	-0.838
	(.024)	(.022)	(.022)	(.025)
Adjusted R^2	.047	.052	.047	.049
N	59,703	59,703	59,703	59,703
PERMCO clusters	3,367	3,367	3,367	3,367
GS – NonGS = 0	.694	.709	.275	.743

Table 3 – continued

	Equity Relationship	Debt Relationship	M&A Relationship	Overall Relationship
	Panel B: 2003 – 2009			
Intercept	0.307	0.408	0.302	0.298
	(.000)	(.000)	(.000)	(.000)
IB Relationship Measures:				
IBRel_GS	0.010	0.037	0.045	0.042
	(.612)	(.025)	(.032)	(.001)
IBRel_NonGS	0.161	0.107	0.176	0.179
	(.000)	(.020)	(.000)	(.000)
IB Characteristics:				
Ln(IB_Size)	-0.076	-0.131	-0.080	-0.080
	(.000)	(.000)	(.000)	(.000)
IB_MktShare	-1.124	0.648	-1.023	-1.000
	(.000)	(.000)	(.000)	(.000)
IB_NonGS	0.170	0.230	0.171	0.173
	(.000)	(.000)	(.000)	(.000)
Analyst Characteristics:				
RelAccuracy	-0.044	-0.042	-0.037	-0.037
	(.233)	(.249)	(.312)	(.308)
AllStar	-0.007	-0.024	-0.009	-0.012
	(.583)	(.039)	(.444)	(.331)
Ln(Seniority)	0.028	0.027	0.026	0.027
	(.000)	(.001)	(.001)	(.001)
Ln(Seasoning)	-0.005	-0.001	-0.006	-0.006
	(.480)	(.940)	(.449)	(.456)
Ln(NFollow)	-0.036	-0.032	-0.031	-0.033
	(.000)	(.000)	(.000)	(.000)
JobMove	0.022	0.022	0.018	0.020
	(.124)	(.127)	(.208)	(.165)
Stock Characteristics:				
Ln(ANF)	0.033	0.031	0.031	0.033
	(.001)	(.002)	(.002)	(.001)
Ln(MV)	-0.004	-0.003	-0.002	-0.003
	(.639)	(.678)	(.769)	(.720)
Ln(Proceeds)	-0.001	-0.001	-0.001	-0.001
	(.793)	(.726)	(.513)	(.598)
InstHoldings	-0.003	-0.011	-0.014	0.009
	(.992)	(.975)	(.967)	(.980)
Adjusted R^2	.068	.067	.069	.068
N	136,193	136,193	136,193	136,193
PERMCO clusters	3,473	3,473	3,473	3,473
GS – NonGS = 0	.002	.145	.014	.000

Table 4 – Alternative Models for Relative Recommendations

This table provides results from regressions of relative recommendations on overall investment bank relationship measures, investment bank characteristics, analyst characteristics, and stock characteristics. Results for the sub-periods before (1998-2001) and after (2003-2009) Global Settlement period are provided in Panels A and B, respectively. Columns 1 through 3 use an indicator variable for the overall investment banking relationship while columns 4 through 6 use a continuous variable for the overall relationship measure. Columns 1 and 4 include firm fixed effects, columns 2 and 5 use analyst fixed effects, and columns 3 and 6 use investment bank fixed effects. All models contain year fixed effects. *p*-values based on robust standard errors are presented in parentheses below the coefficients, where standard errors are clustered by firm. Variable definitions are contained in Appendix Table A1.

	Overall Relationship Dummy			Overall Relationship Continuous		
			Panel A: 1998 – 2001			
Intercept	-0.237	-0.098	-0.684	-0.245	-0.099	-0.691
	(.011)	(.355)	(.000)	(.008)	(.347)	(.000)
IB Relationship Measures:						
IBRel_GS	0.119	0.098	0.104	-	-	-
	(.000)	(.000)	(.000)			
IBRel_NonGS	0.106	0.072	0.070	-	-	-
	(.003)	(.009)	(.011)			
IBRelC_GS				0.098	0.098	0.102
	-	-	-	(.000)	(.000)	(.000)
IBRelC_NonGS				0.118	0.085	0.090
	-	-	-	(.014)	(.019)	(.011)
IB Characteristics:						
Ln(IB_Size)	0.052	0.002	0.135	0.052	0.002	0.135
	(.000)	(.922)	(.000)	(.000)	(.938)	(.000)
IB_MktShare	0.259	0.517	0.281	0.356	0.562	0.341
	(.027)	(.003)	(.141)	(.002)	(.001)	(.073)
IB_NonGS	0.129	0.028		0.127	0.027	
	(.000)	(.249)	-	(.000)	(.270)	-
Analyst Characteristics:						
RelAccuracy	0.053	0.121	0.123	0.054	0.120	0.123
	(.253)	(.066)	(.001)	(.246)	(.068)	(.001)
AllStar	-0.036	0.003	-0.013	-0.034	0.003	-0.012
	(.011)	(.887)	(.272)	(.016)	(.900)	(.334)
Ln(Seniority)	-0.008	-0.031	-0.006	-0.008	-0.030	-0.006
	(.501)	(.317)	(.524)	(.524)	(.328)	(.546)
Ln(Seasoning)	0.052	0.030	0.042	0.052	0.030	0.042
	(.000)	(.001)	(.000)	(.000)	(.001)	(.000)
Ln(NFollow)	-0.043	-0.041	-0.018	-0.043	-0.041	-0.018
	(.000)	(.000)	(.014)	(.000)	(.000)	(.012)
JobMove	-0.033	-0.029	-0.032	-0.035	-0.030	-0.033
	(.023)	(.038)	(.020)	(.017)	(.035)	(.016)
Stock Characteristics:						
Ln(ANF)	0.038	0.048	0.044	0.037	0.047	0.043
	(.006)	(.000)	(.000)	(.007)	(.000)	(.000)
Ln(MV)	-0.005	0.011	0.004	-0.004	0.011	0.005
	(.631)	(.001)	(.125)	(.654)	(.001)	(.101)
Ln(Proceeds)	-0.005	-0.001	-0.002	-0.003	0.000	-0.001
	(.171)	(.625)	(.190)	(.305)	(.870)	(.563)
InstHoldings	-0.838	-0.711	-0.738	-0.846	-0.715	-0.746
	(.025)	(.003)	(.001)	(.023)	(.003)	(.001)
Fixed Effects	Firm	Analyst	IB	Firm	Analyst	IB
Adjusted R^2	.049	.122	.052	.047	.122	.051
N	59,703	59,703	59,703	59,703	59,703	59,703

Table 4 – continued

	Overall Relationship Dummy			Overall Relationship Continuous		
	Panel B: 2003 – 2009					
Intercept	0.298	-0.278	0.157	0.284	-0.280	0.155
	(.000)	(.008)	(.002)	(.000)	(.008)	(.002)
IB Relationship Measures:						
IBRel_GS	0.042	0.039	0.020	-	-	-
	(.001)	(.001)	(.090)			
IBRel_NonGS	0.179	0.097	0.066	-	-	-
	(.000)	(.000)	(.014)			
IBRelC_GS				-0.003	0.029	-0.003
	-	-	-	(.884)	(.143)	(.895)
IBRelC_NonGS				0.260	0.117	0.084
	-	-	-	(.000)	(.005)	(.042)
IB Characteristics:						
Ln(IB_Size)	-0.080	-0.078	-0.103	-0.078	-0.077	-0.102
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
IB_MktShare	-1.000	-0.427	-0.745	-0.939	-0.387	-0.728
	(.000)	(.021)	(.000)	(.000)	(.038)	(.000)
IB_NonGS	0.173	0.162		0.175	0.165	
	(.000)	(.000)	-	(.000)	(.000)	-
Analyst Characteristics:						
RelAccuracy	-0.037	0.046	0.007	-0.040	0.046	0.006
	(.308)	(.385)	(.837)	(.274)	(.386)	(.856)
AllStar	-0.012	-0.012	-0.004	-0.009	-0.011	-0.003
	(.331)	(.452)	(.723)	(.447)	(.479)	(.779)
Ln(Seniority)	0.027	0.060	0.009	0.027	0.061	0.009
	(.001)	(.006)	(.198)	(.001)	(.006)	(.183)
Ln(Seasoning)	-0.006	0.002	0.006	-0.006	0.001	0.005
	(.456)	(.794)	(.404)	(.448)	(.836)	(.431)
Ln(NFollow)	-0.033	-0.012	-0.018	-0.034	-0.012	-0.018
	(.000)	(.113)	(.001)	(.000)	(.108)	(.001)
JobMove	0.020	0.013	0.028	0.020	0.013	0.028
	(.165)	(.356)	(.041)	(.166)	(.366)	(.042)
Stock Characteristics:						
Ln(ANF)	0.033	0.053	0.035	0.033	0.053	0.035
	(.001)	(.000)	(.000)	(.001)	(.000)	(.000)
Ln(MV)	-0.003	0.035	0.031	-0.003	0.035	0.030
	(.720)	(.000)	(.000)	(.742)	(.000)	(.000)
Ln(Proceeds)	-0.001	0.000	-0.001	0.000	0.001	0.000
	(.598)	(.947)	(.545)	(.913)	(.384)	(.969)
InstHoldings	0.009	0.189	-0.188	0.014	0.170	-0.196
	(.980)	(.287)	(.244)	(.967)	(.340)	(.225)
Fixed Effects	Firm	Analyst	IB	Firm	Analyst	IB
Adjusted R^2	.068	.107	.060	.068	.107	.060
N	136,193	136,193	136,193	136,193	136,193	136,193

Table 5 – Relative Recommendations based on a 3-Tier System

This table provides the results from estimating regressions of relative recommendations on investment bank relationship measures, investment bank characteristics, analyst characteristics, and stock characteristics Results for the sub-periods before (1998-2001) and after (2003-2009) Global Settlement period are provided in Panels A and B, respectively. In this table, relative recommendations are measured based on a 3-tier system where a strong buy or buy recommendations are coded as 3 and strong sell or sell recommendations are coded as 1. Columns 1 through 3 respectively use equity, debt, and M&A investment banking relationship measures, while column 4 uses an overall relationship measure. *p*-values based on robust standard errors are presented in parentheses below the coefficients, where standard errors are clustered by firm. Each model contains year and firm fixed effects. Variable definitions are contained in Appendix Table A1.

	Equity Relationship	Debt Relationship	M&A Relationship	Overall Relationship
	Panel A: 1998 – 2001			
Intercept	0.088	0.102	0.086	0.093
	(.144)	(.086)	(.149)	(.120)
IB Relationship Measures:				
IBRel_GS	0.032	0.080	0.044	0.073
	(.037)	(.000)	(.011)	(.000)
IBRel_NonGS	0.011	0.011	0.075	0.035
	(.659)	(.724)	(.018)	(.049)
IB Characteristics:				
Ln(IB_Size)	0.009	0.001	0.009	0.006
	(.138)	(.847)	(.155)	(.295)
IB_MktShare	0.033	0.338	0.109	0.082
	(.631)	(.000)	(.104)	(.251)
IB_NonGS	-0.013	0.002	-0.010	-0.005
	(.076)	(.824)	(.199)	(.546)
Analyst Characteristics:				
RelAccuracy	0.071	0.074	0.072	0.072
	(.011)	(.008)	(.010)	(.011)
AllStar	-0.008	-0.018	-0.010	-0.014
	(.379)	(.038)	(.240)	(.113)
Ln(Seniority)	-0.003	-0.003	-0.003	-0.004
	(.677)	(.736)	(.678)	(.642)
Ln(Seasoning)	0.016	0.015	0.016	0.016
	(.016)	(.023)	(.018)	(.019)
Ln(NFollow)	-0.021	-0.017	-0.020	-0.019
	(.000)	(.001)	(.000)	(.000)
JobMove	-0.021	-0.021	-0.020	-0.019
	(.019)	(.017)	(.020)	(.034)
Stock Characteristics:				
Ln(ANF)	-0.023	-0.023	-0.024	-0.023
	(.012)	(.014)	(.012)	(.014)
Ln(MV)	-0.019	-0.019	-0.019	-0.019
	(.003)	(.003)	(.003)	(.002)
Ln(Proceeds)	0.001	-0.001	0.000	0.000
	(.626)	(.547)	(.931)	(.875)
InstHoldings	-0.758	-0.756	-0.753	-0.750
	(.004)	(.005)	(.005)	(.005)
Adjusted R^2	.057	.059	.057	.058
N	59,703	59,703	59,703	59,703

Table 5 – continued

	Equity Relationship	Debt Relationship	M&A Relationship	Overall Relationship
		Panel B: 2003 – 2009		
Intercept	0.519	0.508	0.515	0.489
	(.000)	(.000)	(.000)	(.000)
IB Relationship Measures:				
IBRel_GS	0.030	0.036	0.048	0.042
	(.057)	(.007)	(.007)	(.000)
IBRel_NonGS	0.086	0.096	0.145	0.113
	(.001)	(.000)	(.000)	(.000)
IB Characteristics:				
Ln(IB_Size)	-0.057	-0.069	-0.061	-0.052
	(.000)	(.000)	(.000)	(.000)
IB_MktShare	-1.207	-0.381	-1.090	-1.375
	(.000)	(.000)	(.000)	(.000)
IB_NonGS	-0.042	0.000	-0.042	-0.048
	(.000)	(.979)	(.000)	(.000)
Analyst Characteristics:				
RelAccuracy	-0.026	-0.027	-0.018	-0.018
	(.349)	(.328)	(.507)	(.514)
AllStar	-0.011	-0.018	-0.014	-0.013
	(.207)	(.044)	(.113)	(.143)
Ln(Seniority)	0.015	0.015	0.014	0.015
	(.009)	(.009)	(.015)	(.011)
Ln(Seasoning)	0.005	0.006	0.005	0.004
	(.382)	(.291)	(.425)	(.510)
Ln(NFollow)	-0.019	-0.020	-0.013	-0.015
	(.000)	(.000)	(.006)	(.002)
JobMove	0.007	0.006	0.002	0.003
	(.512)	(.576)	(.811)	(.728)
Stock Characteristics:				
Ln(ANF)	-0.008	-0.008	-0.009	-0.008
	(.344)	(.327)	(.241)	(.303)
Ln(MV)	-0.029	-0.028	-0.027	-0.027
	(.000)	(.000)	(.000)	(.000)
Ln(Proceeds)	-0.001	0.000	-0.001	-0.001
	(.734)	(.846)	(.396)	(.434)
InstHoldings	-0.214	-0.211	-0.224	-0.205
	(.440)	(.447)	(.420)	(.460)
Adjusted R^2	.050	.047	.052	.053
N	136,193	136,193	136,193	136,193

Table 6 – Logit Models for Buy/Sell Recommendations

This table provides the results from estimating logistic regressions of the probability that an analyst issues a buy or strong buy (sell or strong sell) recommendation on overall investment bank relationship measures, investment bank characteristics, analyst characteristics, and stock characteristics in columns 1 to 3 (4 to 6). Results for the full sample period from 1998 to 2009 are presented in columns 1 and 4. The remaining columns present results for the sub-periods before (1998-2001) and after (2003-2009) Global Settlement. *p*-values based on robust standard errors are presented in parentheses below the coefficients, where standard errors are clustered by firm. Each model contains year and firm fixed effects. Variable definitions are contained in Table A1 of Appendix 1.

	Buy or Strong Buy			Sell or Strong Sell		
	Full Period	1998-2001	2003-2009	Full Period	1998-2001	2003-2009
Post	-0.741	-	-	1.879	-	-
	(.000)			(.000)		
IB Relationship Measures:						
IBRel_GS	0.529	0.455	-	-0.786	-0.579	-
	(.000)	(.000)		(.000)	(.130)	
IBRel_GS*Post	-0.345	-	0.178	0.520	-	-0.261
	(.000)		(.000)	(.015)		(.000)
IBRel_NonGS	0.400	0.256	-	-1.313	-0.612	-
	(.000)	(.030)		(.000)	(.144)	
IBRel_NonGS*Post	-0.107	-	0.324	0.513	-	-0.809
	(.318)		(.000)	(.168)		(.000)
IB Characteristics:						
Ln(IB_Size)	-0.190	-0.125	-0.172	0.251	-1.155	0.355
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
IB_MktShare	-2.763	0.663	-4.712	5.931	-1.266	5.708
	(.000)	(.077)	(.000)	(.000)	(.558)	(.000)
IB_NonGS	-0.243	-0.046	-	1.277	0.166	-
	(.000)	(.278)		(.000)	(.415)	
IB_NonGS*Post	0.192	-	-0.136	-1.007	-	0.362
	(.000)		(.000)	(.000)		(.000)
Analyst Characteristics:						
RelAccuracy	0.228	0.583	0.049	0.178	-0.927	0.411
	(.004)	(.000)	(.630)	(.253)	(.141)	(.013)
AllStar	-0.021	-0.017	-0.021	0.178	-0.165	0.185
	(.409)	(.712)	(.499)	(.000)	(.476)	(.000)
Ln(Seniority)	0.08	0.008	0.057	-0.167	-0.367	-0.140
	(.000)	(.844)	(.006)	(.000)	(.036)	(.000)
Ln(Seasoning)	-0.108	-0.104	-0.066	0.130	0.548	0.112
	(.000)	(.003)	(.001)	(.000)	(.001)	(.001)
Ln(NFollow)	-0.116	-0.149	-0.071	0.115	0.127	0.071
	(.000)	(.000)	(.000)	(.000)	(.349)	(.015)
JobMove	0.071	0.026	0.099	-0.027	0.103	-0.054
	(.009)	(.588)	(.005)	(.648)	(.593)	(.408)
Stock Characteristics:						
Ln(ANF)	-0.430	-0.599	-0.286	0.143	0.021	0.172
	(.000)	(.000)	(.000)	(.002)	(.914)	(.002)
Ln(MV)	0.653	0.833	0.627	-0.650	-0.534	-0.591
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Ln(Proceeds)	0.005	-0.023	0.011	0.001	0.000	0.006
	(.365)	(.062)	(.072)	(.89)	(.991)	(.552)
InstHoldings	0.066	0.177	0.053	-0.037	-0.042	-0.022
	(.000)	(.000)	(.000)	(.016)	(.440)	(.217)

Table 6 – continued

Combined Post Effects:						
GS Banks	0.184	-	-	-0.266	-	-
	(.000)			(.000)		
NonGS Banks	0.293	-	-	-0.800	-	-
	(.000)			(.000)		
Pseudo R^2	.078	.060	.027	.112	.163	.034
N	212,107	54,219	133,483	171,542	11,111	109,467

Table 7 – Analyst Affiliation Effects and Lending

This table provides results related to the incremental effects of lending relationships on analyst affiliation bias. Panel A provides descriptive statistics for the lending variables. Panels B and C presents the results from regressions of relative recommendations on overall investment banking and lending relationship measures, and a set of control variables related to investment bank, analyst, and stock characteristics, with results for the sub-period before Global Settlement (1998-2001) in Panel B and results for the post period (2003-2009) in Panel C. *p*-values based on robust standard errors are presented in parentheses below the coefficients, where standard errors are clustered by firm. Coefficients on the control variables are not reported. Each model contains year and firm fixed effects. Variable definitions are contained in Table A1 of Appendix 1.

Panel A – Summary Statistics

	N	Mean	Median	Min	Max	Std. Dev.
IB Relationship Measures:						
IBRel_Lending (%)	216,242	2.82	0.00	0.00	1.00	14.16
IBRel_Overall (+loan) (%)	216,242	5.84	0.00	0.00	1.00	18.38
IB Characteristics:						
IB_MktShare_Lending (%)	216,242	4.56	0.74	0.00	35.92	8.29
IB_MktShare_Overall (+loan) (%)	216,242	4.58	2.05	0.00	23.83	5.50
Firm/Stock Characteristics:						
Proceeds_Lending	216,242	964.14	40.00	0.00	73,197.78	2,730.11
Proceeds_Overall (+loans)	216,242	2,538.37	375.00	0.00	251,207.45	8,315.22
Proceeds_Lending^{+}	114,659	1,818.33	675.00	0.50	73,197.78	3,536.08
Proceeds_Overall (+loans)$^{+}$	164,818	3,330.35	798.75	0.50	251,207.45	9,385.00

Panel B: Regression Results, 1998–2001

IBRel_GS$_{Overall}$	-	0.108 (.000)	0.101 (.000)	-
IBRel_NonGS$_{Overall}$	-	0.080 (.023)	0.077 (.042)	-
IBRel_GS$_{Lending}$	0.095 (.008)	0.154 (.000)	-	-
IBRel_NonGS$_{Lending}$	0.110 (.009)	0.234 (.000)	-	-
IBRel_GS$_{Overall}$*IBRel_GS$_{Lending}$	-	-	0.176 (.000)	-
IBRel_NonGS$_{Overall}$*IBRel_NonGS$_{Lending}$	-	-	0.207 (.040)	-
IBRel_GS$_{Overall+Lending}$	-	-	-	0.093 (.000)
IBRel_NonGS$_{Overall+Lending}$	-	-	-	0.135 (.000)
Adjusted R^2	.058	.050	.049	.052
N	59,703	59,703	59,703	59,703

Table 7 – continued

Panel C: Regressions Results, 2003–2009				
IBRel_$GS_{Overall}$	-	0.028 (.035)	0.026 (.068)	-
IBRel_$NonGS_{Overall}$	-	0.159 (.000)	0.152 (.000)	-
IBRel_$GS_{Lending}$	0.025 (.246)	0.072 (.001)	-	-
IBRel_$NonGS_{Lending}$	0.064 (.113)	0.069 (.109)	-	-
IBRel_$GS_{Overall}$*IBRel_$GS_{Lending}$	-	-	0.067 (.008)	-
IBRel_$NonGS_{Overall}$*IBRel_$NonGS_{Lending}$	-	-	0.082 (.201)	-
IBRel_$GS_{Overall+Lending}$	-	-	-	0.030 (.014)
IBRel_$NonGS_{Overall+Lending}$	-	-	-	0.121 (.000)
Adjusted R^2	.067	.069	.068	.067
N	136,193	136,193	136,193	136,193

APPENDIX

Table A1 – Variable Definitions

Variable		Definition
Analyst Recommendation and Global Settlement Variables:		
$RelRec_{ijkt}$	=	Relative Recommendation. The most recent recommendation issued by analyst *i* (from investment bank *j*) for firm *k* during the one-year window ending in quarter *t*, normalized by subtracting the consensus (median) recommendation across all analysts covering firm *k* (whether or not they are in our sample) in the same one-year window.
$Post_t$	=	Post Global Settlement. An indicator variable that equals one for all quarters after the Global Analyst Research Settlement and zero otherwise. Following Kadan et al. (2009), we define the beginning of the post Global Settlement period as September 2002.
IB Relationship Measures:		
$IBRelC_{jkt}$	=	Investment Bank Relationship (Continuous). The proportion of a firm *k*'s total transaction value over the 36 months ending in quarter *t* for which investment bank *j* acted as a lead or co-managing underwriter or an M&A advisor. This variable is calculated separately based on equity, debt, and M&A transactions, as well as the combined set of transactions across all three areas.
$IBRel_{jkt}$	=	Investment Bank Relationship (Dummy). A dummy variable equal to one if *IBREL* for a particular transaction category (equity, debt, M&A, lending, or overall) is positive and zero otherwise.
IB Characteristics:		
IB_Size_{jt}	=	Investment Bank Size. The number of analysts employed by investment bank *j* during quarter *t*, according to the I/B/E/S recommendations file.
$IBMktShare_{jt}$	=	Investment Bank Market Share. The proportion of total deal value in a particular transaction category (equity, debt, M&A, lending, or all four combined) during the previous 12 months for which investment bank *j* acted as lead underwriter or advisor.
IB_GS_j (IB_NonGS_j)	=	Global Settlement (Non-Global Settlement) Investment Bank. Indicator variables to identify whether or not investment bank *j* was one of the 12 investment banks included in the Global Analyst Research Settlement (including subsequent name variations as shown in Appendix Table A2). The twelve investment banks included in the Global Settlement are: Bear Stearns; Citigroup (Salomon Smith Barney); CS First Boston; Deutsche Bank; Goldman Sachs; JP Morgan; Lehman Brothers; Merrill Lynch; Morgan Stanley; Thomas Weisel, UBS Warburg; and U.S. Bancorp Piper Jaffray.
Analyst Characteristics:		
$RelAccuracy_{ijt}$	=	Relative Analyst Accuracy. The relative forecast accuracy of the analyst, as defined in Hong and Kubik (2003). For each analyst *i* following firm *k*, we first estimate the absolute value of the difference between the analyst's most recent forecast of fiscal-year earnings (issued between January 1 and July 1 of year *t*) and actual earnings, scaled by price (as of the end of year *t-1*). We then rescale such that the most accurate analyst following firm *k* scores 1 and the least accurate analyst scores 0. Finally, each analyst's relative forecast accuracy is defined as the mean score across all stocks followed by the analyst over years *t*-2 through *t*.

Table A1 continued

AllStar$_{ijt}$	=	All Star Analyst. An indicator variable that equals 1 if the analyst is a ranked as an All-Star by *Institutional Investor* magazine during year *t-1*, and 0 otherwise.
Seniority$_{ijt}$	=	Analyst Seniority. The number of years since analyst *i* first appeared in I/B/E/S.
Seasoning$_{ijt}$	=	Analyst Seasoning. The number of years since analyst *i* initiated coverage of firm *k*, according to I/B/E/S.
NFollow$_{ijt}$	=	Number of Firms Followed. The number of firms followed by analyst *i* during quarter *t*, according to I/B/E/S.
JobMove$_{ijt}$	=	Analyst Job Move. An indicator variable that equals 1 if analyst *i* changed employers during quarter *t*, according to I/B/E/S.
Stock Characteristics:		
ANF$_{kt}$	=	Analyst Following. The number of analysts issuing recommendations for firm *k* during the previous 12 months, according to the I/B/E/S recommendations file.
MV$_{kt}$	=	Market Value. The market value of equity for firm *k* at the end of year *t-1*, according to CRSP.
DealValue$_{kt}$	=	Aggregate Deal Value. The total deal value by firm *k* in a particular transaction category (equity, debt, M&A, lending, or all four combined) during the previous 36 months.
InstHoldings$_{kt}$	=	Institutional Holdings. The percentage of shares of firm *k* held by institutional investors at the end of quarter *t*, according to Thomson Reuters' 13F filings.

Table A2 – Sample Investment Banks

This table lists the investment banks included in our final sample, including all predecessor banks in the case of mergers. Investment Banks that were sanctioned in the Global Settlement and subsequent name variations that are also treated as sanctioned banks in our analysis are listed in bold type. Merrill Lynch and Lehman were included in the Global Settlement but are not included in our sample because they are missing from the I/B/E/S data for all or part of our sample period.

Ultimate IB Name	Predecessor IBs
Sanctioned Banks:	
Bank of America Merrill Lynch	Advest; Banc America; Bank of America; **Bank of America Merrill Lynch**
Citigroup Salomon Smith Barney	Schroder; **Salomon Smith Barney**; **Citigroup Salomon Smith Barney**
CS First Boston	DLJ; **CS First Boston**
Deutsche Alex Brown	**Deutsche Bank**; **Deutsche Alex Brown**
Goldman Sachs	**Goldman Sachs**
JP Morgan Chase	**Bear Stearns**; Chase HQ; Robert Flemming; **JP Morgan**; **JP Morgan Chase**
Morgan Stanley Dean Witter	**Morgan Stanley**; **Morgan Stanley Dean Witter**
Thomas Weisel	**Thomas Weisel**
UBS Paine Webber[a]	JC Bradford; **Paine Webber**; **UBS**; **UBS Warburg**; **UBS Paine Webber**
US Bancorp Piper Jaffray	US Bancorp; **Piper Jaffray**; **US Bancorp Piper Jaffray**
Non-Sanctioned Banks:	
ABN AMRO	ABN AMRO
BNP Paribas	Paribas; BNP Paribas
CIBC	CIBC
Commerzbank	Dresdner Kleinwort; Commerzbank
Friedman	Friedman
HSBC	HSBC
ING Barings Furman	ING Barings Furman
Lazard	Lazard
Needham	Needham
Prudential Securities	Vector Securities; Volpe Brown Whelan; Prudential Securities
Raymond James	Raymond James
RBC Capital Markets	Dain Rauscher Wessels; Ferris; Tucker Anthony Sutro; RBC Capital Markets
Robert Baird	Robert Baird
Scotia	Scotia
SG Cowen	Societe Generale; SG Cowen
Stephens	Stephens
Sun Trust Robinson	Sun Trust Equitable; Sun Trust Robinson
Wells Fargo	Black; JW Charles; Everen; First Union; First Van Kasper; Wachovia; Wachovia Corp; Wells Fargo
William Blair	William Blair

[a] In the case of UBS Paine Webber, occurrences of UBS, UBS Warburg, and Paine Webber prior to the UBS-Paine Webber merger are also classified as sanctioned banks. These three investment banks account for only 191 (0.09%) of the quarterly observations in our analysis.

Expectations and the Structure of Share Prices

John G. Cragg and
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Table 2.16 **Analysis of Forecasts by Industrial Category: 1963 Predictions vs. 1963–68 Actual Earnings**

Pred.	Correlation	T	T^M	T^{BI}	T^{WI}	No. of Observations
1	.21	.75	.32	.23	.63	173
2	.25	.73	.31	.20	.62	171
3	.48	.66	.31	.18	.55	122
4	.75	.46	.05	.21	.41	59
5	.42	.62	.12	.17	.58	172
6	.69	.45	.07	.11	.43	37
7	.51	.58	.16	.22	.51	60
g_{p1}	.42	.65	.07	.26	.59	153
g_{p2}	.39	.71	.09	.32	.63	131
g_{p3}	.47	.66	.04	.19	.63	121
g_{p4}	.45	.77	.04	.17	.75	156

would be 4 for the most difficult industry (in years when there were four predictors compared), 8 for the next most difficult, and so on. In this case, the coefficient of concordance (Kendall's W) would be unity. The values of Kendall's W were significantly different from zero beyond the 0.05 level for most of the years as were differences between industries for the correlation coefficients for most of the predictors.[11] These findings indicate that there were industry differences. For the long-term predictions, correlation coefficients between forecasts and realizations tended to be highest in the oil, food and stores, and "cyclical" industries. For the short-term predictions, there was really no industry that was particularly easy to predict compared with the others; that is, prediction performances were uniformly mediocre across industries.

The electric utility industry turned out to be one of the more difficult industries for which to make long-term forecasts. This would come as a distinct surprise to the participating security analysts who claimed at the outset that they had some reservations about their abilities to predict earnings for the metals and other "cyclical" companies, but had confidence that they could make accurate predictions for the utilities.[12] It turned out that the long-term predictions for the utility industry were considerably worse than for the metals and "cyclicals."

In general, we had little success in associating forecasting performance with industry or company characteristics. Forecasting differences between industries were only moderately related to the average realized

11. The latter was tested on the basis of the asymptotic distribution of the correlation coefficient and the assumption that the data were distributed normally.

12. This confidence was also reflected in the fact that for the electric utility industry there was high agreement among the forecasters, whereas agreement was relatively low for the cyclical group.

The Consensus and Accuracy of Some Predictions of the Growth of Corporate Earnings
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THE CONSENSUS AND ACCURACY OF SOME PREDICTIONS OF THE GROWTH OF CORPORATE EARNINGS

J. G. CRAGG* AND BURTON G. MALKIEL*

FOR YEARS ECONOMISTS HAVE EMPHASIZED the importance of expectations in a variety of problems.[1] The extent of agreement on the significance of expectations is almost matched, however, by the paucity of data that can be considered even reasonable proxies for these forecasts. One area in which expectations are highly important is the valuation of the common stock of a corporation. The price of a share is—or should be—determined primarily by investors' current expectations about the future values of variables that measure the relevant aspects of corporations' performance and profitability, particularly the anticipated growth rate of earnings per share.[2] This theoretical emphasis is matched by efforts in the financial community where security analysts spend considerable effort in forecasting the future earnings of companies they study. These forecasts are of particular interest because one can observe divergence of opinion among different individuals dealing with the same quantities. This paper is devoted to the analysis of a small sample of such predictions and certain related variables obtained from financial houses.[3]

I. NATURE AND SOURCES OF DATA

The principal data used in this study consisted of figures representing the expected growth of earnings per share for 185 corporations[4] as of the end of 1962 and 1963. These data were collected from five investment firms. The participants were recruited through requests to two organizations. One was a group of firms who used computers for financial analysis and who met periodically to discuss mutual problems, the other was the New York Society of

* University of British Columbia and Princeton University, respectively. This Research was supported by the Institute for Quantitative Research in Finance, the National Science Foundation, and the Graduate School of Business, University of Chicago. We are indebted to Paul Cootner for helpful comments.

1. A number of studies of anticipations data have been collected in two National Bureau Volumes [12] and [13]. Some more recent work on the assessment of expectations or forecasts has been done by Zarnowitz [16].

2. The classic theoretical statement of the anticipations view of the determination of share valuation may be found in J. B. Williams [15]. This position is also adopted in the standard textbook in the field [3]. The emphasis on the importance of earnings growth may also be found in [4], [5], and [19].

3. One of the few attempts to conduct a study of this type was made by the Continental Illinois Bank and Trust Company of Chicago [1] in 1963. The bank collected a sample of earnings estimates one year in advance from three investment firms. An analysis of these projections revealed that the financial firms tended to overestimate earnings and that over-all quality of the estimates tended to be poor.

4. The 185 companies for which the growth-rate estimates were made tended to be the large corporations in whose securities investment interest is centered. This selection was made on the basis of availability of data and was not chosen as a random sample.

Financial Analysts. As a result, eleven firms agreed to participate in the proposed study. From the original eleven, however, only five were able to supply comparable sets of long-term earnings forecasts for use in this study.[5] Even among these five there was not complete overlap in the corporations for which predictions were available. One of them had no data for 1962. For only two were data available for the full set of 185 companies.

Of the five participating firms, two are large New York City banks heavily involved in trust management, one is an investment banker and investment adviser doing mainly an institutional brokerage business, one is a mutual fund manager, and the remaining firm does a general brokerage and investment advisory business. We would not argue that these estimates give an accurate picture of general market expectations. It would, however, seem reasonable to suggest that they are representative of opinions of some of the largest professional investment institutions and that they may not be wholly unrepresentative of more general expectations. Since investors consult professional investment institutions in forming their own expectations, individuals' expectations may be strongly influenced—and so reflect—those of their advisers.[6] Also, insofar as investors follow the same sorts of procedures as those used by security analysts in forming expectations, the investors' expectations would resemble those of the analysts. It should be noted, however, that security analysts are not limited to published data in forming their expectations. They frequently visit the companies they study and discuss the corporations' prospects with their executives.

Each growth-rate figure was reported as an average annual rate of growth expected to occur in the next five years. At first thought, such a rate of growth depends on what earnings are expected to be in five years' time and on the base-year earnings figures. However, this dependence need not be very great if the growth rate is regarded more as a parameter of the process determining earnings than as an arithmetic quantity linking the current value to the expected future value. Discussion with the suppliers of the data indicated that all firms were attempting to predict the same future figure, the long-run average ("normalized") earnings level, abstracting from cyclical or special circumstances. The bases used were less clear. Some firms explicitly used their estimates of "normalized" earnings during the year in which the prediction was made. Others provided different figures as bases: in one case the firm estimated actual earnings, in another a prediction of earnings four years in the future was furnished. These differences did not seem to be reflected in the growth rates, however, since attempts to adjust the rates for differences in

5. We are deeply grateful to the participating firms, who wish to remain anonymous. Not all volunteers were able to supply data useful to this study, either because the actual supply of data would have been too burdensome (being kept for internal records in a form that made their extraction difficult) or because the data supplied were not comparable to data used here (either being of a short-term nature or being made at different dates). Because one of our main objectives is to examine differences and similarities in predictions of the same quantities, such data were not used in the present paper.

6. That several of our participating firms find it worthwhile to publish these projections and provide them to their customers provides *prima facie* evidence that a certain segment of the market places some reliance on such information in forming its own expectations.

base figures introduced rather than removed disparities among the predictions.

The growth rates were given as single numbers for each corporation. No indication was provided of the confidence with which these point estimates were held. One firm did provide an instability index of earnings which represented a measure of the past variability of earnings (around trend) adjusted by the security analyst to indicate potential future variability. Moreover, two firms provided quality ratings, which classified companies into three or four quality categories.

Two of the firms provided estimates of past growth rates as well as predictions. The figures represented perceived growth over the past 8-10 years, the past 4-5 years, the past 6 years, and the last year. It may seem unnecessary to rely on the participating firms for estimates of historic growth rates. However, the past growth of a company's earnings is not, in any meaningful sense, a well-defined concept. Earnings—being basically a small difference between two large quantities—can exhibit large year-to-year fluctuations. They also can be negative, which creates problems for most mechanical calculations. In addition, the accounting definition of earnings is not an exact conformity with the economically relevant concept of profits or return on investors' capital. For these reasons, calculated growth rates are sensitive to the particular method employed and the period chosen for the calculation. Consequently, such calculations may be a poor reflection of what growth is generally considered to have been, and may not be useful in assessing the past performance of corporations. Furthermore, it may be supposed that in assessing security analysts' predictions of growth their own estimates of past growth are more likely to be relevant than objectively calculated rates. The extent of agreement among the two types of measures is among the subjects considered in the next section.

Our participating firms also supplied an industrial classification. While other classifications are available, the concept of industry is not really precise enough to get a fixed, unquestionable assignment of corporations to industries. Particular problems are presented by conglomerate companies. Perceived industry may be more relevant than any other grouping when investigating anticipations. The classification we use represents a consensus about industry among our participants. Where disagreements occurred (as was often the case with conglomerates), the corporation was simply classified as "miscellaneous." The classification represented considerable aggregation over finer classifications and only eight industries were distinguished. These were:

1) Electricals and Electronics
2) Electric Utilities
3) Metals
4) Oils
5) Drugs and Specialty Chemicals
6) Foods and Stores
7) "Cyclical"—including companies such as automobile and aircraft manufacturers, and meat packers
8) "Miscellaneous"

II. Agreement among Predictors

The agreement among the growth-rate projections is described and summarized in this section. In the course of this description, the extent of agreement about base-earnings figures and the closeness of the projections to past, perceived, and calculated growth rates are also considered.

A. *Comparisons of Predictions of Future Growth Rates.*

The extent of agreement among the predictors about future growth rates is summarized in Table 1. Of the five predictors, the correlations among predictors A, B, C and E were all roughly of the same orders of magnitude.[7] Predictor D showed some tendency towards lower agreement. (Predictor D also had the highest average growth forecast and standard deviation for the companies for which it and others made forecasts.) Over-all agreement among

TABLE 1
Agreement Among Growth-Rate Predictions*

I. Correlation Coefficients

(Simple correlations in lower left portion, Spearman rank correlations in upper right portion)

	1962					1963				
	A	B	C	D		A	B	C	D	E
A	1.000	.768	.751	.388	A	1.000	.795	.717	.374	.709
B	.840	1.000	.728	.597	B	.832	1.000	.760	.518	.821
C	.889	.819	1.000	.690	C	.854	.764	1.000	.750	.746
D	.563	.621	.848	1.000	D	.537	.567	.898	1.000	.450
					E	.827	.835	.889	.704	1.000

II. Kendall's Coefficient of Concordance for Ranks of Companies by Different Predictors

Predictors	(A,B,C)	(A,B,D)	(A,B,C,D)	(A,B,C,D,E)
1962	.82	.73	.78	
1963	.83	.71	.81	.79

III. Proportions of Total Variance Due to Variance in Average Predictions

Predictors	(A,B,C)	(A,B,D)	(A,B,C,D)	(A,B,C,D,E)
1962	.87	.70	.79	
1963	.85	.68	.83	.87

* The numbers of observations on which this table and other tables are based varies between cells. For the correlations, the numbers of observations are reported below:

	1962				1963			
	A	B	C		A	B	C	D
B	185			B	185			
C	60	60		C	62	62		
D	178	178	58	D	182	182	61	
				E	125	125	39	124

For other comparisons, the number of observations is the minimum of the numbers of observations used to compute the correlations.

7. The analysis is presented mainly for the raw growth figures, but very similar impressions would be obtained from examining their logarithms.

the predictors is further summarized in the second and third parts of Table 1, which show the values of Kendall's coefficient of concordance and the proportion of total variance of the predictions that can be accounted for by differences in the mean prediction among companies.[8] It may be remarked that the entries in Table 1 are based on different numbers of observations. In each case, we used the maximum number of observations (companies) for which a comparison could be made. The impressions to be gained from Table 1 would be little changed, however, by basing all calculations only on the set for which all predictors provided data.

Though Table 1 suggests considerable agreement, the lack of agreement it also reveals can hardly be considered negligible. In addition to the lack of correlation, there were also some systematic differences among the predictors. For the matched set of observations the means and the standard deviations were of roughly the same sizes. However, the differences among the central tendencies were significant according to both parametric and nonparametric tests.

B. *Analysis of Predictions Within Industrial Classifications.*

One might suspect that the correlations among the predictors reflect little more than consensus about the industries that are expected to grow most rapidly rather than agreement about the relative rates of growth of firms within industries. This possibility was investigated by decomposing the correlation coefficients into two parts, one due to correlation within industries (r_w) and one due to correlation among the industry means (r_a).

$$r = r_w + r_a$$

where

$$r_w = \frac{\sum_{j=1}^{J} \sum_{i=1}^{N_j} (x_{ij} - \bar{x}_j)(y_{ij} - \bar{y}_j)}{\sqrt{\sum_{j=1}^{J} \sum_{i=1}^{N_j} (x_{ij} - \bar{x})^2 \sum_{j=1}^{J} \sum_{i=1}^{N_j} (y_{ij} - \bar{y})^2}},$$

and

$$r_a = \frac{\sum_{j=1}^{J} N_j (\bar{x}_j - \bar{x})(\bar{y}_j - \bar{y})}{\sqrt{\sum_{j=1}^{J} \sum_{i=1}^{N_j} (x_{ij} - \bar{x})^2 \sum_{j=1}^{J} \sum_{i=1}^{N_j} (y_{ij} - \bar{y})^2}}$$

with

8. The values shown in all parts of Table 1 are significant well beyond the conventionally used levels of significance. We may note that Tukey's test for interaction in a two-way analysis of variance [11, pp. 129-37]—the typical model in which the breakdown of variance used in Part 3 of Table 1 is employed—indicated a small but highly "significant" proportion of variance attributable to interaction. However, the usual analysis-of-variance model does not seem appropriate for this data, not only because of interactions, but also because of possible lack of homogeneity of variance.

x_{ij}, y_{ij} being the i^{th} observations in the j^{th} class (industry),
N_j being the number of observations in the j^{th} class,
J being the number of classes,
$\bar{x}_j$, $\bar{y}_j$ being the averages within the classes, and
$\bar{x}$, $\bar{y}$ being the over-all averages.

This decomposition indicated that agreement concerning industry growth rates is not the major factor accounting for the correlations among the forecasts. The first part of Table 2 shows the values of r_a using the industrial classification obtained from the participating firms. As comparison with Table 1 shows, only a small part of the correlations among the predictions are due to correlations among the industry means. Further light can be shed on this question by calculating the partial correlations between the predictions, holding industry classification constant. The second panel of Table 2 reveals

TABLE 2
INDUSTRIAL CLASSIFICATION AND AGREEMENT AMONG PREDICTORS

I. Values of r_a

	1962 A	1962 B	1962 C		1963 A	1963 B	1963 C	1963 D
B	.299			B	.305			
C	.285	.323		C	.230	.315		
D	.090	.184	.300	D	.057	.137	.317	
				E	.266	.348	.366	.194

II. Partial Correlations Holding Industrial Classification Constant

	1962 A	1962 B	1962 C		1963 A	1963 B	1963 C	1963 D
B	.799			B	.786			
C	.861	.760		C	.838	.690		
D	.656	.665	.887	D	.657	.650	.861	
				E	.828	.790	.897	.777

that these partial correlations tended to be only slightly less than the simple correlations and, in the case of Predictor D, the partial correlations were actually higher.

It is also interesting to examine the extent to which the correlations among predictors' forecasts varied over the different industry groups. This should indicate whether certain industry groups are more difficult to forecast in an *ex ante* sense. The correlations among forecasters tended to be lowest in the oil and cyclical industry groups, and highest for electric utility companies. These differences were significant for all pairs of predictions considered. Ranking the correlations over industries, and then comparing these ranks among pairs of predictors, showed substantial concordance over the ordering of the correlations.[9]

9. The test for individual pairs of predictions was the likelihood-ratio test. Note that the ranking comparison is not based on independent observations so a statistical test of the concordance is not appropriate. This suggests that the "significance" of the over-all correlations mentioned earlier should really be treated only as descriptive indications of their sizes. The hypothesis that

C. *Comparisons of Predictions and Past Growth Rates.*

The extent of agreement among the predictors can usefully be evaluated by comparisons of the predicted growth rates with earlier predictions and with the past growth rates of earnings. The correlations of the 1963 predictions with the 1962 ones were: .94, .95, .96, and .88 for predictors A through D respectively. All of these are considerably higher than the correlations of the predictions with each other. On the other hand, changes in expected growth rates were not highly correlated among predictors.[10]

TABLE 3
PREDICTIONS AND PAST GROWTH RATES*
(CORRELATIONS OF PREDICTED WITH PAST GROWTH RATES)

	1962				1963				
	A	B	C	D	A	B	C	D	E
g_{p1}	.78	.68	.75	.41	.85	.73	.84	.56	.67
g_{p2}	.75	.67	.72	.51	.79	.69	.80	.58	.76
g_{p3}	.77	.71	.82	.61	.75	.72	.79	.70	.74
g_{p4}	.34	.37	.59	.44	.33	.45	.70	.75	.58
g_{c1}	.55	.46	.65	.32	.63	.52	.61	.30	.58
g_{c2}	.67	.60	.68	.18	.72	.58	.73	.20	.56
g_{c3}	.75	.63	.73	.17	.79	.66	.76	.17	.57
g_{c4}	.82	.68	.79	.24	.83	.69	.79	.29	.60

* g_{p1} is 8-10 year historic growth rate supplied by A
g_{p2} is 4-5 year historic growth rate supplied by A
g_{p3} is 6 year historic growth rate supplied by D
g_{p4} is preceding 1 year growth rate supplied by D
g_{c1} is log-regression trend fitted to last 4 years
g_{c2} is log-regression trend fitted to last 6 years
g_{c3} is log-regression trend fitted to last 8 years
g_{c4} is log-regression trend fitted to last 10 years.

Correlations of the predictions with eight past growth figures are shown in Table 3. Four of these past growth rates were supplied by the participating firms and represent the firms' perceptions of the growth of earnings per share that had occurred in different preceding periods. The others were calculated as the coefficient in the regression of the logarithms of earnings per share on time over the past 4, 6, 8, and 10 years. These correlations generally are not much lower than those found in comparing the predictions with each other. Among the perceived past growth rates, the correlations are apt to be lowest with the growth rates over the most recent year. With the calculated growth rates, there

the correlations are all zero within industries could, however, be rejected well beyond conventional significance levels. Predictor C was dropped from these tests due to paucity of data in many industries.

10. These correlations, for the participants supplying data in both years were:

	A	B	C
B	.19		
C	.04	.04	
D	.07	.11	.29

Only the two largest of these correlations would be significant at the .05 level.

was a tendency for the correlations to increase with the length of period over which the calculations were made.[11]

These comparisons of past with predicted growth rates suggest that the apparent agreement among the predictors may reflect little more than use by all of them of the historic figures. In investigating this possibility, the partial correlations among the predictions, holding constant past perceived growth rates, holding constant past calculated growth rates, and holding both sets constant were calculated. The first two sets of partial correlations were not much smaller than the simple correlations. Holding both sets constant produced the partial correlations shown in Table 4. These are considerably

TABLE 4
PARTIAL CORRELATIONS OF PREDICTIONS
HOLDING PAST GROWTH RATES CONSTANT

	1962				1963			
	A	B	C		A	B	C	D
B	.49			B	.49			
C	.49	.18		C	.25	.03		
D	.35	.39	.22	D	.56	.46	.40	
				E	.56	.62	−.11	.51

NUMBERS OF OBSERVATIONS

	1962				1963			
	A	B	C		A	B	C	D
B	111			B	112			
C	49	49		C	50	50		
D	111	111	49	D	112	112	50	
				E	78	78	36	78

smaller than the simple correlations, though all but the four smallest entries would be significant beyond the .05 level. Thus, while a substantial part of the agreement among predictors appears to result from their use of historic growth figures, there is also evidence that security analysts tend to make similar adjustments to the past growth rates.[12]

Examination of the correlations among past growth rates help both to evaluate the correlations among the predictions and to indicate the sensitivity of measurements of growth rates to the methods by which they were calculated. Table 5 presents correlations between 13 such past growth rates for our 1962 data. The correlations between the different measures of past growth are fairly low. When exactly the same data are used in the calculations, however, the

11. This effect was also found when the calculated growth rates were based on either 1) the regression of earnings per share on time; or, 2) the appropriate root of the ratio of earnings per share at the end of the period to earnings at the beginning.

12. The numbers of observations on which Table 4 is based are considerably smaller than those for which predictions were available. Only a small part of this loss was due to inability to calculate past growth rates due to negative earnings figures. Much more important was the fact that the predictors did not give numerical figures for past growth rates when these would be negative. One might think that the companies for which past growth rates were easily calculated would be ones with highest simple correlations among the predictors. However, the only cases for which this appeared to be true were the correlations of predictor D with A, B, and E.

correlations among the growth rates calculated by different methods are relatively high, though probably not so high that the choice of method of calculation would be a matter of no importance. Finally, the perceived growth rates furnished by the security firms tend to be more highly correlated with the growth rates calculated over longer periods. The increase in correlation coefficients did not continue, however, when calculations over more than ten years were made and, as shown in Table 5, it stopped before ten years in some cases. Correlations for other periods and for the 1963 data were of about the same magnitude as those in Table 5.

TABLE 5

PAST GROWTH CORRELATIONS, 1962*

	g_{p1}	g_{p2}	g_{p3}	g_{p4}	g_{c1}	g_{c2}	g_{c3}	g_{c4}	g_{c5}	g_{c6}	g_{c7}	g_{c8}
g_{p2}	.70											
g_{p3}	.82	.87										
g_{p4}	.49	.39	.37									
g_{c1}	.34	.47	.48	.15								
g_{c2}	.68	.74	.76	.05	.62							
g_{c3}	.81	.89	.97	.15	.49	.90						
g_{c4}	.93	.80	.87	.27	.41	.75	.93					
g_{c5}	.14	.19	.25	.39	.38	.24	.16	.15				
g_{c6}	.34	.46	.47	.14	.96	.59	.45	.37	.53			
g_{c7}	.92	.67	.78	.32	.48	.67	.83	.95	.33	.46		
g_{c8}	.36	.56	.49	.23	.99	.63	.50	.43	.40	.90	.51	
g_{c9}	.87	.75	.88	.18	.46	.77	.93	.99	.17	.40	.91	.43

* $g_{p1} - g_{p4}$, $g_{c1} - g_{c4}$ as defined in footnote to Table 3
g_{c5} is 1 year growth rate calculated from first differences of logarithm
g_{c6} is 4 year growth rate calculated from average of first differences of logs
g_{c7} is 10 year growth rate calculated from average of first differences of logs
g_{c8} is 4 year growth rate calculated from regression of earnings on time
g_{c9} is 10 year growth rate calculated from regression of earnings on time

D. *Comparisons of Predictions with Price-Earnings Ratios.*

Finally, we may examine the extent of agreement among predictors by comparing their forecasts with the price-earnings ratios of the corresponding securities. By utilizing a normative valuation model (see e.g., [4] or [8]) it is possible to calculate an implicit growth rate from the market-determined earnings multiple of a security. Thus, comparisons of the predictions with price-earnings ratios may be interpreted as examinations of the relationship between the forecasts and market-expected growth rates. Correlations with two versions of the price-earnings ratio are shown in Table 6. The prices used were the closing prices for the last day of the year. The earnings were either the actual earnings or the average of the base-earnings figures supplied by A and B for their growth rates. These latter figures represent "normalized" or trend-earnings figures. Specifically, they represent an attempt to estimate what earnings would be in the absence of cyclical or special factors. The correlation coefficients in the table are about the same as those obtained when the forecasts were compared with each other. Since price-earnings ratios are

TABLE 6
CORRELATIONS OF PREDICTIONS WITH PRICE-EARNINGS RATIOS*

	A	B	C	D	E
		1962			
P/E	.76	.80	.86	.56	
P/NE	.82	.83	.83	.55	
		1963			
P/E	.77	.74	.86	.67	.85
P/NE	.81	.76	.80	.60	.85

* P/E is the price/earnings ratio. P/NE is price/average of base (normalized) earnings of A and B.

affected by several variables other than expected growth rates, this exercise underscores the extent of disagreement among the forecasters.

III. ACCURACY OF PREDICTIONS

In assessing the forecasting abilities of the predictors, we encountered one major difficulty. The five years in the future for which the forecasts were made have not yet elapsed. As a result, we were forced to compare the forecasts with the realized growth of actual and normalized earnings (as estimated by Predictors A and B) through 1965. Since the latter figures represent what earnings are thought to be on their long-run growth path, perhaps not too much violence is done to the intentions of the forecasters by making these a standard of comparison.

A. *Method of Evaluation.*

The forecasts were evaluated by the use of simple correlations and by the inequality coefficient,[13]

$$U^2 = \frac{\Sigma(P_i - R_i)^2}{\Sigma R_i^2}, \tag{1}$$

where P_i is the predicted and R_i the realized growth rates for the i^{th} company. It will be noticed that the inequality coefficient, in effect, gives a comparison between perfect prediction ($U^2 = 0$) and a naive prediction of zero growth for all corporations ($U^2 = 1$).

We also investigated the extent to which errors in predictions were related to 1) errors in predicting the average over-all earnings growth of the sample firms; 2) errors in predicting the average growth rate of particular industries; and 3) errors in predicting the growth rates of firms within industries. To accomplish this, we decomposed the numerator of (1) into three parts. The first comes from the average prediction for all companies not being equal to the average realization. The second part arises from differences among the

13. Note that this is similar to the inequality coefficient introduced by Theil [14].

average industry predictions not being equal to the corresponding differences in industry realizations. The third arises from the differences in predictions for the corporations within an industry not being the same as the differences in realization.[14] The proportions of U^2 arising from these three sources will be called U^M, U^{BI}, and U^{WI} respectively for mean errors, between-industry errors, and within-industry errors.

B. *Over-all Accuracy of the Forecasts.*

Statistics summarizing the forecasting abilities of the predictors and the success of using perceived past growth rates to predict the future are presented in Table 7. By and large, the correlations of predicted and realized growth rates are low, though most of them are significantly greater than zero, and the inequality coefficients are large. The major exception to this is Predictor C's forecasts. However, this apparent superiority is largely illusory since C tended to concentrate on large, relatively stable companies and, we suspect, predictions were made only when there was *a priori* reason to believe that the forecasts would be reliable. That this conjecture has some validity is borne out by the fact that the set of companies for which C made forecasts had a lower average instability index than did our whole sample. Moreover, all the other forecasts, including the perceived past growth rates, did better for this set of companies than for the larger set.[15]

Several additional points about the over-all accuracy of the forecasts are worth mentioning. First, the forecasts based on perceived past growth rates, including even growth over the most recent year, do not perform much differently from the predictions. There seems to be no clear-cut forecasting advantage to the careful and involved procedures our predictors employed over their perceptions of past growth rates either in terms of correlation or of the inequality coefficient.

Second, all predictors had a better record than the no-growth forecast for each company. However, it is possible to find a single growth rate that would yield lower mean square errors than any of the predictions. This is a result of the average realized growth rates being considerably higher than the average

14. Letting P_{kj} and R_{kj} be the predicted and realized growth rates for the k^{th} company ($k = 1, \ldots, N_j$) in the j^{th} industry ($j = 1, \ldots, J$), we can write the numerator of (1) as:

$$\sum_{j=1}^{J}\sum_{k=1}^{N_j}(P_{kj}-R_{kj})^2 = \left[\sum_{j=1}^{J} N_j(\bar{P}-\bar{R})^2\right] + \left[\sum_{j=1}^{J} N_j\{(\bar{P}_j-\bar{P})-(\bar{R}_j-\bar{R})\}^2\right]$$
$$+\left[\sum_{j=1}^{J}\sum_{i=1}^{N_j}\{(P_{kj}-\bar{P}_j)-(R_{kj}-\bar{R}_j)\}^2\right],$$

when $\bar{P}_j$, $\bar{R}_j$ are the averages for the j^{th} industry and $\bar{P}$ and $\bar{R}$ are the overall means. The three terms in square brackets are the ones referred to in the text.

15. For this smaller group of companies, the differences among predictors was far less than is suggested by Table 7. It is worth noting that C had a higher correlation and lower inequality index than the others in 1962 (with D a very close second), but both D and E were slightly better on the matched set in 1963.

TABLE 7
ACCURACY OF PREDICTIONS

I. 1962 Predictions Compared with Growth of Actual Earnings 1962-1965

Predictor	A	B	C	D	g_{p1}	g_{p2}	g_{p3}	g_{p4}
Correlation	.07	.16	.66	.45	.22	−.01	.23	.16
U	.80	.78	.57	.67	.74	.88	.74	.78
U^M	.31	.32	.20	.24	.17	.12	.10	.20
U^{BI}	.11	.10	.08	.06	.11	.04	.04	.12
U^{WI}	.58	.58	.71	.70	.73	.84	.75	.68
Number of Observations	185	185	60	178	168	140	140	145

II. 1962 Predictions Compared with Growth of Normalized Earnings 1962-1965

Predictor	A	B	C	D	g_{p1}	g_{p2}	g_{p3}	g_{p4}
Correlation	.26	.32	.68	.45	.23	.16	.38	.09
U	.74	.72	.57	.62	.72	.80	.67	.76
U^M	.25	.25	.08	.13	.09	.12	.09	.19
U^{BI}	.07	.06	.06	.08	.08	.07	.05	.08
U^{WI}	.68	.69	.86	.79	.83	.80	.86	.73
Number of Observations	180	180	59	175	164	136	138	142

III. 1963 Predictions Compared with Growth of Actual Earnings 1963-1965

Predictor	A	B	C	D	E	g_{p1}	g_{p2}	g_{p3}	g_{p4}
Correlation	.05	.16	.78	.47	.29	.20	.31	.22	.55
U	.85	.84	.59	.73	.81	.78	.75	.77	.62
U^M	.33	.34	.27	.28	.40	.20	.19	.16	.27
U^{BI}	.12	.11	.11	.07	.11	.09	.06	.06	.05
U^{WI}	.54	.55	.62	.66	.49	.70	.74	.79	.69
Number of Observations	185	185	62	182	125	167	143	138	169

IV. 1963 Predictions Compared with Growth of Normalized Earnings 1963-1965

Predictor	A	B	C	D	E	g_{p1}	g_{p2}	g_{p3}	g_{p4}
Correlation	.27	.29	.70	.34	.49	.36	.52	.41	.32
U	.78	.78	.61	.70	.74	.69	.64	.67	.69
U^M	.35	.35	.22	.23	.40	.22	.33	.23	.12
U^{BI}	.07	.06	.08	.09	.09	.08	.09	.05	.06
U^{WI}	.58	.59	.70	.68	.50	.70	.57	.72	.82
Number of Observations	180	180	61	177	123	163	139	136	165

expectation of each predictor. This may simply indicate a failure to anticipate the continuation of the expansion through the period considered, but it may also reflect the underestimation of change frequently found in investigating forecasts.[16]

Third, with the exception of the past growth rate in the year immediately preceding the forecast date, all predicted and perceived past growth rates were better at predicting the average normalized growth rates than the actual ones. However, whether this is because normalized earnings gave a better picture

16. See, for example, Zarnowitz [16]. Since almost all the actual growth rates were positive, we do not know whether underestimation of change would also characterize predictions when earnings were generally declining. No forecasters predicted a negative rate of growth.

of the true growth of corporations or because normalized earnings calculations are influenced by past growth-rate forecasts is open to question.

C. *Analysis of the Forecasts by Industrial Categories.*

Turning to the industry breakdown of the forecasts, we find that failure to forecast industry means (U^{BI}) accounted for only a very small proportion of the inequality coefficient. The main sources of inequality were the within-industry errors.

Looking at the correlations of predictions with future growth rates within industries permits us to assess which industries were most difficult to forecast in an *ex post* sense. The extent to which forecasters found the various indus-

TABLE 8
RANK SCORES OF CORRELATIONS OF PREDICTIONS AND REALIZATIONS SUMMED OVER PREDICTORS*

	1962-65 Growth of Actual Earnings	1962-65 Growth of Normalized Earnings	1963-65 Growth of Actual Earnings	1963-65 Growth of Normalized Earnings	Total
Industry					
1)	20	23	20	28	91
2)	18	22	14	25	79
3)	9	11	24	14	58
4)	10	10	8	7	35
5)	5	7	24	26	62
6)	8	5	5	10	28
7)	14	15	20	20	69
8)	24	15	29	14	82
Kendall's W	.76	.74	.72	.65	.32

* Entries are sums of ranks over predictors for correlations of predictions with growth rates indicated in column headings.

tries difficult to predict is indicated in Table 8. To calculate the table, we first ranked each predictor's correlation coefficients between his forecasts and realizations over the eight industry groups. The industry for which the predictor had the most difficulty (worst correlation) was given a rank of one. In Table 8, we present the sums of the ranks for each industry over the four predictors.[17] If the difficulty ranking for all predictors was identical, the rank totals would be 4 for the most difficult industry (in 1963 when there are four predictors compared), 8 for the next most difficult, etc., and the coefficient of concordance (Kendall's W) would be unity. For each of the sets presented, the values of Kendall's W are significant (beyond the .05 level) as were the differences between industries for the correlation coefficients for each predictor.[18] Correlation coefficients between forecasts and realizations tended to

17. Predictor C could not be included in this calculation because of a lack of observations in some industries.

18. The latter, however, was tested only on the basis of the asymptotic distribution of the correlation coefficient and the assumption that the data were distributed normally.

be highest in industries (1) electricals and electronics, (8) "miscellaneous," and (2) electric utilities; they were lowest in (6) foods and stores and (4) oils. Industry (5) drugs, showed very low correlations for the 1962 predictions and high ones for the 1963 predictions. Similar patterns emerged, though more weakly, when perceptions of past growth rates over more than one year were used as forecasts. It is interesting to note that certain industries which were "difficult to forecast" in an *ex ante* sense (see Section II. B) actually turned out to be difficult to predict, *ex post*. For example, there was high (low) agreement among predictors concerning the growth rates for the electric utilities (oils) and also high (low) correlation between predictions and realizations.

In general, we had little success in associating forecasting success with any industry or company characteristics. The differences between industries in forecasting success were only moderately related either to the average growth rates to be realized or to the variances of the realized growth rates. Two of the industries where the highest correlations were found, industries (1) and (2), had respectively the highest and the lowest average growth rates and variances. The third industry where success occurred, (8), fell in the middle range for both quantities. The rank-totals of the last column of Table 8 had a rank correlation with the rank-totals for average growth rates of .14 and of .37 with the rank-totals for the variances.

To further investigate how forecasting ability was related to company characteristics, the corporations were classified according to the quality ratings supplied by two of the predicting firms. There was a tendency for the correlations to be lowest (and negative) in the poorest-quality grouping, but they did not get systematically higher with quality, the highest correlations tending to occur in the middle classes. Similarly, classifying by high, low, or medium values of the instability index showed no pronounced differences in performance. The forecasting performances were again worst for the lowest-quality corporations and best in the middle category. When the corporations were classified by high, medium, or low price-earnings multiple, or past growth rate of earnings, or future growth rates of earnings, sales or assets, no pronounced or significant patterns emerged.

IV. An Appraisal of the Forecasts

The rather poor over-all forecasting performances of the predictors and the fact that their past perceptions of growth rates were about as reliable forecasts as their explicit predictions raises two questions: 1) Does any naive forecasting device based on historic data yield as good forecasts as the painstaking efforts of security analysts? 2) Is it the basically volatile nature of earnings that explains our results and would the predictions appear more accurate if they were taken to be forecasts of more stable measures of the growth of corporations?

To investigate the first of these questions, past growth rates calculated on the basis of arithmetic and logarithmic regressions and on the geometric means of first ratios, calculated over periods up to 14 years, were compared with

TABLE 9
CORRELATIONS OF CALCULATED PAST GROWTH RATES ON REALIZATIONS*

	Growth of Actual Earnings 1962-65	Growth of Normalized Earnings 1962-65	Growth of Actual Earnings 1963-65	Growth of Normalized Earnings 1963-65
I. Correlations				
g_{c1}	.03	.42	.01	.26
g_{c2}	—.15	.19	—.15	.06
g_{c3}	—.13	.15	—.16	.02
g_{c4}	—.10	.09	—.11	—.02
g_{c5}	.22	.62	.18	.46
g_{c6}	.12	.51	.06	.34
g_{c7}	.01	.24	—.01	.12
g_{c8}	—.02	.37	—.03	.23
g_{c9}	—.12	.09	—.14	—.01
II. Inequality Coefficients				
g_{1c}	.93	.79	.93	.85
g_{c2}	1.03	.95	1.01	.96
g_{c3}	.95	.88	.96	.91
g_{c4}	.88	.82	.90	.86
g_{c5}	1.27	1.22	1.11	1.08
g_{c6}	.89	.73	.90	.80
g_{c7}	.83	.75	.86	.80
g_{c8}	.98	.85	.96	.87
g_{c9}	.89	.83	.91	.86

* For definition of g's see footnote to Table 5.

the realized growth rates through 1965. A selection of these comparisons based on data ending in 1962 is found in Table 9.[19]

It is interesting to note first that the calculated growth rates tend to be more closely correlated with the growth rates of normalized earnings than with the growth rates of actual earnings. This is an even more pronounced feature of the calculated growth rates than of the data considered earlier. Second, while the correlations of the calculated growth rates with the realized growth rates tended to be lower than those found for the predictions and perceptions, and fewer of them differed significantly from zero, these differences are not pronounced. However, unlike the earlier data, the calculations seem to have almost no forecasting ability, a finding similar to that of I. M. D. Little [7] for British corporations. Among the calculated rates, those for shorter periods of time tend to be somewhat better in terms of correlation than those for longer ones, a feature highlighted by the strong showing of the growth rates calculated over only one year (g_{c5}). Third, while one would have expected that extrapolations using as the last year for the calculation the same year that is used for the first year in calculation of the realization would have a lower correlation than extrapolations where the data ended a year earlier, in

19. The figures there are typical both of what was found when other periods were used and of the comparisons of calculations ending in 1961 and 1963 with the perceived growth after 1962 and 1963 respectively.

fact the reverse tendency manifested itself. Finally, among the possible ways of calculating growth rates, those based on the geometric means of the first ratios surpassed those based on regressions.

The superiority of the past perceived growth rates over the calculated ones should not be taken too seriously, however, for it was largely due to the fact that negative perceived growth rates were not reported by our participants. The survey respondents only indicated that the rates were negative. As a result, companies for which this was true had to be dropped from the sample when correlations of realized with perceived past growth rates were made. When we dropped the companies whose past calculated growth rates were negative (in order to put the calculated and perceived growth rates on a similar basis), the correlation coefficients of the calculated with the realized growth rates were raised. For example, with this change the first row of Table 9 would read

.30 .53 .17 .42

which compares favorably with the data in Table 7. Similar improvements occurred using the other types of calculated growth rates.

The possibilities of obtaining useful forecasts from simple extrapolation were also examined by calculating growth rates over the four preceding years[20] for (1) earnings plus depreciation, (2) earnings before taxes, (3) sales, (4) assets, and (5) share prices. The correlations of these growth rates calculated to the end of 1962, both with 1962-1965 and 1963-1965 earnings growth and the growth rates of the same variables, are shown in the first five rows of Table 10. It will be noticed that both the levels and the variation of these correlation coefficients are quite similar to those found for the predictions and perceptions of past growth and the equivalently calculated past growth rates of earnings. There was also no marked tendency for the extrapolations to do better at predicting their own growth rates than the growth rates of normalized earnings, but they tended to be better at predicting their own rates than the growth of actual earnings.

The last two rows of Table 10 show the correlations of the price-earnings ratio and the price-to-normalized-earnings ratio with the actual future growth of earnings. As mentioned earlier, these ratios have implicit in them a forecast of the rate of growth anticipated by the market. We find that, in terms of correlation, the market-determined earnings multiples perform no differently from the other predictors we have considered.

A similar picture emerged when the predictions and perceptions of growth rates of earnings were used to predict the growth that would occur in these same variables through the end of 1965. With the exception of the growth of price, the performance of the predictions and perceptions were about the same in terms of correlation as those shown when they were used to forecast the growth of normalized earnings. The inequality coefficients were, if anything, slightly lower. For price growth, however, these forecasts had virtually

20. Other periods and methods of calculating growth rates were also used. The ones presented tended to be very slightly better than the others and are comparable to the most successful of the longer-term earnings extrapolations.

TABLE 10
EXTRAPOLATIONS FROM OTHER SERIES AS PREDICTORS OF EARNINGS AND OWN GROWTH RATES*
(CORRELATION COEFFICIENTS)

	Growth of Actual Earnings 1962-65	Growth of Normalized Earnings 1962-65	Growth of Actual Earnings 1963-65	Growth of Normalized Earnings 1963-65	Growth Rate of Corresponding Variable 1962-65	Growth Rate of Corresponding Variable 1963-65
g_{e1}	.11	.39	.05	.27	.28	.20
g_{e2}	.29	.21	.42	.30	.24	.38
g_{e3}	.23	.37	.15	.29	.39	.31
g_{e4}	.29	.46	.47	.60	.63	.27
g_{e5}	.04	.34	—.03	.20	—.06	.05
P/E	.21	.25	.13	.18	—	—
P/NE	.14	.35	.08	.21	—	—

* g_{e1} is growth of earnings plus depreciation
g_{e2} is growth of earnings plus taxes
g_{e3} is growth of sales
g_{e4} is growth of assets
g_{e5} is growth of price of stock
P/E is price-earnings ratio at end of 1962
P/NE is price-normalized earnings ratio at end of 1962
The period used for the calculations of the growth rates was 1958-62 and the rates were calculated as

$$g = \sqrt[4]{V_{62} / V_{58}} \text{ where } V_{62} \text{ and } V_{58} \text{ are the values of the variables.}$$

no merit, with even poorer performance than they had for the growth of actual earnings.

V. CONCLUSION

In this paper, we have examined the characteristics of a small sample of security analysts' predictions of the long-run earnings growth of corporations. The extent of agreement among the different predictors was considered and their forecasting abilities assessed. Evidence has recently accumulated [7] that earnings growth in past periods is not a useful predictor of future earnings growth. The remarkable conclusion of the present study is that the careful estimates of the security analysts participating in our survey, the bases of which are not limited to public information, perform little better than these past growth rates. Moreover, the market price-earnings ratios themselves were not better than either the analysts' forecasts or the past growth rates in forecasting future earnings growth.

We must be cautious, however, in overgeneralizing these results. We did not have data to investigate directly whether the performance of the predictions of growth in the period considered were atypical of the usual forecasting abilities of such forecasts. The question is important, however, since it can be argued that the peculiarities of the expansion that occurred after the date of the forecasts made the period especially difficult to forecast. Moreover, our work is hampered by the fact that only a few firms were able to participate in our survey. It may also be that shorter-term earnings predictions are considerably more successful relative to naive forecasting methods. Fortunately, we are presently collecting additional data that will help shed light on these conjectures and permit a study of the generation of earnings forecasts and their usefulness in security evaluation.

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DISCOUNTED CASHFLOW MODELS: WHAT THEY ARE AND HOW TO CHOOSE THE RIGHT ONE..

THE FUNDAMENTAL CHOICES FOR DCF VALUATION

- **Cashflows to Discount**
  - Dividends
  - Free Cash Flows to Equity
  - Free Cash Flows to Firm
- **Expected Growth**
  - Stable Growth
  - Two Stages of Growth: High Growth -> Stable Growth
  - Three Stages of Growth: High Growth -> Transition Period -> Stable Growth
- **Discount Rate**
  - Cost of Equity
  - Cost of Capital
- **Base Year Numbers**
  - Current Earnings / Cash Flows
  - Normalized Earnings / Cash Flows

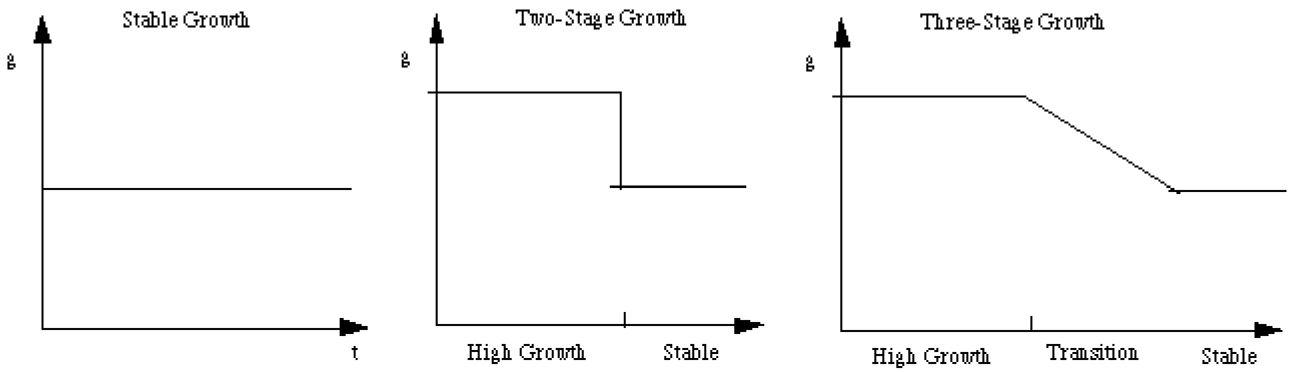
WHICH CASH FLOW TO DISCOUNT...

- **The Discount Rate should be consistent with the cash flow being discounted**
  - Cash Flow to Equity -> Cost of Equity
  - Cash Flow to Firm -> Cost of Capital
- **Should you discount Cash Flow to Equity or Cash Flow to Firm?**
  - *Use Equity Valuation*
    - (a) for firms which have stable leverage, whether high or not, and
    - (b) if equity (stock) is being valued
  - *Use Firm Valuation*
    - (a) for firms which have high leverage, and expect to lower the leverage over time, because
      - debt payments do not have to be factored in
      - the discount rate (cost of capital) does not change dramatically over time.
    - (b) for firms for which you have partial information on leverage (eg: interest expenses are missing..)
    - (c) in all other cases, where you are more interested in valuing the firm than the equity. (Value Consulting?)
- **Given that you discount cash flow to equity, should you discount dividends or Free Cash Flow to Equity?**
  - *Use the Dividend Discount Model*
    - (a) For firms which pay dividends (and repurchase stock) which are close to the Free Cash Flow to Equity (over a extended period)

- (b)For firms where FCFE are difficult to estimate (Example: Banks and Financial Service companies)
- *Use the FCFE Model*
  - (a) For firms which pay dividends which are significantly higher or lower than the Free Cash Flow to Equity. (What is significant? ... As a rule of thumb, if dividends are less than 75% of FCFE or dividends are greater than FCFE)
  - (b) For firms where dividends are not available (Example: Private Companies, IPOs)

WHAT IS THE RIGHT GROWTH PATTERN...

- **The Choices**



THE PRESENT VALUE FORMULAE

- For Stable Firm: $V_0 = \frac{CF_1}{r - g_n}$
- For two stage growth: $V_0 = \frac{CF_0 * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r - g} + \frac{CF_{n+1}}{(r - g_n)(1+r)^n}$
- For three stage growth: $V_0 = \sum_{t=1}^{t=n1} \frac{CF_0 * (1+g_a)^t}{(1+r)^t} + \sum_{t=n1+1}^{t=n2} \frac{CF_t}{(1+r)^t} + \frac{CF_{n2+1}}{(r - g_n)(1+r)^n}$

Definitions of Terms

V_0= Value of Equity (if cash flows to equity are discounted) or Firm (if cash flows to firm are discounted)

CF_t = Cash Flow in period t; *Dividends* or *FCFE* if valuing equity or *FCFF* if valuing firm.

r = Cost of Equity (if discounting Dividends or FCFE) or Cost of Capital (if discounting FCFF)

g = Expected growth rate in Cash Flow being discounted

g_a= Expected growth in Cash Flow being discounted in first stage of three stage growth model

g_n= Expected growth in Cash Flow being discounted in stable period

n = Length of the high growth period in two-stage model

n1 = Length of the first high growth period in three-stage model

n2 - n1 = Transition period in three-stage model

WHICH MODEL SHOULD I USE?

- Use the growth model only if cash flows are positive
- *Use the stable growth model, if*
  - the firm is growing at a rate which is below or close (within 1-2%) to the growth rate of the economy
- *Use the two-stage growth model if*
  - the firm is growing at a moderate rate (... within 8% of the stable growth rate)
- *Use the three-stage growth model if*
  - the firm is growing at a high rate (... more than 8% higher than the stable growth rate)

SUMMARIZING THE MODEL CHOICES

	Dividend Discount Model	**FCFE Model**	**FCFF Model**
Stable Growth Model	• Growth rate in firmís earnings is stable. (g of $\text{firm}_{\text{economy}}$+1%) • Dividends are close to FCFE (or) FCFE is difficult to compute. • Leverage is stable	• Growth rate in firmís earnings is stable. ($g_{\text{firmeconomy}}$+1%) • Dividends are very different from FCFE (or) Dividends not available (Private firm) • Leverage is stable	• Growth rate in firmís earnings is stable. ($g_{\text{firmeconomy}}$+1%) • Leverage is high and expected to change over time (unstable).
Two-Stage Model	• Growth rate in firmís earnings is moderate. • Dividends are close to FCFE (or) FCFE is difficult to compute. • Leverage is stable	• Growth rate in firmís earnings is moderate. • Dividends are very different from FCFE (or) Dividends not available (Private firm) • Leverage is stable	• Growth rate in firmís earnings is moderate. • Leverage is high and expected to change over time (unstable).
Three-Stage Model	• Growth rate in firmís earnings is high.	• Growth rate in firmís earnings is high.	• Growth rate in firmís earnings is high.

	• Dividends are close to FCFE (or) FCFE is difficult to compute. • Leverage is stable	• Dividends are very different from FCFE (or) Dividends not available (Private firm) • Leverage is stable	• Leverage is high and expected to change over time (unstable).

GROWTH AND FIRM CHARACTERISTICS

	Dividend Discount Model	*FCFE Discount Model*	*FCFF Discount Model*
High growth firms generally	• Pay no or low dividends • Earn high returns on projects (ROA) • Have low leverage (D/E) • Have high risk (high betas)	• Have high capital expenditures relative to depreciation. • Earn high returns on projects • Have low leverage • Have high risk	• Have high capital expenditures relative to depreciation. • Earn high returns on projects • Have low leverage • Have high risk
Stable growth firms generally	• Pay large dividends relative to earnings (high payout) • Earn moderate returns on projects (ROA is closer to market or industry average) • Have higher leverage • Have average risk (betas are closer to one.)	• narrow the difference between cap ex and depreciation. (Sometimes they offset each other) • Earn moderate returns on projects (ROA is closer to market or industry average) • Have higher leverage • Have average risk (betas are closer to one.)	• narrow the difference between cap ex and depreciation. (Sometimes they offset each other) • Earn moderate returns on projects (ROA is closer to market or industry average) • Have higher leverage • Have average risk (betas are closer to one.)

SHOULD I NORMALIZE EARNINGS?

- *Why normalize earnings?*
  - The firm may have had an exceptionally good or bad year (which is not expected to be sustainable)
  - The firm is in financial trouble, and its current earnings are below normal or negative.
- *What types of firms can I normalize earnings for?*
  - The firms used to be financially healthy, and the current problems are viewed as temporary.

  - The firm is a small upstart firm in an established industry, where the average firm is profitable.

HOW DO I NORMALIZE EARNINGS?

- If the firm is in trouble because of a recession, and its size has not changed significantly over time,
- *Use average earnings over an extended time period for the firm*

  Normalized Earnings = Average Earnings from past period (5 or 10 years)
- If the firm is in trouble because of a recession, and its size has changed significantly over time,
- *Use average Return on Equity over an extended time period for the firm*

  Normalized Earnings = Current Book Value of Equity * Average Return on Equity (Firm)

- If the firm is in trouble because of firm-specific factors, and the rest of the industry is healthy,
- *Use average Return on Equity for comparable firms*

Normalized Earnings = Current Book Value of Equity * Average Return on Equity (Comparables)

Valuation Approaches and Metrics: A Survey of the Theory and Evidence

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Valuation Approaches and Metrics: A Survey Article

Valuation lies at the heart of much of what we do in finance, whether it is the study of market efficiency and questions about corporate governance or the comparison of different investment decision rules in capital budgeting. In this paper, we consider the theory and evidence on valuation approaches. We begin by surveying the literature on discounted cash flow valuation models, ranging from the first mentions of the dividend discount model to value stocks to the use of excess return models in more recent years. In the second part of the paper, we examine relative valuation models and, in particular, the use of multiples and comparables in valuation and evaluate whether relative valuation models yield more or less precise estimates of value than discounted cash flow models. In the final part of the paper, we set the stage for further research in valuation by noting the estimation challenges we face as companies globalize and become exposed to risk in multiple countries.

Valuation can be considered the heart of finance. In corporate finance, we consider how best to increase firm value by changing its investment, financing and dividend decisions. In portfolio management, we expend resources trying to find firms that trade at less than their true value and then hope to generate profits as prices converge on value. In studying whether markets are efficient, we analyze whether market prices deviate from value, and if so, how quickly they revert back. Understanding what determines the value of a firm and how to estimate that value seems to be a prerequisite for making sensible decisions.

Given the centrality of its role, you would think that the question of how best to value a business, private or public, would have been well researched. As we will show in this paper, the research into valuation models and metrics in finance is surprisingly spotty, with some aspects of valuation, such as risk assessment, being deeply analyzed and others, such as how best to estimate cash flows and reconciling different versions of models, not receiving the attention that they deserve.

Overview of Valuation

Analysts use a wide spectrum of models, ranging from the simple to the sophisticated. These models often make very different assumptions about the fundamentals that determine value, but they do share some common characteristics and can be classified in broader terms. There are several advantages to such a classification -- it makes it is easier to understand where individual models fit in to the big picture, why they provide different results and when they have fundamental errors in logic.

In general terms, there are four approaches to valuation. The first, discounted cashflow valuation, relates the value of an asset to the present value of expected future cashflows on that asset. The second, liquidation and accounting valuation, is built around valuing the existing assets of a firm, with accounting estimates of value or book value often used as a starting point. The third, relative valuation, estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable like earnings, cashflows, book value or sales. The final approach, contingent claim valuation, uses option pricing models to measure the value of assets that share option characteristics. This is what generally falls under the rubric of real options.

Since almost everything in finance can be categorized as a subset of valuation and we run the risk of ranging far from our mission, we will keep a narrow focus in this paper. In particular, we will steer away any work done on real options, since it merits its own survey article. In addition, we will keep our focus on papers that have examined the theory and practice of valuation of companies and stocks, rather than on questions of assessing risk and estimating discount rates that have consumed a great deal of attention in the literature.

Discounted Cash flow Valuation

In discounted cashflows valuation, the value of an asset is the present value of the expected cashflows on the asset, discounted back at a rate that reflects the riskiness of these cashflows. This approach gets the most play in academia and comes with the best theoretical credentials. In this section, we will look at the foundations of the approach and some of the preliminary details on how we estimate its inputs.

Essence of Discounted Cashflow Valuation

We buy most assets because we expect them to generate cash flows for us in the future. In discounted cash flow valuation, we begin with a simple proposition. The value of an asset is not what someone perceives it to be worth but it is a function of the expected cash flows on that asset. Put simply, assets with high and predictable cash flows should have higher values than assets with low and volatile cash flows.

The notion that the value of an asset is the present value of the cash flows that you expect to generate by holding it is neither new nor revolutionary. While knowledge of compound interest goes back thousands of years[1], the concrete analysts of present value was stymied for centuries by religious bans on charging interest on loans, which was treated as usury. In a survey article on the use of discounted cash flow in history, Parker (1968) notes that the earliest interest rate tables date back to 1340 and were prepared by Francesco Balducci Pegolotti, a Florentine merchant and politician, as part of his manuscript titled *Practica della Mercatura*, which was not officially published until

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[1] Neugebauer, O.E.H., 1951, The Exact Sciences in Antiquity, Copenhagen, Ejnar Munksgaard. He notes that interest tables existed in Mesopotamia.

1766.[2] The development of insurance and actuarial sciences in the next few centuries provided an impetus for a more thorough study of present value. Simon Stevin, a Flemish mathematician, wrote one of the first textbooks on financial mathematics in 1582 and laid out the basis for the present value rule in an appendix.[3]

The extension of present value from insurance and lending to corporate finance and valuation can be traced to both commercial and intellectual impulses. On the commercial side, the growth of railroads in the United States in the second half of the nineteenth century created a demand for new tools to analyze long-term investments with significant cash outflows in the earlier years being offset by positive cash flows in the later years. A civil engineer, A.M. Wellington, noted not only the importance of the time value of money but argued that the present value of future cash flows should be compared to the cost of up-front investment.[4] He was followed by Walter O. Pennell, an engineer of Southwestern Bell, who developed present value equations for annuities, to examine whether to install new machinery or retain old equipment.[5]

The intellectual basis for discounted cash flow valuation were laid by Alfred Marshall and Bohm-Bawerk, who discussed the concept of present value in their works in the early part of the twentieth century.[6] In fact, Bohm-Bawerk (1903) provided an explicit example of present value calculations using the example of a house purchase with twenty annual installment payments. However, the principles of modern valuation were developed by Irving Fisher in two books that he published – *The Rate of Interest* in 1907 and *The Theory of Interest* in 1930.[7] In these books, he suggested four alternative approaches for analyzing investments, that he claimed would yield the same results. He argued that when confronted with multiple investments, you should pick the investment (a) that has the highest present value at the market interest rate; (b) where the present

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[2] Parker, R.H., 1968, Discounted Cash Flow in Historical Perspective, Journal of Accounting Research, v6, 58-71.

[3] Stevin, S., 1582, Tables of Interest.

[4] Wellington, A.M., 1887, The Economic Theory of the Location of Railways, Wiley, New York.

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[6] Marshall, A., 1907, Principles of Economics, Macmillan, London; Bohm-Bawerk, A. V., 1903, Recent Literature on Interest, Macmillan.

[7] Fisher, I., 1907, The Rate of Interest, Macmillan, New York; Fisher, I., 1930, The Theory of Interest, Macmillan, New York.

value of the benefits exceeded the present value of the costs the most; (c) with the "rate of return on sacrifice" that most exceeds the market interest rate or (d) that, when compared to the next most costly investment, yields a rate of return over cost that exceeds the market interest rate. Note that the first two approaches represent the net present value rule, the third is a variant of the IRR approach and the last is the marginal rate of return approach. While Fisher did not delve too deeply into the notion of the rate of return, other economists did. Looking at a single investment, Boulding (1935) derived the internal rate of return for an investment from its expected cash flows and an initial investment.[8] Keynes (1936) argued that the "marginal efficiency of capital" could be computed as the discount rate that makes the present value of the returns on an asset equal to its current price and that it was equivalent to Fisher's rate of return on an investment.[9] Samuelson (1937) examined the differences between the internal rate of return and net present value approaches and argued that rational investors should maximize the latter and not the former.[10] In the last 50 years, we have seen discounted cash flow models extend their reach into security and business valuation, and the growth has been aided and abetted by developments in portfolio theory.

Using discounted cash flow models is in some sense an act of faith. We believe that every asset has an intrinsic value and we try to estimate that intrinsic value by looking at an asset's fundamentals. What is intrinsic value? Consider it the value that would be attached to an asset by an all-knowing analyst with access to all information available right now and a perfect valuation model. No such analyst exists, of course, but we all aspire to be as close as we can to this perfect analyst. The problem lies in the fact that none of us ever gets to see what the true intrinsic value of an asset is and we therefore have no way of knowing whether our discounted cash flow valuations are close to the mark or not.

There are four variants of discounted cash flow models in practice, and theorists have long argued about the advantages and disadvantages of each. In the first, we discount expected cash flows on an asset (or a business) at a <u>risk-adjusted discount rate</u> to

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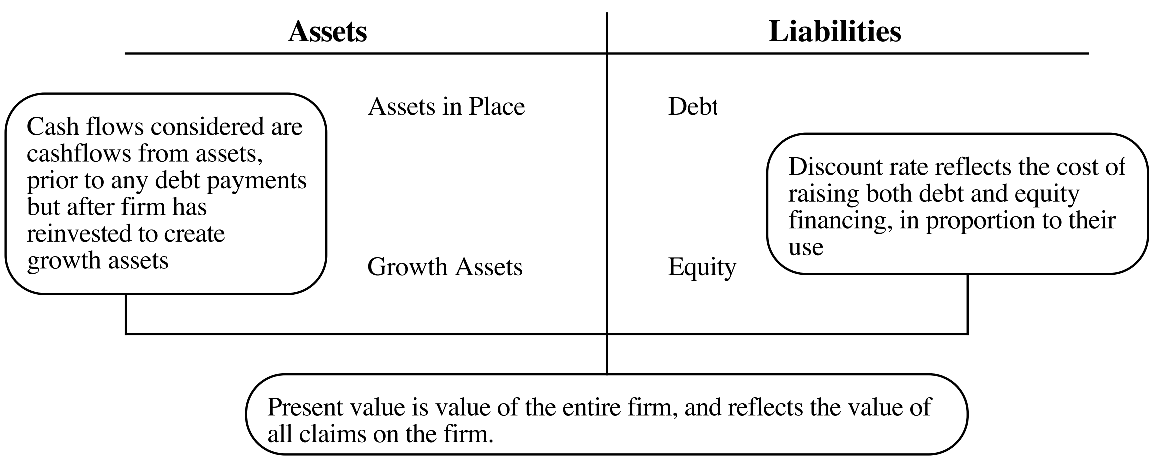
[8] Boulding, K.E., 1935, The Theory of a Single Investment, Quarterly Journal of Economics, v49, 479-494.
[9] Keynes, J.M., 1936, The General Theory of Employment, Macmillan, London.

arrive at the value of the asset. In the second, we adjust the expected cash flows for risk to arrive at what are termed risk-adjusted or certainty equivalent cash flows which we discount at the riskfree rate to estimate the value of a risky asset. In the third, we value a business first, without the effects of debt, and then consider the marginal effects on value, positive and negative, of borrowing money. This approach is termed the adjusted present value approach. Finally, we can value a business as a function of the excess returns we expect it to generate on its investments. As we will show in the following section, there are common assumptions that bind these approaches together, but there are variants in assumptions in practice that result in different values.

Discount Rate Adjustment Models

Of the approaches for adjusting for risk in discounted cash flow valuation, the most common one is the risk adjusted discount rate approach, where we use higher discount rates to discount expected cash flows when valuing riskier assets, and lower discount rates when valuing safer assets. There are two ways in which we can approach discounted cash flow valuation. The first is to value the entire business, with both assets-in-place and growth assets; this is often termed firm or enterprise valuation.

Firm Valuation

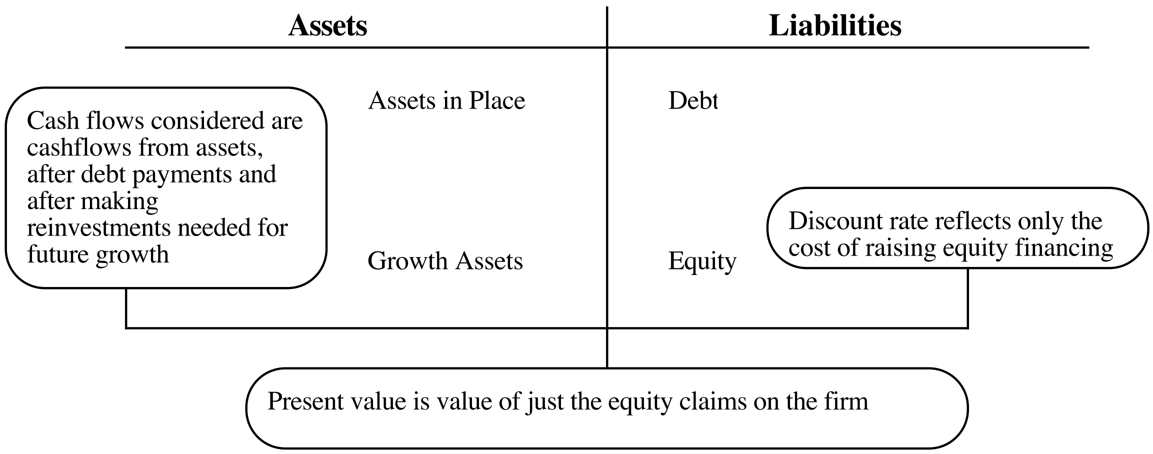


The cash flows before debt payments and after reinvestment needs are termed free cash flows to the firm, and the discount rate that reflects the composite cost of financing from all sources of capital is the cost of capital.

[10] Samuelson, P., 1937, Some Aspects of the Pure Theory of Capital, Quarterly Journal of Economics, v51,

The second way is to just value the equity stake in the business, and this is called equity valuation.

Equity Valuation



The cash flows after debt payments and reinvestment needs are called free cash flows to equity, and the discount rate that reflects just the cost of equity financing is the cost of equity.

Note also that we can always get from the former (firm value) to the latter (equity value) by netting out the value of all non-equity claims from firm value. Done right, the value of equity should be the same whether it is valued directly (by discounting cash flows to equity a the cost of equity) or indirectly (by valuing the firm and subtracting out the value of all non-equity claims).

1. Equity DCF Models

In equity valuation models, we focus our attention of the equity investors in a business and value their stake by discounting the expected cash flows to these investors at a rate of return that is appropriate for the equity risk in the company. The first set of models examined take a strict view of equity cash flows and consider only dividends to be cashflows to equity. These dividend discount models represent the oldest variant of discounted cashflow models. We then consider broader definitions of cash flows to equity, by first including stock buybacks in cash flows to equity and by then expanding out analysis to cover potential dividends or free cash flows to equity.

469-496.

a. Dividend Discount Model

The oldest discounted cash flow models in practice tend to be dividend discount models. While many analysts have turned away from dividend discount models on the premise that they yield estimates of value that are far too conservative, many of the fundamental principles that come through with dividend discount models apply when we look at other discounted cash flow models.

Basis for Dividend Discount Models

When investors buy stock in publicly traded companies, they generally expect to get two types of cashflows - dividends during the holding period and an expected price at the end of the holding period. Since this expected price is itself determined by future dividends, the value of a stock is the present value of dividends through infinity.

$$\text{Value per share of stock} = \sum_{t=1}^{t=\infty} \frac{E(DPS_t)}{(1+k_e)^t}$$

where,

$E(DPS_t)$ = Expected dividends per share in period t

k_e = Cost of equity

The rationale for the model lies in the present value rule - the value of any asset is the present value of expected future cash flows discounted at a rate appropriate to the riskiness of the cash flows. There are two basic inputs to the model - expected dividends and the cost on equity. To obtain the expected dividends, we make assumptions about expected future growth rates in earnings and payout ratios. The required rate of return on a stock is determined by its riskiness, measured differently in different models - the market beta in the CAPM, and the factor betas in the arbitrage and multi-factor models. The model is flexible enough to allow for time-varying discount rates, where the time variation is caused by expected changes in interest rates or risk across time.

While explicit mention of dividend discount models did not show up in research until the last few decades, investors and analysts have long linked equity values to dividends. Perhaps the first book to explicitly connect the present value concept with dividends was *The Theory of Investment Value* by John Burr Williams (1938), where he stated the following:

"A stock is worth the present value of all the dividends ever to be paid upon it, no more, no less... Present earnings, outlook, financial condition, and capitalization should bear upon the price of a stock only as they assist buyers and sellers in estimating future dividends."

Williams also laid the basis for forecasting pro forma financial statements and drew a distinction between valuing mature and growth companies.[11] While much of his work has become shrouded with myth, Ben Graham (1934) also made the connection between dividends and stock values, but not through a discounted valuation model. He chose to develop instead a series of screening measures that including low PE, high dividend yields, reasonable growth and low risk that highlighted stocks that would be under valued using a dividend discount model.[12]

Variations on the Dividend Discount Model

Since projections of dollar dividends cannot be made in perpetuity and publicly traded firms, at least in theory, can last forever, several versions of the dividend discount model have been developed based upon different assumptions about future growth. We will begin with the simplest – a model designed to value stock in a stable-growth firm that pays out what it can afford to in dividends. The value of the stock can then be written as a function of its expected dividends in the next time period, the cost of equity and the expected growth rate in dividends.

$$\text{Value of Stock} = \frac{\text{Expected Dividends next period}}{\text{(Cost of equity - Expected growth rate in perpetuity}}$$

Though this model has made the transition into every valuation textbook, its origins are relatively recent and can be traced to early work by David Durand and Myron Gordon. It was Durand (1957) who noted that valuing a stock with dividends growing at a constant rate forever was a variation of The Petersburg Paradox, a seminal problem in utility theory for which a solution was provided by Bernoulli in the eighteenth century.[13] It was Gordon, though, who popularized the model in subsequent articles and a book, thus

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[11] Williams, J.B., 1938, Theory of Investment Value, Fraser Publishing company (reprint).

[12] Dodd, D. and B. Graham, 1934, Security Analysis, McGraw Hill, New York; Graham, B., 1949, The Intelligent Investor, Collins (reprint).

[13] Durand, D., 1957, Growth Stocks and the St. Petersburg Paradox, Journal of Finance, v12, 348-363.

giving it the title of the Gordon growth model.[14] While the Gordon growth model is a simple approach to valuing equity, its use is limited to firms that are growing at stable rates that can be sustained forever. There are two insights worth keeping in mind when estimating a 'stable' growth rate. First, since the growth rate in the firm's dividends is expected to last forever, it cannot exceed the growth rate of the economy in which the firm operates. The second is that the firm's other measures of performance (including earnings) can also be expected to grow at the same rate as dividends. To see why, consider the consequences in the long term of a firm whose earnings grow 3% a year forever, while its dividends grow at 4%. Over time, the dividends will exceed earnings. On the other hand, if a firm's earnings grow at a faster rate than dividends in the long term, the payout ratio, in the long term, will converge towards zero, which is also not a steady state. Thus, though the model's requirement is for the expected growth rate in dividends, analysts should be able to substitute in the expected growth rate in earnings and get precisely the same result, if the firm is truly in steady state.

In response to the demand for more flexibility when faced with higher growth companies, a number of variations on the dividend discount model were developed over time in practice. The simplest extension is a two-stage growth model allows for an initial phase where the growth rate is not a stable growth rate and a subsequent steady state where the growth rate is stable and is expected to remain so for the long term. While, in most cases, the growth rate during the initial phase will be higher than the stable growth rate, the model can be adapted to value companies that are expected to post low or even negative growth rates for a few years and then revert back to stable growth. The value of equity can be written as the present value of expected dividends during the non-stable growth phase and the present value of the price at the end of the high growth phase, usually computed using the Gordon growth model:

$$P_0 = \sum_{t=1}^{t=n} \frac{E(DPS_t)}{(1+ \text{Cost of Equity})^t} + \frac{P_n}{(1+ \text{Cost of Equity})^n} \text{ where } P_n = \frac{E(DPS_{n+1})}{(\text{Cost of Equity} - g)}$$

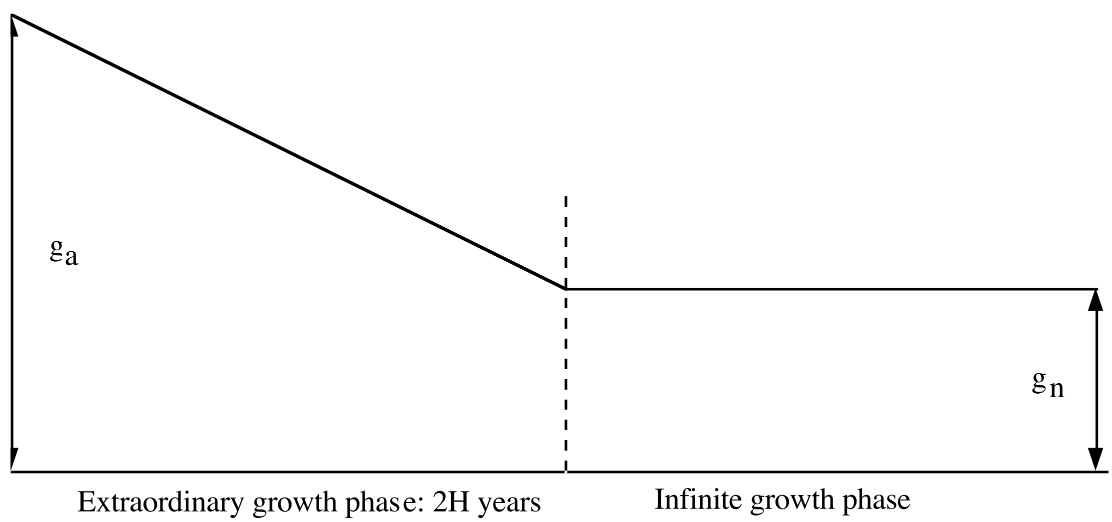
where $E(DPS_t)$ is the expected dividends per share in period t and g is the stable growth rate after n years. More complicated variants of this model allow for more than two

[14] Gordon, M.J., 1962, The Investment, Financing and Valuation of the Corporation, Homewood, Illinois:

stages of growth, with a concurrent increase in the number of inputs that have to be estimated to value a company, but no real change in the underlying principle that the value of a stock is the present value of the expected dividends.[15]

To allow for computational simplicity with higher growth models, some researchers added constraints on other aspects of firm behavior including risk and dividend payout to derive "simpler" high growth models. For instance, the H model is a two-stage model for growth, but unlike the classical two-stage model, the growth rate in the initial growth phase is not constant but declines linearly over time to reach the stable growth rate in steady state. This model was presented in Fuller and Hsia (1984) and is based upon the assumption that the earnings growth rate starts at a high initial rate (g_a) and declines linearly over the extraordinary growth period (which is assumed to last 2H periods) to a stable growth rate (g_n).[16] It also assumes that the dividend payout and cost of equity are constant over time and are not affected by the shifting growth rates. Figure 1 graphs the expected growth over time in the H Model.

Figure 1: Expected Growth in the H Model



Richard D. Irwin, Inc.

[15] The development of multi-stage dividend discount models can be attributed more to practitioners than academic researchers. For instance, Sanford Bernstein, an investment firm founded in 1967, has used a proprietary two-stage dividend discount model to analyze stocks for decades. An extensive categorization of multi-stage models is provided in Damodaran, A., 1994, Damodaran on Valuation, John Wiley, New York.

[16] Fuller, R.J. and C. Hsia, 1984, A Simplified Common Stock Valuation Model, Financial Analysts Journal, v40, 49-56.

The value of expected dividends in the H Model can be written as:

$$P_0 = \frac{DPS_0 * (1+g_n)}{(r - g_n)} + \frac{DPS_0 * H * (g_a - g_n)}{(r - g_n)}$$

where DPS_0 is the current dividend per share and growth is expected to decline linearly over the next 2H years to a stable growth rate of g_n. This model avoids the problems associated with the growth rate dropping precipitously from the high growth to the stable growth phase, but it does so at a cost. First, the decline in the growth rate is expected to follow the strict structure laid out in the model -- it drops in linear increments each year based upon the initial growth rate, the stable growth rate and the length of the extraordinary growth period. While small deviations from this assumption do not affect the value significantly, large deviations can cause problems. Second, the assumption that the payout ratio is constant through both phases of growth exposes the analyst to an inconsistency -- as growth rates decline the payout ratio usually increases. The allowance for a gradual decrease in growth rates over time may make this a useful model for firms which are growing rapidly right now, but where the growth is expected to decline gradually over time as the firms get larger and the differential advantage they have over their competitors declines. The assumption that the payout ratio is constant, however, makes this an inappropriate model to use for any firm that has low or no dividends currently. Thus, the model, by requiring a combination of high growth and high payout, may be quite limited in its applicability [17].

Applicability of the Dividend Discount Model

While many analysts have abandoned the dividend discount model, arguing that its focus on dividends is too narrow, the model does have its proponents. The dividend discount model's primary attraction is its simplicity and its intuitive logic. After all, dividends represent the only cash flow from the firm that is tangible to investors. Estimates of free cash flows to equity and the firm remain estimates and conservative investors can reasonably argue that they cannot lay claim on these cash flows. The second advantage of using the dividend discount model is that we need fewer

[17] Proponents of the model would argue that using a steady state payout ratio for firms that pay little or no dividends is likely to cause only small errors in the valuation.

assumptions to get to forecasted dividends than to forecasted free cashflows. To get to the latter, we have to make assumptions about capital expenditures, depreciation and working capital. To get to the former, we can begin with dividends paid last year and estimate a growth rate in these dividends. Finally, it can be argued that managers set their dividends at levels that they can sustain even with volatile earnings. Unlike cash flows that ebb and flow with a company's earnings and reinvestments, dividends remain stable for most firms. Thus, valuations based upon dividends will be less volatile over time than cash flow based valuations.

The dividend discount model's strict adherence to dividends as cash flows does expose it to a serious problem. Many firms choose to hold back cash that they can pay out to stockholders. As a consequence, the free cash flows to equity at these firms exceed dividends and large cash balances build up. While stockholders may not have a direct claim on the cash balances, they do own a share of these cash balances and their equity values should reflect them. In the dividend discount model, we essentially abandon equity claims on cash balances and under value companies with large and increasing cash balances. At the other end of the spectrum, there are also firms that pay far more in dividends than they have available in cash flows, often funding the difference with new debt or equity issues. With these firms, using the dividend discount model can generate value estimates that are too optimistic because we are assuming that firms can continue to draw on external funding to meet the dividend deficits in perpetuity.

Notwithstanding its limitations, the dividend discount model can be useful in three scenarios.

- It establishes a <u>baseline or floor value</u> for firms that have cash flows to equity that exceed dividends. For these firms, the dividend discount model will yield a conservative estimate of value, on the assumption that the cash not paid out by managers will be wasted n poor investments or acquisitions.
- It yields realistic estimates of value per share for <u>firms that do pay out their free cash flow to equity as dividends</u>, at least on average over time. There are firms, especially in mature businesses, with stable earnings, that try to calibrate their dividends to available cashflows. At least until very recently, regulated utility companies in the United States, such as phone and power, were good examples of such firms.

- In sectors where <u>cash flow estimation is difficult or impossible</u>, dividends are the only cash flows that can be estimated with any degree of precision. There are two reasons why dividend discount model remain widely used to value financial service companies. The first is that estimating capital expenditures and working capital for a bank, an investment bank or an insurance company is difficult to do.[18] The second is that retained earnings and book equity have real consequences for financial service companies since their regulatory capital ratios are computed on the basis of book value of equity.

In summary, then, the dividend discount model has far more applicability than its critics concede. Even the conventional wisdom that the dividend discount model cannot be used to value a stock that pays low or no dividends is wrong. If the dividend payout ratio is adjusted to reflect changes in the expected growth rate, a reasonable value can be obtained even for non-dividend paying firms. Thus, a high-growth firm, paying no dividends currently, can still be valued based upon dividends that it is expected to pay out when the growth rate declines. In practice, Michaud and Davis (1981) note that the dividend discount model is biased towards finding stocks with high dividend yields and low P/E ratios to be under valued.[19] They argue that the anti-growth bias of the dividend discount model can be traced to the use of fixed and often arbitrary risk premiums and costs of equity, and suggest that the bias can be reduced or even eliminated with the use of market implied risk premiums and returns.

How well does the dividend discount model work?

The true measure of a valuation model is how well it works in (i) explaining differences in the pricing of assets at any point in time and across time and (ii) how quickly differences between model and market prices get resolved.

Researchers have come to mixed conclusions on the first question, especially at it relates to the aggregate equity market. Shiller (1981) presents evidence that the volatility

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[18] This is true for any firm whose primary asset is human capital. Accounting conventions have generally treated expenditure on human capital (training, recruiting etc.) as operating expenditures. Working capital is meaningless for a bank, at least in its conventional form since current assets and liabilities comprise much of what is on the balance sheet.

[19] Michaud, R.O. and P.L. Davis, 1981, Valuation Model Bias and the Scale Structure of Dividend Discount Returns, Journal of Finance, v37, 563-573.

in stock prices is far too high to be explained by variance in dividends over time; in other words, market prices vary far more than the present value of dividends.[20] In attempts to explain the excess market volatility, Poterba and Summers (1988) argue that risk premiums can change over time[21] and Fama and French (1988) note that dividend yields are much more variable than dividends.[22] Looking at a much longer time period (1871-2003), Foerster and Sapp (2005) find that the dividend discount model does a reasonably good job of explaining variations in the S&P 500 index, though there are systematic differences over time in how investors value future dividends.[23]

To answer the second question, Sorensen and Williamson (1985) valued 150 stocks from the S&P 400 in December 1980, using the dividend discount model.[24] They used the difference between the market price at that time and the model value to form five portfolios based upon the degree of under or over valuation. They made fairly broad assumptions in using the dividend discount model:

(a) The average of the earnings per share between 1976 and 1980 was used as the current earnings per share.

(b) The cost of equity was estimated using the CAPM.

(c) The extraordinary growth period was assumed to be five years for all stocks and the I/B/E/S consensus analyst forecast of earnings growth was used as the growth rate for this period.

(d) The stable growth rate, after the extraordinary growth period, was assumed to be 8% for all stocks.

(e) The payout ratio was assumed to be 45% for all stocks.

The returns on these five portfolios were estimated for the following two years (January 1981-January 1983) and excess returns were estimated relative to the S&P 500 Index using the betas estimated at the first stage. Figure 2 illustrates the excess returns earned

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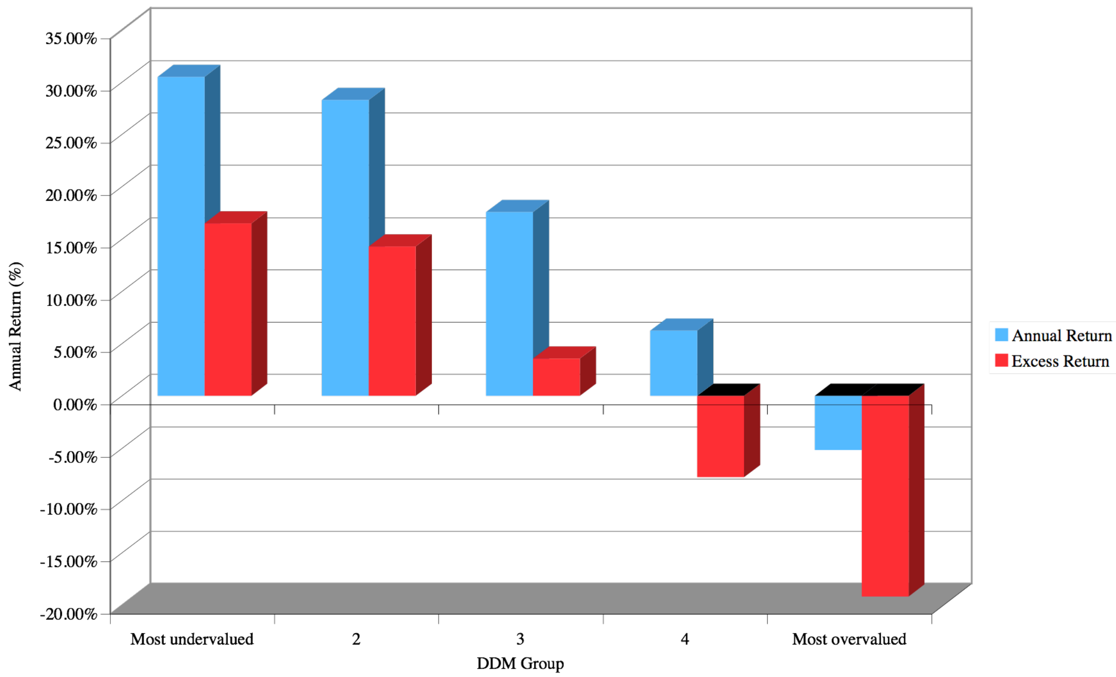
20 Shiller, R., 1981, Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends? American Economic Review, v71, 421-436.
21 Poterba, J., and L. Summers, 1988, Mean reversion in stock prices: evidence and implications, Journal of Financial Economics, v22, 27-59.
22 Fama, E. and K. French, 1988, Dividend Yields and Expected Stock Returns, Journal of Financial Economics 22, 3-25.
23 Foerster, S.R. and S.G. Sapp, 2005, Dividends and Stock Valuation: A Study of the Nineteenth to the Twenty-first Century, Working Paper, University of Western Ontario.
24 Sorensen, E.H. and D.A. Williamson, 1985, Some Evidence on the Value of the Dividend Discount

by the portfolio that was undervalued by the dividend discount model relative to both the market and the overvalued portfolio.

Figure 2: Performance of Dividend Discount Model



The undervalued portfolio had a positive excess return of 16% per annum between 1981 and 1983, while the overvalued portfolio had a negative excess return of almost 20% per annum during the same time period. In the long term, undervalued (overvalued) stocks from the dividend discount model outperform (under perform) the market index on a risk-adjusted basis. However, this result should be taken with a grain of salt, given that the dividend discount model tends to find stocks with high dividend yields and low PE ratios to be under valued, and there is well established empirical evidence showing that stocks with those characteristics generate excess returns, relative to established risk and return models in finance. In other words, it is unclear how much of the superior performance attributed to the dividend discount model could have been replicated with a far simpler strategy of buying low PE stocks with high dividend yields.

Model, Financial Analysts Journal, v41, 60-69.

b. Extended Equity Valuation Models

In the dividend discount model, we implicitly assume that firms pay out what they can afford to as dividends. In reality, though, firms often choose not to do so. In some cases, they accumulate cash in the hope of making investments in the future. In other cases, they find other ways, including buybacks, of returning cash to stockholders. Extended equity valuation models try to capture this cash build-up in value by considering the cash that could have been paid out in dividends rather than the actual dividends.

Dividends versus Potential Dividends

Fama and French (2001) report that only 20.8% of firms paid dividends in 1999, compared with 66.5% in 1978 and find that only a portion of the decline can be attributed to changes in firm characteristics; there were more small cap, high growth firms in 1999 than in 1978. After controlling for differences, they conclude that firms became less likely to pay dividends over the period.[25]

The decline in dividends over time has been attributed to a variety of factors. DeAngelo, DeAngelo and Skinner (2004) argue that aggregate dividends paid by companies has not decreased and that the decreasing dividends can be traced to smaller firms that are uninterested in paying dividends.[26] Baker and Wurgler (2004) provide a behavioral rationale by pointing out that the decrease in dividends over time can be attributed to an increasing segment of investors who do not want dividends.[27] Hoberg and Prabhala (2005) posit that the decrease in dividends is because of an increase in risk, by noting that increases in idiosyncratic risk (rather than dividend clientele) explain the drop in dividends.[28] Notwithstanding the reasons, the gap between dividends paid and potential dividends has increased over time both in the aggregate and for individual firms, creating a challenge to those who use dividend discount models.

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[25] Fama, E.F. and K.R. French, 2001, 2001, Disappearing dividends: Changing firm characteristics or lower propensity to pay?, Journal of Financial Economics 60, 3–44.

[26] DeAngelo, H., L. DeAngelo, and D. Skinner, 2004, Are dividends disappearing? Dividend concentration and the consolidation of earnings, Journal of Financial Economics, v72, 425–456.

[27] Baker, M., and J. Wurgler, 2004a, Appearing and disappearing dividends: The link to catering incentives, Journal of Financial Economics 73, 271–288. Baker, M., and J. Wurgler 2004b, A catering theory of dividends, The Journal of Finance 59, 1125–1165.

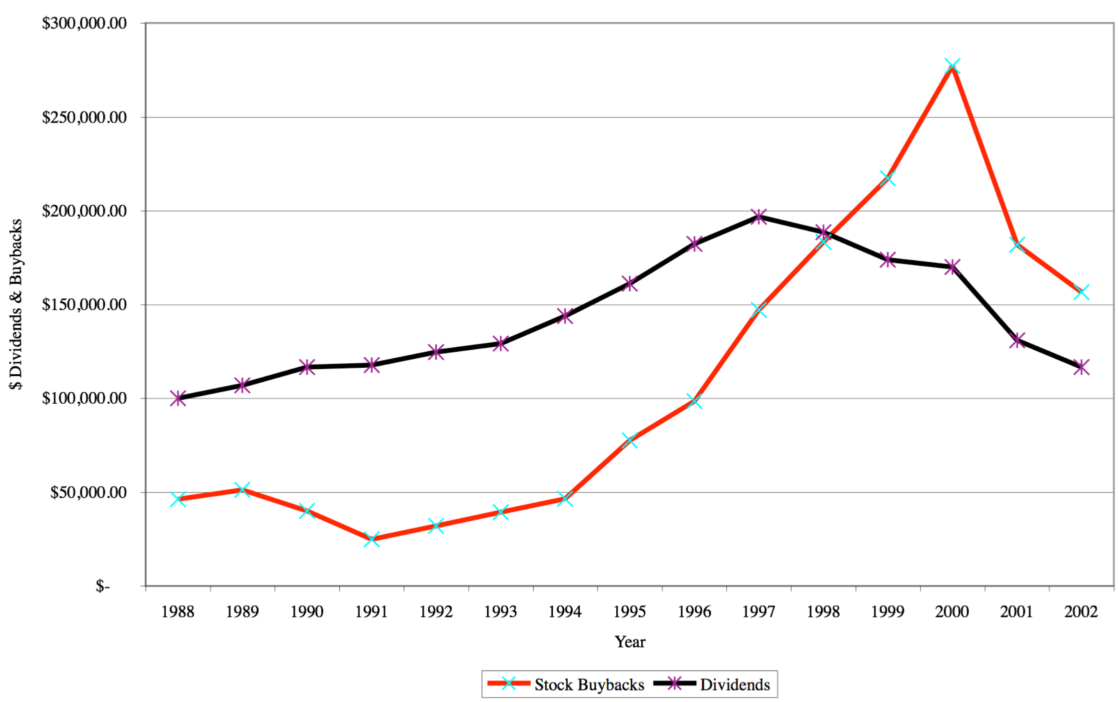
[28] Hoberg, G. and N.R. Prabhala, 2005, Disappearing Dividends: The Importance of idiosyncratic risk and the irrelevance of catering, Working Paper, University of Maryland.

One fix for this problem is to replace dividends in the dividend discount models with potential dividends, but that raises an estimation question: How do we best estimate potential dividends? There are three suggested variants. In the first, we extend our definition of cash returned to stockholders to include stock buybacks, thus implicitly assuming that firms that accumulate cash by not paying dividends return use them to buy back stock. In the second, we try to compute the cash that could have been paid out as dividends by estimating the residual cash flow after meeting reinvestment needs and making debt payments. In the third, we either accounting earnings or variants of earnings as proxies for potential dividends.

Buybacks as Dividends

One reason for the fall of the dividend discount model from favor has been the increased use of stock buybacks as a way of returning cash to stockholders. A simple response to this trend is to expand the definition of dividends to include stock buybacks and to value stocks based on this composite number. In recent years, firms in the United States have increasingly turned to stock buybacks as a way of returning cash to stockholders. Figure 3 presents the cumulative amounts paid out by firms in the form of dividends and stock buybacks from 1989 to 2002.

Figure 3: Stock Buybacks and Dividends: Aggregate for US Firms - 1989-2002



The trend towards stock buybacks is very strong, especially in the 1990s. By early 2000, more cash was being returned to stockholders in stock buybacks than in conventional dividends.

What are the implications for the dividend discount model? Focusing strictly on dividends paid as the only cash returned to stockholders exposes us to the risk that we might be missing significant cash returned to stockholders in the form of stock buybacks. The simplest way to incorporate stock buybacks into a dividend discount model is to add them on to the dividends and compute a modified payout ratio:

$$\text{Modified dividend payout ratio} = \frac{\text{Dividends} + \text{Stock Buybacks}}{\text{Net Income}}$$

While this adjustment is straightforward, the resulting ratio for any year can be skewed by the fact that stock buybacks, unlike dividends, are not smoothed out. In other words, a firm may buy back $ 3 billion in stock in one year and not buy back stock for the next 3 years. Consequently, a much better estimate of the modified payout ratio can be obtained by looking at the average value over a four or five year period. In addition, firms may sometimes buy back stock as a way of increasing financial leverage. If this is a concern, we could adjust for this by netting out new debt issued from the calculation above:

$$\text{Modified dividend payout} = \frac{\text{Dividends} + \text{Stock Buybacks} - \text{Long Term Debt issues}}{\text{Net Income}}$$

Damodaran (2006) presents this extension to the basic dividend discount model and argues that it works well in explaining the market prices of companies that follow a policy of returning cash over regular intervals in the form of stock buybacks.[29]

Free Cash Flow to Equity (FCFE) Model

The free cash flow to equity model does not represent a radical departure from the traditional dividend discount model. In fact, one way to describe a free cash flow to equity model is that it represents a model where we discount potential dividends rather than actual dividends. Damodaran (1994) a measure of free cash flow to equity that captures the cash flow left over all reinvestment needs and debt payments:

FCFE = Net Income + Depreciation - Capital Expenditures – Change in non-cash Working Capital – (New Debt Issued – Debt repayments)

Practitioners have long used variants of free cash flow to equity to judge the attractiveness of companies as investments. Buffett, for instance, has argued that investors should judge companies based upon what he called "owner's earnings", which he defined to be cash flows left over after capital expenditures and working capital needs, a measure of free cash flow to equity that ignores cash flows from debt.[30]

When we replace the dividends with FCFE to value equity, we are doing more than substituting one cash flow for another. We are implicitly assuming that the FCFE will be paid out to stockholders. There are two consequences.

1. There will be no future cash build-up in the firm, since the cash that is available after debt payments and reinvestment needs is paid out to stockholders each period.
2. The expected growth in FCFE will include growth in income from operating assets and not growth in income from increases in marketable securities. This follows directly from the last point.

How does discounting free cashflows to equity compare with the modified dividend discount model, where stock buybacks are added back to dividends and discounted? You can consider stock buybacks to be the return of excess cash accumulated largely as a consequence of not paying out their FCFE as dividends. Thus, FCFE represent a smoothed out measure of what companies can return to their stockholders over time in the form of dividends and stock buybacks.

The FCFE model treats the stockholder in a publicly traded firm as the equivalent of the owner in a private business. The latter can lay claim on all cash flows left over in the business after taxes, debt payments and reinvestment needs have been met. Since the free cash flow to equity measures the same for a publicly traded firm, we are assuming that stockholders are entitled to these cash flows, even if managers do not choose to pay them out. In essence, the FCFE model, when used in a publicly traded firm, implicitly assumes that there is a strong corporate governance system in place. Even if stockholders cannot force managers to return free cash flows to equity as dividends, they can put pressure on managers to ensure that the cash that does not get paid out is not wasted.

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[29] Damodaran, A. 2006, Damodaran on Valuation, Second Edition, John Wiley and Sons, New York.
[30] Hagstrom, R., 2004, The Warren Buffett Way, John Wiley, New York.

As with the dividend discount model, there are variations on the free cashflow to equity model, revolving around assumptions about future growth and reinvestment needs. The constant growth FCFE model is designed to value firms that are growing at a stable rate and are hence in steady state. The value of equity, under the constant growth model, is a function of the expected FCFE in the next period, the stable growth rate and the required rate of return.

$$P_0 = \frac{\text{Expected FCFE}_1}{\text{Cost of Equity} - \text{Stable Growth Rate}}$$

The model is very similar to the Gordon growth model in its underlying assumptions and works under some of the same constraints. The growth rate used in the model has to be less than or equal to the expected nominal growth rate in the economy in which the firm operates. The assumption that a firm is in steady state also implies that it possesses other characteristics shared by stable firms. This would mean, for instance, that capital expenditures, relative to depreciation, are not disproportionately large and the firm is of 'average' risk. Damodaran (1994, 2002) examines two-stage and multi-stage versions of these models with the estimation adjustments that have to be made as growth decreases over time. The assumptions about growth are similar to the ones made by the multi-stage dividend discount model, but the focus is on FCFE instead of dividends, making it more suited to value firms whose dividends are significantly higher or lower than the FCFE. In particular, it gives more realistic estimates of value for equity for high growth firms that are expected to have negative cash flows to equity in the near future. The discounted value of these negative cash flows, in effect, captures the effect of the new shares that will be issued to fund the growth during the period, and thus indirectly captures the dilution effect of value of equity per share today.

Earnings Models

The failure of companies to pay out what they can afford to in dividends and the difficulties associated with estimating cash flows has led some to argue that firms are best valued by discounting earnings or variants of earnings. Ohlson (1995) starts with the dividend discount model but adds an overlay of what he terms a “clean surplus” relation, where the goodwill on the balance sheet represents the present value of future abnormal earnings. He goes on to show that the value of a stock can be written in terms of its book value and capitalized current earnings, adjusted for dividends.[31] Feltham and Ohlson (1995) build on the same argument to establish a relationship between value and earnings.[32] Penman and Sougiannis (1997) also argue that GAAP earnings can be substituted for dividends in equity valuation, as long as analysts reduce future earnings and book value to reflect dividend payments.[33] Since these models are built as much on book value as they are on earnings, we will return to consider them in the context of accounting valuation models.

While it is possible, on paper, to establish the equivalence of earnings-based and dividend discount models, if done right, the potential for double counting remains high with the former. In particular, discounting earnings as if they were cash flows paid out to stockholders while also counting the growth that is created by reinvesting those earnings will lead to the systematic overvaluation of stocks. In one of the more egregious examples of this double counting, Glassman and Hassett (2000) assumed that equity was close to risk free in the long term and discounted earnings as cash flows, while counting on long term earnings growth set equal to nominal GDP growth, to arrive at the conclusion that the Dow Jones should be trading at three times its then prevailing level.[34]

Potential Dividend versus Dividend Discount Models

The FCFE model can be viewed as an alternative to the dividend discount model. Since the two approaches sometimes provide different estimates of value for equity, it is worth examining when they provide similar estimates of value, when they provide different estimates of value and what the difference tells us about the firm.

There are two conditions under which the value from using the FCFE in discounted cashflow valuation will be the same as the value obtained from using the dividend discount model. The first is the obvious one, where the dividends are equal to the FCFE. There are firms that maintain a policy of paying out excess cash as dividends

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[31]Ohlson, J. 1995, Earnings, Book values and Dividends in Security Valuation, Contemporary Accounting Research, v11, 661-687.

[32]Feltham, G. and J. Ohlson. 1995. Valuation and Clean Surplus Accounting of Operation and Financial Activities, Contemporary Accounting Research, v11, 689-731.

[33] Penman, S. and T. Sougiannis, 1997. The Dividend Displacement Property and the Substitution of Anticipated Earnings for Dividends in Equity Valuation, The Accounting Review, v72, 1-21.

[34] Glassman, J. and K. Hassett, 2000, Dow 36,000: The New Strategy for Profiting from the Coming Rise in the Stock Market, Three Rivers Press.

either because they have pre-committed to doing so or because they have investors who expect this policy of them. The second condition is more subtle, where the FCFE is greater than dividends, but the excess cash (FCFE - Dividends) is invested in fairly priced assets (i.e. assets that earn a fair rate of return and thus have zero net present value). For instance, investing in financial assets that are fairly priced should yield a net present value of zero. To get equivalent values from the two approaches, though, we have to keep track of accumulating cash in the dividend discount model and add it to the value of equity. Damodaran (2006) provides an illustration of this equivalence.[35]

There are several cases where the two models will provide different estimates of value. First, when the FCFE is greater than the dividend and the excess cash either earns below-market interest rates or is invested in negative net present value assets, the value from the FCFE model will be greater than the value from the dividend discount model. There is reason to believe that this is not as unusual as it would seem at the outset. There are numerous case studies of firms, which having accumulated large cash balances by paying out low dividends relative to FCFE, have chosen to use this cash to overpay on acquisitions. Second, the payment of dividends less than FCFE lowers debt-equity ratios and may lead the firm to become under levered, causing a loss in value. In the cases where dividends are greater than FCFE, the firm will have to issue either new stock or debt to pay these dividends or cut back on its investments, leading to at least one of three negative consequences for value. If the firm issues new equity to fund dividends, it will face substantial issuance costs that decrease value. If the firm borrows the money to pay the dividends, the firm may become over levered (relative to the optimal) leading to a loss in value. Finally, if paying too much in dividends leads to capital rationing constraints where good projects are rejected, there will be a loss of value (captured by the net present value of the rejected projects). There is a third possibility and it reflects different assumptions about reinvestment and growth in the two models. If the same growth rate used in the dividend discount and FCFE models, the FCFE model will give a higher value than the dividend discount model whenever FCFE ar
e higher than dividends and a lower value when dividends exceed FCFE. In reality, the growth rate in FCFE should be different from the growth rate in dividends, because the free cash flow to equity is assumed to be paid out to stockholders. In general, when firms

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[35] Damnodaran, A,, 2006, Damodaran on Valuation (Second edition), John Wiley & Sons, New York.

pay out much less in dividends than they have available in FCFE, the expected growth rate and terminal value will be higher in the dividend discount model, but the year-to-year cash flows will be higher in the FCFE model.

When the value using the FCFE model is different from the value using the dividend discount model, with consistent growth assumptions, there are two questions that need to be addressed - What does the difference between the two models tell us? Which of the two models is the appropriate one to use in evaluating the market price? The more common occurrence is for the value from the FCFE model to exceed the value from the dividend discount model. The difference between the value from the FCFE model and the value using the dividend discount model can be considered one component of the value of controlling a firm - it measures the value of controlling dividend policy. In a hostile takeover, the bidder can expect to control the firm and change the dividend policy (to reflect FCFE), thus capturing the higher FCFE value. As for which of the two values is the more appropriate one for use in evaluating the market price, the answer lies in the openness of the market for corporate control. If there is a sizable probability that a firm can be taken over or its management changed, the market price will reflect that likelihood and the appropriate benchmark to use is the value from the FCFE model. As changes in corporate control become more difficult, either because of a firm's size and/or legal or market restrictions on takeovers, the value from the dividend discount model will provide the appropriate benchmark for comparison.

2. Firm DCF Models

The alternative to equity valuation is to value the entire business. The value of the firm is obtained by discounting the free cashflow to the firm at the weighted average cost of capital. Embedded in this value are the tax benefits of debt (in the use of the after-tax cost of debt in the cost of capital) and expected additional risk associated with debt (in the form of higher costs of equity and debt at higher debt ratios).

Basis for Firm Valuation Models

In the cost of capital approach, we begin by valuing the firm, rather than the equity. Netting out the market value of the non-equity claims from this estimate yields the value of equity in the firm. Implicit in the cost of capital approach is the assumption that the cost of capital captures both the tax benefits of borrowing and the expected bankruptcy costs. The cash flows discounted are the cash flows to the firm, computed as if the firm had no debt and no tax benefits from interest expenses.

The origins of the firm valuation model lie in one of corporate finance's most cited papers by Miller and Modigliani (1958) where they note that the value of a firm can be written as the present value of its after-tax operating cash flows:[36]

$$\text{Value of firm} = \sum_{t=1}^{t=\infty} \frac{E(X_t - I_t)}{(1+ \text{ Cost of Capital})^t}$$

where X_t is the after-tax operating earnings and I_t is the investment made back into the firm's assets in year t. The focus of that paper was on capital structure, with the argument being that the cost of capital would remain unchanged as debt ratio changed in a world with no taxes, default risk and agency issues. While there are varying definitions of the expected after-tax operating cash flow in use, the most common one is the free cash flow to the firm, defined as follows:

Free Cash Flow to Firm = After-tax Operating Income – (Capital Expenditures – Depreciation) – Change in non-cash Working Capital

In essence, this is a cash flow after taxes and reinvestment needs but before any debt payments, thus providing a contrast to free cashflows to equity that are after interest payments and debt cash flows.

There are two things to note about this model. The first is that it is general enough to survive the relaxing of the assuming of financing irrelevance; in other words, the value of the firm is still the present value of the after-tax operating cash flows in a world where the cost of capital changes as the debt ratio changes. Second, while it is a widely held preconception that the cost of capital approach requires the assumption of a constant debt ratio, the approach is flexible enough to allow for debt ratios that change over time. In fact, one of the biggest strengths of the model is the ease with which changes in the financing mix can be built into the valuation through the discount rate rather than through the cash flows.

The most revolutionary and counter intuitive idea behind firm valuation is the notion that equity investors and lenders to a firm are ultimately partners who supply capital to the firm and share in its success. The primary difference between equity and

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[36]Modigliani, F. and M. Miller, 1958, The Cost of Capital, Corporation Finance and the Theory of Investment, American Economic Review, v48, 261-297.

debt holders in firm valuation models lies in the nature of their cash flow claims – lenders get prior claims to fixed cash flows and equity investors get residual claims to remaining cash flows.

Variations on firm valuation models

As with the dividend discount and FCFE models, the FCFF model comes in different forms, largely as the result of assumptions about how high the expected growth is and how long it is likely to continue. As with the dividend discount and FCFE models, a firm that is growing at a rate that it can sustain in perpetuity – a stable growth rate – can be valued using a stable growth mode using the following equation:

$$\text{Value of firm} = \frac{FCFF_1}{WACC - g_n}$$

where,

$FCFF_1$ = Expected FCFF next year

WACC = Weighted average cost of capital

g_n = Growth rate in the FCFF (forever)

There are two conditions that need to be met in using this model, both of which mirror conditions imposed in the dividend discount and FCFE models. First, the growth rate used in the model has to be less than or equal to the growth rate in the economy – nominal growth if the cost of capital is in nominal terms, or real growth if the cost of capital is a real cost of capital. Second, the characteristics of the firm have to be consistent with assumptions of stable growth. In particular, the reinvestment rate used to estimate free cash flows to the firm should be consistent with the stable growth rate. Implicit in the use of a constant cost of capital for a growing firm is the assumption that the debt ratio of the firm is held constant over time. The implications of this assumption were examined in Miles and Ezzel (1980), who noted that the approach not only assumed tax savings that would grow in perpetuity but that these tax savings were, in effect, being discounted as the unlevered cost of equity to arrive at value.[37]

Like all stable growth models, this one is sensitive to assumptions about the expected growth rate. This sensitivity is accentuated, however, by the fact that the

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[37] Miles, J. and J.R. Ezzell, 1980, The weighted average cost of capital, perfect capital markets and project life: A clarification, Journal of Financial and Quantitative Analysis, v40, 1485-1492.

discount rate used in valuation is the WACC, which is lower than the cost of equity for most firms. Furthermore, the model is sensitive to assumptions made about capital expenditures relative to depreciation. If the inputs for reinvestment are not a function of expected growth, the free cashflow to the firm can be inflated (deflated) by reducing (increasing) capital expenditures relative to depreciation. If the reinvestment rate is estimated from the return on capital, changes in the return on capital can have significant effects on firm value.

Rather than break the free cash flow model into two-stage and three-stage models and risk repeating what was said earlier, we present the general version of the model in this section. The value of the firm, in the most general case, can be written as the present value of expected free cashflows to the firm.

$$\text{Value of Firm} = \sum_{t=1}^{t=\infty} \frac{FCFF_t}{(1+WACC)^t}$$

where,

$FCFF_t$ = Free Cashflow to firm in year t

WACC = Weighted average cost of capital

If the firm reaches steady state after n years and starts growing at a stable growth rate g_n after that, the value of the firm can be written as:

$$\text{Value of Operating Assets of the firm} = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t} + \frac{[FCFF_{n+1}/(WACC - g_n)]}{(1+WACC)^n}$$

Since the cash flows used are cash flows from the operating assets, the cost of capital that is used should reflect only the operating risk of the company. It also follows that the present value of the cash flows obtained by discounting the cash flows at the cost of capital will measure the value of only the operating assets of the firm (which contribute to the operating income). Any assets whose earnings are not part of operating income have not been valued yet. The McKinsey books on valuation have provided extensive coverage both of the estimation questions associated with discounted cash flow valuation and the link between value and corporate financial decisions.[38]

To get from the value of operating assets to the value of equity, we have to first incorporate the value of non-operating assets that are owned by the firm and then subtract out all non-equity claims that may be outstanding against the firm. Non-operating assets include all assets whose earnings are not counted as part of the operating income. The most common of the non-operating assets is cash and marketable securities, which can often amount to billions at large corporations and the value of these assets should be added on to the value of the operating assets. In addition, the operating income from minority holdings in other companies is not included in the operating income and FCFF; we therefore need to value these holdings and add them on to the value of the operating assets. Finally, the firm may own idle and unutilized assets that do not generate earnings or cash flows. These assets can still have value and should be added on to the value of the operating assets. The non-equity claims that have to be subtracted out include not only all debt, but all capitalized leases as well as unfunded pension plan and health care obligations. Damodaran (2006) contains extensive discussions of the adjustments that have to be made to arrive at equity value and further still at equity value per share.[39]

Firm versus Equity Valuation Models

This firm valuation model, unlike the dividend discount model or the FCFE model, values the firm rather than equity. The value of equity, however, can be extracted from the value of the firm by subtracting out the market value of outstanding debt. Since this model can be viewed as an alternative way of valuing equity, two questions arise - Why value the firm rather than equity? Will the values for equity obtained from the firm valuation approach be consistent with the values obtained from the equity valuation approaches described in the previous section?

The advantage of using the firm valuation approach is that cashflows relating to debt do not have to be considered explicitly, since the FCFF is a pre-debt cashflow, while they have to be taken into account in estimating FCFE. In cases where the leverage is

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38 Copeland, T.E., T. Koller and J. Murrin, 1990, Valuation: Measuring and Managing the Value of Companies, John Wiley and Sons (first three editions) and Koller, T., M. Goedhart and D. Wessels, 2005, Valuation: Measuring and Managing the Value of Companies, John Wiley and Sons (Fourth Edition).

39 Damodaran, A., 2006, Damodaran on Valuation, Second Edition, John Wiley and Sons, New York.

expected to change significantly over time, this is a significant saving, since estimating new debt issues and debt repayments when leverage is changing can become increasingly difficult, the further into the future you go. The firm valuation approach does, however, require information about debt ratios and interest rates to estimate the weighted average cost of capital.

The value for equity obtained from the firm valuation and equity valuation approaches will be the same if you make consistent assumptions about financial leverage. Getting them to converge in practice is much more difficult. Let us begin with the simplest case – a no-growth, perpetual firm. Assume that the firm has $166.67 million in earnings before interest and taxes and a tax rate of 40%. Assume that the firm has equity with a market value of $600 million, with a cost of equity of 13.87% debt of $400 million and with a pre-tax cost of debt of 7%. The firm's cost of capital can be estimated.

$$\text{Cost of capital} = (13.87\%)\left(\frac{600}{1000}\right) + (7\%)(1 - 0.4)\left(\frac{400}{1000}\right) = 10\%$$

$$\text{Value of the firm} = \frac{\text{EBIT}(1 - t)}{\text{Cost of capital}} = \frac{166.67(1 - 0.4)}{0.10} = \$1{,}000$$

Note that the firm has no reinvestment and no growth. We can value equity in this firm by subtracting out the value of debt.

Value of equity = Value of firm – Value of debt = $ 1,000 - $400 = $ 600 million

Now let us value the equity directly by estimating the net income:

Net Income = (EBIT – Pre-tax cost of debt * Debt) (1-t) = (166.67 - 0.07*400) (1-0.4) = 83.202 million

The value of equity can be obtained by discounting this net income at the cost of equity:

$$\text{Value of equity} = \frac{\text{Net Income}}{\text{Cost of equity}} = \frac{83.202}{0.1387} = \$\,600 \text{ million}$$

Even this simple example works because of the following assumptions that we made implicitly or explicitly during the valuation.

1. The values for debt and equity used to compute the cost of capital were equal to the values that we obtained in the valuation. Notwithstanding the circularity in reasoning – you need the cost of capital to obtain the values in the first place – it indicates that a cost of capital based upon market value weights will not yield the

same value for equity as an equity valuation model, if the firm is not fairly priced in the first place.

2. There are no extraordinary or non-operating items that affect net income but not operating income. Thus, to get from operating to net income, all we do is subtract out interest expenses and taxes.
3. The interest expenses are equal to the pre-tax cost of debt multiplied by the market value of debt. If a firm has old debt on its books, with interest expenses that are different from this value, the two approaches will diverge.

If there is expected growth, the potential for inconsistency multiplies. We have to ensure that we borrow enough money to fund new investments to keep our debt ratio at a level consistent with what we are assuming when we compute the cost of capital.

Certainty Equivalent Models

While most analysts adjust the discount rate for risk in DCF valuation, there are some who prefer to adjust the expected cash flows for risk. In the process, they are replacing the uncertain expected cash flows with the certainty equivalent cashflows, using a risk adjustment process akin to the one used to adjust discount rates.

Misunderstanding Risk Adjustment

At the outset of this section, it should be emphasized that many analysts misunderstand what risk adjusting the cash flows requires them to do. There are some who consider the cash flows of an asset under a variety of scenarios, ranging from best case to catastrophic, assign probabilities to each one, take an expected value of the cash flows and consider it risk adjusted. While it is true that bad outcomes have been weighted in to arrive at this cash flow, it is still an expected cash flow and is not risk adjusted. To see why, assume that you were given a choice between two alternatives. In the first one, you are offered $ 95 with certainty and in the second, you will receive $ 100 with probability 90% and only $50 the rest of the time. The expected values of both alternatives is $95 but risk averse investors would pick the first investment with guaranteed cash flows over the second one.

If this argument sounds familiar, it is because it is a throwback to the very beginnings of utility theory. In one of the most widely cited thought experiments in economics, Nicholas Bernoulli proposed a hypothetical gamble that updated would look something like this: He would flip a coin once and would pay you a dollar if the coin came up tails on the first flip; the experiment would stop if it came up heads. If you won the dollar on the first flip, though, you would be offered a second flip where you could double your winnings if the coin came up tails again. The game would thus continue, with the prize doubling at each stage, until you lost. How much, he wanted to know, would you be willing to pay to partake in this gamble? This gamble, called the St. Petersburg Paradox, has an expected value of infinity but no person would be willing to pay that much. In fact, most of us would pay only a few dollars to play this game. In that context, Bernoulli unveiled the notion of a certainty equivalent, a guaranteed cash flow that we would accept instead of an uncertain cash flow and argued that more risk averse investors would settle for lower certainty equivalents for a given set of uncertain cash flows than less risk averse investors. In the example given in the last paragraph, a risk averse investor would have settled for a guaranteed cash flow of well below $95 for the second alternative with an expected cash flow of $95.[40]

The practical question that we will address in this section is how best to convert uncertain expected cash flows into guaranteed certainty equivalents. While we do not disagree with the notion that it should be a function of risk aversion, the estimation challenges remain daunting.

Utility Models: Bernoulli revisited

The first (and oldest) approach to computing certainty equivalents is rooted in the utility functions for individuals. If we can specify the utility function of wealth for an individual, we are well set to convert risky cash flows to certainty equivalents for that individual. For instance, an individual with a log utility function would have demanded a certainty equivalent of $79.43 for the risky gamble presented in the last section (90% chance of $ 100 and 10% chance of $ 50):

Utility from gamble = .90 ln(100) + .10 ln(50) = 4.5359

Certainty Equivalent = $\exp^{4.5359}$ = $93.30

[40] Bernoulli, D., 1738, Exposition of a New Theory on the Measurement of Risk. Translated into English in Econometrica, January 1954.

The certainty equivalent of $93.30 delivers the same utility as the uncertain gamble with an expected value of $95. This process can be repeated for more complicated assets, and each expected cash flow can be converted into a certainty equivalent.[41]

One quirk of using utility models to estimate certainty equivalents is that the certainty equivalent of a positive expected cash flow can be negative. Consider, for instance, an investment where you can make $ 2000 with probability 50% and lose $ 1500 with probability 50%. The expected value of this investment is $ 250 but the certainty equivalent may very well be negative, with the effect depending upon the utility function assumed.

There are two problems with using this approach in practice. The first is that specifying a utility function for an individual or analyst is very difficult, if not impossible, to do with any degree of precision. In fact, most utility functions that are well behaved (mathematically) do not seem to explain actual behavior very well. The second is that, even if we were able to specify a utility function, this approach requires us to lay out all of the scenarios that can unfold for an asset (with corresponding probabilities) for every time period. Not surprisingly, certainty equivalents from utility functions have been largely restricted to analyzing simple gambles in classrooms.

Risk and Return Models

A more practical approach to converting uncertain cash flows into certainty equivalents is offered by risk and return models. In fact, we would use the same approach to estimating risk premiums that we employ while computing risk adjusted discount rates but we would use the premiums to estimate certainty equivalents instead.

Certainty Equivalent Cash flow = Expected Cash flow/ (1 + Risk Premium in Risk-adjusted Discount Rate)

Assume, for instance, that Google has a risk-adjusted discount rate of 13.45%, based upon its market risk exposure and current market conditions; the riskfree rate used was 4.25%. Instead of discounting the expected cash flows on the stock at 13.45%, we would

[41] Gregory, D.D., 1978, Multiplicative Risk Premiums, Journal of Financial and Quantitative Analysis, v13, 947-963. This paper derives certainty equivalent functions for quadratic, exponential and gamma distributed utility functions and examines their behavior.

decompose the expected return into a risk free rate of 4.25% and a compounded risk premium of 8.825%.[42]

$$\text{Compounded Risk Premium} = \frac{(1+ \text{ Risk adjusted Discount Rate})}{(1+ \text{ Riskfree Rate})} - 1 = \frac{(1.1345)}{(1.0425)} - 1 = .08825$$

If the expected cash flow in years 1 and 2 are $ 100 million and $ 120 million respectively, we can compute the certainty equivalent cash flows in those years:

Certainty Equivalent Cash flow in year 1 = $ 100 million/1.08825 = $ 91.89 million

Certainty Equivalent Cash flow in year 2 = $120 million/ 1.08825^2 = $ 101.33 million

This process would be repeated for all of the expected cash flows and it has two effects. Formally, the adjustment process for certainty equivalents can be then written more formally as follows (where the risk adjusted return is r and the riskfree rate is r_f):[43]

$$CE\,(CF_t) = \alpha_t\, E(CF_t) = \frac{(1+r_f)^t}{(1+r\ )^t} E(CF_t)$$

This adjustment has two effects. The first is that expected cash flows with higher uncertainty associated with them have lower certainty equivalents than more predictable cash flows at the same point in time. The second is that the effect of uncertainty compounds over time, making the certainty equivalents of uncertain cash flows further into the future lower than uncertain cash flows that will occur sooner.

Cashflow Haircuts

A far more common approach to adjusting cash flows for uncertainty is to "haircut" the uncertain cash flows subjectively. Thus, an analyst, faced with uncertainty, will replace uncertain cash flows with conservative or lowball estimates. This is a weapon commonly employed by analysts, who are forced to use the same discount rate for projects of different risk levels, and want to even the playing field. They will haircut the cash flows of riskier projects to make them lower, thus hoping to compensate for the failure to adjust the discount rate for the additional risk.

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[42] A more common approximation used by many analysts is the difference between the risk adjusted discount rate and the risk free rate. In this case, that would have yielded a risk premium of 9.2% (13.45% - 4.25% = 9.20%)

[43] Robichek, A.A. and S. C. Myers, 1966, Conceptual Problems in the Use of Risk Adjusted Discount Rates, Journal of Finance, v21, 727-730.

In a variant of this approach, there are some investors who will consider only those cashflows on an asset that are predictable and ignore risky or speculative cash flows when valuing the asset. When Warren Buffet expresses his disdain for the CAPM and other risk and return models, and claims to use the riskfree rate as the discount rate, we suspect that he can get away with doing so because of a combination of the types of companies he chooses to invest in and his inherent conservatism when it comes to estimating the cash flows.

While cash flow haircuts retain their intuitive appeal, we should be wary of their usage. After all, gut feelings about risk can vary widely across analysts looking at the same asset; more risk averse analysts will tend to haircut the cashflows on the same asset more than less risk averse analysts. Furthermore, the distinction we drew between diversifiable and market risk when developing risk and return models can be completely lost when analysts are making intuitive adjustments for risk. In other words, the cash flows may be adjusted downwards for risk that will be eliminated in a portfolio. The absence of transparency about the risk adjustment can also lead to the double counting of risk, especially when the analysis passes through multiple layers of analysis. To provide an illustration, after the first analyst looking at a risky investment decides to use conservative estimates of the cash flows, the analysis may pass to a second stage, where his superior may decide to make an additional risk adjustment to the already risk adjusted cash flows.

Risk Adjusted Discount Rate or Certainty Equivalent Cash Flow

Adjusting the discount rate for risk or replacing uncertain expected cash flows with certainty equivalents are alternative approaches to adjusting for risk, but do they yield different values, and if so, which one is more precise? The answer lies in how we compute certainty equivalents. If we use the risk premiums from risk and return models to compute certainty equivalents, the values obtained from the two approaches will be the same. After all, adjusting the cash flow, using the certainty equivalent, and then discounting the cash flow at the riskfree rate is equivalent to discounting the cash flow at a risk adjusted discount rate. To see this, consider an asset with a single cash flow in one year and assume that r is the risk-adjusted cash flow, r_f is the riskfree rate and RP is the compounded risk premium computed as described earlier in this section.

$$\text{Certainty Equivalent Value} = \frac{CE}{(1+r_f)} = \frac{E(CF)}{(1+RP)(1+r_f)} = \frac{E(CF)}{\frac{(1+r)}{(1+r_f)}(1+r_f)} = \frac{E(CF)}{(1+r)}$$

This analysis can be extended to multiple time periods and will still hold.[44] Note, though, that if the approximation for the risk premium, computed as the difference between the risk-adjusted return and the risk free rate, had been used, this equivalence will no longer hold. In that case, the certainty equivalent approach will give lower values for any risky asset and the difference will increase with the size of the risk premium.

Are there other scenarios where the two approaches will yield different values for the same risky asset? The first is when the risk free rates and risk premiums change from time period to time period; the risk-adjusted discount rate will also then change from period to period. Robichek and Myers, in the paper we referenced earlier, argue that the certainty equivalent approach yields more precise estimates of value in this case. The other is when the certainty equivalents are computed from utility functions or subjectively, whereas the risk-adjusted discount rate comes from a risk and return model. The two approaches can yield different estimates of value for a risky asset. Finally, the two approaches deal with negative cash flows differently. The risk-adjusted discount rate discounts negative cash flows at a higher rate and the present value becomes less negative as the risk increases. If certainty equivalents are computed from utility functions, they can yield certainty equivalents that are negative and become more negative as you increase risk, a finding that is more consistent with intuition.[45]

The biggest dangers arise when analysts use an amalgam of approaches, where the cash flows are adjusted partially for risk, usually subjectively and the discount rate is also adjusted for risk. It is easy to double count risk in these cases and the risk adjustment to value often becomes difficult to decipher.

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[44] The proposition that risk adjusted discount rates and certainty equivalents yield identical net present values is shown in the following paper: Stapleton, R.C., 1971, Portfolio Analysis, Stock Valuation and Capital Budgeting Decision Rules for Risky Projects, Journal of Finance, v26, 95-117.

[45] Beedles, W.L., 1978, Evaluating Negative Benefits, Journal of Financial and Quantitative Analysis, v13, 173-176.

Excess Return Models

The model that we have presented in this section, where expected cash flows are discounted back at a risk-adjusted discount rate is the most commonly used discounted cash flow approach but there are variants. In the excess return valuation approach, we separate the cash flows into excess return cash flows and normal return cash flows. Earning the risk-adjusted required return (cost of capital or equity) is considered a normal return cash flow but any cash flows above or below this number are categorized as excess returns; excess returns can therefore be either positive or negative. With the *excess return valuation* framework, the value of a business can be written as the sum of two components:

Value of business = Capital Invested in firm today + Present value of excess return cash flows from both existing and future projects

If we make the assumption that the accounting measure of capital invested (book value of capital) is a good measure of capital invested in assets today, this approach implies that firms that earn positive excess return cash flows will trade at market values higher than their book values and that the reverse will be true for firms that earn negative excess return cash flows.

Basis for Models

Excess return models have their roots in capital budgeting and the net present value rule. In effect, an investment adds value to a business only if it has positive net present value, no matter how profitable it may seem on the surface. This would also imply that earnings and cash flow growth have value only when it is accompanied by excess returns, i.e., returns on equity (capital) that exceed the cost of equity (capital). Excess return models take this conclusion to the logical next step and compute the value of a firm as a function of expected excess returns.

While there are numerous versions of excess return models, we will consider one widely used variant, which is economic value added (EVA) in this section. The economic value added (EVA) is a measure of the surplus value created by an investment or a portfolio of investments. It is computed as the product of the "excess return" made on an investment or investments and the capital invested in that investment or investments.

Economic Value Added = (Return on Capital Invested – Cost of Capital) (Capital Invested) = After-tax operating income – (Cost of Capital) (Capital Invested)

Economic value added is a simple extension of the net present value rule. The net present value of the project is the present value of the economic value added by that project over its life.[46]

$$NPV = \sum_{t=1}^{t=n} \frac{EVA_t}{(1+k_c)^t}$$

where EVA_t is the economic value added by the project in year t and the project has a life of n years and k_c is the cost of capital.

This connection between economic value added and NPV allows us to link the value of a firm to the economic value added by that firm. To see this, let us begin with a simple formulation of firm value in terms of the value of assets in place and expected future growth.[47]

Firm Value = Value of Assets in Place + Value of Expected Future Growth

Note that in a discounted cash flow model, the values of both assets in place and expected future growth can be written in terms of the net present value created by each component.

$$\text{Firm Value} = \text{Capital Invested}_{\text{Assets in Place}} + \text{NPV}_{\text{Assets in Place}} + \sum_{t=1}^{t=\infty} \text{NPV}_{\text{Future Projects, t}}$$

Substituting the economic value added version of net present value into this equation, we get:

$$\text{Firm Value} = \text{Capital Invested}_{\text{Assets in Place}} + \sum_{t=1}^{t=\infty} \frac{\text{EVA}_{\text{t, Assets in Place}}}{(1+k_c)^t} + \sum_{t=1}^{t=\infty} \frac{\text{EVA}_{\text{t, Future Projects}}}{(1+k_c)^t}$$

Thus, the value of a firm can be written as the sum of three components, the capital invested in assets in place, the present value of the economic value added by these assets and the expected present value of the economic value that will be added by future investments.[48]

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[46] This is true, though, only if the expected present value of the cash flows from depreciation is assumed to be equal to the present value of the return of the capital invested in the project. A proof of this equality can be found in Damodaran, A, 1999, Value Enhancement: Back to Basics, Contemporary Finance Digest, v2, 5-51.

[47] Brealey, R.A. and S. C. Myers, 2003, Principles of Corporate Finance (Seventh Edition), McGraw-Hill Irwin.

[48] Brealery, A., 2004, Investment Valuation, Second Edition, John Wiley & Sons, New York.

Measuring Economic Value Added

The definition of EVA outlines three basic inputs we need for its computation - the return on capital earned on investments, the cost of capital for those investments and the capital invested in them. In measuring each of these, we will make many of the same adjustments we discussed in the context of discounted cash flow valuation. Stewart (1991) and Young and O'Byrne (2000) extensively cover the computation of economic value added in their books on the topic.[49]

How much *capital is invested* in existing assets? One obvious answer is to use the market value of the firm, but market value includes capital invested not just in assets in place but in expected future growth[50]. Since we want to evaluate the quality of assets in place, we need a measure of the capital invested in these assets. Given the difficulty of estimating the value of assets in place, it is not surprising that we turn to the book value of capital as a proxy for the capital invested in assets in place. The book value, however, is a number that reflects not just the accounting choices made in the current period, but also accounting decisions made over time on how to depreciate assets, value inventory and deal with acquisitions. The older the firm, the more extensive the adjustments that have to be made to book value of capital to get to a reasonable estimate of the market value of capital invested in assets in place. Since this requires that we know and take into account every accounting decision over time, there are cases where the book value of capital is too flawed to be fixable. Here, it is best to estimate the capital invested from the ground up, starting with the assets owned by the firm, estimating the market value of these assets and cumulating this market value. To evaluate the return on this invested capital, we need an estimate of the *after-tax operating income* earned by a firm on these investments. Again, the accounting measure of operating income has to be adjusted for operating leases, R&D expenses and one-time charges to compute the return on capital. The third and final component needed to estimate the economic value added is the *cost of capital*. In keeping with arguments both in the investment analysis and the discounted cash flow valuation sections, the cost of capital should be estimated based upon the

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[49] Stewart , G. B. (1991), The Quest for Value. The EVA Management Guide. Harper Business; Young, S.D and S.F. OByrne, 2000, EVA and Value-Based Management, McGraw Hill,

[50] As an illustration, computing the return on capital at Google using the market value of the firm, instead of book value, results in a return on capital of about 1%. It would be a mistake to view this as a sign of poor investments on the part of the firm's managers.

market values of debt and equity in the firm, rather than book values. There is no contradiction between using book value for purposes of estimating capital invested and using market value for estimating cost of capital, since a firm has to earn more than its market value cost of capital to generate value. From a practical standpoint, using the book value cost of capital will tend to understate cost of capital for most firms and will understate it more for more highly levered firms than for lightly levered firms. Understating the cost of capital will lead to overstating the economic value added.

In a survey of practices of firms that used economic value added, Weaver (2001) notes that firms make several adjustments to operating income and book capital in computing EVA, and that the typical EVA calculation involves 19 adjustments from a menu of between 9 and 34 adjustments. In particular, firms adjust book value of capital and operating income for goodwill, R&D and leases, before computing return on capital.[51]

Variants on Economic Value Added

There are several variants on economic value added that build on excess returns. While they share the same basic foundation – that value is created by generating excess returns on investments – they vary in how excess returns are computed.

- In <u>Economic Profit</u>, the excess return is defined from the perspective of equity investors and thus is based on net income and cost of equity, rather than after-tax operating income and cost of capital

  Economic Profit = Net Income – Cost of Equity * Book Value of Equity

  Many of the papers that we referenced in the context of earnings-based valuation models, especially by Ohlson, are built on this theme. We will examine these models in the context of accounting based valuations later in this paper.[52]
- In <u>Cash Flow Return on Investment</u> or CFROI models, there are two significant differences. The first is that the return earned on investments is computed not based on accounting earnings but on after-tax cash flow. The second is that both returns and the cost of capital are computed in real terms rather than nominal terms. Madden

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[51] Weaver, S. C., 2001, Measuring Economic Value Added: A Survey of the Practices of EVA Proponents, Journal of Applied Finance, Fall/Winter, pp. 7-17.

(1998) provides an extensive analysis of the CFROI approach and what he perceives as its advantages over conventional accounting-based measures.[53]

While proponents of each measure claim its superiority, they agree on far more than they disagree on. Furthermore, the disagreements are primarily in which approach computes the excess return earned by a firm best, rather than on the basic premise that the value of a firm can be written in terms of its capital invested and the present value of its excess return cash flows.

Equivalence of Excess Return and DCF Valuation Models

It is relatively simple to show that the discounted cash flow value of a firm should match the value that you obtain from an excess return model, if you are consistent in your assumptions about growth and reinvestment. In particular, excess return models are built around a link between reinvestment and growth; in other words, a firm can generate higher earnings in the future only by reinvesting in new assets or using existing assets more efficiently. Discounted cash flow models often do not make this linkage explicit, even though you can argue that they should. Thus, analysts will often estimate growth rates and reinvestment as separate inputs and not make explicit links between the two.

Illustrating that discounted cash flow models and excess return models converge when we are consistent about growth and reinvestment is simple. The equivalence of discounted cash flow firm valuations and EVA valuations is shown in several papers: Fernandez (2002), Hartman (2000) and Shrieves and Wachowicz (2000).[54] In a similar vein, Feltham and Ohlson (1995), Penman (1998) and Lundholm and O'Keefe (2001) all provide proof that equity excess return models converge on equity discounted cash flow models.[55]

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[52] Ohlson, J. 1995, Earnings, Book values and Dividends in Security Valuation, Contemporary Accounting Research, v11, 661-687.

[53] Madden. B.L., 1998, CFROI Cash Flow Return on Investment Valuation: A Total System Approach to Valuing a Firm, Butterworth-Heinemann.

[54] Fernandez, P., 2002, Three Residual Income Valuation Models and Discounted Cash Flow Valuation, Working Paper, IESE Business School; Hartman, J. C., 2000, On the Equivalence of Net Present Value and Economic Value Added as Measures of a Project's Economic Worth, *The Engineering Economist,* v45, 158-165.*;* Shrieves, R.E. and J.M. Wachowicz, 2000, Free Cash Flow, Economic Value Added and Net Present Value: A Reconciliation of Variations of Discounted Cash Flow Valuation, Working Paper, University of Tennessee.

[55] Feltham, G. and J. Ohlson, 1995, Valuation and Clean Surplus Accounting of Operation and Financial

The model values can diverge because of differences in assumptions and ease of estimation. Penman and Sourgiannis (1998) compared the dividend discount model to excess return models and concluded that the valuation errors in a discounted cash flow model, with a ten-year horizon, significantly exceeded the errors in an excess return model.[56] They attributed the difference to GAAP accrual earnings being more informative than either cash flows or dividends. Francis, Olson and Oswald (1999) concurred with Penman and also found that excess return models outperform dividend discount models.[57] Courteau, Kao and Richardson (2001) argue that the superiority of excess return models in these studies can be attributed entirely to differences in the terminal value calculation and that using a terminal price estimated by Value Line (instead of estimating one) results in dividend discount models outperforming excess return models.[58]

Adjusted Present Value Models

In the *adjusted present value (APV) approach*, we separate the effects on value of debt financing from the value of the assets of a business. In contrast to the conventional approach, where the effects of debt financing are captured in the discount rate, the APV approach attempts to estimate the expected dollar value of debt benefits and costs separately from the value of the operating assets.

Basis for APV Approach

In the APV approach, we begin with the value of the firm without debt. As we add debt to the firm, we consider the net effect on value by considering both the benefits and the costs of borrowing. In general, using debt to fund a firm's operations creates tax

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Activities, Contemporary Accounting Research, v11, 689-731; Penman, S.H., 1998, A Synthesis of Equity Valuation Techniques and the Terminal Value Calculation for the Dividend Discount Model, Review of Accounting Studies, *v*2, 303-323; Lundholm, R., and T. O'Keefe. 2001. Reconciling value estimates from the discounted cash flow model and the residual income model. Contemporary Accounting Research, *v*18, 311-35.

[56] Penman, S. and T. Sougiannis. 1998. A Comparison of Dividend, Cash Flow, and Earnings Approaches to Equity Valuation, Contemporary Accounting Research, v15, 343-383.

[57] Francis, J., P. Olsson, and D. Oswald. 2000. Comparing the Accuracy and Explainability of Dividend, Free Cash Flow and Abnormal Earnings Equity Value Estimates. Journal of Accounting Research, v38, 45-70.

[58] Courteau, L., J. Kao and G.D. Richardson, 2001, The Equivalence of Dividend, Cash Flow and Residual Earnings Approaches to Equity Valuation Employing Ideal Terminal Value Calculations, Contemporary Accounting Research, v18 ,625–661.

benefits (because interest expenses are tax deductible) on the plus side and increases bankruptcy risk (and expected bankruptcy costs) on the minus side. The value of a firm can be written as follows:

Value of business = Value of business with 100% equity financing + Present value of Expected Tax Benefits of Debt – Expected Bankruptcy Costs

The first attempt to isolate the effect of tax benefits from borrowing was in Miller and Modigliani (1963), where they valued the present value of the tax savings in debt as a perpetuity using the cost of debt as the discount rate.[59] The adjusted present value approach, in its current form, was first presented in Myers (1974) in the context of examining the interrelationship between investment and financing decisions.[60]

Implicitly, the adjusted present value approach is built on the presumption that it is easier and more precise to compute the valuation impact of debt in absolute terms rather than in proportional terms. Firms, it is argued, do not state target debt as a ratio of market value (as implied by the cost of capital approach) but in dollar value terms.

Measuring Adjusted Present Value

In the adjusted present value approach, we estimate the value of the firm in three steps. We begin by estimating the value of the firm with no leverage. We then consider the present value of the interest tax savings generated by borrowing a given amount of money. Finally, we evaluate the effect of borrowing the amount on the probability that the firm will go bankrupt, and the expected cost of bankruptcy.

The first step in this approach is the estimation of the value of the unlevered firm. This can be accomplished by valuing the firm as if it had no debt, i.e., by discounting the expected free cash flow to the firm at the unlevered cost of equity. In the special case where cash flows grow at a constant rate in perpetuity, the value of the firm is easily computed.

$$\text{Value of Unlevered Firm} = \frac{\text{FCFF}_o(1+g)}{\rho_u - g}$$

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[59] Modigliani, F. and M. Miller (1963), Corporate Income Taxes and the Cost of Capital: A Correction, American Economic Review, v53, 433-443.

[60] Myers, S., 1974, Interactions in Corporate Financing and Investment Decisions—Implications for Capital Budgeting, Journal of Finance, v29,1-25.

where $FCFF_0$ is the current after-tax operating cash flow to the firm, ρ_u is the unlevered cost of equity and g is the expected growth rate. In the more general case, we can value the firm using any set of growth assumptions we believe are reasonable for the firm. The inputs needed for this valuation are the expected cashflows, growth rates and the unlevered cost of equity.

The second step in this approach is the calculation of the expected tax benefit from a given level of debt. This tax benefit is a function of the tax rate of the firm and is discounted to reflect the riskiness of this cash flow.

$$\text{Value of Tax Benefits} = \sum_{t=1}^{t=\infty} \frac{\text{Tax Rate}_t \ * \ \text{Interest Rate}_t * \text{Debt}_t}{(1+\text{r})^t}$$

There are three estimation questions that we have to address here. The first is what tax rate to use in computing the tax benefit and whether than rate can change over time. The second is the dollar debt to use in computing the tax savings and whether that amount can vary across time. The final issue relates to what discount rate to use to compute the present value of the tax benefits. In the early iterations of APV, the tax rate and dollar debt were viewed as constants (resulting in tax savings as a perpetuity) and the pre-tax cost of debt was used as the discount rate leading to a simplification of the tax benefit value:

$$\begin{aligned} &= \frac{(\text{Tax Rate})(\text{Cost of Debt})(\text{Debt})}{\text{Cost of Debt}} \\ \text{Value of Tax Benefits} &= (\text{Tax Rate})(\text{Debt}) \\ &= t_c D \end{aligned}$$

Subsequent adaptations of the approach allowed for variations in both the tax rate and the dollar debt level, and raised questions about whether it was appropriate to use the cost of debt as the discount rate. Fernandez (2004) argued that the value of tax benefits should be computed as the difference between the value of the levered firm, with the interest tax savings, and the value of the same firm without leverage.[61] Consequently, he arrives at a much higher value for the tax savings than the conventional approach, by a multiple of the unlevered firm's cost of equity to the cost of debt. Cooper and Nyborg (2006) argue

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[61] Fernandez, P., P., 2004, The value of tax shields is not equal to the present value of the tax shields, Journal of Financial Economics, v73, 145-165.

that Fernandez is wrong and that the value of the tax shield is the present value of the interest tax savings, discounted back at the cost of debt.[62]

The third step is to evaluate the effect of the given level of debt on the default risk of the firm and on expected bankruptcy costs. In theory, at least, this requires the estimation of the probability of default with the additional debt and the direct and indirect cost of bankruptcy. If π_a is the probability of default after the additional debt and BC is the present value of the bankruptcy cost, the present value of expected bankruptcy cost can be estimated.

$$\text{PV of Expected Bankruptcy cost} \begin{array}{l} = (\text{Probability of Bankruptcy})(\text{PV of Bankruptcy Cost}) \\ = \pi_a BC \end{array}$$

This step of the adjusted present value approach poses the most significant estimation problem, since neither the probability of bankruptcy nor the bankruptcy cost can be estimated directly. There are two basic ways in which the probability of bankruptcy can be estimated indirectly. One is to estimate a bond rating, as we did in the cost of capital approach, at each level of debt and use the empirical estimates of default probabilities for each rating. The other is to use a statistical approach to estimate the probability of default, based upon the firm's observable characteristics, at each level of debt. The bankruptcy cost can be estimated, albeit with considerable error, from studies that have looked at the magnitude of this cost in actual bankruptcies. Research that has looked at the direct cost of bankruptcy concludes that they are small[63], relative to firm value. In fact, the costs of distress stretch far beyond the conventional costs of bankruptcy and liquidation. The perception of distress can do serious damage to a firm's operations, as employees, customers, suppliers and lenders react. Firms that are viewed as distressed lose customers (and sales), have higher employee turnover and have to accept much tighter restrictions from suppliers than healthy firms. These indirect bankruptcy costs can be catastrophic for many firms and essentially make the perception of distress into a

[62] Cooper, I.A. and K.G. Nyborg, 2006, The value of tax shields is equal to the present value of the tax shields, Journal of Financial Economics, v81, 215-225.
[63] Warner, J.N., 1977, Bankruptcy Costs: Some Evidence, Journal of Finance, v32, 337-347. In this study of railroad bankruptcies, the direct cost of bankruptcy was estimated to be about 5%.

reality. The magnitude of these costs has been examined in studies and can range from 10-25% of firm value.[64]

Variants on APV

While the original version of the adjusted present value model was fairly rigid in its treatment of the tax benefits of debt and expected bankruptcy costs, subsequent variations allow for more flexibility in the treatment of both. Some of these changes can be attributed to pragmatic considerations, primarily because of the absence of information, whereas others represented theoretical corrections.

One adaptation of the model was suggested by Luehrman (1997), where he presents an example where the dollar debt level, rather than remain fixed as it does in conventional APV, changes over time as a fraction of book value.[65] The interest tax savings reflect the changing debt but the present value of the tax savings is still computed using the cost of debt.

Another variation on adjusted present value was presented by Kaplan and Ruback (1995) in a paper where they compared the discounted cash flow valuations of companies to the prices paid in leveraged transactions.[66] They first estimated what they termed capital cash flows which they defined to be cash flows to both debt and equity investors and thus inclusive of the tax benefits from interest payments on debt. This is in contrast with the conventional unlevered firm valuation, which uses only operating cash flows and does not include interest tax savings. These capital cash flows are discounted back at the unlevered cost of equity to arrive at firm value. In effect, the compressed adjusted present value approach differs from the conventional adjusted present value approach on two dimensions. First, the tax savings from debt are discounted back at the unlevered cost of equity rather than the cost of debt. Second, the expected bankruptcy costs are effectively

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[64] For an examination of the theory behind indirect bankruptcy costs, see Opler, T. and S. Titman, 1994, Financial Distress and Corporate Performance. Journal of Finance 49, 1015-1040. For an estimate on how large these indirect bankruptcy costs are in the real world, see Andrade, G. and S. Kaplan, 1998, How Costly is Financial (not Economic) Distress? Evidence from Highly Leveraged Transactions that Become Distressed. Journal of Finance. 53, 1443-1493. They look at highly levered transactions that subsequently became distressed snd conclude that the magnitude of these costs ranges from 10% to 23% of firm value.

[65] Luehrman, T. A., 1997, Using APV: A Better Tool for Valuing Operations, *Harvard Business Review*, May-June, 145-154.

ignored in the computation. Kaplan and Ruback argue that this approach is simpler to use than the conventional cost of capital approach in levered transactions because the leverage changes over time, which will result in time-varying costs of capital. In effect, they are arguing that it is easier to reflect the effects of changing leverage in the cash flows than it is in debt ratios. Gilson, Hotchkiss and Ruback (2000) use the compressed APV approach to value bankrupt firms that are reorganized and conclude that while the approach yields unbiased estimates of value, the valuation errors remain large.[67] The key limitation of the compressed APV approach, notwithstanding its simplicity, is that it ignores expected bankruptcy costs. In fact, using the compressed adjusted present value approach will lead to the conclusion that a firm is always worth more with a higher debt ratio than with a lower one. Kaplan and Ruback justify their approach by noting that the values that they arrive at are very similar to the values obtained using comparable firms, but this cannot be viewed as vindication.

Ruback (2000) provides a more extensive justification of the capital cash flow approach to valuation.[68] He notes that the conventional APV's assumption that interest tax savings have the same risk as the debt (and thus get discounted back at the cost of debt) may be justifiable for a fixed dollar debt but that it is more reasonable to assume that interest tax savings share the same risk as the operating assets, when dollar debt is expected to change over time. He also notes that the capital cash flow approach assumes that debt grows with firm value and is thus closer to the cost of capital approach, where free cash flows to the firm are discounted back at a cost of capital. In fact, he shows that when the dollar debt raised each year is such that the debt ratio stays constant, the cost of capital approach and the capital cash flows approach yield identical results.

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[66] Kaplan, S.N. and R.S. Ruback, 1995, The Valuation of Cash Flow Forecasts, Journal of Finance, v50, 1059-1093.

[67] Gilson, S.C., E. S. Hotchkiss and R. Ruback, 1998, Valuation of Bankrupt Firms, Review of Financial Studies, v13, 43-74. The one modification they introduce is that the tax savings from net operating loss carryforwards are discounted back at the cost of debt.

[68] Ruback, R.S., 2000, Capital Cash Flows: A Simple Approach to Valuing Risky Cash Flows, Working Paper, Harvard Business School.

Cost of Capital versus APV Valuation

To understand when the cost of capital approach, the adjusted present value approach and the modified adjusted present value approach (with capital cash flows) yield similar and different results, we consider the mechanics of each approach in table 1:

Table 1: Cost of Capital, APV and Compressed APV

	Cost of Capital	*Conventional APV*	*Compressed APV*
Cash flow discounted	Free Cash Flow to Firm (prior to all debt payments)	Free Cash Flow to Firm (prior to debt payments)	Free Cash Flow to Firm + Tax Savings from Interest Payments
Discount Rate used	Weighted average of cost of equity and after-tax cost of debt = Cost of capital	Unlevered cost of equity	Weighted average of cost of equity and pre-tax cost of debt = Unlevered cost of equity
Tax Savings from Debt	Shows up through the discount rate	Added on separately as present value of tax savings (using cost of debt as discount rate)	Shows up through cash flow
Dollar debt levels	Determined by debt ratios used in cost of capital. If debt ratio stays fixed, dollar debt increases with firm value	Fixed dollar debt	Dollar debt can change over time – increase or decrease.
Discount rate for tax benefits from interest expenses	Discounted at unlevered cost of equity	Discounted at pre-tax cost of debt	Discounted at unlevered cost of equity
Bankruptcy Costs	Reflected as higher costs of equity and debt, as default risk increases.	Can be computed separately, based upon likelihood of distress and the cost of such distress. (In practice, often ignored)	Can be computed separately, based upon likelihood of distress and the cost of such distress. (In practice, often ignored)

In an APV valuation, the value of a levered firm is obtained by adding the net effect of debt to the unlevered firm value.

$$\text{Value of Levered Firm} = \frac{\text{FCFF}_o(1+g)}{\rho_u - g} + t_c D - \pi_a BC$$

The tax savings from debt are discounted back at the cost of debt. In the cost of capital approach, the effects of leverage show up in the cost of capital, with the tax benefit incorporated in the after-tax cost of debt and the bankruptcy costs in both the levered beta and the pre-tax cost of debt. Inselbag and Kaufold (1997) provide examples where they get identical values using the APV and Cost of Capital approaches, but only because they infer the costs of equity to use in the latter.[69]

Will the approaches yield the same value? Not necessarily. The first reason for the differences is that the models consider bankruptcy costs very differently, with the adjusted present value approach providing more flexibility in allowing you to consider indirect bankruptcy costs. To the extent that these costs do not show up or show up inadequately in the pre-tax cost of debt, the APV approach will yield a more conservative estimate of value. The second reason is that the conventional APV approach considers the tax benefit from a fixed dollar debt value, usually based upon existing debt. The cost of capital and compressed APV approaches estimate the tax benefit from a debt ratio that may require the firm to borrow increasing amounts in the future. For instance, assuming a market debt to capital ratio of 30% in perpetuity for a growing firm will require it to borrow more in the future and the tax benefit from expected future borrowings is incorporated into value today. Finally, the discount rate used to compute the present value of tax benefits is the pre-tax cost of debt in the conventional APV approach and the unlevered cost of equity in the compressed APV and the cost of capital approaches. As we noted earlier, the compressed APV approach yields equivalent values to the cost of capital approach, if we allow dollar debt to reflect changing firm value (and debt ratio assumptions) and ignore the effect of indirect bankruptcy costs. The conventional APV approach yields a higher value than either of the other two approaches because it views the tax savings from debt as less risky and assigns a higher value to it.

Which approach will yield more reasonable estimates of value? The dollar debt assumption in the APV approach is a more conservative one but the fundamental flaw with the APV model lies in the difficulties associated with estimating expected bankruptcy costs. As long as that cost cannot be estimated, the APV approach will

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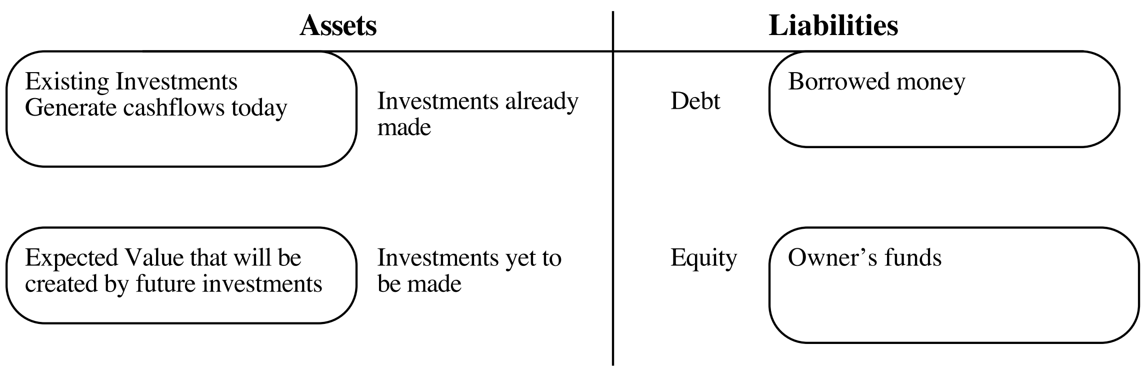
[69] Inselbag, I. and H. Kaufold, 1997, Two DCF approaches for valuing companies under alternative financing strategies and how to choose between them, Journal of Applied Corporate Finance, v10, 114-122.

continue to be used in half-baked form where the present value of tax benefits will be added to the unlevered firm value to arrive at total firm value.

Liquidation and Accounting Valuation

The value of an asset in the discounted cash flow framework is the present value of the expected cash flows on that asset. Extending this proposition to valuing a business, it can be argued that the value of a business is the sum of the values of the individual assets owned by the business. While this may be technically right, there is a key difference between valuing a collection of assets and a business. A business or a company is an on-going entity with assets that it already owns and assets it expects to invest in the future. This can be best seen when we look at the financial balance sheet (as opposed to an accounting balance sheet) for an ongoing company in figure 4:

Figure 4: A Simple View of a Firm



Note that investments that have already been made are categorized as assets in place, but investments that we expect the business to make in the future are growth assets.

A financial balance sheet provides a good framework to draw out the differences between valuing a business as a going concern and valuing it as a collection of assets. In a going concern valuation, we have to make our best judgments not only on existing investments but also on expected future investments and their profitability. While this may seem to be foolhardy, a large proportion of the market value of growth companies comes from their growth assets. In an asset-based valuation, we focus primarily on the assets in place and estimate the value of each asset separately. Adding the asset values together yields the value of the business. For companies with lucrative growth opportunities, asset-based valuations will yield lower values than going concern valuations.

Book Value Based Valuation

There are some who contend that the accounting estimate of the value of a business, as embodied by the book value of the assets and equity on a balance sheet, represents a more reliable estimate of value than valuation models based on shaky assumptions about the future. In this section, we examine book value as a measure of the value of going concern and then extend the analysis to look at book value based valuation models that are also use forecasted earnings to estimate value. We end the section with a short discussion of fair value accounting, a movement that has acquired momentum in recent years.

Book Value

The original ideals for accounting statements were that the income statements would provide a measure of the true earnings potential of a firm and that the balance sheet would yield a reliable estimate of the value of the assets and equity in the firm. Daniels (1934), for instance, lays out these ideals thus:[70]

> *"In short the lay reader of financial statements usually believes that the total asset figure of the balance sheet is indicative, and is intended to be so, of the value of the company. He probably understanding this "value" as what the business could be sold for, market value – the classic meeting of the minds between a willing buyer and seller."*

In the years since, accountants have wrestled with how put this ideal into practice. In the process, they have had the weigh how much importance to give the historical cost of an asset relative to its estimated value today and have settled on different rules. For fixed assets, they have largely concluded that the book value should be reflective of the original cost of the asset and subsequent depletion in and additions to that asset. For current assets, they have been much more willing to consider the alternative of market value. Finally, they have discovered new categories for assets such as brand name where neither the original cost nor the current value is easily accessible.

While there are few accountants who would still contend that the book value of a company is a good measure of its market value, this has not stopped some investors from implicitly making that assumption. In fact, the notion that a stock is under valued if is market price falls below its book value is deeply entrenched in investing. It is one of the screens that Ben Graham proposed for finding undervalued stocks[71] and it remains a rough proxy for what is loosely called value investing.[72] Academics have fed into this belief by presenting evidence that low price to book value stocks do earn higher returns than the rest of the market.[73]

Is it possible for book value to be a reasonable proxy for the true value of a business? For mature firms with predominantly fixed assets, little or no growth opportunities and no potential for excess returns, the book value of the assets may yield a reasonable measure of the true value of these firms. For firms with significant growth opportunities in businesses where they can generate excess returns, book values will be very different from true value.

Book Value plus Earnings

In the context of equity valuation models, we considered earnings based models that have been developed in recent years, primarily in the accounting community. Most of these models are built on a combination of book values and expected future earnings and trace their antecedents to Ohlson (1995) and Feltham and Ohlson (1995), both works that we referenced earlier in the context of earnings based valuation models.[74] Ohlson's basic model states the true value of equity as a function of its book value of equity and the excess equity returns that the firm can generate in the future. As a consequence, it is termed a residual income model and can be derived from a simple dividend discount model:

$$\text{Value of equity} = \sum_{t=1}^{t=\infty} \frac{\text{E(Dividends}_t)}{(1+\ \text{Cost of Equity})^t}$$

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70 Daniels, M.B., 1934, Principles of Asset Valuation, The Accounting Review, v9, 114-121.

71 Graham, B., 1949, The Intelligent Investor, HarperCollins,

72 Morningstar categorizes mutual funds into growth and value, based upon the types of stocks that they invest in. Funds that invest in low price to book stocks are categorized as value funds.

73 Fama, E.F. and K.R. French, 1992, *The Cross-Section of Expected Returns*, Journal of Finance, v47, 427-466.

74 Ohlson, J. 1995, Earnings, Book values and Dividends in Security Valuation, Contemporary Accounting Research, v11, 661-687.; Feltham and Ohlson, 1995, Valuation and Clean Surplus Accounting for Operating and Financial Activities, Contemporary Accounting Research, v11, 689-731.

Now substitute in the full equation for book value (BV) of equity as a function of the starting book equity and earnings and dividends during a period (clean surplus relationship):

$$\text{Book Value of Equity}_t = \text{BV of Equity}_{t-1} + \text{Net Income}_t - \text{Dividends}_t$$

Substituting back into the dividend discount model, we get

$$\text{Value of Equity}_0 = \text{BV of Equity}_0 + \frac{\sum_{t=1}^{t=\infty}(\text{Net Income}_t - \text{ Cost of Equity}_t * \text{BV of Equity}_{t-1})}{(1+ \text{ Cost of Equity}_t)^t}$$

Thus the value of equity in a firm is the sum of the current book value of equity and the present value of the expected excess returns to equity investors in perpetuity

The enthusiasm with which the Ohlson residual income model has been received by accounting researchers is puzzling, given that it is neither new nor revolutionary. Walter(1966)[75] and Mao (1974)[76] extended the dividend discount model to incorporate excess returns earned on future investment opportunities. In fact, we used exactly the same rationale to relate enterprise value to EVA earlier in the paper. The only real difference is that the Ohlson model is an extension of the more limiting dividend discount model, whereas the EVA model is an extension of a more general firm valuation model. In fact, Lundholm and O'Keefe (2001) show that discounted cash flow models and residual income models yield identical valuations of companies, if we make consistent assumptions.[77] One explanation for the enthusiasm is that the Ohlson model has allowed accountants to argue that accounting numbers are still relevant to value. After all, Lev (1989) had presented evidence on the declining significance of accounting earnings

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7575 Walter, J.E., 1966, Dividend Policies and Common Stock Prices, Journal of Finance, v11, 29-41. Walters modified the dividend discount model as follows: $P = \frac{D + \frac{ROE}{k_e}(E-D)}{k_e}$, where E and D are the expected earnings and dividends in the next period, ROE is the expected return on equity in perpetuity on retained earnings and k_e is the cost of equity. Note that the second term in the numerator is the excess return generated on an annual basis and that dividing by the cost of equity yields its present value in perpetuity.

76 Mao, J.C.T., 1974, The Valuation of Growth Stocks: The Investment Opportunities Approach, Journal of Finance, v21, 95-102. The key difference is that rather than build off book value of equity, as Ohlson did, Mao capitalized current earnings (as a perpetuity) and added the present value of future excess returns to this value.

77 Lundholm, R., and T. O'Keefe. 2001. Reconciling value estimates from the discounted cash flow model and the residual income model. *Contemporary Accounting Research, v*18, 311-35.

numbers by noting a drop in the correlation between market value and earnings.[78] In the years since, a number of studies have claimed to find strong evidence to back up the Ohlson model. For instance, Frankel and Lee (1996)[79], Hand and Landsman (1998)[80] and Dechow, Hutton and Sloan (1999)[81] all find that the residual income model explains 70-80% of variation in prices across stocks. The high R-squared in these studies is deceptive since they are not testing an equation as much as a truism: the total market value of equity should be highly correlated with the total book value of equity and total net income. Firms with higher market capitalization will tend to have higher book value of equity and higher net income, reflecting their scale and this has little relevance for whether the Ohlson model actually works.[82] A far stronger and more effective test of the model is whether changes in equity value are correlated with changes in book value of equity and net income and the model does no better on these tests than established models.

Fair Value Accounting

In the last decade, there has been a strong push from both accounting rule makers and regulators towards "fair value accounting". Presumably, the impetus for this push has been a return to the original ideal that the book value of the assets on a balance sheet and the resulting net worth for companies be good measures of the fair value of these assets and equity.

The move towards fair value accounting has not been universally welcomed even within the accounting community. On the one hand, there are some who believe that this is a positive development increasing the connection of accounting statements to value and

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[78] Lev, B. 1989. On the usefulness of earnings: Lessons and directions from two decades of empirical research, Journal of Accounting Research, v
27 (Supplement): 153-192.
[79] Frankel, R. and C.M.C. Lee. 1998. Accounting Valuation, Market Expectations, and Crosssectional Stock Returns. Journal of Accounting Economics, v25: 283-319.
[80] Hand, J.R.M. and W.R. Landsman. 1999. Testing the Ohlson Model: v or not v, that is the Question. Working Paper, University of North Carolina at Chapel Hill.
[81] Dechow, P., A. Hutton, R. Sloan, 1999. An Empirical Assessment of the Residual Income Valuation Model. Journal of Accounting and Economics 26 (1-3)1-34.
[82] Lo, K. and Lys, T., 2005, The Ohlson Model: Contribution to Valuation Theory, Limitations and Empirical Applications, Working Paper, Kellogg School of Management, Northwestern University.

providing useful information to financial markets.[83] There are others who believe that fair value accounting increases the potential for accounting manipulation, and that financial statements will become less informative as a result.[84] In fact, it used to be common place for firms in the United States to revalue their assets at fair market value until 1934, and the SEC discouraged this practice after 1934 to prevent the widespread manipulation that was prevalent.[85] While this debate rages on, the accounting standards boards have adopted a number of rules that favor fair value accounting, from the elimination of purchase accounting in acquisitions to the requirement that more assets be marked to market on the balance sheet.

The question then becomes an empirical one. Do fair value judgments made by accountants provide information to financial markets or do they just muddy up the waters? In a series of articles, Barth concluded that fair value accounting provided useful information to markets in a variety of contexts.[86] In contrast, Nelson (1996) examines fair value accounting in banking, where marking to market has been convention for a much longer period, and finds the reported fair values of investment securities have little incremental explanatory power when it comes to market values.[87] In an interesting test of the effects of fair value accounting, researchers have begun looking at market reactions in the aftermath of the adoption of SFAS 141 and 142, which together eliminated pooling, while also requiring that firms estimate "fair-value impairments" of goodwill rather than amortizing goodwill. Chen, Kohlbeck and Warfield (2004) find that stock prices react negatively to goodwill impairments, which they construe to indicate that there is

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[83] Barth, M., W. Beaver and W. Landsman. 2001. The relevance of the value-relevance literature for financial accounting standard setting: another view. *Journal of Accounting and Economics* 31: 77-104

[84] Holthausen, R. and R. Watts. 2001. The relevance of the value-relevance literature for financial accounting standard setting. Journal of Accounting and Economics, v31, 3-75.

[85] Fabricant, S. 1938. Capital Consumption and Adjustment, National Bureau of Economic Research.

[86] Barth, M.E., 1994. Fair Value Accounting: Evidence from Investment Securities and theMarket Valuation of Banks, *Accounting Review*, v69, No. 1 (January): 1–25; Barth, M.E., W. R. Landsman, and J. M. Whalen. 1995. Fair value accounting: effects on banks' earnings volatility, regulatory capital, and value of contractual cash flows, *Journal of Banking and Finance* v19, No.3-4 (June): 577–605; Barth, M.E., W.H. Beaver, and W.R. Landsman. 1996. Value relevance of banks fair value disclosures under SFAS 107, *The Accounting Review,* v71, No.4 (October): 513–37; Barth, M.E. and G. Clinch. 1998. Revalued financial, tangible, and intangible assets: Associations with share prices and non-market-based value estimates, *Journal of Accounting Research*, v36 (Supplement): 199–233.

[87] Nelson, K.K., 1996, Fair Value Accounting for Commercial Banks: An Empirical Analysis of SFAS 107, The Accounting Review, v71, 161-182.

information in these accounting assessments.[88] Note, though, that this price reaction can be consistent with a number of other interpretations as well and can be regarded, at best, as weak evidence that fair value accounting assessments convey information to markets.

We believe that fair value accounting, at best, will provide a delayed reflection of what happens in the market. In other words, goodwill be impaired (as it was in many technology companies in 2000 and 2001) after the market value has dropped and fair value adjustments will convey little, if any, information to financial markets. If in the process of marking to market, some of the raw data that is now provided to investors is replaced or held back, we will end up with accounting statements that neither reflect market value nor invested capital.

Liquidation Valuation

One special case of asset-based valuation is liquidation valuation, where we value assets based upon the presumption that they have to be sold now. In theory, this should be equal to the value obtained from discounted cash flow valuations of individual assets but the urgency associated with liquidating assets quickly may result in a discount on the value. The magnitude of the discount will depend upon the number of potential buyers for the assets, the asset characteristics and the state of the economy.

The research on liquidation value can be categorized into two groups. The first group of studies examines the relationship between liquidation value and the book value of assets, whereas the second takes apart the deviations of liquidation value from discounted cash flow value and addresses directly the question of how much of a cost you bear when you have to liquidate assets rather than sell a going concern.

While it may seem naïve to assume that liquidation value is equal or close to book value, a number of liquidation rules of thumb are structured around book value. For instance, it is not uncommon to see analysts assume that liquidation value will be a specified percentage of book value. Berger, Ofek and Swary (1996) argue and provide evidence that book value operates as a proxy for abandonment value in many firms.[89]

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[88] Chen, C., M. Kohlbeck and T. Warfield, 2004, Goodwill Valuation Effects of the Initial Adoption of SFAS 142, Working Paper, University of Wisconsin- Madison.
[89] Berger, P., E. Ofek and I. Swary, 1996, Investor Valuation of the Abandonment Option, Journal of Financial Economics, v42, 257-287.

Lang, Stulz and Walkling (1989) use book value as a proxy for the replacement cost of assets when computing Tobin's Q.[90]

The relationship between liquidation and discounted cash flow value is more difficult to discern. It stands to reason that liquidation value should be significantly lower than discounted cash flow value, partly because the latter reflects the value of expected growth potential and the former usually does not. In addition, the urgency associated with the liquidation can have an impact on the proceeds, since the discount on value can be considerable for those sellers who are eager to divest their assets. Kaplan (1989) cited a Merrill Lynch estimate that the speedy sales of the Campeau stake in Federated would bring about 32% less than an orderly sale of the same assets.[91] Holland (1990) estimates the discount to be greater than 50% in the liquidation of the assets of machine tool manufacturer.[92] Williamson (1988) makes the very legitimate point that the extent of the discount is likely to be smaller for assets that are not specialized and can be redeployed elsewhere.[93] Shleifer and Vishny (1992) argue that assets with few potential buyers or buyers who are financially constrained are likely to sell at significant discounts on market value.[94]

In summary, liquidation valuation is likely to yield more realistic estimates of value for firms that are distressed, where the going concern assumption underlying conventional discounted cash flow valuation is clearly violated. For healthy firms with significant growth opportunities, it will provide estimates of value that are far too conservative.

Relative Valuation

In relative valuation, we value an asset based upon how similar assets are priced in the market. A prospective house buyer decides how much to pay for a house by looking at the prices paid for similar houses in the neighborhood. A baseball card

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[90] Lang, L.H.P., R.M. Stulz and R.Walking. 1989. Managerial Performance, Tobin's Q, and The Gains from Successful Tender Offers. Journal of Financial Economics, v29, 137-154.

[91] Kaplan, S.N., 1989, Campeau's Acquisition of Federated: Value Destroyed or Value Added? Journal of Financial Economics, v25, 191-212.

[92] Holland, M., 1990, When the Machine Stopped, Harvard Business School Press, Cambridge, MA.

[93] Williamson, O.E., 1988, Corporate Finance and Corporate Governance, Journal of Finance, v43, 567-592.

[94] Shleifer, A., and R. W. Vishny, 1992, Liquidation Values and Debt Capacity: A Market Equilibrium

collector makes a judgment on how much to pay for a Mickey Mantle rookie card by checking transactions prices on other Mickey Mantle rookie cards. In the same vein, a potential investor in a stock tries to estimate its value by looking at the market pricing of "similar" stocks.

Embedded in this description are the three essential steps in relative valuation. The first step is finding comparable assets that are priced by the market, a task that is easier to accomplish with real assets like baseball cards and houses than it is with stocks. All too often, analysts use other companies in the same sector as comparable, comparing a software firm to other software firms or a utility to other utilities, but we will question whether this practice really yields similar companies later in this paper. The second step is scaling the market prices to a common variable to generate standardized prices that are comparable. While this may not be necessary when comparing identical assets (Mickey Mantle rookie cards), it is necessary when comparing assets that vary in size or units. Other things remaining equal, a smaller house or apartment should trade at a lower price than a larger residence. In the context of stocks, this equalization usually requires converting the market value of equity or the firm into multiples of earnings, book value or revenues. The third and last step in the process is adjusting for differences across assets when comparing their standardized values. Again, using the example of a house, a newer house with more updated amenities should be priced higher than a similar sized older house that needs renovation. With stocks, differences in pricing across stocks can be attributed to all of the fundamentals that we talked about in discounted cash flow valuation. Higher growth companies, for instance, should trade at higher multiples than lower growth companies in the same sector. Many analysts adjust for these differences qualitatively, making every relative valuation a story telling experience; analysts with better and more believable stories are given credit for better valuations.

Basis for approach

There is a significant philosophical difference between discounted cash flow and relative valuation. In discounted cash flow valuation, we are attempting to estimate the intrinsic value of an asset based upon its capacity to generate cash flows in the future. In

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Approach, Journal of Finance, v47, 143-66.

relative valuation, we are making a judgment on how much an asset is worth by looking at what the market is paying for similar assets. If the market is correct, on average, in the way it prices assets, discounted cash flow and relative valuations may converge. If, however, the market is systematically over pricing or under pricing a group of assets or an entire sector, discounted cash flow valuations can deviate from relative valuations.

Harking back to our earlier discussion of discounted cash flow valuation, we argued that discounted cash flow valuation was a search (albeit unfulfilled) for intrinsic value. In relative valuation, we have given up on estimating intrinsic value and essentially put our trust in markets getting it right, at least on average. It can be argued that most valuations are relative valuations. Damodaran (2002) notes that almost 90% of equity research valuations and 50% of acquisition valuations use some combination of multiples and comparable companies and are thus relative valuations.[95]

Standardized Values and Multiples

When comparing identical assets, we can compare the prices of these assets. Thus, the price of a Tiffany lamp or a Mickey Mantle rookie card can be compared to the price at which an identical item was bought or sold in the market. However, comparing assets that are not exactly similar can be a challenge. After all, the price per share of a stock is a function both of the value of the equity in a company and the number of shares outstanding in the firm. Thus, a stock split that doubles the number of units will approximately halve the stock price. To compare the values of "similar" firms in the market, we need to standardize the values in some way by scaling them to a common variable. In general, values can be standardized relative to the earnings firms generate, to the book values or replacement values of the firms themselves, to the revenues that firms generate or to measures that are specific to firms in a sector.

- One of the more intuitive ways to think of the value of any asset is as a <u>multiple of the earnings that asset generates</u>. When buying a stock, it is common to look at the price paid as a multiple of the earnings per share generated by the company. This price/earnings ratio can be estimated using current earnings per share, yielding a current PE, earnings over the last 4 quarters, resulting in a trailing PE, or an expected earnings per share in the next year, providing a forward PE. When buying a business, as opposed to just the equity in the business, it is common to examine the value of the firm as a multiple of the operating income or the earnings before interest, taxes, depreciation and amortization (EBITDA). While, as a buyer of the equity or the firm, a lower multiple is better than a higher one, these multiples will be affected by the growth potential and risk of the business being acquired.

- While financial markets provide one estimate of the value of a business, accountants often provide a very different estimate of value of for the same business. As we noted earlier, investors often look at the relationship between the price they pay for a stock and the book value of equity (or net worth) as a measure of how over- or undervalued a stock is; the price/book value ratio that emerges can vary widely across industries, depending again upon the growth potential and the quality of the investments in each. When valuing businesses, we estimate this ratio using the value of the firm and the book value of all assets or capital (rather than just the equity). For those who believe that book value is not a good measure of the true value of the assets, an alternative is to use the replacement cost of the assets; the ratio of the value of the firm to replacement cost is called Tobin's Q.
- Both earnings and book value are accounting measures and are determined by accounting rules and principles. An alternative approach, which is far less affected by accounting choices, is to use the ratio of the value of a business to the revenues it generates. For equity investors, this ratio is the price/sales ratio (PS), where the market value of equity is divided by the revenues generated by the firm. For firm value, this ratio can be modified as the enterprise value/to sales ratio (VS), where the numerator becomes the market value of the operating assets of the firm. This ratio, again, varies widely across sectors, largely as a function of the profit margins in each. The advantage of using revenue multiples, however, is that it becomes far easier to compare firms in different markets, with different accounting systems at work, than it is to compare earnings or book value multiples.
- While earnings, book value and revenue multiples are multiples that can be computed for firms in any sector and across the entire market, there are some multiples that are specific to a sector. For instance, when internet firms first appeared on the market in the later 1990s, they had negative earnings and negligible revenues and book value.

[95] Damodaran, A., 2002, Investment Valuation (Second Edition), John Wiley and Sons, New York.

Analysts looking for a multiple to value these firms divided the market value of each of these firms by the number of hits generated by that firm's web site. Firms with lower market value per customer hit were viewed as under valued. More recently, cable companies have been judged by the market value per cable subscriber, regardless of the longevity and the profitably of having these subscribers. While there are conditions under which sector-specific multiples can be justified, they are dangerous for two reasons. First, since they cannot be computed for other sectors or for the entire market, sector-specific multiples can result in persistent over or under valuations of sectors relative to the rest of the market. Thus, investors who would never consider paying 80 times revenues for a firm might not have the same qualms about paying $2000 for every page hit (on the web site), largely because they have no sense of what high, low or average is on this measure. Second, it is far more difficult to relate sector specific multiples to fundamentals, which is an essential ingredient to using multiples well. For instance, does a visitor to a company's web site translate into higher revenues and profits? The answer will not only vary from company to company, but will also be difficult to estimate looking forward.

There have been relatively few studies that document the usage statistics on these multiples and compare their relative efficacy. Damodaran (2002) notes that the usage of multiples varies widely across sectors, with Enterprise Value/EBITDA multiples dominating valuations of heavy infrastructure businesses (cable, telecomm) and price to book ratios common in financial service company valuations.[96] Fernandez (2001) presents evidence on the relative popularity of different multiples at the research arm of one investment bank – Morgan Stanley Europe – and notes that PE ratios and EV/EBITDA multiples are the most frequently employed.[97] Liu, Nissim and Thomas (2002) compare how well different multiples do in pricing 19,879 firm-year observations between 1982 and 1999 and suggest that multiples of forecasted earnings per share do best in explaining pricing differences, that multiples of sales and operating cash flows do

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[96] Damodaran, A, 2002, Investment Valuation, Second Edition, John Wiley and Sons, New York.

[97] Fernandez, P., 2001, Valuation using multiples. How do analysts reach their conclusions?, Working Paper, IESE Business School.

worst and that multiples of book value and EBITDA fall in the middle.[98] Lie and Lie (2002) examine 10 different multiples across 8,621 companies between 1998 and 1999 and arrive at similar conclusions.[99]

Determinants of Multiples

In the introduction to discounted cash flow valuation, we observed that the value of a firm is a function of three variables – it capacity to generate cash flows, the expected growth in these cash flows and the uncertainty associated with these cash flows. Every multiple, whether it is of earnings, revenues or book value, is a function of the same three variables – risk, growth and cash flow generating potential. Intuitively, then, firms with higher growth rates, less risk and greater cash flow generating potential should trade at higher multiples than firms with lower growth, higher risk and less cash flow potential.

The specific measures of growth, risk and cash flow generating potential that are used will vary from multiple to multiple. To look under the hood, so to speak, of equity and firm value multiples, we can go back to fairly simple discounted cash flow models for equity and firm value and use them to derive the multiples. In the simplest discounted cash flow model for equity, which is a stable growth dividend discount model, the value of equity is:

$$\text{Value of Equity} = P_0 = \frac{DPS_1}{k_e - g_n}$$

where DPS_1 is the expected dividend in the next year, k_e is the cost of equity and g_n is the expected stable growth rate. Dividing both sides by the earnings, we obtain the discounted cash flow equation specifying the PE ratio for a stable growth firm.

$$\frac{P_0}{EPS_0} = PE = \frac{\text{Payout Ratio} * (1 + g_n)}{k_e - g_n}$$

The key determinants of the PE ratio are the expected growth rate in earnings per share, the cost of equity and the payout ratio. Other things remaining equal, we would expect higher growth, lower risk and higher payout ratio firms to trade at higher multiples of earnings than firms without these characteristics. In fact, this model can be expanded to

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[98] Liu, J., D. Nissim, and J. Thomas. 2002. Equity Valuation Using Multiples. *Journal of Accounting Research*, V 40, 135-172.

[99] Lie E., H.J. Lie, 2002, Multiples Used to Estimate Corporate Value. Financial Analysts Journal, v58, 44-54.

allow for high growth in near years and stable growth beyond.[100] Researchers have long recognized that the PE for a stock is a function of both the level and the quality of its growth and its risk. Beaver and Morse (1978) related PE ratios to valuation fundamentals[101], as did earlier work by Edwards and Bell (1961).[102] Peasnell (1982) made a more explicit attempt to connect market values to accounting numbers.[103] Zarowin (1990) looked at the link between PE ratios and analyst forecasts of growth to conclude that PE ratios are indeed positively related to long term expected growth.[104] Leibowitz and Kogelman (1990, 1991, 1992) expanded on the relationship between PE ratios and the excess returns earned on investments, which they titled franchise opportunities, in a series of articles on the topic, noting that for a stock to have a high PE ratio, it needs to generate high growth in conjunction with excess returns on its new investments.[105] Fairfield (1994) provides a generalized version of their model, allowing for changing return on equity over time.[106] While these papers focused primarily on growth and returns, Kane, Marcus and Noe (1996) examine the relationship between PE and risk for the aggregate market and conclude that PE ratios decrease as market volatility increases.[107]

Dividing both sides of the stable growth dividend discount model by the book value of equity, we can estimate the price/book value ratio for a stable growth firm.

$$\frac{P_0}{BV_0} = PBV = \frac{ROE * \text{Payout Ratio} * (1 + g_n)}{k_e - g_n}$$

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[100] Damodaran, A., 2002, Investment Valuation, John Wiley and Sons, New York. The expanded versions of the models are available in the chapter on PE ratios.

[101] Beaver, W. and D. Morse, 1978, What do P/E ratios mean?, Financial Analysts Journal, v34, 65-76.

[102] Edwards, E. and P. Bell, 1961, The Theory and Measurement of Business Income, University of California Press, Berkeley.

[103] Peasnell, K., 1982, Some Financial Connections between Economic Values and Accounting Numbers, Journal of Business Finance and Accounting, v9, 361-381.

[104] Zarowin, P. 1990. What determines earnings-price ratios: revisited, Journal of Accounting, Auditing, and Finance, v5: 439-57.

[105] Leibowitz, M.L. and S. Kogelman, 1990, Inside the PE Ratio: The Franchise Factor, Financial Analysts Journal, v46, 17-35; Leibowitz, M.L. and S. Kogelman, 1991, The Franchise Factor for Leveraged Firms, Financial Analysts Journal, v47, 29-43.; Leibowitz, M.L. and S. Kogelman, 1992, Franchise Value and the Growth Factor, Financial Analysts Journal, v48, 16-23.

[106] Fairfield, P., 1994, P/E, P/B and the present value of future dividends, Financial Analysts Journal, v50, 23-31.

[107] Kane, A., A.J. Marcus and J. Noh, The P/E Multiple and Market Volatility, Financial Analysts Journal, v52, 16-24.

where ROE is the return on equity and is the only variable in addition to the three that determine PE ratios (growth rate, cost of equity and payout) that affects price to book equity. The strong connection between price to book and return on equity was noted by Wilcox (1984), with his argument that cheap stocks are those that trade at low price to book ratios while maintaining reasonable or even high returns on equity.[108] The papers we referenced in the earlier section on book-value based valuation approaches centered on the Ohlson model can be reframed as a discussion of the determinants of price to book ratios. Penman (1996) draws a distinction between PE ratios and PBV ratios when it comes to the link with return on equity, by noting that while PBV ratios increase with ROE, the relationship between PE ratios and ROE is weaker.[109]

Finally, dividing both sides of the dividend discount model by revenues per share, the price/sales ratio for a stable growth firm can be estimated as a function of its profit margin, payout ratio, risk and expected growth.

$$\frac{P_0}{Sales_0} = PS = \frac{\text{Profit Margin} * \text{Payout Ratio} * (1 + g_n)}{k_e - g_n}$$

The net margin is the new variable that is added to the process. While all of these computations are based upon a stable growth dividend discount model, we will show that the conclusions hold even when we look at companies with high growth potential and with other equity valuation models. While less work has been done on revenue multiples than on book value or earnings multiples, Leibowitz (1997) extends his franchise value argument from PE ratios to revenue multiples and notes the importance of what profit margins.[110]

We can do a similar analysis to derive the firm value multiples. The value of a firm in stable growth can be written as:

$$\text{Value of Firm} = V_0 = \frac{FCFF_1}{k_c - g_n}$$

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[108] Wilcox, J., 1984, The P/B-ROE Valuation Model, Financial Analysts Journal, 58-66.
[109] Penman, S.H., 1996, The Articulation of Price-Earnings and Market-to-Book Ratios and the Evaluation of Growth, Journal of Accounting Research, v34, 235-259.
[110] Leibowitz, M.L., 1997, Franchise Margins and the Sales-Driven Franchise Value, Financial Analysts Journal, v53, 43-53.

Dividing both sides by the expected free cash flow to the firm yields the Value/FCFF multiple for a stable growth firm.

$$\frac{V_0}{FCFF_1} = \frac{1}{k_c - g_n}$$

The multiple of FCFF that a firm commands will depend upon two variables – its cost of capital and its expected stable growth rate. Since the free cash flow the firm is the after-tax operating income netted against the net capital expenditures and working capital needs of the firm, the multiples of EBIT, after-tax EBIT and EBITDA can also be estimated similarly.

In short, multiples are determined by the same variables and assumptions that underlie discounted cash flow valuation. The difference is that while the assumptions are explicit in the latter, they are often implicit in the use of the former.

Comparable Firms

When multiples are used, they tend to be used in conjunction with comparable firms to determine the value of a firm or its equity. But what is a comparable firm? A comparable firm is one with cash flows, growth potential, and risk similar to the firm being valued. It would be ideal if we could value a firm by looking at how an exactly identical firm - in terms of risk, growth and cash flows - is priced. Nowhere in this definition is there a component that relates to the industry or sector to which a firm belongs. Thus, a telecommunications firm can be compared to a software firm, if the two are identical in terms of cash flows, growth and risk. In most analyses, however, analysts define comparable firms to be other firms in the firm's business or businesses. If there are enough firms in the industry to allow for it, this list is pruned further using other criteria; for instance, only firms of similar size may be considered. The implicit assumption being made here is that firms in the same sector have similar risk, growth, and cash flow profiles and therefore can be compared with much more legitimacy. This approach becomes more difficult to apply when there are relatively few firms in a sector. In most markets outside the United States, the number of publicly traded firms in a particular sector, especially if it is defined narrowly, is small. It is also difficult to define firms in the same sector as comparable firms if differences in risk, growth and cash flow profiles across firms within a sector are large. The tradeoff is therefore a simple one. Defining an industry more broadly increases the number of comparable firms, but it also results in a more diverse group of companies. Boatman and Baskin (1981) compare the precision of PE ratio estimates that emerge from using a random sample from within the same sector and a narrower set of firms with the most similar 10-year average growth rate in earnings and conclude that the latter yields better estimates.[111]

There are alternatives to the conventional practice of defining comparable firms as other firms in the same industry. One is to look for firms that are similar in terms of valuation fundamentals. For instance, to estimate the value of a firm with a beta of 1.2, an expected growth rate in earnings per share of 20% and a return on equity of 40%[112], we would find other firms across the entire market with similar characteristics.[113] Alford (1992) examines the practice of using industry categorizations for comparable firms and compares their effectiveness with using categorizations based upon fundamentals such as risk and growth.[114] Based upon the prediction error from the use of each categorization, he concludes that industry based categorizations match or slightly outperform fundamental based categorization, which he views as evidence that much of the variation in multiples that can be explained by fundamentals can be also explained by industry. In contrast, Cheng and McNamara (2000) and Bhojraj and Lee (2002) argue that picking comparables using a combination of industry categorization and fundamentals such as total assets yields more precise valuations than using just the industry classification.[115]

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[111] Boatman, J.R. and E.F. Baskin, 1981, Asset Valuation in Incomplete Markets, The Accounting Review, 38-53.

[112] The return on equity of 40% becomes a proxy for cash flow potential. With a 20% growth rate and a 40% return on equity, this firm will be able to return half of its earnings to its stockholders in the form of dividends or stock buybacks.

[113] Finding these firms manually may be tedious when your universe includes 10000 stocks. You could draw on statistical techniques such as cluster analysis to find similar firms.

[114] Alford, A.W., 1992, The Effect of the set of Comparable Firms on the Accuracy of the Price Earnings Valuation Method, Journal of Accounting Research, v30, 94-108.

[115] Cheng, C. S. A. and R. McNamara, 2000, The valuation accuracy of the price-earnings and price-book benchmark valuation methods, Review of Quantitative Finance and Accounting, v15, 349-370; Bhojraj, S. and C. M. C. Lee (2002): Who is my peer? A valuation-based approach to the selection of comparable firms, Journal of Accounting Research, *v*40, 407-439. Bhojraj S., C. M. C. Lee, Oler D. (2003), What's My Line? A Comparison of Industry Classification Schemes for Capital Market Research. Journal of Accounting Research, v41, 745-774.

Controlling for Differences across Firms

No matter how carefully we construct our list of comparable firms, we will end up with firms that are different from the firm we are valuing. The differences may be small on some variables and large on others and we will have to control for these differences in a relative valuation. There are three ways of controlling for these differences.

1. Subjective Adjustments

Relative valuation begins with two choices - the multiple used in the analysis and the group of firms that comprises the comparable firms. In many relative valuations, the multiple is calculated for each of the comparable firms and the average is computed. One issue that does come up with subjective adjustments to industry average multiples is how best to compute that average. Beatty, Riffe and Thompson (1999) examine multiples of earnings, book value and total assets and conclude that the harmonic mean provides better estimates of value than the arithmetic mean.[116] To evaluate an individual firm, the analyst then compare the multiple it trades at to the average computed; if it is significantly different, the analyst can make a subjective judgment about whether the firm's individual characteristics (growth, risk or cash flows) may explain the difference. If, in the judgment of the analyst, the difference on the multiple cannot be explained by the fundamentals, the firm will be viewed as over valued (if its multiple is higher than the average) or undervalued (if its multiple is lower than the average). The weakness in this approach is not that analysts are called upon to make subjective judgments, but that the judgments are often based upon little more than guesswork. All too often, these judgments confirm their biases about companies.

2. Modified Multiples

In this approach, we modify the multiple to take into account the most important variable determining it – the companion variable. To provide an illustration, analysts who compare PE ratios across companies with very different growth rates often divide the PE ratio by the expected growth rate in EPS to determine a growth-adjusted PE ratio or the PEG ratio. This ratio is then compared across companies with different growth rates to find under and over valued companies. There are two implicit assumptions that we make

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[116] Beatty, R.P., S.M. Riffe, and R. Thompson, 1999, The method of comparables and tax court

when using these modified multiples. The first is that these firms are comparable on all the other measures of value, other than the one being controlled for. In other words, when comparing PEG ratios across companies, we are assuming that they are all of equivalent risk. If some firms are riskier than others, you would expect them to trade at lower PEG ratios. The other assumption generally made is that that the relationship between the multiples and fundamentals is linear. Again, using PEG ratios to illustrate the point, we are assuming that as growth doubles, the PE ratio will double; if this assumption does not hold up and PE ratios do not increase proportional to growth, companies with high growth rates will look cheap on a PEG ratio basis. Easton (2004) notes that one of the weaknesses of the PEG ratio approach is its emphasis on short term growth and provides a way of estimating the expected rate of return for a stock, using the PEG ratio, and concludes that PEG ratios are effective at ranking stocks.[117]

3. Statistical Techniques

Subjective adjustments and modified multiples are difficult to use when the relationship between multiples and the fundamental variables that determine them becomes complex. There are statistical techniques that offer promise, when this happens. In this section, we will consider the advantages of these approaches and potential concerns.

Sector Regressions

In a regression, we attempt to explain a dependent variable by using independent variables that we believe influence the dependent variable. This mirrors what we are attempting to do in relative valuation, where we try to explain differences across firms on a multiple (PE ratio, EV/EBITDA) using fundamental variables (such as risk, growth and cash flows). Regressions offer three advantages over the subjective approach:

a. The output from the regression gives us a measure of how strong the relationship is between the multiple and the variable being used. Thus, if we are contending that higher growth companies have higher PE ratios, the regression should yield clues to both how growth and PE ratios are related (through the coefficient on growth as an

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valuations of private firms: an empirical investigation, Accounting Horizons 13, 177–199.

[117] Easton, P., 2004, PE Ratios, PEG Ratios and Estimating the Implied Expected Rate of Return on Equity Capital, The Accounting Review, v79, 79-95.

independent variable) and how strong the relationship is (through the t statistics and R squared).

b. If the relationship between a multiple and the fundamental we are using to explain it is non-linear, the regression can be modified to allow for the relationship.

c. Unlike the modified multiple approach, where we were able to control for differences on only one variable, a regression can be extended to allow for more than one variable and even for cross effects across these variables.

In general, regressions seem particularly suited to our task in relative valuation, which is to make sense of voluminous and sometimes contradictory data. There are two key questions that we face when running sector regressions:

- The first relates to how we define the sector. If we define sectors too narrowly, we run the risk of having small sample sizes, which undercut the usefulness of the regression. Defining sectors broadly entails fewer risks. While there may be large differences across firms when we do this, we can control for those differences in the regression.
- The second involves the independent variables that we use in the regression. While the focus in statistics exercises is increasing the explanatory power of the regression (through the R-squared) and including any variables that accomplish this, the focus of regressions in relative valuations is narrower. Since our objective is not to explain away all differences in pricing across firms but only those differences that are explained by fundamentals, we should use only those variables that are related to those fundamentals. The last section where we analyzed multiples using DCF models should yield valuable clues. As an example, consider the PE ratio. Since it is determined by the payout ratio, expected growth and risk, we should include only those variables in the regression. We should not add other variables to this regression, even if doing so increases the explanatory power, if there is no fundamental reason why these variables should be related to PE ratios.

Market Regression

Searching for comparable firms within the sector in which a firm operates is fairly restrictive, especially when there are relatively few firms in the sector or when a firm operates in more than one sector. Since the definition of a comparable firm is not one that is in the same business but one that has the same growth, risk and cash flow characteristics as the firm being analyzed, we need not restrict our choice of comparable firms to those in the same industry. The regression introduced in the previous section controls for differences on those variables that we believe cause multiples to vary across firms. Based upon the variables that determine each multiple, we should be able to regress PE, PBV and PS ratios against the variables that should affect them. As shown in the last section, the fundamentals that determine each multiple are summarized in table 2:

Table 2: Fundamentals Determining Equity Multiples

Multiple	*Fundamental Determinants*
Price Earnings Ratio	Expected Growth, Payout, Risk
Price to Book Equity Ratio	Expected Growth, Payout, Risk, ROE
Price to Sales Ratio	Expected Growth, Payout, Risk, Net Margin
EV to EBITDA	Expected Growth, Reinvestment Rate, Risk, ROC, Tax rate
EV to Capital Ratio	Expected Growth, Reinvestment Rate, Risk, ROC
EV to Sales	Expected Growth, Reinvestment Rate, Risk, Operating Margin

It is, however, possible that the proxies that we use for risk (beta), growth (expected growth rate in earnings per share), and cash flow (payout) are imperfect and that the relationship is not linear. To deal with these limitations, we can add more variables to the regression - e.g., the size of the firm may operate as a good proxy for risk.

The first advantage of this market-wide approach over the "subjective" comparison across firms in the same sector, described in the previous section, is that it does quantify, based upon actual market data, the degree to which higher growth or risk should affect the multiples. It is true that these estimates can contain errors, but those errors are a reflection of the reality that many analysts choose not to face when they make subjective judgments. Second, by looking at all firms in the market, this approach allows us to make more meaningful comparisons of firms that operate in industries with relatively few firms. Third, it allows us to examine whether all firms in an industry are under- or overvalued, by estimating their values relative to other firms in the market.

In one of the earliest regressions of PE ratios against fundamentals across the market, Kisor and Whitbeck(1963) used data from the Bank of New York for 135 stocks to arrive at the following result.[118]

P/E = 8.2 + 1.5 (Growth rate in Earnings) + 6.7 (Payout ratio) - 0.2 (Standard Deviation in EPS changes)

Cragg and Malkiel (1968) followed up by estimating the coefficients for a regression of the price-earnings ratio on the growth rate, the payout ratio and the beta for stocks for the time period from 1961 to 1965.[119]

Year	*Equation*	R^2
1961	$P/E = 4.73 + 3.28\ g + 2.05\ \pi - 0.85\ \beta$	0.70
1962	$P/E = 11.06 + 1.75\ g + 0.78\ \pi - 1.61\ \beta$	0.70
1963	$P/E = 2.94 + 2.55\ g + 7.62\ \pi - 0.27\ \beta$	0.75
1964	$P/E = 6.71 + 2.05\ g + 5.23\ \pi - 0.89\ \beta$	0.75
1965	$P/E = 0.96 + 2.74\ g + 5.01\ \pi - 0.35\ \beta$	0.85

where,

P/E = Price/Earnings Ratio at the start of the year

g = Growth rate in Earnings

π = Earnings payout ratio at the start of the year

β = Beta of the stock

They concluded that while such models were useful in explaining PE ratios, they were of little use in predicting performance. In both of these studies, the three variables used – payout, risk and growth – represent the three variables that were identified as the determinants of PE ratios in an earlier section.

The regressions were updated in Damodaran (1996, 2002) using a much broader sample of stocks and for a much wider range of multiples.[120] The results for PE ratios from 1987 to 1991 are summarized below.

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[118] Kisor, M., Jr., and V.S. Whitbeck, 1963, A New Tool in Investment Decision-Making, Financial Analysts Journal, v19, 55-62.

[119] Cragg, J.G., and B.G. Malkiel, 1968, The Consensus and Accuracy of Predictions of the Growth of Corporate Earnings, Journal of Finance, v23, 67-84.

[120] Damodaran, A., 1996 & 2004, Investment Valuation, John Wiley and Sons (first and second editions). These regressions look at all stocks listed on the COMPUSTAT database and similar regressions are run using price to book, price to sales and enterprise value multiples. The updated versions of these regressions

Year	*Regression*	*R squared*
1987	PE = 7.1839 + 13.05 PAYOUT - 0.6259 BETA + 6.5659 EGR	0.9287
1988	PE = 2.5848 + 29.91 PAYOUT - 4.5157 BETA + 19.9143 EGR	0.9465
1989	PE = 4.6122 + 59.74 PAYOUT - 0.7546 BETA + 9.0072 EGR	0.5613
1990	PE = 3.5955 + 10.88 PAYOUT - 0.2801 BETA + 5.4573 EGR	0.3497
1991	PE = 2.7711 + 22.89 PAYOUT - 0.1326 BETA + 13.8653 EGR	0.3217

Note the volatility in the R-squared over time and the changes in the coefficients on the independent variables. For instance, the R squared in the regressions reported above declines from 0.93 in 1987 to 0.32 in 1991 and the coefficients change dramatically over time. Part of the reason for these shifts is that earnings are volatile and the price-earnings ratios reflect this volatility. The low R-squared for the 1991 regression can be ascribed to the recession's effects on earnings in that year. These regressions are clearly not stable, and the predicted values are likely to be noisy. In addition, the regressions for book value and revenue multiples consistently have higher explanatory power than the regressions for price earnings ratios.

Limitations of Statistical Techniques

Statistical techniques are not a panacea for research or for qualitative analysis. They are tools that every analyst should have access to, but they should remain tools. In particular, when applying regression techniques to multiples, we need to be aware of both the distributional properties of multiples that we talked about earlier in the paper and the relationship among and with the independent variables used in the regression.

- The distribution of multiple values across the population is not normal for a very simple reason; most multiples are restricted from taking on values below zero but can be very large positive values.[121] This can pose problems when using standard regression techniques, and these problems are accentuated with small samples, where the asymmetry in the distribution can be magnified by the existence of a few large outliers.

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are online at http://www.damodaran.com. The growth rate over the previous 5 years was used as the expected growth rate and the betas were estimated from the CRSP tape.

[121] Damodaran, A., 2006, Damodaran on Valuation (Second Edition), John Wiley and Sons, New York. The distributional characteristics of multiples are described in chapter 7.

- In a multiple regression, the independent variables are themselves supposed to be independent of each other. Consider, however, the independent variables that we have used to explain valuation multiples – cash flow potential or payout ratio, expected growth and risk. Across a sector and over the market, it is quite clear that high growth companies will tend to be risky and have low payout. This correlation across independent variables creates "multicollinearity" which can undercut the explanatory power of the regression.
- The distributions for multiples change over time, making comparisons of PE ratios or EV/EBITDA multiples across time problematic. By the same token, a multiple regression where we explain differences in a multiple across companies at a point in time will itself lose predictive power as it ages. A regression of PE ratios against growth rates in early 2005 may therefore not be very useful in valuing stocks in early 2006.
- As a final note of caution, the R-squared on relative valuation regressions will almost never be higher than 70% and it is common to see them drop to 30 or 35%. Rather than ask the question of how high an R-squared has to be to be meaningful, we would focus on the predictive power of the regression. When the R-squared decreases, the ranges on the forecasts from the regression will increase.

Reconciling Relative and Discounted Cash Flow Valuations

The two approaches to valuation – discounted cash flow valuation and relative valuation – will generally yield different estimates of value for the same firm at the same point in time. It is even possible for one approach to generate the result that the stock is under valued while the other concludes that it is over valued. Furthermore, even within relative valuation, we can arrive at different estimates of value depending upon which multiple we use and what firms we based the relative valuation on.

The differences in value between discounted cash flow valuation and relative valuation come from different views of market efficiency, or put more precisely, market inefficiency. In discounted cash flow valuation, we assume that markets make mistakes, that they correct these mistakes over time, and that these mistakes can often occur across entire sectors or even the entire market. In relative valuation, we assume that while markets make mistakes on individual stocks, they are correct on average. In other words, when we value a new software company relative to other small software companies, we are assuming that the market has priced these companies correctly, on average, even though it might have made mistakes in the pricing of each of them individually. Thus, a stock may be over valued on a discounted cash flow basis but under valued on a relative basis, if the firms used for comparison in the relative valuation are all overpriced by the market. The reverse would occur, if an entire sector or market were underpriced.

Kaplan and Ruback (1995) examine the transactions prices paid for 51 companies in leveraged buyout deals and conclude that discounted cash flow valuations yield values very similar to relative valuations, at least for the firms in their sample.[122] They used the compressed APV approach, described in an earlier section, to estimate discounted cash flow values and multiples of EBIT and EBITDA to estimate relative values. Berkman, Bradbury and Ferguson (2000) use the PE ratio and discounted cash flow valuation models to value 45 newly listed companies on the New Zealand Stock Exchange and conclude that both approaches explain about 70% of the price variation and have similar accuracy.[123] In contrast to these findings, Kim and Ritter (1998) value a group of IPOs using PE and price to book ratios and conclude that multiples have only modest predictive ability.[124] Lee, Myers and Swaminathan (1999) compare valuations obtained for the Dow 30 stocks using both multiples and a discounted cash flow model, based upon residual income, and conclude that prices are more likely to converge on the latter in the long term. While the evidence seems contradictory, it can be explained by the fact the studies that find relative valuation works well look at cross sectional differences across stocks, whereas studies that look at pricing differences that correct over time conclude that intrinsic valuations are more useful.[125]

Directions for future research

As we survey the research done on valuation in the last few decades, there are three key trends that emerge from the research. First, the focus has shifted from valuing

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[122] Kaplan, S.N. and R.S. Ruback, 1995, The Valuation of Cash Flow Forecasts: An Empirical Analysis, Journal of Finance, v50, 1059-1093.
[123] Berkman, H., M.E. Bradbury and J. Ferguson, 2000, The Accuracy of Price-Earnings and Discounted Cash Flow Methods of IPO Equity Valuation, Journal of International Financial Management and Accounting, v11, 71-83.
[124] Kim, M. and J. R. Ritter (1999): Valuing IPOs, Journal of Financial Economics, v53, 409-437.
[125] Lee, C.M.C., J. Myers and B.Swaminathan, 1999, What is the intrinsic value of the Dow?, Journal of Finance, v54, 1693-1741.

stocks through models such as the dividend discount model to valuing businesses, representing the increased use of valuation models in acquisitions and corporate restructuring (where the financing mix is set by the acquirer) and the possibility that financial leverage can change quickly over time. Second, the connections between corporate finance and valuation have become clearer as value is linked to a firm's actions. In particular, the excess return models link value directly to the quality of investment decisions, whereas adjusted present value models make value a function of financing choices. Third, the comforting conclusion is that all models lead to equivalent values, with consistent assumptions, which should lead us to be suspicious of new models that claim to be more sophisticated and yield more precise values than prior iterations.

The challenges for valuation research in the future lie in the types of companies that we are called upon to value. First, the shift of investments from developed markets to emerging markets in Asia and Latin America has forced us to re-examine the assumptions we make about value. In particular, the interrelationship between corporate governance and value, and the question of how best to deal with the political and economic risk endemic to emerging markets have emerged as key topics. Second, the entry of young companies into public markets, often well before they have established revenue and profit streams, requires us to turn our attention to estimation questions: How best do we estimate the revenues and margins for a firm that has an interesting product idea but no commercial products? How do we forecast the reinvestment needs and estimate discount rates for such a firm? Third, with both emerging market and young companies, we need to reassess our dependence on current financial statement values as the basis for valuation. For firms in transition, in markets that are themselves changing, we need to be able to allow for significant changes in fundamentals, be they risk parameters, debt ratios and growth rats, over time. In short, we need dynamic valuation models rather than the static ones that we offer as the default currently. Fourth, as the emphasis has shifted from growth to excess returns as the driver of value, the importance of tying corporate strategy to value has also increased. After all, corporate strategy is all about creating new barriers to entry and augmenting or preserving existing ones, and much work needs to be done at the intersection of strategy and valuation. Understanding why a company earns excess returns in the first place and why those excess returns may come under assault is a pre-requisit for good valuation. Finally, while the increase in computing power and easy access to statistical tools has opened the door to more sophisticated variations in valuation, it has also increased the potential for misuse of these tools. Research on how best to incorporate statistical tools into the conventional task of valuing a business is needed. In particular, is there a place for simulations in valuation and if so, what is it? How about scenario analysis or neural networks? The good news is that there is a great deal of interesting work left to be done in valuation. The bad news is that it will require a mix of interdisciplinary skills including accounting, corporate strategy, statistics and corporate finance for this research to have a significant impact.

Conclusion

Since valuation is key to so much of what we do in finance, it is not surprising that there are a myriad of valuation approaches in use. In this paper, we examined three different approaches to valuation, with numerous sub-approaches within each. The first is discounted cash flow valuation, where the value of a business or asset is determined by its cash flows and can be estimated in one of four ways: (a) expected cash flows can be discounted back at a risk-adjusted discount rate (b) uncertain cash flows can be converted into certainty equivalents and discounted back at a riskfree rate (c) expected cash flows can be broken down into normal (representing a fair return on capital invested) and excess return cash flows and valued separately and (d) the value of the asset or business is first estimated on an all-equity funded basis and the effects of debt on value are computed separately. Not surprisingly, given their common roots, these valuation approaches can be shown to yield the same value for an asset, if we make consistent assumptions. In practice, though, proponents of these approaches continue to argue for their superiority and arrive at very different asset values, often because of difference in the implicit assumptions that they make within each approach.

The second approach has its roots in accounting, and builds on the notion that there is significant information in the book value of a firm's assets and equity. While there are few who would claim that the book value is a good measure of the true value, there are approaches that build on the book value and accrual earnings to arrive at consistent estimates of value. In recent years, there has also been a push towards fair value accounting with the ultimate objective of making balance sheets more informative and value relevant.

The third approach to valuation is relative valuation, where we value an asset based upon how similar assets are priced. It is built on the assumption that the market, while it may be wrong in how it prices individual assets, gets it right on average and is clearly the dominant valuation approach in practice. Relative valuation is built on standardized prices, where we scale the market value to some common measure such as earnings, book value or revenues, but the determinants of these multiples are the same ones that underlie discounted cash flow valuation.

Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2015 Edition

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Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2015 Edition

Equity risk premiums are a central component of every risk and return model in finance and are a key input in estimating costs of equity and capital in both corporate finance and valuation. Given their importance, it is surprising how haphazard the estimation of equity risk premiums remains in practice. We begin this paper by looking at the economic determinants of equity risk premiums, including investor risk aversion, information uncertainty and perceptions of macroeconomic risk. In the standard approach to estimating the equity risk premium, historical returns are used, with the difference in annual returns on stocks versus bonds over a long time period comprising the expected risk premium. We note the limitations of this approach, even in markets like the United States, which have long periods of historical data available, and its complete failure in emerging markets, where the historical data tends to be limited and volatile. We look at two other approaches to estimating equity risk premiums – the survey approach, where investors and managers are asked to assess the risk premium and the implied approach, where a forward-looking estimate of the premium is estimated using either current equity prices or risk premiums in non-equity markets. In the next section, we look at the relationship between the equity risk premium and risk premiums in the bond market (default spreads) and in real estate (cap rates) and how that relationship can be mined to generated expected equity risk premiums. We close the paper by examining why different approaches yield different values for the equity risk premium, and how to choose the "right" number to use in analysis.

(This is the eighth update of this piece. The first update was in the midst of the financial crisis in 2008 and there have been annual updates at the start of each year from 2009 through 2014.)

The notion that risk matters, and that riskier investments should have higher expected returns than safer investments, to be considered good investments, is intuitive and central to risk and return models in finance. Thus, the expected return on any investment can be written as the sum of the riskfree rate and a risk premium to compensate for the risk. The disagreement, in both theoretical and practical terms, remains on how to measure the risk in an investment, and how to convert the risk measure into an expected return that compensates for risk. A central number in this debate is the premium that investors demand for investing in the 'average risk' equity investment (or for investing in equities as a class), i.e., the equity risk premium.

In this paper, we begin by examining competing risk and return models in finance and the role played by equity risk premiums in each of them. We argue that equity risk premiums are central components in every one of these models and consider what the determinants of these premiums might be. We follow up by looking at three approaches for estimating the equity risk premium in practice. The first is to survey investors or managers with the intent of finding out what they require as a premium for investing in equity as a class, relative to the riskfree rate. The second is to look at the premiums earned historically by investing in stocks, as opposed to riskfree investments. The third is to back out an equity risk premium from market prices today. We consider the pluses and minuses of each approach and how to choose between the very different numbers that may emerge from these approaches.

Equity Risk Premiums: Importance and Determinants

Since the equity risk premium is a key component of every valuation, we should begin by looking at not only why it matters in the first place but also the factors that influence its level at any point in time and why that level changes over time. In this section, we look at the role played by equity risk premiums in corporate financial analysis, valuation and portfolio management, and then consider the determinants of equity risk premiums.

Why does the equity risk premium matter?

The equity risk premium reflects fundamental judgments we make about how much risk we see in an economy/market and what price we attach to that risk. In the process, it affects the expected return on every risky investment and the value that we estimate for that investment. Consequently, it makes a difference in both how we allocate wealth across different asset classes and which specific assets or securities we invest in within each asset class.

A Price for Risk

To illustrate why the equity risk premium is the price attached to risk, consider an alternate (though unrealistic) world where investors are risk neutral. In this world, the value of an asset would be the present value of expected cash flows, discounted back at a risk free rate. The expected cash flows would capture the cash flows under all possible scenarios (good and bad) and there would be no risk adjustment needed. In the real world, investors are risk averse and will pay a lower price for risky cash flows than for riskless cash flows, with the same expected value. How much lower? That is where equity risk premiums come into play. In effect, the equity risk premium is the premium that investors demand for the average risk investment, and by extension, the discount that they apply to expected cash flows with average risk. When equity risk premiums rise, investors are charging a higher price for risk and will therefore pay lower prices for the same set of risky expected cash flows.

Expected Returns and Discount Rates

Building on the theme that the equity risk premium is the price for taking risk, it is a key component into the expected return that we demand for a risky investment. This expected return, is a determinant of both the cost of equity and the cost of capital, essential inputs into corporate financial analysis and valuation.

While there are several competing risk and return models in finance, they all share some common assumptions about risk. First, they all define risk in terms of variance in actual returns around an expected return; thus, an investment is riskless when actual returns are always equal to the expected return. Second, they argue that risk has to be measured from the perspective of the marginal investor in an asset, and that this marginal investor is well diversified. Therefore, the argument goes, it is only the risk that an investment adds on to a diversified portfolio that should be measured and compensated. In fact, it is this view of risk that leads us to break the risk in any investment into two components. There is a firm-specific component that measures risk that relates only to that investment or to a few investments like it, and a market component that contains risk that affects a large subset or all investments. It is the latter risk that is not diversifiable and should be rewarded.

All risk and return models agree on this fairly crucial distinction, but they part ways when it comes to how to measure this market risk. In the capital asset pricing model (CAPM), the market risk is measured with a beta, which when multiplied by the equity risk premium yields the total risk premium for a risky asset. In the competing models, such as the arbitrage pricing and multi-factor models, betas are estimated against individual market risk factors, and each factor has it own price (risk premium). Table 1 summarizes four models, and the role that equity risk premiums play in each one:

Table 1: Equity Risk Premiums in Risk and Return Models

	Model	*Equity Risk Premium*
The CAPM	Expected Return = Riskfree Rate + $Beta_{Asset}$ (Equity Risk Premium)	Risk Premium for investing in the market portfolio, which includes all risky assets, relative to the riskless rate.
Arbitrage pricing model (APM)	$\text{Expected Return} = \text{Riskfree Rate} + \sum_{j=1}^{j=k} \beta_j (\text{Risk Premium}_j)$	Risk Premiums for individual (unspecified) market risk factors.
Multi-Factor Model	$\text{Expected Return} = \text{Riskfree Rate} + \sum_{j=1}^{j=k} \beta_j (\text{Risk Premium}_j)$	Risk Premiums for individual (specified) market risk factors
Proxy Models	Expected Return = a + b (Proxy 1) + c (Proxy 2) (where the proxies are firm characteristics such as market capitalization, price to book ratios or return momentum)	No explicit risk premium computation, but coefficients on proxies reflect risk preferences.

All of the models other than proxy models require three inputs. The first is the riskfree rate, simple to estimate in currencies where a default free entity exists, but more complicated in markets where there are no default free entities. The second is the beta (in the CAPM) or betas (in the APM or multi-factor models) of the investment being analyzed, and the third is the appropriate risk premium for the portfolio of all risky assets (in the CAPM) and the factor risk premiums for the market risk factors in the APM and multi-factor models. While I examine the issues of riskfree rate and beta estimation in companion pieces, I will concentrate on the measurement of the risk premium in this paper.

Note that the equity risk premium in all of these models is a market-wide number, in the sense that it is not company specific or asset specific but affects expected returns on all risky investments. Using a larger equity risk premium will increase the expected returns for all risky investments, and by extension, reduce their value. Consequently, the choice of an equity risk premium may have much larger consequences for value than firm-specific inputs such as cash flows, growth and even firm-specific risk measures (such as betas).

Investment and Policy Implications

It may be tempting for those not in the midst of valuation or corporate finance analysis to pay little heed to the debate about equity risk premium, but it would be a mistake to do so, since its effects are far reaching.

- The amounts set aside by both corporations and governments to meet future pension fund and health care obligations are determined by their expectations of returns from investing in equity markets, i.e., their views on the equity risk premium. Assuming that the equity risk premium is 6% will lead to far less being set aside each year to cover future obligations than assuming a premium of 4%. If the actual premium delivered by equity markets is only 2%, the fund's assets will be insufficient to meet its liabilities, leading to fund shortfalls which have to be met by raising taxes (for governments) or reducing profits (for corporations) In some cases, the pension benefits can be put at risk, if plan administrators use unrealistically high equity risk premiums, and set aside too little each year.
- Business investments in new assets and capacity is determined by whether the businesses think they can generate higher returns on those investments than the cost that they attach to the capital in that investment. If equity risk premiums increase, the cost of equity and capital will have to increase with them, leading to less overall investment in the economy and lower economic growth.
- Regulated monopolies, such as utility companies, are often restricted in terms of the prices that they charge for their products and services. The regulatory commissions that determine "reasonable" prices base them on the assumption that these companies have to earn a fair rate of return for their equity investors. To come up with this fair rate of return, they need estimates of equity risk premiums; using higher equity risk premiums will translate into higher prices for the customers in these companies.[1]
- Judgments about how much you should save for your retirement or health care and where you should invest your savings are clearly affected by how much return you think you can make on your investments. Being over optimistic about equity risk premiums will lead you to save too little to meet future needs and to over investment in risky asset classes.

Thus, the debate about equity risk premiums has implications for almost every aspect of our lives.

Market Timing and Risk Premiums

Any one who invests has a view on equity risk premiums, though few investors are explicit about their views. In particular, if you believe that markets are efficient, you

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[1] The Society of Utility and Regulatory Financial Analysts (SURFA) has annual meetings of analysts involved primarily in this debate. Not surprisingly, they spend a good chunk of their time discussing equity risk premiums, with analysts working for the utility firms arguing for higher equity risk premiums and analysts working for the state or regulatory authorities wanting to use lower risk premiums.

are arguing that the equity risk premiums built into market prices today are correct. If you believe that stock markets are over valued or in a bubble, you are asserting that the equity risk premiums built into prices today are too low, relative to what they should be (based on the risk in equities and investor risk aversion). Conversely, investors who believe that stocks are collectively underpriced or cheap are also making a case that the equity risk premium in the market today is much higher than what you should be making (again based on the risk in equities and investor risk aversion). Thus, every debate about the overall equity market can be translated into a debate about equity risk premiums.

Put differently, asset allocation decisions that investors make are explicitly or implicitly affected by investor views on risk premiums and how they vary across asset classes and geographically. Thus, if you believe that equity risk premiums are low, relative to the risk premiums in corporate bond markets (which take the form or default spreads on bonds), you will allocated more of your overall portfolio to bonds. Your allocation of equities across geographical markets are driven by your perceptions of equity risk premiums in those markets, with more of your portfolio going into markets where the equity risk premium is higher than it should be (given the risk of those markets). Finally, if you determine that the risk premiums in financial assets (stocks and bonds) are too low, relative to what you can earn in real estate or other real assets, you will redirect more of your portfolio into the latter.

By making risk premiums the focus of asset allocation decisions, you give focus to those decisions. While it is very difficult to compare PE ratios for stocks to interest rates on bonds and housing price indicators, you can compare equity risk premiums to default spreads to real estate capitalization rates to make judgments about where you get the best trade off on risk and return. In fact, we will make these comparisons later in this paper.

What are the determinants of equity risk premiums?

Before we consider different approaches for estimating equity risk premiums, we should examine the factors that determine equity risk premiums. After all, equity risk premiums should reflect not only the risk that investors see in equity investments but also the price they attach to that risk.

Risk Aversion and Consumption Preferences

The first and most critical factor, obviously, is the risk aversion of investors in the markets. As investors become more risk averse, equity risk premiums will climb, and as risk aversion declines, equity risk premiums will fall. While risk aversion will vary across investors, it is the collective risk aversion of investors that determines equity risk premium, and changes in that collective risk aversion will manifest themselves as changes in the equity risk premium. While there are numerous variables that influence risk aversion, we will focus on the variables most likely to change over time.

a. Investor Age: There is substantial evidence that individuals become more risk averse as they get older. The logical follow up to this proposition is that markets with older investors, in the aggregate, should have higher risk premiums than markets with younger investors, for any given level of risk. Bakshi and Chen (1994), for instance, examined risk premiums in the United States and noted an increase in risk premiums as investors aged.[2] Liu and Spiegel computed the ratio of the middle-age cohort (40-49 years) to the old-age cohort (60-69) and found that PE ratios are closely and positively related to the MO ratio for the US equity market from 1954 to 2010; since the equity risk premium is inversely related to the PE, this would suggest that investor age does play a role in determining equity risk premiums.[3]
b. Preference for current consumption: We would expect the equity risk premium to increase as investor preferences for current over future consumption increase. Put another way, equity risk premiums should be lower, other things remaining equal, in markets where individuals are net savers than in markets where individuals are net consumers. Consequently, equity risk premiums should increase as savings rates decrease in an economy. Rieger, Wang and Hens (2012) compare equity risk premiums and time discount factors across 27 countries and find that premiums are higher in countries where investors are more short term.[4]

Relating risk aversion to expected equity risk premiums is not straightforward. While the direction of the relationship is simple to establish – higher risk aversion should translate into higher equity risk premiums- getting beyond that requires us to be more precise in our judgments about investor utility functions, specifying how investor utility relates to wealth (and variance in that wealth). As we will see later in this paper, there has been a significant angst among financial economics that most conventional utility models do not do a good job of explaining observed equity risk premiums.

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[2] Bakshi, G. S., and Z. Chen, 1994, *Baby Boom, Population Aging, and Capital Markets*, The Journal of Business, LXVII, 165-202.

[3] Liu, Z. and M.M. Siegel, 2011, *Boomer Retirement: Headwinds for US Equity Markets?* FRBSF Economic Letters, v26.

[4] Rieger, M.O., M. Wang and T. Hens, 2012, International Evidence on the Equity Risk Premium Puzzle and Time Discounting, SSRN Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2120442

Economic Risk

The risk in equities as a class comes from more general concerns about the health and predictability of the overall economy. Put in more intuitive terms, the equity risk premium should be lower in an economy with predictable inflation, interest rates and economic growth than in one where these variables are volatile. Lettau, Ludwigson and Wachter (2008) link the changing equity risk premiums in the United States to shifting volatility in the real economy.[5] In particular, they attribute that that the lower equity risk premiums of the 1990s (and higher equity values) to reduced volatility in real economic variables including employment, consumption and GDP growth. One of the graphs that they use to illustrate the correlation looks at the relationship between the volatility in GDP growth and the dividend/ price ratio (which is the loose estimate that they use for equity risk premiums), and it is reproduced in figure 1.

Figure 1: Volatility in GDP growth and Equity Risk Premiums (US)

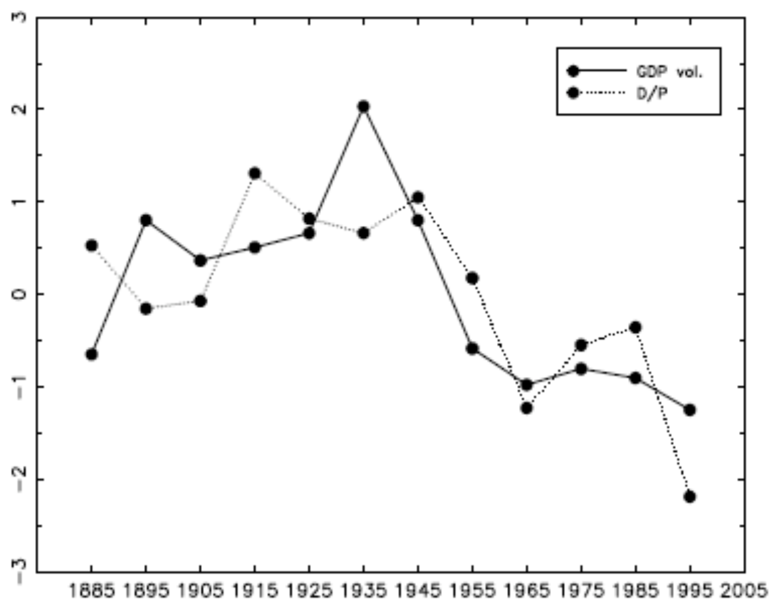

Figure 3
GDP volatility and the D/P ratio—Prewar evidence
This figure plots the standard deviations of GDP growth and the mean D/P ratio by decade starting in 1880 until 2000. Both series are demeaned and divided by their standard deviation. The GDP data are from Ray Fair's website (http://fairmodel.econ.yale.edu/RAYFAIR/PDF/2002DTBL.HTM) based on Balke and Gordon (1989). The dividend yield data is from Robert Shiller's website (http://aida.econ.yale.edu/~shiller/data/ie_data.htm).

Note how closely the dividend yield has tracked the volatility in the real economy over this very long time period.

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[5] Lettau, M., S.C. Ludvigson and J.A. Wachter, 2008. *The Declining Equity Risk Premium: What role does macroeconomic risk play?* Review of Financial Studies, v21, 1653-1687.

Gollier (2001) noted that the linear absolute risk tolerance often assumed in standard models breaks down when there is income inequality and the resulting concave absolute risk tolerance should lead to higher equity risk premiums.[6] Hatchondo (2008) attempted to quantify the impact on income inequality on equity risk premiums. In his model, which is narrowly structured, the equity risk premium is higher in an economy with unequal income than in an egalitarian setting, but only by a modest amount (less than 0.50%).[7]

A related strand of research examines the relationship between equity risk premium and inflation, with mixed results. Studies that look at the relationship between the level of inflation and equity risk premiums find little or no correlation. In contrast, Brandt and Wang (2003) argue that news about inflation dominates news about real economic growth and consumption in determining risk aversion and risk premiums.[8] They present evidence that equity risk premiums tend to increase if inflation is higher than anticipated and decrease when it is lower than expected. Another strand of research on the Fisher equation, which decomposes the riskfree rate into expected inflation and a real interest rate, argues that when inflation is stochastic, there should be a third component in the risk free rate: an inflation risk premium, reflecting uncertainty about future inflation.[9] Reconciling the findings, it seems reasonable to conclude that it is not so much the level of inflation that determines equity risk premiums but uncertainty about that level, and that some of the inflation uncertainty premium may be captured in the risk free rate, rather than in the equity risk premiums.

Since the 2008 crisis, with its aftermath oflow government bond rates and a simmering economic crisis, equity risk premiums in the United States have behaved differently than they have historically. Connolly and Dubofsky (2015) find that equity risk premiums have increased (decreased) as US treasury bond rates decrease (increase), and have moved inversely with inflation (with higher inflation leading to lower equity risk premiums), both behaviors at odds with the relationship in the pre-2008 time period, suggesting a structural break in 2008.[10]

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[6] Gollier, C., 2001. *Wealth Inequality and Asset Pricing*, Review of Economic Studies, v68, 181–203.

[7] Hatchondo, J.C., 2008, *A Quantitative Study of the Role of Income Inequality on Asset Prices*, Economic Quarterly, v94, 73–96.

[8] Brandt, M.W. and K.Q. Wang. 2003. *Time-varying risk aversion and unexpected inflation*, Journal of Monetary Economics, v50, pp. 1457-1498.

[9] Benninga, S., and A. Protopapadakis, 1983, *Real and Nominal Interest Rates under Uncertainty: The Fisher Problem and the Term Structure*, Journal of Political Economy, vol. 91, pp. 856–67.

[10] Connolly, R. and D. Dubofsky, 2015, *Risk Perceptions, Inflation and Financial Asset Returns: A Tale of Two Connections*, Working Paper, SSRN #2527213.

Information

When you invest in equities, the risk in the underlying economy is manifested in volatility in the earnings and cash flows reported by individual firms in that economy. Information about these changes is transmitted to markets in multiple ways, and it is clear that there have been significant changes in both the quantity and quality of information available to investors over the last two decades. During the market boom in the late 1990s, there were some who argued that the lower equity risk premiums that we observed in that period were reflective of the fact that investors had access to more information about their investments, leading to higher confidence and lower risk premiums in 2000. After the accounting scandals that followed the market collapse, there were others who attributed the increase in the equity risk premium to deterioration in the quality of information as well as information overload. In effect, they were arguing that easy access to large amounts of information of varying reliability was making investors less certain about the future.

As these contrary arguments suggest, the relationship between information and equity risk premiums is complex. More precise information should lead to lower equity risk premiums, other things remaining equal. However, precision here has to be defined in terms of what the information tells us about future earnings and cash flows. Consequently, it is possible that providing more information about last period's earnings may create more uncertainty about future earnings, especially since investors often disagree about how best to interpret these numbers. Yee (2006) defines earnings quality in terms of volatility of future earnings and argues that equity risk premiums should increase (decrease) as earnings quality decreases (increases).[11]

Empirically, is there a relationship between earnings quality and observed equity risk premiums? The evidence is mostly anecdotal, but there are several studies that point to the deteriorating quality of earnings in the United States, with the blame distributed widely. First, the growth of technology and service firms has exposed inconsistencies in accounting definitions of earnings and capital expenditures – the treatment of R&D as an operating expense is a prime example. Second, audit firms have been accused of conflicts of interest leading to the abandonment of their oversight responsibility. Finally, the earnings game, where analysts forecast what firms will earn and firms then try to beat these forecasts has led to the stretching (and breaking) of accounting rules and standards. If earnings have become less informative in the aggregate, it stands to reason that equity

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[11] Yee, K. K.,, 2006, *Earnings Quality and the Equity Risk Premium: A Benchmark Model*, Contemporary Accounting Research, 23: 833–877.

investors will demand large equity risk premiums to compensate for the added uncertainty.

Information differences may be one reason why investors demand larger risk premiums in some emerging markets than in others. After all, markets vary widely in terms of transparency and information disclosure requirements. Markets like Russia, where firms provide little (and often flawed) information about operations and corporate governance, should have higher risk premiums than markets like India, where information on firms is not only more reliable but also much more easily accessible to investors. Lau, Ng and Zhang (2011) look at time series variation in risk premiums in 41 countries and conclude that countries with more information disclosure, measured using a variety of proxies, have less volatile risk premiums and that the importance of information is heightened during crises (illustrated using the 1997 Asian financial crisis and the 2008 Global banking crisis).[12]

Liquidity and Fund Flows

In addition to the risk from the underlying real economy and imprecise information from firms, equity investors also have to consider the additional risk created by illiquidity. If investors have to accept large discounts on estimated value or pay high transactions costs to liquidate equity positions, they will be pay less for equities today (and thus demand a large risk premium).

The notion that market for publicly traded stocks is wide and deep has led to the argument that the net effect of illiquidity on aggregate equity risk premiums should be small. However, there are two reasons to be skeptical about this argument. The first is that not all stocks are widely traded and illiquidity can vary widely across stocks; the cost of trading a widely held, large market cap stock is very small but the cost of trading an over-the-counter stock will be much higher. The second is that the cost of illiquidity in the aggregate can vary over time, and even small variations can have significant effects on equity risk premiums. In particular, the cost of illiquidity seems to increase when economies slow down and during periods of crisis, thus exaggerating the effects of both phenomena on the equity risk premium.

While much of the empirical work on liquidity has been done on cross sectional variation across stocks (and the implications for expected returns), there have been attempts to extend the research to look at overall market risk premiums. Gibson and Mougeot (2004) look at U.S. stock returns from 1973 to 1997 and conclude that liquidity

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[12] Lau. S.T., L. Ng and B. Zhang, 2011, *Information Environment and Equity Risk Premium Volatility around the World*, Management Science, Forthcoming.

accounts for a significant component of the overall equity risk premium, and that its effect varies over time.[13] Baekart, Harvey and Lundblad (2006) present evidence that the differences in equity returns (and risk premiums) across emerging markets can be partially explained by differences in liquidity across the markets.[14]

Another way of framing the liquidity issue is in terms of funds flows, where the equity risk premium is determined by funds flows into and out of equities. Thus, if more funds are flowing into an equity market, either from other asset classes or other geographies, other things remaining equal, the equity risk premium should decrease, whereas funds flowing out of an equity market will lead to higher equity risk premiums.

Catastrophic Risk

When investing in equities, there is always the potential for catastrophic risk, i.e. events that occur infrequently but can cause dramatic drops in wealth. Examples in equity markets would include the great depression from 1929-30 in the United States and the collapse of Japanese equities in the last 1980s. In cases like these, many investors exposed to the market declines saw the values of their investments drop so much that it was unlikely that they would be made whole again in their lifetimes.[15] While the possibility of catastrophic events occurring may be low, they cannot be ruled out and the equity risk premium has to reflect that risk.

Rietz (1988) uses the possibility of catastrophic events to justify higher equity risk premiums and Barro (2006) extends this argument. In the latter's paper, the catastrophic risk is modeled as both a drop in economic output (an economic depression) and partial default by the government on its borrowing.[16] Gabaix (2009) extends the Barro-Rietz model to allow for time varying losses in disasters.[17] Barro, Nakamura, Steinsson and Ursua (2009) use panel data on 24 countries over more than 100 years to examine the empirical effects of disasters.[18] They find that the average length of a disaster is six years

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[13] Gibson R., Mougeot N., 2004, *The Pricing of Systematic Liquidity Risk: Empirical Evidence from the US Stock Market*. Journal of Banking and Finance, v28: 157–78.

[14] Bekaert G., Harvey C. R., Lundblad C., 2006, *Liquidity and Expected Returns: Lessons from Emerging Markets*, The Review of Financial Studies.

[15] An investor in the US equity markets who invested just prior to the crash of 1929 would not have seen index levels return to pre-crash levels until the 1940s. An investor in the Nikkei in 1987, when the index was at 40000, would still be facing a deficit of 50% (even after counting dividends) in 2008,

[16] Rietz, T. A., 1988, *The equity premium~: A solution*, Journal of Monetary Economics, v22, 117-131; Barro R J., 2006, *Rare Disasters and Asset Markets in the Twentieth Century*, Quarterly Journal of Economics, August, 823-866.

[17] Gabaix, Xavier, 2012, *Variable Rare Disasters: An Exactly Solved Framework for Ten Puzzles in Macro-Finance*, The Quarterly Journal of Economics, v127, 645-700.

[18] Barro, R., E. Nakamura, J. Steinsson and J. Ursua, 2009, *Crises and Recoveries in an Empirical Model of Consumption Disasters*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1594554.

and that half of the short run impact is reversed in the long term. Investigating the asset pricing implications, they conclude that the consequences for equity risk premiums will depend upon investor utility functions, with some utility functions (power utility, for instance) yielding low premiums and others generating much higher equity risk premiums. Barro and Ursua (2008) look back to 1870 and identify 87 crises through 2007, with an average impact on stock prices of about 22%, and estimate that investors would need to generate an equity risk premium of 7% to compensate for risk taken.[19] Wachter (2012) builds a consumption model, where consumption follows a normal distribution with low volatility most of the time, with a time-varying probability of disasters that explains high equity risk premiums.[20]

There have been attempts to measure the likelihood of catastrophic risk and incorporate them into models that predict equity risk premiums. In a series of papers with different co-authors, Bollerslev uses the variance risk premium, i.e., the difference between the implied variance in stock market options and realized variance, as a proxy for expectations of catastrophic risk, and documents a positive correlation with equity risk premiums.[21] Kelly (2012) looks at extreme stock market movements as a measure of expected future jump (catastrophic) risk and finds a positive link between jump risk and equity risk premiums.[22] Guo, Liu, Wang, Zhou and Zuo (2014) refine this analysis by decomposing jumps into bad (negative) and good (positive) ones and find that it is the risk of downside jumps that determines equity risk premiums..[23] Maheu, McCurdy and Zhao (2013) used a time-varying jump-arrival process and a two-component GARCH model on US stock market data from 1926 to 2011, and estimated that each additional jump per year increased the equity risk premium by 0.1062% and that there were, on average, 34 jumps a year, leading to a jump equity risk premium of 3.61%.[24]

The banking and financial crisis of 2008, where financial and real estate markets plunged in the last quarter of the year, has provided added ammunition to this school. As

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19 Barro, R. and J. Ursua, 2008, Macroeconomic Crises since 1870, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1124864.

20 Wachter, J.A., 2013, *Can time-varying risk of rare disasters explain aggregate stock market volatility?* Journal of Finance, v68, 987-1035.

21 Bollerslev, T. M., T. H. Law, and G. Tauchen, 2008, *Risk, Jumps, and Diversification*, Journal of Econometrics, 144, 234-256; Bollerslev, T. M., G. Tauchen, and H. Zhou, 2009, *Expected Stock Returns and Variance Risk Premia*, Review of Financial Studies, 101-3, 552-573; Bollerselv, T.M., and V. Todorov, 2011, *Tails, Fears, and Risk Premia*, Journal of Finance, 66-6, 2165-2211.

22 Kelly, B., 2012, *Tail Risk and Asset Prices*, Working Paper, University of Chicago.

23 Guo, H., Z. Liu, K. Wang, H. Zhou and H. Zuo, 2014, *Good Jumps, Bad Jumps and Conditional Equity Risk Premium*, Working Paper, SSRN #2516074.

24 Maheu, J.M., T.H. McCurdy and X. Wang, 2013, *Do Jumps Contribute to the Dynamics of the Equity Premium,* Journal of Financial Economics, v110, 457-477.

we will see later in the paper, risk premiums in all markets (equity, bond and real estate) climbed sharply during the weeks of the market crisis. In fact, the series of macro crises in the last four years that have affected markets all over the world has led some to hypothesize that the globalization may have increased the frequency and probability of disasters and by extension, equity risk premiums, in all markets.

Government Policy

The prevailing wisdom, at least until 2008, was that while government policy affected equity risk premiums in emerging markets, it was not a major factor in determining equity risk premiums in developed markets. The banking crisis of 2008 and the government responses to it have changed some minds, as both the US government and European governments have made policy changes that at times have calmed markets and at other times roiled them, potentially affecting equity risk premiums.

Pastor and Veronesi (2012) argue that uncertainty about government policy can translate into higher equity risk premiums.[25] The model they develop has several testable implications. First, government policy changes will be more likely just after economic downturns, thus adding policy uncertainty to general economic uncertainty and pushing equity risk premiums upwards. Second, you should expect to see stock prices fall, on average, across all policy changes, with the magnitude of the negative returns increasing for policy changes create more uncertainty. Third, policy changes will increase stock market volatility and the correlation across stocks.

Lam and Zhang (2014) try to capture the potential policy shocks from either an unstable government (government stability) or an incompetent bureaucracy (bureaucracy quality) in 49 countries from 1995 to 2006, using two measures of policy uncertainty drawn from the international country risk guide (ICG). They do find that equity risk premiums are higher in countries with more policy risk from either factor, with more bureaucratic risk increasing the premium by approximately 8%.[26]

The behavioral/ irrational component

Investors do not always behave rationally, and there are some who argue that equity risk premiums are determined, at least partially, by quirks in human behavior. While there are several strands to this analysis, we will focus on three:

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[25] Pástor, L. and P. Veronesi, 2012. *Uncertainty about Government policy and Stock Prices*. Journal of Finance 67: 1219-1264.

[26] Lam, S.S. and W. Zhang, 2014, *Does Policy Uncertainty matter for International Equity Markets?* Working Paper, SSRN #2297133.

a. The Money Illusion: As equity prices declined significantly and inflation rates increased in the late 1970s, Modigliani and Cohn (1979) argued that low equity values of that period were the consequence of investors being inconsistent about their dealings with inflation. They argued that investors were guilty of using historical growth rates in earnings, which reflected past inflation, to forecast future earnings, but current interest rates, which reflected expectations of future inflation, to estimate discount rates.[27] When inflation increases, this will lead to a mismatch, with high discount rates and low cash flows resulting in asset valuations that are too low (and risk premiums that are too high). In the Modigliani-Cohn model, equity risk premiums will rise in periods when inflation is higher than expected and drop in periods when inflation in lower than expected. Campbell and Voulteenaho (2004) update the Modigliani-Cohn results by relating changes in the dividend to price ratio to changes in the inflation rate over time and find strong support for the hypothesis.[28]

b. Narrow Framing: In conventional portfolio theory, we assume that investors assess the risk of an investment in the context of the risk it adds to their overall portfolio, and demand a premium for this risk. Behavioral economists argue that investors offered new gambles often evaluate those gambles in isolation, separately from other risks that they face in their portfolio, leading them to over estimate the risk of the gamble. In the context of the equity risk premium, Benartzi and Thaler (1995) use this "narrow framing" argument to argue that investors over estimate the risk in equity, and Barberis, Huang and Santos (2001) build on this theme.[29]

The Equity Risk Premium Puzzle

While many researchers have focused on individual determinants of equity risk premiums, there is a related question that has drawn almost as much attention. Are the equity risk premiums that we have observed in practice compatible with the theory? Mehra and Prescott (1985) fired the opening shot in this debate by arguing that the observed historical risk premiums (which they estimated at about 6% at the time of their analysis) were too high, and that investors would need implausibly high risk-aversion

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[27] Modigliani, Franco and Cohn, Richard. 1979, *Inflation, Rational Valuation, and the Market*, Financial Analysts Journal, v37(3), pp. 24-44.

[28] Campbell, J.Y. and T. Vuolteenaho, 2004, *Inflation Illusion and Stock Prices,* American Economic Review, v94, 19-23.

[29] Benartzi, S. and R. Thaler, 1995, *Myopic Loss Aversion and the Equity Premium Puzzle*, Quarterly Journal of Economics; Barberis, N., M. Huang, and T. Santos, 2001, *Prospect Theory and Asset Prices*, Quarterly Journal of Economics, v 116(1), 1-53.

coefficients to demand these premiums.[30] In the years since, there have been many attempts to provide explanations for this puzzle:

1. Statistical artifact: The historical risk premium obtained by looking at U.S. data is biased upwards because of a survivor bias (induced by picking one of the most successful equity markets of the twentieth century). The true premium, it is argued, is much lower. This view is backed up by a study of large equity markets over the twentieth century, which concluded that the historical risk premium is closer to 4% than the 6% cited by Mehra and Prescott.[31] However, even the lower risk premium would still be too high, if we assumed reasonable risk aversion coefficients.
2. Disaster Insurance: A variation on the statistical artifact theme, albeit with a theoretical twist, is that the observed volatility in an equity market does not fully capture the potential volatility, which could include rare but disastrous events that reduce consumption and wealth substantially. Reitz, referenced earlier, argues that investments that have dividends that are proportional to consumption (as stocks do) should earn much higher returns than riskless investments to compensate for the possibility of a disastrous drop in consumption. Prescott and Mehra (1988) counter than the required drops in consumption would have to be of such a large magnitude to explain observed premiums that this solution is not viable. [32] Berkman, Jacobsen and Lee (2011) use data from 447 international political crises between 1918 and 2006 to create a crisis index and note that increases in the index increase equity risk premiums, with disproportionately large impacts on the industries most exposed to the crisis.[33]
3. Taxes: One possible explanation for the high equity returns in the period after the Second World War is the declining marginal tax rate during that period. McGrattan and Prescott (2001), for instance, provide a hypothetical illustration where a drop in the tax rate on dividends from 50% to 0% over 40 years would cause equity prices to rise about 1.8% more than the growth rate in GDP; adding the dividend yield to this expected price appreciation generates returns similar to

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[30] Mehra, Rajnish, and Edward C.Prescott, 1985, *The Equity Premium: A Puzzle*, Journal of Monetary Economics, v15, 145–61. Using a constant relative risk aversion utility function and plausible risk aversion coefficients, they demonstrate the equity risk premiums should be much lower (less than 1%).

[31] Dimson, E., P. March and M. Staunton, 2002, *Triumph of the Optimists*, Princeton University Press.

[32] Mehra, R. and E.C. Prescott, 1988, *The Equity Risk Premium: A Solution?* Journal of Monetary Economics, v22, 133-136.

[33] Berkman, H., B. Jacobsen and J. Lee, 2011, *Time-varying Disaster Risk and Stock Returns*, Journal of Financial Economics, v101, 313-332

the observed equity risk premium.[34] In reality, though, the drop in marginal tax rates was much smaller and cannot explain the surge in equity risk premiums.

4. Alternative Preference Structures: There are some who argue that the equity risk premium puzzle stems from its dependence upon conventional expected utility theory to derive premiums. In particular, the constant relative risk aversion (CRRA) function used by Mehra and Prescott in their paper implies that if an investor is risk averse to variation in consumption across different states of nature at a point in time, he or she will also be equally risk averse to consumption variation across time. Epstein and Zin consider a class of utility functions that separate risk aversion (to consumption variation at a point in time) from risk aversion to consumption variation across time. They argue that individuals are much more risk averse when it comes to the latter and claim that this phenomenon explain the larger equity risk premiums.[35] Put in more intuitive terms, individuals will choose a lower and more stable level of wealth and consumption that they can sustain over the long term over a higher level of wealth and consumption that varies widely from period to period. Constantinides (1990) adds to this argument by noting that individuals become used to maintaining past consumption levels and that even small changes in consumption can cause big changes in marginal utility. The returns on stocks are correlated with consumption, decreasing in periods when people have fewer goods to consume (recessions, for instance); the additional risk explains the higher observed equity risk premiums.[36]
5. Myopic Loss Aversion: Myopic loss aversion refers to the finding in behavioral finance that the loss aversion already embedded in individuals becomes more pronounced as the frequency of their monitoring increases. Thus, investors who receive constant updates on equity values actually perceive more risk in equities, leading to higher risk premiums. The paper that we cited earlier by Benartzi and Thaler yields estimates of the risk premium very close to historical levels using a one-year time horizon for investors with plausible loss aversion characteristics (of about 2, which is backed up by the experimental research).

In conclusion, it is not quite clear what to make of the equity risk premium puzzle. It is true that historical risk premiums are higher than could be justified using conventional

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[34] McGrattan, E.R., and E.C. Prescott. 2001, *Taxes, Regulations, and Asset Prices*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=292522.

[35] Epstein, L.G., and S.E. Zin. 1991. *Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: An Empirical Analysis*, Journal of Political Economy, v99, 263–286.

[36] Constantinides, G.M. 1990. *Habit Formation: A Resolution of the Equity Premium Puzzle*, Journal of Political Economy, v98, no. 3 (June):519–543.

utility models for wealth. However, that may tell us more about the dangers of using historical data and the failures of classic utility models than they do about equity risk premiums. In fact, the last decade of poor stock returns in the US and declining equity risk premiums may have made the equity risk premium puzzle less of a puzzle, since explaining a historical premium of 4% (the premium in 2011) is far easier than explaining a historical premium of 6% (the premium in 1999).

Estimation Approaches

There are three broad approaches used to estimate equity risk premiums. One is to survey subsets of investors and managers to get a sense of their expectations about equity returns in the future. The second is to assess the returns earned in the past on equities relative to riskless investments and use this historical premium as the expectation. The third is to attempt to estimate a forward-looking premium based on the market rates or prices on traded assets today; we will categorize these as implied premiums.

Survey Premiums

If the equity risk premium is what investors demand for investing in risky assets today, the most logical way to estimate it is to ask these investors what they require as expected returns. Since investors in equity markets number in the millions, the challenge is often finding a subset of investors that best reflects the aggregate market. In practice, se see surveys of investors, managers and even academics, with the intent of estimating an equity risk premium.

Investors

When surveying investors, we can take one of two tacks. The first is to focus on individual investors and get a sense of what they expect returns on equity markets to be in the future. The second is to direct the question of what equities will deliver as a premium at portfolio managers and investment professionals, with the rationale that their expectations should matter more in the aggregate, since they have the most money to invest.

a. Individual Investors: The oldest continuous index of investor sentiment about equities was developed by Robert Shiller in the aftermath of the crash of 1987 and has been updated since.[37] UBS/Gallup has also polled individual investors since 1996 about their optimism about future stock prices and reported a measure of investor

[37] The data is available at http://bit.ly/NcgTW7.

sentiment.[38] While neither survey provides a direct measure of the equity risk premium, they both yield broad measure of where investors expect stock prices to go in the near future. The Securities Industry Association (SIA) surveyed investors from 1999 to 2004 on the expected return on stocks and yields numbers that can be used to extract equity risk premiums. In the 2004 survey, for instance, they found that the median expected return across the 1500 U.S. investors they questioned was 12.8%, yielding a risk premium of roughly 8.3% over the treasury bond rate at that time.[39]

b. Institutional Investors/ Investment Professionals: Investors Intelligence, an investment service, tracks more than a hundred newsletters and categorizes them as bullish, bearish or neutral, resulting in a consolidated advisor sentiment index about the future direction of equities. Like the Shiller and UBS surveys, it is a directional survey that does not yield an equity risk premium. Merrill Lynch, in its monthly survey of institutional investors globally, explicitly poses the question about equity risk premiums to these investors. In its February 2007 report, for instance, Merrill reported an average equity risk premium of 3.5% from the survey, but that number jumped to 4.1% by March, after a market downturn.[40] As markets settled down in 2009, the survey premium has also settled back to 3.76% in January 2010. Through much of 2010, the survey premium stayed in a tight range (3.85% - 3.90%) but the premium climbed to 4.08% in the January 2012 update. In February 2014, the survey yielded a risk premium of 4.6%, though it may not be directly comparable to the earlier numbers because of changes in the survey.[41]

While survey premiums have become more accessible, very few practitioners seem to be inclined to use the numbers from these surveys in computations and there are several reasons for this reluctance:

1. Survey risk premiums are responsive to recent stock prices movements, with survey numbers generally increasing after bullish periods and decreasing after market decline. Thus, the peaks in the SIA survey premium of individual investors occurred in the bull market of 1999, and the more moderate premiums of 2003 and 2004 occurred after the market collapse in 2000 and 2001.
2. Survey premiums are sensitive not only to whom the question is directed at but how the question is asked. For instance, individual investors seem to have higher

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[38] The data is available at http://www.ubs.com/us/en/wealth/misc/investor-watch.html

[39] See http://www.sifma.org/research/surveys.aspx. The 2004 survey seems to be the last survey done by SIA. The survey yielded expected stock returns of 10% in 2003, 13% in 2002, 19% in 2001, 33% in 2000 and 30% in 1999.

[40] See http://www.ml.com/index.asp?id=7695_8137_47928.

[41] Global Fund Manager Survey, Bank of America Merrill Lynch, February 2014.

(and more volatile) expected returns on equity than institutional investors and the survey numbers vary depending upon the framing of the question.[42]

3. In keeping with other surveys that show differences across sub-groups, the premium seems to vary depending on who gets surveyed. Kaustia, Lehtoranta and Puttonen (2011) surveyed 1,465 Finnish investment advisors and note that not only are male advisors more likely to provide an estimate but that their estimated premiums are roughly 2% lower than those obtained from female advisors, after controlling for experience, education and other factors.[43]
4. Studies that have looked at the efficacy of survey premiums indicate that if they have any predictive power, it is in the wrong direction. Fisher and Statman (2000) document the negative relationship between investor sentiment (individual and institutional) and stock returns.[44] In other words, investors becoming more optimistic (and demanding a larger premium) is more likely to be a precursor to poor (rather than good) market returns.

As technology aids the process, the number and sophistication of surveys of both individual and institutional investors will also increase. However, it is also likely that these survey premiums will be more reflections of the recent past rather than good forecasts of the future.

Managers

As noted in the first section, equity risk premiums are a key input not only in investing but also in corporate finance. The hurdle rates used by companies – costs of equity and capital – are affected by the equity risk premiums that they use and have significant consequences for investment, financing and dividend decisions. Graham and Harvey have been conducting annual surveys of Chief Financial Officers (CFOs) or companies for roughly the last decade with the intent of estimating what these CFOs think is a reasonable equity risk premium (for the next 10 years over the ten-year bond rate). In their March 2014 survey, they report an average equity risk premium of 3.73% across survey respondents, down slightly from the average premium of 4.27% a year earlier. The median premium in the March 2014 survey was 3.3%.[45]

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[42] Asking the question "What do you think stocks will do next year?" generates different numbers than asking "What should the risk premium be for investing in stocks?"

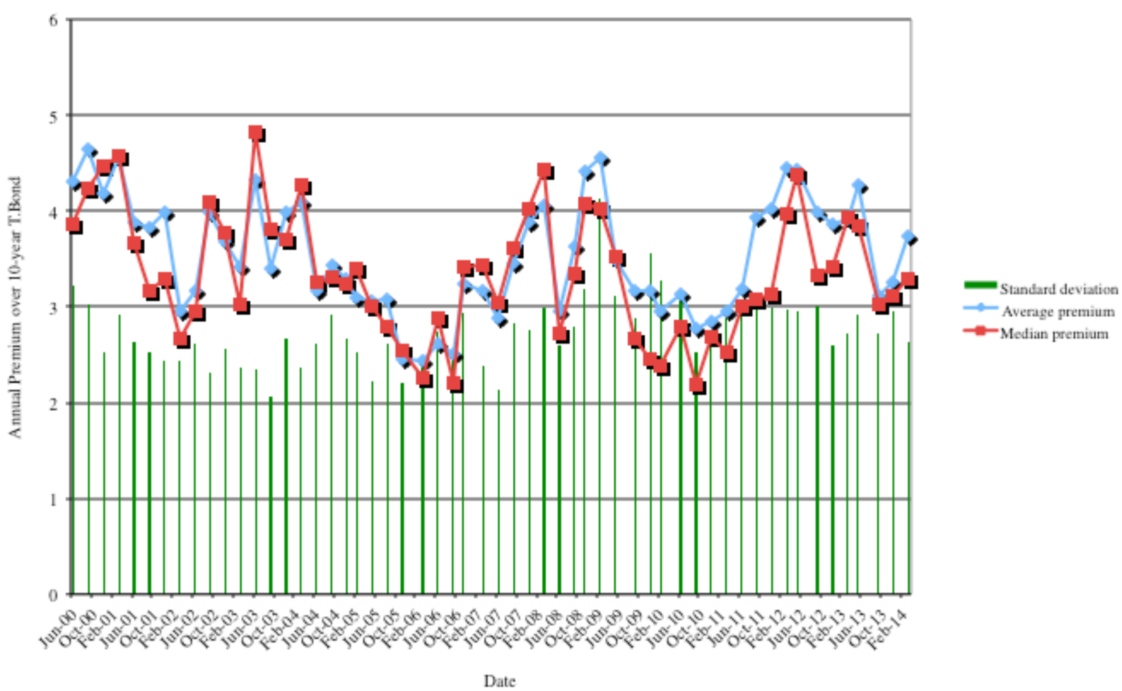
[43] Kaustia, M., A. Lehtoranta and V. Puttonen, 2011, *Sophistication and Gender Effects in Financial Advisers Expectations*, Working Paper, Aalto University.

[44] Fisher, K.L., and M. Statman, 2000, *Investor Sentiment and Stock Returns*, Financial Analysts Journal, v56, 16-23.

[45] Graham, J.R. and C.R. Harvey, 2014, *The Equity Risk Premium in 2014*, Working paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2422008 . See also Graham, J.R. and C.R. Harvey,

To get a sense of how these assessed equity risk premiums have behaved over time, we have graphed the average and median values of the premium and the cross sectional standard deviation in the estimates in each CFO survey, from 2001 to 2014, in Figure 2.

Figure 2: CFO Survey Premiums



Note the survey premium peak was in February 2009, right after the crisis, at 4.56% and had its lowest recording (2.5%) in September 2006. The average across all 14 years of surveys (more than 10,000 responses) was 3.54%, but the standard deviation in the survey responses did increase after the 2008 crisis.

Academics

Most academics are neither big players in equity markets, nor do they make many major corporate finance decisions. Notwithstanding this lack of real world impact, what they think about equity risk premiums may matter for two reasons. The first is that many of the portfolio managers and CFOs that were surveyed in the last two sub-sections received their first exposure to the equity risk premium debate in the classroom and may have been influenced by what was presented as the right risk premium in that setting. The

2009, *The Equity Risk Premium amid a Global Financial Crisis*, Working paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1405459.

second is that practitioners often offer academic work (textbooks and papers) as backing for the numbers that they use.

Welch (2000) surveyed 226 financial economists on the magnitude of the equity risk premium and reported interesting results. On average, economists forecast an average annual risk premium (arithmetic) of about 7% for a ten-year time horizon and 6-7% for one to five-year time horizons. As with the other survey estimates, there is a wide range on the estimates, with the premiums ranging from 2% at the pessimistic end to 13% at the optimistic end. Interestingly, the survey also indicates that economists believe that their estimates are higher than the consensus belief and try to adjust the premiums down to reflect that view.[46]

Fernandez (2010) examined widely used textbooks in corporate finance and valuation and noted that equity risk premiums varied widely across the books and that the moving average premium has declined from 8.4% in 1990 to 5.7% in 2010.[47] In a more recent survey, Fernandez, Aguirreamalloa and L. Corres (2011) compared both the level and standard deviation of equity risk premium estimates for analysts, companies and academics in the United States:[48]

Group	*Average Equity Risk Premium*	*Standard deviation in Equity Risk Premium estimates*
Academics	5.6%	1.6%
Analysts	5.0%	1.1%
Companies	5.5%	1.6%

The range on equity risk premiums in use is also substantial, with a low of 1.5% and a high of 15%, often citing the same sources. The same authors also report survey responses from the same groups (academics, analysts and companies) in 88 countries in 2014 and note that those in emerging markets use higher risk premiums (not surprisingly) than those in developed markets.[49]

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[46] Welch, I., 2000, *Views of Financial Economists on the Equity Premium and on Professional Controversies*, Journal of Business, v73, 501-537.

[47] Fernandez, P., 2010, *The Equity Premium in 150 Textbooks*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1473225. He notes that the risk premium actually varies within the book in as many as a third of the textbooks surveyed.

[48] Fernandez, P., J. Aguirreamalloa and L. Corres, 2011, Equity Premium used in 2011 for the USA by Analysts, Companies and Professors: A Survey, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1805852&rec=1&srcabs=1822182.

[49] Fernandez, P., P. Linares and I.F. Acin, 2014, Market Risk Premium used in 88 countries in 2014, A Survey with 8228 Answers, http://ssrn.com/abstract=2450452.

Historical Premiums

While our task is to estimate equity risk premiums in the future, much of the data we use to make these estimates is in the past. Most investors and managers, when asked to estimate risk premiums, look at historical data. In fact, the most widely used approach to estimating equity risk premiums is the historical premium approach, where the actual returns earned on stocks over a long time period is estimated, and compared to the actual returns earned on a default-free (usually government security). The difference, on an annual basis, between the two returns is computed and represents the historical risk premium. In this section, we will take a closer look at the approach.

Estimation Questions and Consequences

While users of risk and return models may have developed a consensus that historical premium is, in fact, the best estimate of the risk premium looking forward, there are surprisingly large differences in the actual premiums we observe being used in practice, with the numbers ranging from 3% at the lower end to 12% at the upper end. Given that we are almost all looking at the same historical data, these differences may seem surprising. There are, however, three reasons for the divergence in risk premiums: different time periods for estimation, differences in riskfree rates and market indices and differences in the way in which returns are averaged over time.

1. Time Period

Even if we agree that historical risk premiums are the best estimates of future equity risk premiums, we can still disagree about how far back in time we should go to estimate this premium. For decades, Ibbotson Associates was the most widely used estimation service, reporting stock return data and risk free rates going back to 1926,[50] and Duff and Phelps now provides the same service[51]. There are other less widely used databases that go further back in time to 1871 or even to 1792.[52]

While there are many analysts who use all the data going back to the inception date, there are almost as many analysts using data over shorter time periods, such as fifty, twenty or even ten years to come up with historical risk premiums. The rationale

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[50] Ibbotson Stocks, Bonds, Bills and Inflation Yearbook (SBBI), 2011 Edition, Morningstar.

[51] Duff and Phelps, 2014 Valuation Handbook, Industry Cost of Capital.

[52] Siegel, in his book, Stocks for the Long Run, estimates the equity risk premium from 1802-1870 to be 2.2% and from 1871 to 1925 to be 2.9%. (Siegel, Jeremy J., Stocks for the Long Run, Second Edition, McGraw Hill, 1998). Goetzmann and Ibbotson estimate the premium from 1792 to 1925 to be 3.76% on an arithmetic average basis and 2.83% on a geometric average basis. Goetzmann. W.N. and R. G. Ibbotson, 2005, History and the Equity Risk Premium, Working Paper, Yale University. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=702341.

presented by those who use shorter periods is that the risk aversion of the average investor is likely to change over time, and that using a shorter and more recent time period provides a more updated estimate. This has to be offset against a cost associated with using shorter time periods, which is the greater noise in the risk premium estimate. In fact, given the annual standard deviation in stock returns[53] between 1928 and 2014 of 19.90% (approximated to 20%), the standard error associated with the risk premium estimate can be estimated in table 2 follows for different estimation periods:[54]

Table 2: Standard Errors in Historical Risk Premiums

Estimation Period	*Standard Error of Risk Premium Estimate*
5 years	$20\%/\sqrt{5} = 8.94\%$
10 years	$20\%/\sqrt{10} = 6.32\%$
25 years	$20\% / \sqrt{25} = 4.00\%$
50 years	$20\% / \sqrt{50} = 2.83\%$
80 years	$20\% / \sqrt{80} = 2.23\%$

Even using all of the entire data (about 85 years) yields a substantial standard error of 2.2%. Note that that the standard errors from ten-year and twenty-year estimates are likely to be almost as large or larger than the actual risk premium estimated. This cost of using shorter time periods seems, in our view, to overwhelm any advantages associated with getting a more updated premium.

What are the costs of going back even further in time (to 1871 or before)? First, the data is much less reliable from earlier time periods, when trading was lighter and record keeping more haphazard. Second, and more important, the market itself has changed over time, resulting in risk premiums that may not be appropriate for today. The U.S. equity market in 1871 more closely resembled an emerging market, in terms of volatility and risk, than a mature market. Consequently, using the earlier data may yield premiums that have little relevance for today's markets.

There are two other solutions offered by some researchers. The first is to break the annual data down into shorter return intervals – quarters or even months – with the intent of increasing the data points over any given time period. While this will increase

[53] For the historical data on stock returns, bond returns and bill returns check under "updated data" in http://www.damodaran.com.

[54] The standard deviation in annual stock returns between 1928 and 2014 is 19.90%; the standard deviation in the risk premium (stock return – bond return) is a little higher at 21.59%. These estimates of the standard error are probably understated, because they are based upon the assumption that annual returns are uncorrelated over time. There is substantial empirical evidence that returns are correlated over time, which would make this standard error estimate much larger. The raw data on returns is provided in Appendix 1.

the sample size, the effect on the standard error will be minimal.[55] The second is to use the entire data but to give a higher weight to more recent data, thus getting more updated premiums while preserving the data. While this option seems attractive, weighting more recent data will increase the standard error of the estimate. After all, using only the last ten years of data is an extreme form of time weighting, with the data during that period being weighted at one and the data prior to the period being weighted at zero.

2. Riskfree Security and Market Index

The second estimation question we face relates to the riskfree rate. We can compare the expected return on stocks to either short-term government securities (treasury bills) or long term government securities (treasury bonds) and the risk premium for stocks can be estimated relative to either. Given that the yield curve in the United States has been upward sloping for most of the last eight decades, the risk premium is larger when estimated relative to short term government securities (such as treasury bills) than when estimated against treasury bonds.

Some practitioners and a surprising number of academics (and textbooks) use the treasury bill rate as the riskfree rate, with the alluring logic that there is no price risk in a treasury bill, whereas the price of a treasury bond can be affected by changes in interest rates over time. That argument does make sense, but only if we are interested in a single period equity risk premium (say, for next year). If your time horizon is longer (say 5 or 10 years), it is the treasury bond that provides the more predictable returns.[56] Investing in a 6-month treasury bill may yield a guaranteed return for the next six months, but rolling over this investment for the next five years will create reinvestment risk. In contrast, investing in a ten-year treasury bond, or better still, a ten-year zero coupon bond will generate a guaranteed return for the next ten years.[57]

The riskfree rate chosen in computing the premium has to be consistent with the riskfree rate used to compute expected returns. Thus, if the treasury bill rate is used as the riskfree rate, the premium has to be the premium earned by stocks over that rate. If the treasury bond rate is used as the riskfree rate, the premium has to be estimated relative to that rate. For the most part, in corporate finance and valuation, the riskfree rate will be a

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[55] If returns are uncorrelated over time, the variance in quarterly (monthly) risk premiums will be approximately one-quarter (one twelfth) the variance in annual risk premiums.

[56] For more on risk free rates, see Damodaran, A., 2008, *What is the riskfree rate?* Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1317436.

[57] There is a third choice that is sometimes employed, where the short term government security (treasury bills) is used as the riskfree rate and a "term structure spread" is added to this to get a normalized long term rate.

long-term default-free (government) bond rate and not a short-term rate. Thus, the risk premium used should be the premium earned by stocks over treasury bonds.

The historical risk premium will also be affected by how stock returns are estimated. Using an index with a long history, such as the Dow 30, seems like an obvious solution, but returns on the Dow may not be a good reflection of overall returns on stocks. In theory, at least, we would like to use the broadest index of stocks to compute returns, with two caveats. The first is that the index has to be market-weighted, since the overall returns on equities will be tilted towards larger market cap stocks. The second is that the returns should be free of survivor bias; estimating returns only on stocks that have survived that last 80 years will yield returns that are too high. Stock returns should incorporate those equity investments from earlier years that did not make it through the estimation period, either because the companies in question went bankrupt or were acquired.

Finally, there is some debate about whether the equity risk premiums should be computed using nominal returns or real returns. While the choice clearly makes a difference, if we estimate the return on stocks or the government security return standing alone, it is less of an issue, when computing equity risk premiums, where we look at the difference between the two values.

3. Averaging Approach

The final sticking point when it comes to estimating historical premiums relates to how the average returns on stocks, treasury bonds and bills are computed. The arithmetic average return measures the simple mean of the series of annual returns, whereas the geometric average looks at the compounded return[58]. Many estimation services and academics argue for the arithmetic average as the best estimate of the equity risk premium. In fact, if annual returns are uncorrelated over time, and our objective was to estimate the risk premium for the next year, the arithmetic average is the best and most unbiased estimate of the premium. There are, however, strong arguments that can be made for the use of geometric averages. First, empirical studies seem to indicate that returns on stocks are negatively correlated[59] over time. Consequently, the arithmetic

[58] The compounded return is computed by taking the value of the investment at the start of the period ($Value_0$) and the value at the end ($Value_N$), and then computing the following:

$$\text{Geometric Average} = \left(\frac{\text{Value}_N}{\text{Value}_0}\right)^{1/N} - 1$$

[59] In other words, good years are more likely to be followed by poor years, and vice versa. The evidence on negative serial correlation in stock returns over time is extensive, and can be found in Fama and French (1988). While they find that the one-year correlations are low, the five-year serial correlations are strongly

average return is likely to over state the premium. Second, while asset pricing models may be single period models, the use of these models to get expected returns over long periods (such as five or ten years) suggests that the estimation period may be much longer than a year. In this context, the argument for geometric average premiums becomes stronger. Indro and Lee (1997) compare arithmetic and geometric premiums, find them both wanting, and argue for a weighted average, with the weight on the geometric premium increasing with the time horizon.[60]

In closing, the averaging approach used clearly matters. Arithmetic averages will be yield higher risk premiums than geometric averages, but using these arithmetic average premiums to obtain discount rates, which are then compounded over time, seems internally inconsistent. In corporate finance and valuation, at least, the argument for using geometric average premiums as estimates is strong.

Estimates for the United States

The questions of how far back in time to go, what riskfree rate to use and how to average returns (arithmetic or geometric) may seem trivial until you see the effect that the choices you make have on your equity risk premium. Rather than rely on the summary values that are provided by data services, we will use raw return data on stocks, treasury bills and treasury bonds from 1928 to 2014 to make this assessment.[61] In figure 3, we begin with a chart of the annual returns on stock, treasury bills and bonds for each year:

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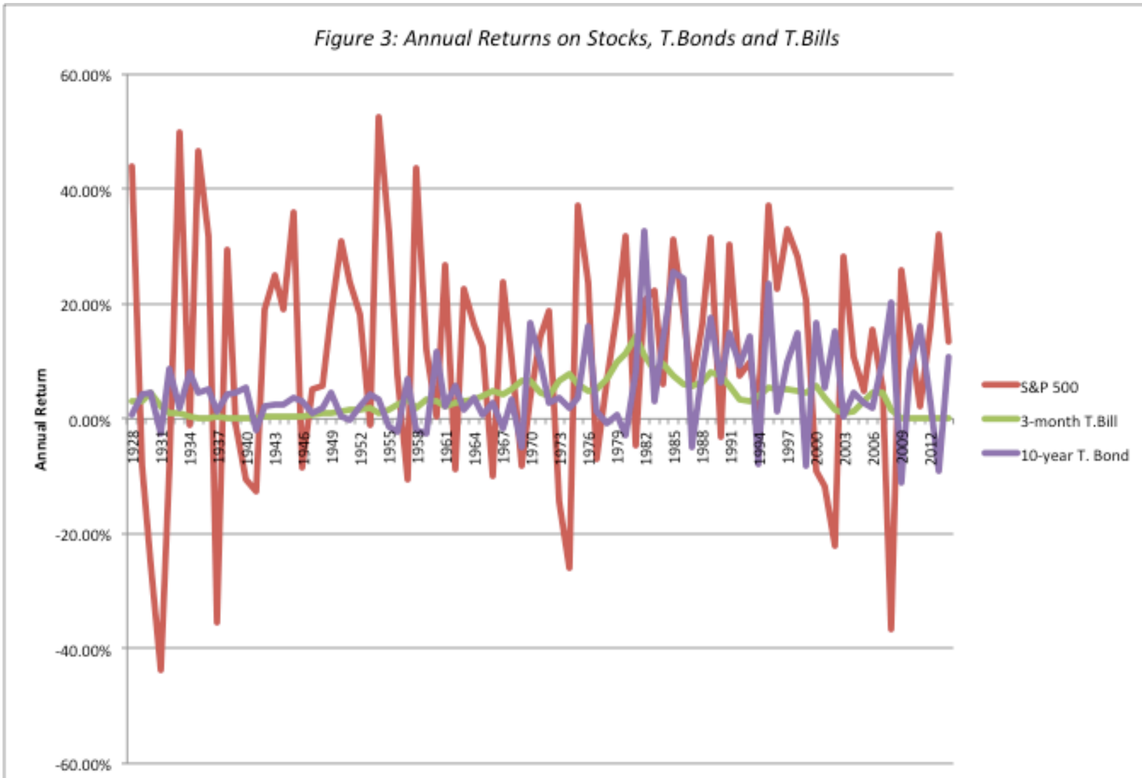
negative for all size classes. Fama, E.F. and K.R. French, 1992, *The Cross-Section of Expected Returns*, Journal of Finance, Vol 47, 427-466.

[60] Indro, D.C. and W. Y. Lee, 1997, *Biases in Arithmetic and Geometric Averages as Estimates of Long-run Expected Returns and Risk Premium*, Financial Management, v26, 81-90.

[61] The raw data for treasury rates is obtained from the Federal Reserve data archive (http://research.stlouisfed.org/fred2/) at the Fed site in St. Louis, with the 3-month treasury bill rate used for treasury bill returns and the 10-year treasury bond rate used to compute the returns on a constant maturity 10-year treasury bond. The stock returns represent the returns on the S&P 500. Appendix 1 provides the returns by year on stocks, bonds and bills, by year, from 1928 through the current year.



It is difficult to make much of this data other than to state the obvious, which is that stock returns are volatile, which is at the core of the demand for an equity risk premium in the first place. In table 3, we present summary statistics for stock, 3-month Treasury bill and ten-year Treasury bond returns from 1928 to 2014:

Table 3: Summary Statistics- U.S. Stocks, T.Bills and T. Bonds- 1928-2014

	Stocks	T. Bills	T. Bonds
Mean	11.53%	3.53%	5.28%
Standard Error	2.13%	0.33%	0.84%
Median	14.22%	3.11%	3.61%
Standard Deviation	19.90%	3.06%	7.83%
Kurtosis	2.98	3.82	4.39
Skewness	-0.41	0.96	0.94
Minimum	-43.84%	0.03%	-11.12%
Maximum	52.56%	14.30%	32.81%
25th percentile	-1.19%	1.01%	2.20%
75th percentile	26.11%	5.32%	8.93%

While U.S. equities have delivered much higher returns than treasuries over this period, they have also been more volatile, as evidenced both by the higher standard deviation in returns and by the extremes in the distribution. Using this table, we can take a first shot at estimating a risk premium by taking the difference between the average returns on stocks and the average return on treasuries, yielding a risk premium of 8.00% for stocks over T.Bills (11.53%-3.53%) and 6.25% for stocks over T.Bonds (11.53%-5.28%). Note, though, that these represent arithmetic average, long-term premiums for stocks over treasuries.

How much will the premium change if we make different choices on historical time periods, riskfree rates and averaging approaches? To answer this question, we estimated the arithmetic and geometric risk premiums for stocks over both treasury bills and bonds over different time periods in table 4, with standard errors reported in brackets below the arithmetic averages:

Table 4: Historical Equity Risk Premiums (ERP) –Estimation Period, Riskfree Rate and Averaging Approach

	Arithmetic Average		*Geometric Average*	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2014	8.00%	6.25%	6.11%	4.60%
	(2.17%)	(2.32%)		
1965-2014	6.19%	4.12%	4.84%	3.14%
	(2.42%	(2.74%)		
2005-2014	7.94%	4.06%	6.18%	2.73%
	(6.05%)	(8.65%)		

Note that even with only three slices of history considered, the premiums range from 2.73% to 8.00%, depending upon the choices made. If we take the earlier discussion about the "right choices" to heart, and use a long-term geometric average premium over the long-term rate as the risk premium to use in valuation and corporate finance, the equity risk premium that we would use would be 4.60%. The caveats that we would offer, though, are that this estimate comes with significant standard error and is reflective of time periods (such as 1920s and 1930s) when the U.S. equity market (and investors in it) had very different characteristics.

There have been attempts to extend the historical time period to include years prior to 1926 (the start of the Ibbotson database). Goetzmann and Jorion (1999) estimate the returns on stocks and bonds between 1792 and 1925 and report an arithmetic average premium, for stocks over bonds, of 2.76% and a geometric average premium of 2.83%.[62] The caveats about data reliability and changing market characteristics that we raised in an earlier section apply to these estimates.

[62] Jorion, Philippe and William N. Goetzmann, 1999, *Global Stock Markets in the Twentieth Century*, Journal of Finance, 54(3), 953-980.

There is one more troublesome (or at least counter intuitive) characteristic of historical risk premiums. The geometric average equity risk premium through the end of 2007 was 4.79%, higher than the 3.88% estimated though the end of 2008; in fact, every single equity risk premium number in this table would have been much higher, if we had stopped with 2007 as the last year. Adding the data for 2008, an abysmal year for stocks and a good year for bonds, lowers the historical premium dramatically, even when computed using a long period of history. In effect, the historical risk premium approach would lead investors to conclude, after one of worst stock market crisis in several decades, that stocks were less risky than they were before the crisis and that investors should therefore demand lower premiums. In contrast, adding the data for 2009, a good year for stocks (+25.94%) and a bad year for bonds (-11.12%) would have increased the equity risk premium from 3.88% to 4.29%. As a general rule, historical risk premiums will tend to rise when markets are buoyant and investors are less risk averse and will fall as markets collapse and investor fears rise.

Global Estimates

If it is difficult to estimate a reliable historical premium for the US market, it becomes doubly so when looking at markets with short, volatile and transitional histories. This is clearly true for emerging markets, where equity markets have often been in existence for only short time periods (Eastern Europe, China) or have seen substantial changes over the last few years (Latin America, India). It also true for many West European equity markets. While the economies of Germany, Italy and France can be categorized as mature, their equity markets did not share the same characteristics until recently. They tended to be dominated by a few large companies, many businesses remained private, and trading was thin except on a few stocks.

Notwithstanding these issues, services have tried to estimate historical risk premiums for non-US markets with the data that they have available. To capture some of the danger in this practice, Table 5 summarizes historical arithmetic average equity risk premiums for major non-US markets below for 1976 to 2001, and reports the standard error in each estimate:[63]

Table 5: Risk Premiums for non-US Markets: 1976- 2001

Country	*Weekly average*	*Weekly standard deviation*	*Equity Risk Premium*	*Standard error*
Canada	0.14%	5.73%	1.69%	3.89%

[63] Salomons, R. and H. Grootveld, 2003, *The equity risk premium: Emerging vs Developed Markets,* Emerging Markets Review, v4, 121-144.

France	0.40%	6.59%	4.91%	4.48%
Germany	0.28%	6.01%	3.41%	4.08%
Italy	0.32%	7.64%	3.91%	5.19%
Japan	0.32%	6.69%	3.91%	4.54%
UK	0.36%	5.78%	4.41%	3.93%
India	0.34%	8.11%	4.16%	5.51%
Korea	0.51%	11.24%	6.29%	7.64%
Chile	1.19%	10.23%	15.25%	6.95%
Mexico	0.99%	12.19%	12.55%	8.28%
Brazil	0.73%	15.73%	9.12%	10.69%

Before we attempt to come up with rationale for why the equity risk premiums vary across countries, it is worth noting the magnitude of the standard errors on the estimates, largely because the estimation period includes only 25 years. Based on these standard errors, we cannot even reject the hypothesis that the equity risk premium in each of these countries is zero, let alone attach a value to that premium.

If the standard errors on these estimates make them close to useless, consider how much more noise there is in estimates of historical risk premiums for some emerging market equity markets, which often have a reliable history of ten years or less, and very large standard deviations in annual stock returns. Historical risk premiums for emerging markets may provide for interesting anecdotes, but they clearly should not be used in risk and return models.

The survivor bias

Given how widely the historical risk premium approach is used, it is surprising that the flaws in the approach have not drawn more attention. Consider first the underlying assumption that investors' risk premiums have not changed over time and that the average risk investment (in the market portfolio) has remained stable over the period examined. We would be hard pressed to find anyone who would be willing to sustain this argument with fervor. The obvious fix for this problem, which is to use a more recent time period, runs directly into a second problem, which is the large noise associated with historical risk premium estimates. While these standard errors may be tolerable for very long time periods, they clearly are unacceptably high when shorter periods are used.

Even if there is a sufficiently long time period of history available, and investors' risk aversion has not changed in a systematic way over that period, there is a final problem. Markets such as the United States, which have long periods of equity market history, represent "survivor markets". In other words, assume that one had invested in the largest equity markets in the world in 1926, of which the United States was one.[64] In the period extending from 1926 to 2000, investments in many of the other equity markets would have earned much smaller premiums than the US equity market, and some of them would have resulted in investors earning little or even negative returns over the period. Thus, the survivor bias will result in historical premiums that are larger than expected premiums for markets like the United States, even assuming that investors are rational and factor risk into prices.

How can we mitigate the survivor bias? One solution is to look at historical risk premiums across multiple equity markets across very long time periods. In the most comprehensive attempt of this analysis, Dimson, Marsh and Staunton (2002, 2008) estimated equity returns for 17 markets and obtained both local and a global equity risk premium.[65] In their most recent update in 2015, they provide the risk premiums from 1900 to 2014 for 20 markets, with standard errors on each estimate (reported in table 6):[66]

Table 6: Historical Risk Premiums across Equity Markets – 1900 – 2014 (in %)

	Stocks minus Short term Governments				*Stocks minus Long term Governments*			
Country	*Geometric Mean*	*Arithmetic Mean*	*Standard Error*	*Standard Deviation*	*Geometric Mean*	*Arithmetic Mean*	*Standard Error*	*Standard Deviation*
Australia	6.6%	8.1%	1.6%	17.5%	5.6%	7.5%	1.9%	20.0%
Austria	5.5%	10.4%	3.5%	37.4%	2.5%	21.5%	14.4%	153.5%
Belgium	3.0%	5.4%	2.2%	23.9%	2.3%	4.4%	2.0%	21.1%
Canada	4.2%	5.6%	1.6%	16.9%	3.5%	5.1%	1.7%	18.2%
Denmark	3.1%	5.0%	1.9%	20.5%	2.0%	3.6%	1.7%	17.9%
Finland	5.9%	9.5%	2.8%	29.9%	5.1%	8.7%	2.8%	30.1%
France	6.1%	8.7%	2.3%	24.2%	3.0%	5.3%	2.1%	22.8%
Germany	6.0%	9.9%	3.0%	31.5%	5.0%	8.4%	2.7%	28.6%
Ireland	3.5%	5.8%	2.0%	21.3%	2.6%	4.5%	1.8%	19.6%
Italy	5.7%	9.5%	2.9%	31.6%	3.1%	6.5%	2.7%	29.5%

[64] Jorion, Philippe and William N. Goetzmann, 1999, *Global Stock Markets in the Twentieth Century*, Journal of Finance, 54(3), 953-980. They looked at 39 different equity markets and concluded that the US was the best performing market from 1921 to the end of the century. They estimated a geometric average premium of 3.84% across all of the equity markets that they looked at, rather than just the US and estimated that the survivor bias added 1.5% to the US equity risk premium (with arithmetic averages) and 0.9% with geometric averages.

[65] Dimson, E.,, P Marsh and M Staunton, 2002, *Triumph of the Optimists: 101 Years of Global Investment Returns,* Princeton University Press, NJ; Dimson, E.,, P Marsh and M Staunton, 2008, The Worldwide Equity Risk Premium: a smaller puzzle, Chapter 11 in the Handbook of the Equity Risk Premium, edited by R. Mehra, Elsevier.

[66] *Credit Suisse Global Investment Returns Sourcebook,* 2015, Credit Suisse/ London Business School. Summary data is accessible at the Credit Suisse website.

Japan	6.1%	9.3%	2.6%	27.7%	5.1%	9.1%	3.0%	32.6%
Netherlands	4.4%	6.5%	2.1%	22.5%	3.2%	5.6%	2.1%	22.3%
New Zealand	4.4%	5.9%	1.7%	18.1%	3.9%	5.5%	1.7%	17.9%
Norway	3.1%	5.9%	2.4%	26.1%	2.3%	5.3%	2.6%	27.7%
South Africa	6.3%	8.4%	2.0%	21.7%	5.4%	7.1%	1.8%	19.6%
Spain	3.4%	5.5%	2.0%	21.6%	1.9%	3.9%	1.9%	20.7%
Sweden	3.9%	5.9%	1.9%	20.5%	3.0%	5.3%	2.0%	21.5%
Switzerland	3.7%	5.3%	1.7%	18.7%	2.1%	3.6%	1.6%	17.5%
U.K.	4.3%	6.1%	1.8%	19.7%	3.7%	5.0%	1.6%	17.3%
U.S.	5.6%	7.5%	1.8%	19.6%	4.4%	6.5%	1.9%	20.7%
Europe	3.4%	5.2%	1.8%	19.3%	3.1%	4.4%	1.5%	16.1%
World-ex U.S.	3.6%	5.2%	1.7%	18.6%	2.8%	3.9%	1.4%	14.7%
World	4.3%	5.7%	1.6%	17.0%	3.2%	4.5%	1.5%	15.5%

In making comparisons of the numbers in this table to prior years, note that this database was modified in two ways: the world estimates are now weighted by market capitalization and the issue of survivorship bias has been dealt with frontally by incorporating the return histories of three markets (Austria, China and Russia) where equity investors would have lost their entire investment during the century. Note that the risk premiums, averaged across the markets, are lower than risk premiums in the United States. For instance, the geometric average risk premium for stocks over long-term government bonds, across the non-US markets, is only 2.8%, lower than the 4.4% for the US markets. The results are similar for the arithmetic average premium, with the average premium of 3.9% across non-US markets being lower than the 6.5% for the United States. In effect, the difference in returns captures the survivorship bias, implying that using historical risk premiums based only on US data will results in numbers that are too high for the future. Note that the "noise" problem persists, even with averaging across 20 markets and over 112 years. The standard error in the global equity risk premium estimate is 1.5%, suggesting that the range for the historical premium remains a large one.

Decomposing the historical equity risk premium

As the data to compute historical risk premiums has become richer, those who compute historical risk premiums have also become more creative, breaking down the historical risk premiums into its component parts, partly to understand the drivers of the premiums and partly to get better predictors for the future. Ibbotson and Chen (2013) started this process by breaking down the historical risk premium into four components:[67]

1. The income return is the return earned by stockholders from dividends and stock buybacks.
2. The second is the inflation rate during the estimation time period
3. The third is the growth rate in real earnings (earnings cleansed of inflation) during the estimation period
4. The change in PE ratio over the period, since an increase (decrease) in the PE ratio will raise (lower) the realized return on stocks during an estimation period.

Using the argument that the first three are sustainable and generated by "the productivity of corporations in the economy" and the fourth is not, they sum up the first three components to arrive at what they term a "supply-side" equity risk premium.

Following the same playbook, Dimson, Marsh and Staunton decompose the realized equity risk premium in each market into three components: the level of dividends, the growth in those dividends and the effects on stock price of a changing multiple for dividend (price to dividend ratio). For the United States, they attribute 1.67% of the overall premium of 5.59% (for stocks over treasury bills) to growth in real dividends and 0.57% to expansion in the price to dividend ratio. Of the global premium of 4.32%, 0.57% can be attributed to growth in dividends and 0.53% to increases in the price to dividend ratio.

While there is some value in breaking down a historical risk premium, notice that none of these decompositions remove the basic problems with historical risk premiums, which is that they are backward looking and noisy. Thus, a supply side premium has to come with all of the caveats that a conventional historical premium with the added noise created by the decomposition, i.e, measuring inflation and real earnings.

Historical Premium Plus

If we accept the proposition that historical risk premiums are the best way to estimate future risk premiums and also come to terms with the statistical reality that we need long time periods of history to get reliable estimates, we are trapped when it comes to estimating risk premiums in most emerging markets, where historical data is either non-existent or unreliable. Furthermore, the equity risk premium that we estimate becomes the risk premium that we use for all stocks within a market, no matter what their

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[67] Ibbotson, R. and P. Chen, 2003, *Long-Run Stock Returns: Participating in the Real Economy*, Financial Analysts Journal, pp.88-98.

differences are on market capitalization and growth potential; in effect, we assume that the betas we use will capture differences in risk across companies.

In this section, we consider one way out of this box, where we begin with the US historical risk premium (4.60%) or the global premium from the DMS data (3.20%) as the base premium for a mature equity market and then build additional premiums for riskier markets or classes of stock. For the first part of this section, we stay within the US equity market and consider the practice of adjusting risk premiums for company-specific characteristics, with market capitalization being the most common example. In the second part, we extend the analysis to look at emerging markets in Asia, Latin American and Eastern Europe, and take a look at the practice of estimating country risk premiums that augment the US equity risk premium. Since many of these markets have significant exposures to political and economic risk, we consider two fundamental questions in this section. The first relates to whether there should be an additional risk premium when valuing equities in these markets, because of the country risk. As we will see, the answer will depend upon whether we think country risk is diversifiable or non-diversifiable, view markets to be open or segmented and whether we believe in a one-factor or a multi-factor model. The second question relates to estimating equity risk premiums for emerging markets. Depending upon our answer to the first question, we will consider several solutions.

Small cap and other risk premiums

In computing an equity risk premium to apply to all investments in the capital asset pricing model, we are essentially assuming that betas carry the weight of measuring the risk in individual firms or assets, with riskier investments having higher betas than safer investments. Studies of the efficacy of the capital asset pricing model over the last three decades have cast some doubt on whether this is a reasonable assumption, finding that the model understates the expected returns of stocks with specific characteristics; small market cap companies and companies low price to book ratios, in particular, seem to earn much higher returns than predicted by the CAPM. It is to counter this finding that many practitioners add an additional premium to the required returns (and costs of equity) of smaller market cap companies.

The CAPM and Market Capitalization

In one of very first studies to highlight the failure of the traditional capital asset pricing model to explain returns at small market cap companies, Banz (1981) looked returns on stocks from 1936-1977 and concluded that investing in the smallest companies (the bottom 20% of NYSE firms in terms of capitalization) would have generated about 6% more, after adjusting for beta risk, than larger cap companies.[68] In the years since, there has been substantial research on both the origins and durability of the small cap premium, with mixed conclusions. First, there is evidence of a small firm premium in markets outside the United States as well. Studies find small cap premiums of about 7% from 1955 to 1984 in the United Kingdom,[69] 8.8% in France and 3% in Germany,[70] and a premium of 5.1% for Japanese stocks between 1971 and 1988.[71] Dimson, March and Staunton (2015), in their updated assessment of equity risk premiums in global markets, also compute small cap premiums in 23 markets over long time periods (which range from 113 years for some markets to less for others). Of the 23 markets, small cap stocks have not outperformed the rest of the market in only Norway, Finland and the Netherlands; the small cap premium, over the long term, has been higher in developed markets than in emerging markets. Second, while the small cap premium has been persistent in US equity markets, it has also been volatile, with large cap stocks outperforming small cap stocks for extended periods. In figure 4, we look at the difference in returns between small cap (defined as bottom 10% of firms in terms of market capitalization) and all US stocks between 1927 and 2014; note that the premium was pronounced in the 1970s and disappeared for much of the 1980s.[72]

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68 Banz, R., 1981, *The Relationship between Return and Market Value of Common Stocks*, Journal of Financial Economics, v9.

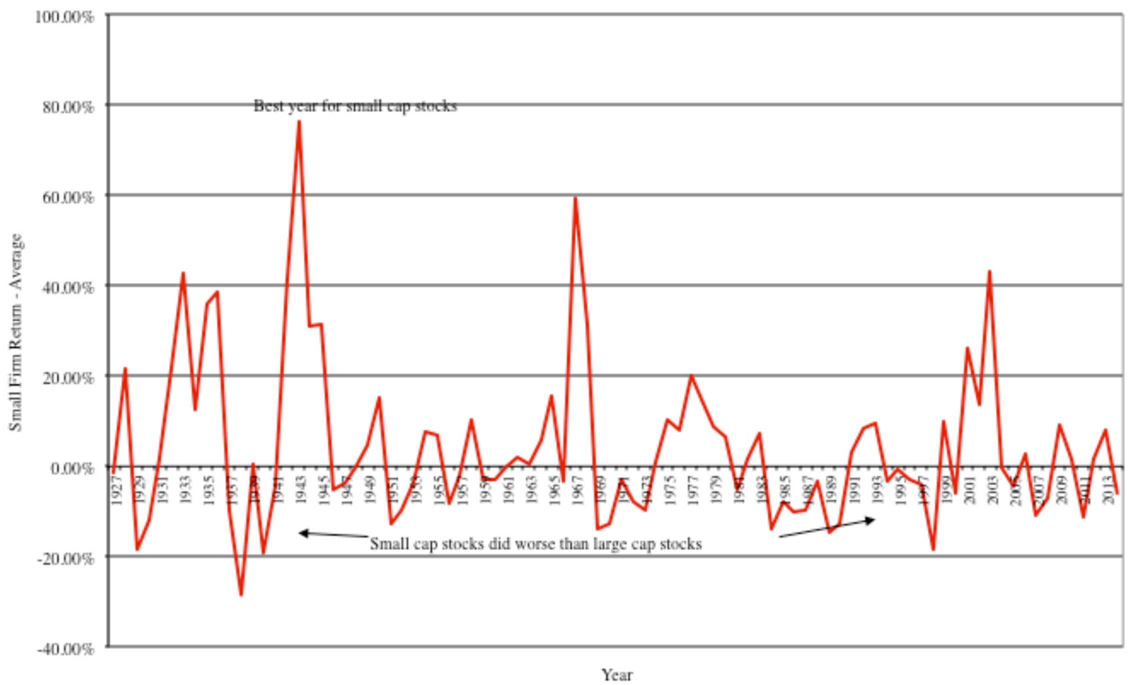
69 Dimson, E. and P.R. Marsh, 1986, *Event Studies and the Size Effect: The Case of UK Press Recommendations*, Journal of Financial Economics, v17, 113-142.

70 Bergstrom,G.L., R.D. Frashure and J.R. Chisholm, 1991, *The Gains from international small-company diversification* in Global Portfolios: Quantiative Strategies for Maximum Performance, Edited By R.Z. Aliber and B.R. Bruce, Business One Irwin, Homewood.

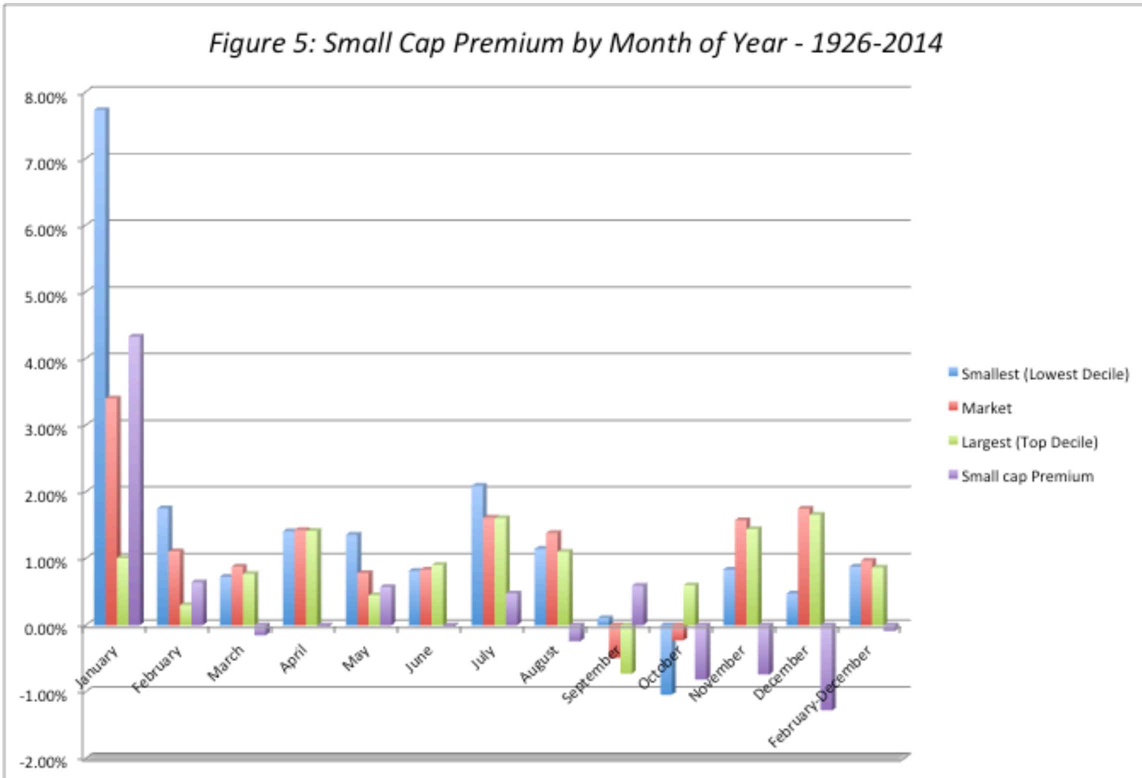
71 Chan, L.K., Y. Hamao, and J. Lakonishok, 1991, *Fundamentals and Stock Returns in Japan*, Journal of Finance. v46. 1739-1789.

72 The raw data for this table is obtained from Professor Ken French's website at Dartmouth. These premiums are based on value weighted portfolios. If equally weighted portfolios are used, the small cap premium is larger (almost 10.71%).

Figure 4: Small Firm Premium over time- 1927 -2014



The average premium for stocks in the smallest companies, in terms of market capitalization, between 1926 and 2013 was 4.33%, but the standard error in that estimate is 1.96%. Third, much of the premium is generated in one month of the year: January. As Figure 5 shows, eliminating that month from our calculations would essentially dissipate the entire small stock premium. That would suggest that size itself is not the source of risk, since small firms in January remain small firms in the rest of the year, but that the small firm premium, if it exists, comes from some other risk that is more pronounced or prevalent in January than in the rest of the year.



Source: Raw data from Ken French

Finally, a series of studies have argued that market capitalization, by itself, is not the reason for excess returns but that it is a proxy for other ignored risks such as illiquidity and poor information.

In summary, while the empirical evidence supports the notion that small cap stocks have earned higher returns after adjusting for beta risk than large cap stocks, it is not as conclusive, nor as clean as it was initially thought to be. The argument that there is, in fact, no small cap premium and that we have observed over time is just an artifact of history cannot be rejected out of hand.

The Small Cap Premium

If we accept the notion that there is a small cap premium, there are two ways in which we can respond to the empirical evidence that small market cap stocks seem to earn higher returns than predicted by the traditional capital asset pricing model. One is to view this as a market inefficiency that can be exploited for profit: this, in effect, would require us to load up our portfolios with small market cap stocks that would then proceed to deliver higher than expected returns over long periods. The other is to take the excess returns as evidence that betas are inadequate measures of risk and view the additional returns are compensation for the missed risk. The fact that the small cap premium has endured for as long as it has suggests that the latter is the more reasonable path to take.

If CAPM betas understate the true risk of small cap stocks, what are the solutions? The first is to try and augment the model to reflect the missing risk, but this would require being explicit about this risk. For instance, there are models that include additional factors for illiquidity and imperfect information that claim to do better than the CAPM in predicting future returns. The second and simpler solution that is adopted by many practitioners is to add a premium to the expected return (from the CAPM) of small cap stocks. To arrive at this premium, analysts look at historical data on the returns on small cap stocks and the market, adjust for beta risk, and attribute the excess return to the small cap effect. As we noted earlier, using the data from 1926-2014, we would estimate a small cap premium of 4.33%. Duff and Phelps present a richer set of estimates, where the premiums are computed for stocks in 25 different size classes (with size measured on eight different dimensions including market capitalization, book value and net income). Using the Fama/French data, we present excess returns for firms broken down by ten market value classes in Table 7, with the standard error for each estimate.

Table 7: Excess Returns by Market Value Class: US Stocks from 1927 – 2014

Excess Return = Return on Portfolio – Return on Market

Decile	*Average*	*Standard Error*	*Maximum*	*Minimum*
Smallest	4.33%	1.96%	76.28%	-28.42%
2	1.63%	1.14%	41.25%	-17.96%
3	1.47%	0.77%	41.98%	-13.54%
4	0.64%	0.55%	15.56%	-7.33%
5	0.05%	0.53%	11.63%	-16.05%
6	-0.01%	0.51%	15.21%	-14.01%
7	-0.51%	0.55%	7.48%	-19.50%
8	-1.50%	0.81%	11.20%	-29.42%
9	-2.13%	1.02%	21.96%	-36.09%
Largest	-3.98%	1.56%	31.29%	-65.57%

Note that the market capitalization effect shows up at both extremes – the smallest firms earn higher returns than expected whereas the largest firms earn lower returns than expected. The small firm premium is statistically significant only for the lowest and three highest size deciles.

Perils of the approach

While the small cap premium may seem like a reasonable way of dealing with the failure of the CAPM to capture the risk in smaller companies, there are significant costs to using the approach.

a. Standard Error on estimates: One of the dangers we noted with using historical risk premiums is the high standard error in our estimates. This danger is magnified when we look at sub-sets of stocks, based on market capitalization or any other characteristic, and extrapolate past returns. The standard errors on the small cap premiums that are estimated are likely to be significant, as is evidenced in table 7.
b. Small versus Large Cap: At least in its simplest form, the small cap premium adjustment requires us to divide companies into small market companies and the rest of the market, with stocks falling on one side of the line having much higher required returns (and costs of equity) than stocks falling on the other side.
c. Understanding Risk: Even in its more refined format, where the required returns are calibrated to market cap, using small cap premiums allows analysts to evade basic questions about what it is that makes smaller cap companies riskier, and whether these factors may vary across companies.
d. Small cap companies become large cap companies over time: When valuing companies, we attach high growth rates to revenues, earnings and value over time. Consequently, companies that are small market cap companies now grow to become large market cap companies over time. Consistency demands that we adjust the small cap premium as we go further into a forecast period.
e. Other risk premiums: Using a small cap premium opens the door to other premiums being used to augment expected returns. Thus, we could adjust expected returns upwards for stocks with price momentum and low price to book ratios, reflecting the excess returns that these characteristics seem to deliver, at least on paper. Doing so will deliver values that are closer to market prices, across assets, but undercuts the rationale for intrinsic valuation, i.e., finding market mistakes.

There is another reason why we are wary about adjusting costs of equity for a small cap effect. If, as is the practice now, we add a small cap premium of between 4% to 5% to the cost of equity of small companies, without attributing this premium to any specific risk factor, we are exposed to the risk of double counting risk. For instance, assume that the small cap premium that we have observed over the last few decades is attributable to the lower liquidity (and higher transactions costs) of trading small cap stocks. Adding that premium on to the discount rate will reduce the estimated values of small cap and private businesses. If we attach an illiquidity discount to this value, we are double counting the effect of illiquidity.

The small cap premium is firmly entrenched in practice, with analysts generally adding on 4% to 5% to the conventional cost of equity for small companies, with the definition of small shifting from analyst to analyst. Even if you believe that small cap companies are more exposed to market risk than large cap ones, this is an extremely sloppy and lazy way of dealing with that risk, since risk ultimately has to come from something fundamental (and size is not a fundamental factor). Thus, if you believe that small cap stocks are more prone to failure or distress, it behooves you to measure that risk directly and incorporate it into the cost of equity. If it is illiquidity that is at the heart of the small cap premium, then you should be measuring liquidity risk and incorporating it into the cost of equity and you certainly should not be double counting the risk by first incorporating a small cap premium into the discount rate and then applying an illiquidity discount to value.

The question of whether there is a small cap premium ultimately is not a theoretical one but a practical one. While those who incorporate a small cap premium justify the practice with the historical data, we will present a more forward-looking approach, where we use market pricing of small capitalization stocks to see if the market builds in a small cap premium, later in this paper.

Country Risk Premiums

As both companies and investors get used to the reality of a global economy, they have also been forced to confront the consequences of globalization for equity risk premiums and hurdle rates. Should an investor putting his money in Indian stocks demand a higher risk premium for investing in equities that one investing in German stocks? Should a US consumer product company investing in Brazil demand the same hurdle rates for its Brazilian investments as it does for its US investments? In effect, should we demand one global equity risk premium that we use for investments all over the world or should we use higher equity risk premiums in some markets than in others?

The arguments for no country risk premium

Is there more risk in investing in a Malaysian or Brazilian stock than there is in investing in the United States? The answer, to most, seems to be obviously affirmative, with the solution being that we should use higher equity risk premiums when investing in riskier emerging markets. There are, however, three distinct and different arguments offered against this practice.

1. Country risk is diversifiable

In the risk and return models that have developed from conventional portfolio theory, and in particular, the capital asset pricing model, the only risk that is relevant for purposes of estimating a cost of equity is the market risk or risk that cannot be diversified away. The key question in relation to country risk then becomes whether the additional risk in an emerging market is diversifiable or non-diversifiable risk. If, in fact, the additional risk of investing in Malaysia or Brazil can be diversified away, then there should be no additional risk premium charged. If it cannot, then it makes sense to think about estimating a country risk premium.

But diversified away by whom? Equity in a publicly traded Brazilian, or Malaysian, firm can be held by hundreds or even thousands of investors, some of whom may hold only domestic stocks in their portfolio, whereas others may have more global exposure. For purposes of analyzing country risk, we look at the marginal investor – the investor most likely to be trading on the equity. If that marginal investor is globally diversified, there is at least the potential for global diversification. If the marginal investor does not have a global portfolio, the likelihood of diversifying away country risk declines substantially. Stulz (1999) made a similar point using different terminology.[73] He differentiated between segmented markets, where risk premiums can be different in each market, because investors cannot or will not invest outside their domestic markets, and open markets, where investors can invest across markets. In a segmented market, the marginal investor will be diversified only across investments in that market, whereas in an open market, the marginal investor has the opportunity (even if he or she does not take it) to invest across markets. It is unquestionable that investors today in most markets have more opportunities to diversify globally than they did three decades ago, with international mutual funds and exchange traded funds, and that many more of them take advantage of these opportunities. It is also true still that a significant home bias exists in most investors' portfolios, with most investors over investing in their home markets.

Even if the marginal investor is globally diversified, there is a second test that has to be met for country risk to be diversifiable. All or much of country risk should be country specific. In other words, there should be low correlation across markets. Only then will the risk be diversifiable in a globally diversified portfolio. If, on the other hand, the returns across countries have significant positive correlation, country risk has a market risk component, is not diversifiable and can command a premium. Whether

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[73] Stulz, R.M., *Globalization, Corporate finance, and the Cost of Capital,* Journal of Applied Corporate Finance, v12. 8-25.

returns across countries are positively correlated is an empirical question. Studies from the 1970s and 1980s suggested that the correlation was low, and this was an impetus for global diversification.[74] Partly because of the success of that sales pitch and partly because economies around the world have become increasingly intertwined over the last decade, more recent studies indicate that the correlation across markets has risen. The correlation across equity markets has been studied extensively over the last two decades and while there are differences, the overall conclusions are as follows:

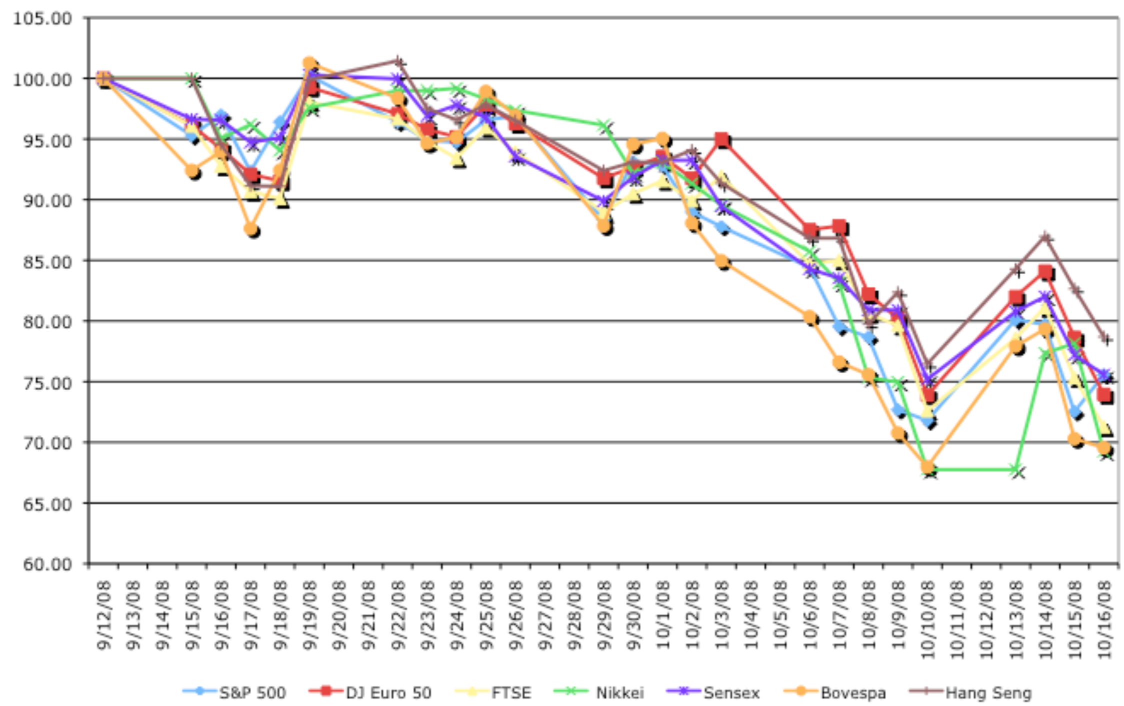
1. The correlation across markets has increased over time, as both investors and firms have globalized. Yang, Tapon and Sun (2006) report correlations across eight, mostly developed markets between 1988 and 2002 and note that the correlation in the 1998-2002 time period was higher than the correlation between 1988 and 1992 in every single market; to illustrate, the correlation between the Hong Kong and US markets increased from 0.48 to 0.65 and the correlation between the UK and the US markets increased from 0.63 to 0.82.[75] In the global returns sourcebook, from Credit Suisse, referenced earlier for historical risk premiums for different markets, the authors estimate the correlation between developed and emerging markets between 1980 and 2013, and note that it has increased from 0.57 in 1980 to 0.88 in 2013.
2. The correlation across equity markets increases during periods of extreme stress or high volatility.[76] This is borne out by the speed with which troubles in one market, say Russia, can spread to a market with little or no obvious relationship to it, say Brazil. The contagion effect, where troubles in one market spread into others is one reason to be skeptical with arguments that companies that are in multiple emerging markets are protected because of their diversification benefits. In fact, the market crisis in the last quarter of 2008 illustrated how closely bound markets have become, as can be seen in figure 6:

[74] Levy, H. and M. Sarnat, 1970, *International Diversification of Investment Portfolios*, American Economic Review 60(4), 668-75.

[75] Yang, Li , Tapon, Francis and Sun, Yiguo, 2006, *International correlations across stock markets and industries: trends and patterns 1988-2002*, Applied Financial Economics, v16: 16, 1171-1183

[76] Ball, C. and W. Torous, 2000, *Stochastic correlation across international stock markets*, Journal of Empirical Finance. v7, 373-388.

Figure 6: The globalization of risk



Between September 12, 2008 and October 16, 2008, markets across the globe moved up and down together, with emerging markets showing slightly more volatility.

3. The downside correlation increases more than upside correlation: In a twist on the last point, Longin and Solnik (2001) report that it is not high volatility per se that increases correlation, but downside volatility. Put differently, the correlation between global equity markets is higher in bear markets than in bull markets.[77]
4. Globalization increases exposure to global political uncertainty, while reducing exposure to domestic political uncertainty: In the most direct test of whether we should be attaching different equity risk premiums to different countries due to systematic risk exposure, Brogaard, Dai, Ngo and Zhang (2014) looked at 36 countries from 1991-2010 and measured the exposure of companies in these countries to global political uncertainty and domestic political uncertainty.[78] They find that the costs of capital of companies in integrated markets are more highly

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[77] Longin, F. and B. Solnik, 2001, *Extreme Correlation of International Equity Markets*, Journal of Finance, v56 , pg 649-675.

[78] Brogaard, J., L. Dai, P.T.H. Ngo, B. Zhuang, 2014, *The World Price of Political Uncertainty*, SSRN #2488820.

influenced by global uncertainty (increasing as uncertainty increases) and those in segmented markets are more highly influenced by domestic uncertainty.[79]

2. A Global Capital Asset Pricing Model

The other argument against adjusting for country risk comes from theorists and practitioners who believe that the traditional capital asset pricing model can be adapted fairly easily to a global market. In their view, all assets, no matter where they are traded, should face the same global equity risk premium, with differences in risk captured by differences in betas. In effect, they are arguing that if Malaysian stocks are riskier than US stocks, they should have higher betas and expected returns.

While the argument is reasonable, it flounders in practice, partly because betas do not seem capable of carry the weight of measuring country risk.

1. If betas are estimated against local indices, as is usually the case, the average beta within each market (Brazil, Malaysia, US or Germany) has to be one. Thus, it would be mathematically impossible for betas to capture country risk.
2. If betas are estimated against a global equity index, such as the Morgan Stanley Capital Index (MSCI), there is a possibility that betas could capture country risk but there is little evidence that they do in practice. Since the global equity indices are market weighted, it is the companies that are in developed markets that have higher betas, whereas the companies in small, very risky emerging markets report low betas. Table 8 reports the average beta estimated for the ten largest market cap companies in Brazil, India, the United States and Japan against the MSCI.

Table 8: Betas against MSCI – Large Market Cap Companies

Country	*Average Beta (against local index)*	*Average Beta (against MSCI)*
India	0.97	0.83
Brazil	0.98	0.81
United States	0.96	1.05
Japan	0.94	1.03

[a] The betas were estimated using two years of weekly returns from January 2006 to December 2007 against the most widely used local index (Sensex in India, Bovespa in Brazil, S&P 500 in the US and the Nikkei in Japan) and the MSCI using two years of weekly returns.

The emerging market companies consistently have lower betas, when estimated against global equity indices, than developed market companies. Using these betas with a global equity risk premium will lead to lower costs of equity for emerging market companies than developed market companies. While there are creative fixes

[79] The implied costs of capital for companies in the 36 countries were computed and related to global political uncertainty, measured using the US economic policy uncertainty index, and to domestic political uncertainty, measured using domestic national elections.

that practitioners have used to get around this problem, they seem to be based on little more than the desire to end up with higher expected returns for emerging market companies.[80]

3. *Country risk is better reflected in the cash flows*

The essence of this argument is that country risk and its consequences are better reflected in the cash flows than in the discount rate. Proponents of this point of view argue that bringing in the likelihood of negative events (political chaos, nationalization and economic meltdowns) into the expected cash flows effectively risk adjusts the cashflows, thus eliminating the need for adjusting the discount rate.

This argument is alluring but it is wrong. The expected cash flows, computed by taking into account the possibility of poor outcomes, is not risk adjusted. In fact, this is exactly how we should be calculating expected cash flows in any discounted cash flow analysis. Risk adjustment requires us to adjust the expected cash flow further for its risk, i.e. compute certainty equivalent cash flows in capital budgeting terms. To illustrate why, consider a simple example where a company is considering making the same type of investment in two countries. For simplicity, let us assume that the investment is expected to deliver $ 90, with certainty, in country 1 (a mature market); it is expected to generate $ 100 with 90% probability in country 2 (an emerging market) but there is a 10% chance that disaster will strike (and the cash flow will be $0). The expected cash flow is $90 on both investments, but only a risk neutral investor would be indifferent between the two. A risk averse investor would prefer the investment in the mature market over the emerging market investment, and would demand a premium for investing in the emerging market.

In effect, a full risk adjustment to the cash flows will require us to go through the same process that we have to use to adjust discount rates for risk. We will have to estimate a country risk premium, and use that risk premium to compute certainty equivalent cash flows.[81]

The arguments for a country risk premium

There are elements in each of the arguments in the previous section that are persuasive but none of them is persuasive enough.

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[80] There are some practitioners who multiply the local market betas for individual companies by a beta for that market against the US. Thus, if the beta for an Indian chemical company is 0.9 and the beta for the Indian market against the US is 1.5, the global beta for the Indian company will be 1.35 (0.9*1.5). The beta for the Indian market is obtained by regressing returns, in US dollars, for the Indian market against returns on a US index (say, the S&P 500).

[81] In the simple example above, this is how it would work. Assume that we compute a country risk premium of 3% for the emerging market to reflect the risk of disaster. The certainty equivalent cash flow on the investment in that country would be $90/1.03 = $87.38.

- Investors have become more globally diversified over the last three decades and portions of country risk can therefore be diversified away in their portfolios. However, the significant home bias that remains in investor portfolios exposes investors disproportionately to home country risk, and the increase in correlation across markets has made a portion of country risk into non-diversifiable or market risk.
- As stocks are traded in multiple markets and in many currencies, it is becoming more feasible to estimate meaningful global betas, but it also is still true that these betas cannot carry the burden of capturing country risk in addition to all other macro risk exposures.
- Finally, there are certain types of country risk that are better embedded in the cash flows than in the risk premium or discount rates. In particular, risks that are discrete and isolated to individual countries should be incorporated into probabilities and expected cash flows; good examples would be risks associated with nationalization or related to acts of God (hurricanes, earthquakes etc.).

After you have diversified away the portion of country risk that you can, estimated a meaningful global beta and incorporated discrete risks into the expected cash flows, you will still be faced with residual country risk that has only one place to go: the equity risk premium.

There is evidence to support the proposition that you should incorporate additional country risk into equity risk premium estimates in riskier markets:

1. Historical equity risk premiums: Donadelli and Prosperi (2011) look at historical risk premiums in 32 different countries (13 developed and 19 emerging markets) and conclude that emerging market companies had both higher average returns and more volatility in these returns between 1988 and 2010 (see table 9).

Table 9: Historical Equity Risk Premiums (Monthly) by Region

Region	*Monthly ERP*	*Standard deviation*
Developed Markets	0.62%	4.91%
Asia	0.97%	7.56%
Latin America	2.07%	8.18%
Eastern Europe	2.40%	15.66%
Africa	1.41%	6.03%

While we remain cautious about using historical risk premiums over short time periods (and 22 years is short in terms of stock market history), the evidence is consistent with the argument that country risk should be incorporated into a larger equity risk premium.[82]

2. Survey premiums: Earlier in the paper, we referenced a paper by Fernandez et al (2014) that surveyed academics, analysts and companies in 82 countries on equity risk premiums. The reported average premiums vary widely across markets and are higher for riskier emerging markets, as can be seen in table 10.

Table 10: Survey Estimates of Equity Risk Premium: By Region

Region	Number	Average	Median
Africa	11	10.14%	9.85%
Developed Markets	20	5.44%	5.29%
Eastern Europe	15	8.29%	8.25%
Emerging Asia	12	8.33%	8.08%
EU Troubled	7	8.36%	8.31%
Latin America	15	9.45%	9.39%
Middle East	8	7.14%	6.79%
Grand Total	**88**	**7.98%**	**7.82%**

Again, while this does not conclusively prove that country risk commands a premium, it does indicate that those who do valuations in emerging market countries seem to act like it does. Ultimately, the question of whether country risk matters and should affect the equity risk premium is an empirical one, not a theoretical one, and for the moment, at least, the evidence seems to suggest that you should incorporate country risk into your discount rates. This could change as we continue to move towards a global economy, with globally diversified investors and a global equity market, but we are not there yet.

Estimating a Country Risk Premium

If country risk is not diversifiable, either because the marginal investor is not globally diversified or because the risk is correlated across markets, we are then left with the task of measuring country risk and considering the consequences for equity risk premiums. In this section, we will consider three approaches that can be used to estimate country risk premiums, all of which build off the historical risk premiums estimated in the last section. To approach this estimation question, let us start with the basic proposition that the risk premium in any equity market can be written as:

[82] Donadelli, M. and L. Prosperi, 2011, *The Equity Risk Premium: Empirical Evidence from Emerging Markets*, Working Paper, http://ssrn.com/abstract=1893378.

Equity Risk Premium = Base Premium for Mature Equity Market + Country Risk Premium

The country premium could reflect the extra risk in a specific market. This boils down our estimation to estimating two numbers – an equity risk premium for a mature equity market and the additional risk premium, if any, for country risk. To estimate a mature market equity risk premium, we can look at one of two numbers. The first is the historical risk premium that we estimated for the United States, which yielded 4.60% as the geometric average premium for stocks over treasury bonds from 1928 to 2014. If we do this, we are arguing that the US equity market is a mature market, and that there is sufficient historical data in the United States to make a reasonable estimate of the risk premium. The other is the average historical risk premium across 20 equity markets, approximately 3.3%, that was estimated by Dimson et al (see earlier reference), as a counter to the survivor bias that they saw in using the US risk premium. Consistency would then require us to use this as the equity risk premium, in every other equity market that we deem mature; the equity risk premium in January 2015 would be 4.60% in Germany, France and the UK, for instance. For markets that are not mature, however, we need to measure country risk and convert the measure into a country risk premium, which will augment the mature market premium.

Measuring Country Risk

There are at least three measures of country risk that we can use. The first is the sovereign rating attached to a country by ratings agencies. The second is to subscribe to services that come up with broader measures of country risk that explicitly factor in the economic, political and legal risks in individual countries. The third is go with a market-based measure such as the volatility in the country's currency or markets.

i. Sovereign Ratings

One of the simplest and most accessible measures of country risk is the rating assigned to a country's debt by a ratings agency (S&P, Moody's and Fitch, among others, all provide country ratings). These ratings measure default risk (rather than equity risk) but they are affected by many of the factors that drive equity risk – the stability of a country's currency, its budget and trade balances and political uncertainty, among other variables[83].

[83] The process by which country ratings are obtained in explained on the S&P web site at http://www.ratings.standardpoor.com/criteria/index.htm.

To get a measure of country ratings, consider six countries – Germany, Brazil, China, India, Russia and Greece. In January 2015, the Moody's ratings for the countries are summarized in table 11:

Table 11: Sovereign Ratings in January 2015 – Moody's

Country	*Foreign Currency Rating*	*Local Currency Rating*
Brazil	Baa2	Baa2
China	Aa3	Aa3
Germany	Aaa	Aaa
Greece	Caa1	Caa1
India	Baa3	Baa3
Russia	Baa2	Baa2

What do these ratings tell us? First, the local currency and foreign currency ratings are identical for all of the countries on the list. There are a few countries (not on this list) where the two ratings diverge, and when they do, the local currency ratings tend to be higher (or at worst equal to) the foreign currency ratings for most countries, because a country should be in a better position to pay off debt in the local currency than in a foreign currency. Second, at least based on Moody's assessments in 2015, Germany is the safest company in this group, followed by China, Russia, Brazil, India and Greece, in that order. Third, ratings do change over time. In fact, Brazil's rating has risen from B1 in 2001 to its current rating of Baa2, reflecting both strong economic growth and a more robust political system. Appendix 2 contains the current ratings – local currency and foreign currency – for the countries that are tracked by Moody's in January 2015.[84]

While ratings provide a convenient measure of country risk, there are costs associated with using them as the only measure. First, ratings agencies often lag markets when it comes to responding to changes in the underlying default risk. The ratings for India, according to Moody's, were unchanged from 2004 to 2007, though the Indian economy grew at double-digit rates over that period. Similarly, Greece's ratings did not plummet until the middle of 2011, though their financial problems were visible well before that time. Second, the ratings agency focus on default risk may obscure other risks that could still affect equity markets. For instance, rising commodity (and especially oil) prices pushed up the ratings for commodity supplying countries (like Russia), even

[84] In a disquieting reaction to the turmoil of the market crisis in the last quarter of 2008, Moody's promoted the notion that Aaa countries were not all created equal and slotted these countries into three groups – resistant Aaa (the stongest), resilient Aaa (weaker but will probably survive intact) and vulnerable Aaa (likely to face additional default risk.

though there was little improvement in the rest of the economy. Finally, not all countries have ratings; much of sub-Saharan Africa, for instance, is unrated.

ii. Country Risk Scores

Rather than focus on just default risk, as rating agencies do, some services have developed numerical country risk scores that take a more comprehensive view of risk. These risk scores are often estimated from the bottom-up by looking at economic fundamentals in each country. This, of course, requires significantly more information and, as a consequence, most of these scores are available only to commercial subscribers.

The Political Risk Services (PRS) group, for instance, considers political, financial and economic risk indicators to come up with a composite measure of risk (ICRG) for each country that ranks from 0 to 100, with 0 being highest risk and 100 being the lowest risk.[85] Appendix 3 classifies countries based on composite country risk measures from the PRS Group in January 2014.[86] Harvey (2005) examined the efficacy of these scores and found that they were correlated with costs of capital, but only for emerging market companies.

The Economist, the business newsmagazine, also operates a country risk assessment unit that measures risk from 0 to 100, with 0 being the least risk and 100 being the most risk. In September 2008, Table 12 the following countries were ranked as least and most risky by their measure:

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[85] The PRS group considers three types of risk – political risk, which accounts for 50% of the index, financial risk, which accounts for 25%, and economic risk, which accounts for the balance. While this table is dated, updated numbers are available for a hefty price. We have used the latest information in the public domain. Some university libraries have access to the updated data. While we have not updated the numbers, out of concerns about publishing proprietary data, you can get the latest PRS numbers by paying $99 on their website (http://www.prsgroup.com).

[86] Harvey, C.R., *Country Risk Components, the Cost of Capital, and Returns in Emerging Markets*, Working paper, Duke University. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=620710.

Table 12: Country Risk Scores – The Economist

Economist.com rankings

Country risk

Selected countries and territories, September 2008 (except where noted)

Least risky

Rank		Score*
1	Switzerland †	12
2	Finland **	14
	Norway **	14
	Sweden ††	14
5	Canada **	17
	Denmark †	17
	Netherlands §	17
8	Germany ††	18
9	Austria **	19
	France ††	19
11	Belgium ††	20
12	Singapore	21
13	Japan **	23
14	Ireland #	24
	Britain	24
	United States †	24

Most risky

Rank		Score
120	Zimbabwe	86
119	Iraq	80
118	Sudan	76
117	Myanmar	75
116	Nicaragua	69
115	Jamaica	68
114	Kenya	66
113	Cuba	64
112	Cambodia	62
111	Côte d'Ivoire	61
	Ecuador	61
	Pakistan	61
	Venezuela	61
	Vietnam	61
106	Syria	60

*Out of 100, with higher numbers indicating more risk. Scores are based on indicators from three categories: currency risk, sovereign debt risk and banking risk.

† May 2008; ** July 2008; †† June 2008; § August 2008; # February 2008

In fact, comparing the PRS and Economist measures of country risk provides some insight into the problems with using their risk measures. The first is that the measures may be internally consistent but are not easily comparable across different services. The Economist, for instance, assigns its lowest scores to the safest countries whereas PRS assigns the highest scores to these countries. The second is that, by their very nature, a significant component of these measures have to be black boxes to prevent others from replicating them at no cost. Third, the measures are not linear and the services do not claim that they are; a country with a risk score of 60 in the Economist measure is not twice as risky as a country with a risk score of 30.

iii. Market-based Measures

To those analysts who feel that ratings agencies are either slow to respond to changes in country risk or take too narrow a view of risk, there is always the alternative of using market based measures.

- Bond default spread: We can compute a default spread for a country if it has bonds that are denominated in currencies such as the US dollar, Euro or Yen, where there is a riskfree rate to compare it to. In January 2015, for instance, a 10-year US dollar denominated bond issued by the Brazilian government had a yield to maturity of 3.87%, giving it a default spread of 1.70% over the 10-year US treasury bond rate (2.17%), as of the same time.
- Credit Default Swap Spreads: In the last few years, credit default swaps (CDS) markets have developed, allowing us to obtain updated market measures of default risk in different entities. In particular, there are CDS spreads for countries (governments) that yield measures of default risk that are more updated and precise, at least in some cases, than bond default spreads.[87] Table 13 summarizes the CDS spreads for all countries where a CDS spread was available, in January 2015:

Table 13: Credit Default Swap Spreads (in basis points)– January 2015

Country	Moody's rating	CDS Spread	CDS Spread adj for US	Country	Moody's rating	CDS Spread	CDS Spread adj for US	Country	Moody's rating	CDS Spread	CI Spr adj U
Abu Dhabi	Aa2	1.43%	1.12%	Hungary	Ba1	2.64%	2.33%	Poland	A2	1.46%	1.1
Argentina	Caa1	83.48%	83.17%	Iceland	Baa3	2.27%	1.96%	Portugal	Ba1	3.09%	2.7
Australia	Aaa	0.97%	0.66%	India	Baa3	2.64%	2.33%	Qatar	Aa2	1.57%	1.2
Austria	Aaa	0.81%	0.50%	Indonesia	Baa3	2.82%	2.51%	Romania	Baa3	2.23%	1.9
Bahrain	Baa2	3.18%	2.87%	Ireland	Baa1	1.26%	0.95%	Russia	Baa2	5.63%	5.3
Belgium	Aa3	1.20%	0.89%	Israel	A1	0.42%	0.11%	Saudi Arabia	Aa3	1.39%	1.0
Brazil	Baa2	3.17%	2.86%	Italy	Baa2	2.34%	2.03%	Slovakia	A2	1.32%	1.0
Bulgaria	Baa2	2.99%	2.68%	Japan	A1	1.55%	1.24%	Slovenia	Ba1	2.14%	1.8
Chile	Aa3	1.77%	1.46%	Kazakhstan	Baa2	4.16%	3.85%	South Africa	Baa2	2.96%	2.6
China	Aa3	1.78%	1.47%	Korea	Aa3	1.17%	0.86%	Spain	Baa2	1.79%	1.4
Colombia	Baa2	2.57%	2.26%	Latvia	Baa1	1.92%	1.61%	Sweden	Aaa	0.65%	0.3
Costa Rica	Ba1	3.58%	3.27%	Lebanon	B2	4.69%	4.38%	Switzerland	Aaa	0.72%	0.4
Croatia	Ba1	3.65%	3.34%	Lithuania	Baa1	1.88%	1.57%	Thailand	Baa1	1.91%	1.6
Cyprus	B3	6.35%	6.04%	Malaysia	A3	2.15%	1.84%	Tunisia	Ba3	3.38%	3.0
Czech Republic	A1	1.25%	0.94%	Mexico	A3	2.05%	1.74%	Turkey	Baa3	2.77%	2.4
Denmark	Aaa	0.79%	0.48%	Morocco	Ba1	2.55%	2.24%	Uganda	B1	0.31%	0.0
Egypt	Caa1	3.56%	3.25%	Netherlands	Aaa	0.78%	0.47%	Ukraine	Caa3	15.74%	15.
Estonia	A1	1.20%	0.89%	New Zealand	Aaa	1.01%	0.70%	UAE	Aa2	1.54%	1.2
Finland	Aaa	0.81%	0.50%	Norway	Aaa	0.61%	0.30%	United Kingdom	Aa1	0.77%	0.4
France	Aa1	1.22%	0.91%	Pakistan	Caa1	10.41%	10.10%	United States	Aaa	0.31%	0.0
Germany	Aaa	0.74%	0.43%	Panama	Baa2	2.09%	1.78%	Venezuela	Caa1	18.06%	17.
Greece	Caa1	10.76%	10.45%	Peru	A3	2.23%	1.92%	Vietnam	B1	3.15%	2.8

[87] The spreads are usually stated in US dollar or Euro terms.

Hong Kong	Aa1	1.12%	0.81%	Philippines	Baa2	1.98%	1.67%

Source: Bloomberg
Spreads are for 10-year US $ CDS.

In January 2015, for instance, the CDS market yielded a spread of 3.17% for the Brazilian Government, higher than the 1.70% that we obtained from the 10-year dollar denominated Brazilian bond. However, the CDS market does have some counterparty risk exposure and other risk exposures that are incorporated into the spreads. In fact, there is no country with a zero CDS spread, indicating either that there is no entity with default risk or that the CDS spread is not a pure default spread. To counter that problem, we netted the US CDS spread of 0.31% from each country's CDS to get a modified measure of country default risk.[88] Using this approach for Brazil, for instance, yields a netted CDS spread of 2.86% for the country.

- Market volatility: In portfolio theory, the standard deviation in returns is generally used as the proxy for risk. Extending that measure to emerging markets, there are some analysts who argue that the best measure of country risk is the volatility in local stock prices. Stock prices in emerging markets will be more volatile that stock prices in developed markets, and the volatility measure should be a good indicator of country risk. While the argument makes intuitive sense, the practical problem with using market volatility as a measure of risk is that it is as much a function of the underlying risk as it is a function of liquidity. Markets that are risky and illiquid often have low volatility, since you need trading to move stock prices. Consequently, using volatility measures will understate the risk of emerging markets that are illiquid and overstate the risk of liquid markets.

Market-based numbers have the benefit of constant updating and reflect the points of view of investors at any point in time. However, they also are also afflicted with all of the problems that people associate with markets – volatility, mood shifts and at times, irrationality. They tend to move far more than the other two measures – sovereign ratings and country risk scores – sometimes for good reasons and sometimes for no reason at all.

b. Estimating Country Risk Premium (for Equities)

How do we link a country risk measure to a country risk premium? In this section, we will look at three approaches. The first uses default spreads, based upon

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[88] If we assume that there is default risk in the US, we would subtract the default spread associated with this risk from the 0.67% first, before netting the value against other CDS spreads. Thus, if the default spread for the US is 0.15%, we would subtract out only 0.52% (0.67% - 0.15%) from each country's CDS spread to get to a corrected default spread for that country.

country bonds or ratings, whereas the latter two use equity market volatility as an input in estimating country risk premiums.

1. Default Spreads

The simplest and most widely used proxy for the country risk premium is the default spread that investors charge for buying bonds issued by the country. This default spread can be estimated in one of three ways.

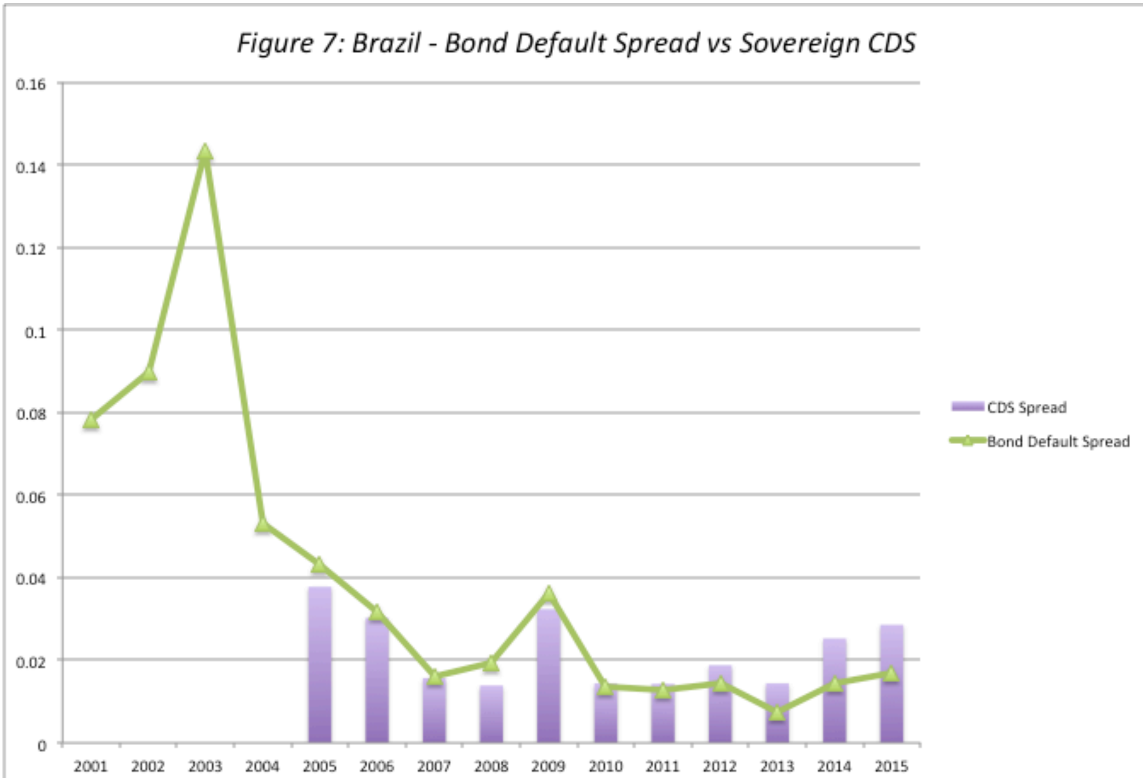
a. Current Default Spread on Sovereign Bond or CDS market: As we noted in the last section, the default spread comes from either looking at the yields on bonds issued by the country in a currency where there is a default free bond yield to which it can be compared or spreads in the CDS market.[89] With the 10-year US dollar denominated Brazilian bond that we cited as an example in the last section, the default spread would have amounted to 1.70% in January 2015: the difference between the interest rate on the Brazilian bond and a treasury bond of the same maturity. The netted CDS market spread on the same day for the default spread was 2.86%. Bekaert, Harvey, Lundblad and Siegel (2014) break down the sovereign bond default spread into four components, including global economic conditions, country-specific economic factors, sovereign bond liquidity and policial risk, and find that it is the political risk component that best explain money flows into and out of the country equity markets.[90]

b. Average (Normalized) spread on bond: While we can make the argument that the default spread in the dollar denominated is a reasonable measure of the default risk in Brazil, it is also a volatile measure. In figure 7, we have graphed the yields on the dollar denominated ten-year Brazilian Bond and the U.S. ten-year treasury bond and highlighted the default spread (as the difference between the two yields) from January 2000 to January 2015. In the same figure, we also show the 10-year CDS spreads from 2005 to 2015,[91] the spreads have also changed over time but move with the bond default spreads.

[89] You cannot compare interest rates across bonds in different currencies. The interest rate on a peso bond cannot be compared to the interest rate on a dollar denominated bond.

[90] Bekaert, G., C.R. Harvey, C.T. Lundblad and S. Siegel, 2014, *Political Risk Spreads*, Journal of International Business Studies, v45, 471-493.

[91] Data for the sovereign CDS market is available only from the last part of 2004.



Note that the bond default spread widened dramatically during 2002, mostly as a result of uncertainty in neighboring Argentina and concerns about the Brazilian presidential elections.[92] After the elections, the spreads decreased just as quickly and continued on a downward trend through the middle of last year. Since 2004, they have stabilized, with a downward trend; they spiked during the market crisis in the last quarter of 2008 but have settled back into pre-crisis levels. Given this volatility, a reasonable argument can be made that we should consider the average spread over a period of time rather than the default spread at the moment. If we accept this argument, the normalized default spread, using the average spreads over the last 5 years of data would be 1.65% (bond default spread) or 1.99% (CDS spread). Using this approach makes sense only if the economic fundamentals of the country have not changed significantly (for the better or worse) during the period but will yield misleading values, if there have been structural shifts in the economy. In 2008, for instance, it would have made sense to use averages over time for a country like Nigeria, where oil price movements created volatility in spreads over time, but not for countries like China and India, which saw their economies expand and mature dramatically over the period or Venezuela, where government capriciousness

[92] The polls throughout 2002 suggested that Lula Da Silva who was perceived by the market to be a leftist would beat the establishment candidate. Concerns about how he would govern roiled markets and any poll that showed him gaining would be followed by an increase in the default spread.

made operating private businesses a hazardous activity (with a concurrent tripling in default spreads). In fact, the last year has seen a spike in the Brazilian default spread, partly the result of another election and partly because of worries about political corruption and worse in large Brazilian companies.

c. Imputed or Synthetic Spread: The two approaches outlined above for estimating the default spread can be used only if the country being analyzed has bonds denominated in US dollars, Euros or another currency that has a default free rate that is easily accessible. Most emerging market countries, though, do not have government bonds denominated in another currency and some do not have a sovereign rating. For the first group (that have sovereign rating but no foreign currency government bonds), there are two solutions. If we assume that countries with the similar default risk should have the same sovereign rating, we can use the typical default spread for other countries that have the same rating as the country we are analyzing and dollar denominated or Euro denominated bonds outstanding. Thus, Bulgaria, with a Baa2 rating, would be assigned the same default spread as Brazil, which also has Baa2 rating, and dollar denominated bonds and CDS prices from which we can extract a default spread. For the second group, we are on even more tenuous grounds. Assuming that there is a country risk score from the Economist or PRS for the country, we could look for other countries that are rated and have similar scores and assign the default spreads that these countries face. For instance, we could assume that Cuba and Cameroon, which fall within the same score grouping from PRS, have similar country risk; this would lead us to attach Cuba's rating of Caa1 to Cameroon (which is not rated) and to use the same default spread (based on this rating) for both countries.

In table 14, we have estimated the typical default spreads for bonds in different sovereign ratings classes in January 2015. One problem that we had in obtaining the numbers for this table is that relatively few emerging markets have dollar or Euro denominated bonds outstanding. Consequently, there were some ratings classes where there was only one country with data and several ratings classes where there were none. To mitigate this problem, we used spreads from the CDS market, referenced in the earlier section. We were able to get default spreads for 65 countries, categorized by rating class, and we averaged the spreads across multiple countries in the same ratings class.[93] An alternative approach to estimating default spread is to assume that sovereign ratings are

[93] There were thirteen Baa2 rated countries, with ten-year CDS spreads, in January 2015. The average spread across the these countries is 2.68%. We noticed wide variations across countries in the same ratings class, and no discernible trend when compared to the January 2014 averages. Consequently, we decided to use the same default spreads that we used last year.

comparable to corporate ratings, i.e., a Ba1 rated country bond and a Ba1 rated corporate bond have equal default risk. In this case, we can use the default spreads on corporate bonds for different ratings classes. Table 14 summarizes the typical default spreads by sovereign rating class in January 2015, and compares it to the default spreads for similar corporate ratings.

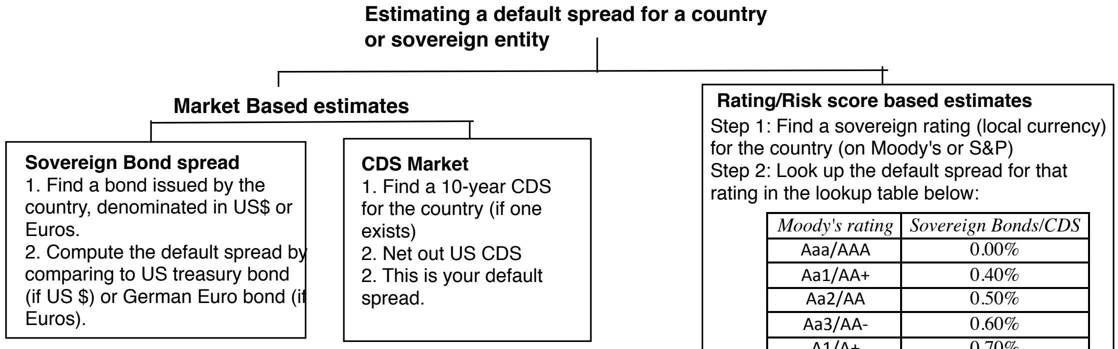
Table 14: Default Spreads by Ratings Class – Sovereign vs. Corporate in January 2015

Moody's rating	*Sovereign Bonds/CDS*	Corporate Bonds
Aaa/AAA	0.00%	0.42%
Aa1/AA+	0.40%	0.60%
Aa2/AA	0.50%	0.78%
Aa3/AA-	0.60%	0.87%
A1/A+	0.70%	0.96%
A2/A	0.85%	0.97%
A3/A-	1.20%	1.10%
Baa1/BBB+	1.60%	1.36%
Baa2/BBB	1.90%	1.67%
Baa3/BBB-	2.20%	2.22%
Ba1/BB+	2.50%	2.61%
Ba2/BB	3.00%	2.97%
Ba3/BB-	3.60%	3.33%
B1/B+	4.50%	3.74%
B2/B	5.50%	4.10%
B3/B-	6.50%	4.45%
Caa1/ CCC+	7.50%	4.86%
Caa2/CCC	9.00%	7.50%
Caa3/ CCC-	10.00%	10.00%

Note that the corporate bond spreads, at least in January 2015, were slightly larger than the sovereign spreads for the higher ratings classes, converge for the intermediate ratings and widen again at the lowest ratings. Using this approach to estimate default spreads for Brazil, with its rating of Baa2 would result in a spread of 1.90% (1.67%), if we use sovereign spreads (corporate spreads). These spreads are down from post-crisis levels at the end of 2008 but are still larger than the actual spreads on Brazilian sovereign bonds in early 2014.

Figure 8 depicts the alternative approaches to estimating default spreads for four countries, Brazil, China, India and Poland, in early 2015:

Figure 8: Approaches for estimating Sovereign Default Spreads



Moody's rating	Sovereign Bonds/CDS
Aaa/AAA	0.00%
Aa1/AA+	0.40%
Aa2/AA	0.50%
Aa3/AA-	0.60%
A1/A+	0.70%
A2/A	0.85%
A3/A-	1.20%
Baa1/BBB+	1.60%
Baa2/BBB	1.90%
Baa3/BBB-	2.20%
Ba1/BB+	2.50%
Ba2/BB	3.00%
Ba3/BB-	3.60%
B1/B+	4.50%
B2/B	5.50%
B3/B-	6.50%
Caa1/ CCC+	7.50%
Caa2/CCC	9.00%
Caa3/ CCC-	10.00%

Country	Sovereign Bond Yield	Currency	Risk free rate	Default Spread	CDS Spread (net of US)
Brazil	3.87%	US $	2.17%	1.70%	2.86%
China	NA	NA	NA	NA	1.47%
India	NA	NA	NA	NA	2.33%
Poland	1.70%	Euro	0.50%	1.20%	1.15%

Country	Moody's Rating	Default Spread
Brazil	Baa2	1.90%
China	Aa3	0.60%
India	Baa3	2.20%
Poland	A2	0.85%

With some countries, without US-dollar (or Euro) denominated sovereign bonds or CDS spreads, you don't have a choice since the only estimate of the default spread comes from the sovereign rating. With other countries, such as Brazil, you have multiple estimates of the default spreads: 1.70% from the dollar denominated bond, 3.17% from the CDS spread, 2.86% from the netted CDS spread and 1.90% from the sovereign rating look up table (table 14). You could choose one of these approaches and stay consistent over time or average across them.

Analysts who use default spreads as measures of country risk typically add them on to both the cost of equity and debt of every company traded in that country. Thus, the cost of equity for an Indian company, estimated in U.S. dollars, will be 2.2% higher than the cost of equity of an otherwise similar U.S. company, using the January 2015 measure of the default spread, based upon the rating. In some cases, analysts add the default spread to the U.S. risk premium and multiply it by the beta. This increases the cost of equity for high beta companies and lowers them for low beta firms.[94]

[94] In a companion paper, I argue for a separate measure of company exposure to country risk called lambda that is scaled around one (just like beta) that is multiplied by the country risk premium to estimate the cost

While many analysts use default spreads as proxies for country risk, the evidence for its use is still thin. Abuaf (2011) examines ADRs from ten emerging markets and relates the returns on these ADRs to returns on the S&P 500 (which yields a conventional beta) and to the CDS spreads for the countries of incorporation. He finds that ADR returns as well as multiples (such as PE ratios) are correlated with movement in the CDS spreads over time and argues for the addition of the CDS spread (or some multiple of it) to the costs of equity and capital to incorporate country risk.[95]

2. Relative Equity Market Standard Deviations

There are some analysts who believe that the equity risk premiums of markets should reflect the differences in equity risk, as measured by the volatilities of these markets. A conventional measure of equity risk is the standard deviation in stock prices; higher standard deviations are generally associated with more risk. If you scale the standard deviation of one market against another, you obtain a measure of relative risk. For instance, the relative standard deviation for country X (against the US) would be computed as follows:

$$\text{Relative Standard Deviation}_{\text{Country X}} = \frac{\text{Standard Deviation}_{\text{Country X}}}{\text{Standard Deviation}_{\text{US}}}$$

If we assume a linear relationship between equity risk premiums and equity market standard deviations, and we assume that the risk premium for the US can be computed (using historical data, for instance) the equity risk premium for country X follows:

$$\text{Equity risk premium}_{\text{Country X}} = \text{Risk Premum}_{\text{US}} * \text{Relative Standard Deviation}_{\text{Country X}}$$

Assume, for the moment, that you are using an equity risk premium for the United States of 5.75%. The annualized standard deviation in the S&P 500 in two years preceding January 2014, using weekly returns, was 10.85%, whereas the standard deviation in the Bovespa (the Brazilian equity index) over the same period was 22.25%.[96] Using these values, the estimate of a total risk premium for Brazil would be as follows.

$$\text{Equity Risk Premium}_{Brazil} = 5.75\% * \frac{22.25\%}{10.85\%} = 11.77\%$$

The country risk premium for Brazil can be isolated as follows:

$$\text{Country Risk Premium}_{Brazil} = 11.77\% - 5.75\% = 6.02\%$$

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of equity. See Damodaran, A., 2007, Measuring Company Risk Exposure to Country Risk, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=889388.

95 Abuaf, N., 2011, *Valuing Emerging Market Equities – The Empirical Evidence*, Journal of Applied Finance, v21, 123-138.

96 If the dependence on historical volatility is troubling, the options market can be used to get implied volatilities for both the US market (14.16%) and for the Bovespa (24.03%).

Table 15 lists country volatility numbers for some of the Latin American markets and the resulting total and country risk premiums for these markets, based on the assumption that the equity risk premium for the United States is 5.75%. Appendix 4 contains a more complete list of emerging markets, with equity risk premiums and country risk premiums estimated for each.

Table 15: Equity Market Volatilities and Risk Premiums (Weekly returns: Feb 13-Feb 15): Latin American Countries

Country	*Standard deviation in Equities (weekly)*	*Relative Volatility (to US)*	*Total Equity Risk Premium*	*Country risk premium*
Argentina	35.50%	3.27	18.78%	13.03%
Brazil	22.25%	2.05	11.77%	6.02%
Chile	13.91%	1.28	7.36%	1.61%
Colombia	16.00%	1.47	8.46%	2.71%
Costa Rica	8.78%	0.81	4.64%	-1.11%
Mexico	14.81%	1.36	7.83%	2.08%
Panama	6.18%	0.57	3.27%	-2.48%
Peru	16.15%	1.49	8.54%	2.79%
US	**10.87%**	**1.00**	5.75%	0.00%
Venezuela	40.03%	3.68	21.18%	15.43%

While this approach has intuitive appeal, there are problems with using standard deviations computed in markets with widely different market structures and liquidity. Since equity market volatility is affected by liquidity, with more liquid markets often showing higher volatility, this approach will understate premiums for illiquid markets and overstate the premiums for liquid markets. For instance, the standard deviations for Panama and Costa Rica are lower than the standard deviation in the S&P 500, leading to equity risk premiums for those countries that are lower than the US. The second problem is related to currencies since the standard deviations are usually measured in local currency terms; the standard deviation in the U.S. market is a dollar standard deviation, whereas the standard deviation in the Brazilian market is based on nominal Brazilian Real returns. This is a relatively simple problem to fix, though, since the standard deviations can be measured in the same currency – you could estimate the standard deviation in dollar returns for the Brazilian market.

3. Default Spreads + Relative Standard Deviations

In the first approach to computing equity risk premiums, we assumed that the default spreads (actual or implied) for the country were good measures of the additional risk we face when investing in equity in that country. In the second approach, we argued that the information in equity market volatility can be used to compute the country risk premium. In the third approach, we will meld the first two, and try to use the information in both the country default spread and the equity market volatility.

The country default spreads provide an important first step in measuring country equity risk, but still only measure the premium for default risk. Intuitively, we would expect the country equity risk premium to be larger than the country default risk spread. To address the issue of how much higher, we look at the volatility of the equity market in a country relative to the volatility of the bond market used to estimate the spread. This yields the following estimate for the country equity risk premium.

$$\text{Country Risk Premium} = \text{Country Default Spread} * \left(\frac{\sigma_{\text{Equity}}}{\sigma_{\text{Country Bond}}} \right)$$

To illustrate, consider again the case of Brazil. As noted earlier, the default spread for Brazil in January 2015, based upon its sovereign rating, was 1.90%. We computed annualized standard deviations, using two years of weekly returns, in both the equity market and the government bond, in early March 2015. The annualized standard deviation in the Brazilian dollar denominated ten-year bond was 11.97%, well below the standard deviation in the Brazilian equity index of 22.25%. The resulting country equity risk premium for Brazil is as follows:

$$\text{Brazil Country Risk Premium} = 1.90\% * \frac{22.25\%}{11.97\%} = 3.53\%$$

Unlike the equity standard deviation approach, this premium is in addition to a mature market equity risk premium. Thus, assuming a 5.75% mature market premium, we would compute a total equity risk premium for Brazil of 8.22%:

Brazil's Total Equity Risk Premium = 5.75% + 3.53% = 9.28%

Note that this country risk premium will increase if the country rating drops or if the relative volatility of the equity market increases.

Why should equity risk premiums have any relationship to country bond spreads? A simple explanation is that an investor who can make 1.90% risk premium on a dollar-denominated Brazilian government bond would not settle for a risk premium of 1.90% (in dollar terms) on Brazilian equity. Playing devil's advocate, however, a critic could argue that the interest rate on a country bond, from which default spreads are extracted, is not really an expected return since it is based upon the promised cash flows (coupon and principal) on the bond rather than the expected cash flows. In fact, if we wanted to estimate a risk premium for bonds, we would need to estimate the expected return based upon expected cash flows, allowing for the default risk. This would result in a lower default spread and equity risk premium. Both this approach and the last one use the standard deviation in equity of a market to make a judgment about country risk premium, but they measure it relative to different bases. This approach uses the country bond as a base, whereas the previous one uses the standard deviation in the U.S. market. This approach assumes that investors are more likely to choose between Brazilian bonds and Brazilian equity, whereas the previous approach assumes that the choice is across equity markets.

There are two potential measurement problems with using this approach. The first is that the relative standard deviation of equity is a volatile number, both across countries (ranging from 4.04 for India to 0.48 for the Phillipines) and across time (Brazil's relative volatility numbers have ranged from close to one to well above 2). The second is that computing the relative volatility requires us to estimate volatility in the government bond, which, in turn, presupposes that long-term government bonds not only exist but are also traded.[97] In countries where this data item is not available, we have three choices. One is to fall back on one of the other two approaches. The second is to use a different market measure of default risk, say the CDS spread, and compute the standard deviation in the spread; this number can be standardized by dividing the level of the spread. The third is to compute a cross sectional average of the ratio of stock market to bond market volatility across countries, where both items are available, and use that average. In 2015, for instance, there were 26 emerging markets, where both the equity market volatility and the government bond volatility numbers were available, at least for 100 trading weeks; the numbers are summarized in Appendix 5. The median ratio, across these markets, of equity market volatility to bond price volatility was approximately 1.88.[98] We also computed a second measure of relative volatility: equity volatility divided by the coefficient of variation in the CDS spread.

	$\sigma_{Equity} / \sigma_{Bond}$	$\sigma_{Equity} / \sigma_{CDS}$
Number of countries with data	26	46

[97] One indication that the government bond is not heavily traded is an abnormally low standard deviation on the bond yield.

[98] The ratio seems to be lowest in the markets with the highest default spreads and higher in markets with lower default spreads. The median ratio this year is higher than it has been historically. On my website, I continue to use a multiple of 1.50, reflecting the historical value for this ratio.

Average	1.86	2.11
Median	1.88	0.97
Maximum	4.04	23.49
Minimum	0.48	0.51

Looking at the descriptive statistics, the need to adjust default spreads seems to be smaller, at least in the cross section, if you use the CDS spread as your measure of the default spread for a country; the median ratio is close to one.

Choosing between the approaches

The three approaches to estimating country risk premiums will usually give you different estimates, with the bond default spread and relative equity standard deviation approaches generally yielding lower country risk premiums than the melded approach that uses both the country bond default spread and the equity and bond standard deviations. Table 16 summarizes the estimates of country equity and total risk premium using the three approaches for Brazil in March 2014:

Table 16: Country and Total Equity Risk Premium: Brazil in January 2013

Approach	*Mature Market Equity Premium*	*Brazil Country Risk Premium*	*Total Equity Risk Premium*
Country Bond Default Spread	5.75%	1.90%	7.65%
Relative Equity Market Standard Deviations	5.75%	6.02%	11.77%
Melded Approach (Bond default spread X Relative Standard $\text{Deviation}_{\text{Bond}}$)	5.75%	1.90%*1.86 = 3.53%	9.28%
Melded Approach (CDS X Relative Standard $\text{Deviation}_{\text{CDS}}$)	5.75%	3.37% *1.87= 6.30%	12.05%

The CDS and relative equity market approaches yield similar equity risk premiums, but that is more the exception than the rule. In particular, the melded CDS approach offers more promise going forward, as more countries have CDS traded on them. With all three approaches, just as companies mature and become less risky over time, countries can mature and become less risky as well.

One way to adjust country risk premiums over time is to begin with the premium that emerges from the melded approach and to adjust this premium down towards either the country bond default spread or the country premium estimated from equity standard deviations. Thus, the equity risk premium will converge to the country bond default spread as we look at longer term expected returns. As an illustration, the country risk premium for Brazil would be 3.53% for the next year but decline over time to 1.90% (country default spread) or perhaps even lower, depending upon your assessment of how Brazil's economy will evolve over time.

Implied Equity Premiums

The problem with any historical premium approach, even with substantial modifications, is that it is backward looking. Given that our objective is to estimate an updated, forward-looking premium, it seems foolhardy to put your faith in mean reversion and past data. In this section, we will consider three approaches for estimating equity risk premiums that are more forward looking.

1. DCF Model Based Premiums

When investors price assets, they are implicitly telling you what they require as an expected return on that asset. Thus, if an asset has expected cash flows of $15 a year in perpetuity, and an investor pays $75 for that asset, he is announcing to the world that his required rate of return on that asset is 20% (15/75). In this section, we expand on this intuition and argue that the current market prices for equity, in conjunction with expected cash flows, should yield an estimate on the equity risk premium.

A Stable Growth DDM Premium

It is easiest to illustrated implied equity premiums with a dividend discount model (DDM). In the DDM, the value of equity is the present value of expected dividends from the investment. In the special case where dividends are assumed to grow at a constant rate forever, we get the classic stable growth (Gordon) model:

$$\text{Value of equity} = \frac{\text{Expected Dividends Next Period}}{\text{(Required Return on Equity - Expected Growth Rate)}}$$

This is essentially the present value of dividends growing at a constant rate. Three of the four inputs in this model can be obtained or estimated - the current level of the market (value), the expected dividends next period and the expected growth rate in earnings and dividends in the long term. The only "unknown" is then the required return on equity; when we solve for it, we get an implied expected return on stocks. Subtracting out the riskfree rate will yield an implied equity risk premium.

To illustrate, assume that the current level of the S&P 500 Index is 900, the expected dividend yield on the index is 2% and the expected growth rate in earnings and dividends in the long term is 7%. Solving for the required return on equity yields the following:

$$900 = (.02*900) /(r - .07)$$

Solving for r,

$$r = (18+63)/900 = 9\%$$

If the current riskfree rate is 6%, this will yield a premium of 3%.

In fact, if we accept the stable growth dividend discount model as the base model for valuing equities and assume that the expected growth rate in dividends should equate to the riskfree rate in the long term, the dividend yield on equities becomes a measure of the equity risk premium:

$$\text{Value of equity} = \frac{\text{Expected Dividends Next Period}}{\text{(Required Return on Equity - Expected Growth Rate)}}$$

$$\text{Dividends/ Value of Equity} = \text{Required Return on Equity} - \text{Expected Growth rate}$$

$$\text{Dividend Yield} = \text{Required Return on Equity} - \text{Riskfree rate}$$

$$= \text{Equity Risk Premium}$$

Rozeff (1984) made this argument[99] and empirical support has been claimed for dividend yields as predictors of future returns in many studies since.[100] Note that this simple equation will break down if (a) companies do not pay out what they can afford to in dividends, i.e., they hold back cash or (b) if earnings are expected to grow at extraordinary rates for the short term.

There is another variant of this model that can be used, where we focus on earnings instead of dividends. To make this transition, though, we have to state the expected growth rate as a function of the payout ratio and return on equity (ROE) :[101]

$$\text{Growth rate} = (1 - \text{Dividends/ Earnings}) (\text{Return on equity})$$

$$= (1 - \text{Payout ratio}) (\text{ROE})$$

Substituting back into the stable growth model,

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[99] Rozeff, M. S. 1984. *Dividend yields are equity risk premiums*, Journal of Portfolio Management, v11, 68-75.

[100] Fama, E. F., and K. R. French. 1988. *Dividend yields and expected stock returns*. Journal of Financial Economics, v22, 3-25.

[101] This equation for sustainable growth is discussed more fully in Damodaran, A., 2002, Investment Valuation, John Wiley and Sons.

$$\text{Value of equity} = \frac{\text{Expected Earnings Next Period (Payout ratio)}}{\text{(Required Return on Equity - (1-Payout ratio) (ROE))}}$$

If we assume that the return on equity (ROE) is equal to the required return on equity (cost of equity), i.e., that the firm does not earn excess returns, this equation simplifies as follows:

$$\text{Value of equity} = \frac{\text{Expected Earnings Next Period}}{\text{Required Return on Equity}}$$

In this case, the required return on equity can be written as:

$$\text{Required return on equity} = \frac{\text{Expected Earnings Next Period}}{\text{Value of Equity}}$$

In effect, the inverse of the PE ratio (also referenced as the earnings yield) becomes the required return on equity, if firms are in stable growth and earning no excess returns. Subtracting out the riskfree rate should yield an implied premium:

Implied premium (EP approach) = Earnings Yield on index – Riskfree rate

In January 2015, the first of these approaches would have delivered a very low equity risk premium for the US market.

Dividend Yield = 1.87%

The second approach of netting the earnings yield against the risk free rate would have generated a more plausible number[102]:

Earnings Yield = 5.57%:

Implied premium = Earnings yield – 10-year US Treasury Bond rate

= 5.57% - 2.17% = 3.40%

Both approaches, though, draw on the dividend discount model and make strong assumptions about firms being in stable growth and/or long-term excess returns.

A Generalized Model: Implied Equity Risk Premium

To expand the model to fit more general specifications, we would make the following changes: Instead of looking at the actual dividends paid as the only cash flow to equity, we would consider potential dividends instead of actual dividends. In my earlier work (2002, 2006), the free cash flow to equity (FCFE), i.e, the cash flow left over after taxes, reinvestment needs and debt repayments, was offered as a measure of potential dividends.[103] Over the last decade, for instance, firms have paid out only about half their FCFE as dividends. If this poses too much of an estimation challenge, there is a

[102] The earnings yield in January 2015 is estimated by dividing the aggregated earnings for the index by the index level.

[103] Damodaran, A., 2002, *Investment Valuation*, John Wiley and Sons; Damodaran, A., 2006, *Damodaran on Valuation*, John Wiley and Sons.

simpler alternative. Firms that hold back cash build up large cash balances that they use over time to fund stock buybacks. Adding stock buybacks to aggregate dividends paid should give us a better measure of total cash flows to equity. The model can also be expanded to allow for a high growth phase, where earnings and dividends can grow at rates that are very different (usually higher, but not always) than stable growth values. With these changes, the value of equity can be written as follows:

$$\text{Value of Equity} = \sum_{t=1}^{t=N} \frac{E(FCFE_t)}{(1+k_e)^t} + \frac{E(FCFE_{N+1})}{(k_e\text{-}g_N)\,(1+k_e)^N}$$

In this equation, there are N years of high growth, $E(FCFE_t)$ is the expected free cash flow to equity (potential dividend) in year t, k_e is the rate of return expected by equity investors and g_N is the stable growth rate (after year N). We can solve for the rate of return equity investors need, given the expected potential dividends and prices today. Subtracting out the riskfree rate should generate a more realistic equity risk premium.

In a variant of this approach, the implied equity risk premium can be computed from excess return or residual earnings models. In these models, the value of equity today can be written as the sum of capital invested in assets in place and the present value of future excess returns:[104]

$$\text{Value of Equity} = \text{Book Equity today} + \sum_{t=1}^{t=\infty} \frac{\text{Net Income}_t - k_e(\text{Book Equity}_{t-1})}{(1+k_e)^t}$$

If we can make estimates of the book equity and net income in future periods, we can then solve for the cost of equity and use that number to back into an implied equity risk premium. Claus and Thomas (2001) use this approach, in conjunction with analyst forecasts of earnings growth, to estimate implied equity risk premiums of about 3% for the market in 2000.[105] Easton (2007) provides a summary of possible limitations of models that attempt to extract costs of equity from accounting data including the unreliability of book value numbers and the use of optimistic estimates of growth from analysts.[106]

Implied Equity Risk Premium: S&P 500

Given its long history and wide following, the S&P 500 is a logical index to use to try out the implied equity risk premium measure. In this section, we will begin by

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[104] For more on excess return models, see Damodaran, A, 2006, *Valuation Approaches and Metrics: A Survey of the Theory and Evidence,* Working Paper, www.damodaran.com.

[105] Claus, J. and J. Thomas, 2001,'*Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets*, Journal of Finance 56(5), 1629–1666.

[106] Easton, P., 2007, *Estimating the cost of equity using market prices and accounting data*, Foundations and Trends in Accounting, v2, 241-364.

estimating implied equity risk premiums at the start of the years 2008-2015, and follow up by looking at the volatility in that estimate over time.

Implied Equity Risk Premiums: Annual Estimates from 2008 to 2015

On December 31, 2007, the S&P 500 Index closed at 1468.36, and the dividend yield on the index was roughly 1.89%. In addition, the consensus estimate of growth in earnings for companies in the index was approximately 5% for the next 5 years.[107] Since this is not a growth rate that can be sustained forever, we employ a two-stage valuation model, where we allow growth to continue at 5% for 5 years, and then lower the growth rate to 4.02% (the riskfree rate) after that.[108] Table 17 summarizes the expected dividends for the next 5 years of high growth, and for the first year of stable growth thereafter:

Table 17: Estimated Dividends on the S&P 500 Index – January 1, 2008

Year	*Dividends on Index*
1	29.12
2	30.57
3	32.10
4	33.71
5	35.39
6	36.81

[a]Dividends in the first year = 1.89% of 1468.36 (1.05)

If we assume that these are reasonable estimates of the expected dividends and that the index is correctly priced, the value can be written as follows:

$$1468.36 = \frac{29.12}{(1+r)} + \frac{30.57}{(1+r)^2} + \frac{32.10}{(1+r)^3} + \frac{33.71}{(1+r)^4} + \frac{35.39}{(1+r)^5} + \frac{36.81}{(r-.0402)(1+r)^5}$$

Note that the last term in the equation is the terminal value of the index, based upon the stable growth rate of 4.02%, discounted back to the present. Solving for required return in this equation yields us a value of 6.04%. Subtracting out the ten-year treasury bond rate (the riskfree rate) yields an implied equity premium of 2.02%.

The focus on dividends may be understating the premium, since the companies in the index have bought back substantial amounts of their own stock over the last few years. Table 18 summarizes dividends and stock buybacks on the index, going back to 2001.

Table 18: Dividends and Stock Buybacks: 2001- 2007

Year	*Dividend*	*Stock Buyback*	*Total Yield*

[107] We used the average of the analyst estimates for individual firms (bottom-up). Alternatively, we could have used the top-down estimate for the S&P 500 earnings.

[108] The treasury bond rate is the sum of expected inflation and the expected real rate. If we assume that real growth is equal to the real interest rate, the long term stable growth rate should be equal to the treasury bond rate.

	Yield	Yield	
2001	1.37%	1.25%	2.62%
2002	1.81%	1.58%	3.39%
2003	1.61%	1.23%	2.84%
2004	1.57%	1.78%	3.35%
2005	1.79%	3.11%	4.90%
2006	1.77%	3.39%	5.16%
2007[a]	1.89%	4.00%	5.89%
Average total yield between 2001-2007 =			4.02%

[a]Trailing 12-month data, from September 2006 through September 2007. In January 2008, this was the information that would have been available. The actual cash yield for all of 2007 was 6.49%.

In 2007, for instance, firms collectively returned more than twice as much in the form of buybacks than they paid out in dividends. Since buybacks are volatile over time, and 2007 may represent a high-water mark for the phenomenon, we recomputed the expected cash flows, in table 19, for the next 6 years using the average total yield (dividends + buybacks) of 4.11%, instead of the actual dividends, and the growth rates estimated earlier (5% for the next 5 years, 4.02% thereafter):

Table 19: Cashflows on S&P 500 Index

Year	*Dividends+ Buybacks on Index*
1	63.37
2	66.54
3	69.86
4	73.36
5	77.02

Using these cash flows to compute the expected return on stocks, we derive the following:

$$1468.36 = \frac{63.37}{(1+r)} + \frac{66.54}{(1+r)^2} + \frac{69.86}{(1+r)^3} + \frac{73.36}{(1+r)^4} + \frac{77.02}{(1+r)^5} + \frac{77.02(1.0402)}{(r-.0402)(1+r)^5}$$

Solving for the required return and the implied premium with the higher cash flows:

Required Return on Equity = 8.39%

Implied Equity Risk Premium = Required Return on Equity - Riskfree Rate

= 8.48% - 4.02% = 4.46%

This value (4.46%) would have been our estimate of the equity risk premium on January 1, 2008.

During 2008, the S&P 500 lost just over a third of its value and ended the year at 903.25 and the treasury bond rate plummeted to close at 2.21% on December 31, 2008. Firms also pulled back on stock buybacks and financial service firms in particular cut dividends during the year. The inputs to the equity risk premium computation reflect these changes:

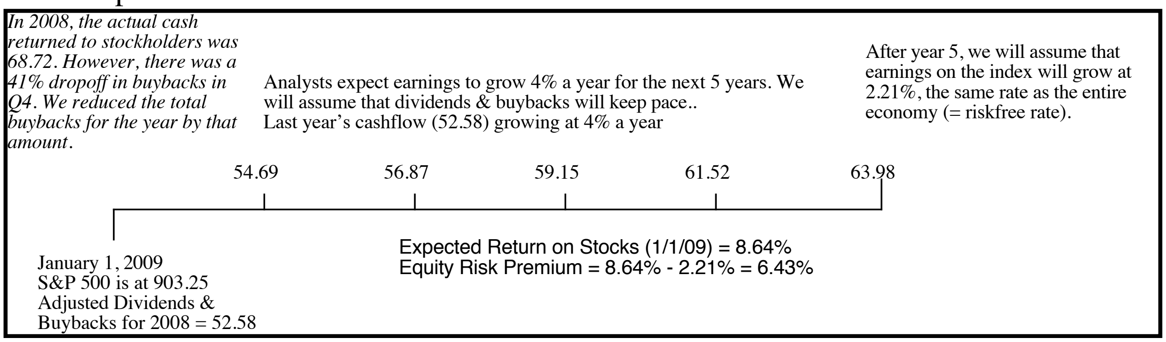
Level of the index = 903.25 (Down from 1468.36)

Treasury bond rate = 2.21% (Down from 4.02%)

Updated dividends and buybacks on the index = 52.58 (Down about 15%)

Expected growth rate = 4% for next 5 years (analyst estimates) and 2.21% thereafter (set equal to riskfree rate).

The computation is summarized below:



The resulting equation is below:

$$903.25 = \frac{54.69}{(1+r)} + \frac{56.87}{(1+r)^2} + \frac{59.15}{(1+r)^3} + \frac{61.52}{(1+r)^4} + \frac{63.98}{(1+r)^5} + \frac{63.98(1.0221)}{(r-.0221)(1+r)^5}$$

Solving for the required return and the implied premium with the higher cash flows:

Required Return on Equity = 8.64%

Implied Equity Risk Premium = Required Return on Equity - Riskfree Rate

= 8.64% - 2.21% = 6.43%

The implied premium rose more than 2%, from 4.37% to 6.43%, over the course of the year, indicating that investors perceived more risk in equities at the end of the year, than they did at the start and were demanding a higher premium to compensate.

By January 2010, the fears of a banking crisis had subsided and the S&P 500 had recovered to 1115.10. However, a combination of dividend cuts and a decline in stock buybacks had combined to put the cash flows on the index down to 40.38 in 2009. That was partially offset by increasing optimism about an economic recovery and expected earnings growth for the next 5 years had bounced back to 7.2%.[109] The resulting equity risk premium is 4.36%:

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[109] The expected earnings growth for just 2010 was 21%, primarily driven by earnings bouncing back to pre-crisis levels, followed by a more normal 4% earnings growth in the following years. The compounded average growth rate is $((1.21)(1.04)^4)^{1/5}$-1= .072 or 7.2%.

In 2009, the actual cash returned to stockholders was 40.38. That was down about 40% from 2008 levels.

Analysts expect earnings to grow 21% in 2010, resulting in a compounded annual growth rate of 7.2% over the next 5 years. We will assume that dividends & buybacks will keep pace.

After year 5, we will assume that earnings on the index will grow at 3.84%, the same rate as the entire economy (= riskfree rate).

43.29 46.40 49.74 53.32 57.16

January 1, 2010
S&P 500 is at 1115.10
Adjusted Dividends & Buybacks for 2009 = 40.38

$$1115.10 = \frac{43.29}{(1+r)} + \frac{46.40}{(1+r)^2} + \frac{49.74}{(1+r)^3} + \frac{53.32}{(1+r)^4} + \frac{57.16}{(1+r)^5} + \frac{57.16(1.0384)}{(r-.0384)(1+r)^5}$$

Expected Return on Stocks (1/1/10) = 8.20%
T.Bond rate on 1/1/10 = 3.84 %
Equity Risk Premium = 8.20% - 3.84% = 4.36%

In effect, equity risk premiums have reverted back to what they were before the 2008 crisis.

Updating the numbers to January 2011, the S&P 500 had climbed to 1257.64, but cash flows on the index, in the form of dividends and buybacks, made an even more impressive comeback, increasing to 53.96 from the depressed 2009 levels. The implied equity risk premium computation is summarized below:

In 2010, the actual cash returned to stockholders was 53.96. That was up about 30% from 2009 levels.

Analysts expect earnings to grow 13% in 2011, 8% in 2012, 6% in 2013 and 4% therafter, resulting in a compounded annual growth rate of 6.95% over the next 5 years. We will assume that dividends & buybacks will tgrow 6.95% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 3.29%, the same rate as the entire economy (= riskfree rate).

57.72 61.73 66.02 70.60 75.51

January 1, 2011
S&P 500 is at 1257.64
Adjusted Dividends & Buybacks for 2010 = 53.96

$$1257.64 = \frac{57.72}{(1+r)} + \frac{61.73}{(1+r)^2} + \frac{66.02}{(1+r)^3} + \frac{70.60}{(1+r)^4} + \frac{75.51}{(1+r)^5} + \frac{75.51(1.0329)}{(r-.0329)(1+r)^5}$$

Expected Return on Stocks (1/1/11) = 8.49%
T.Bond rate on 1/1/11 = 3.29%
Equity Risk Premium = 8.03% - 3.29% = 5.20%

Data Sources:
Dividends and Buybacks last year: S&P
Expected growth rate: News stories, Yahoo! Finance, Zacks

The implied equity risk premium climbed to 5.20%, with the higher cash flows more than offsetting the rise in equity prices.

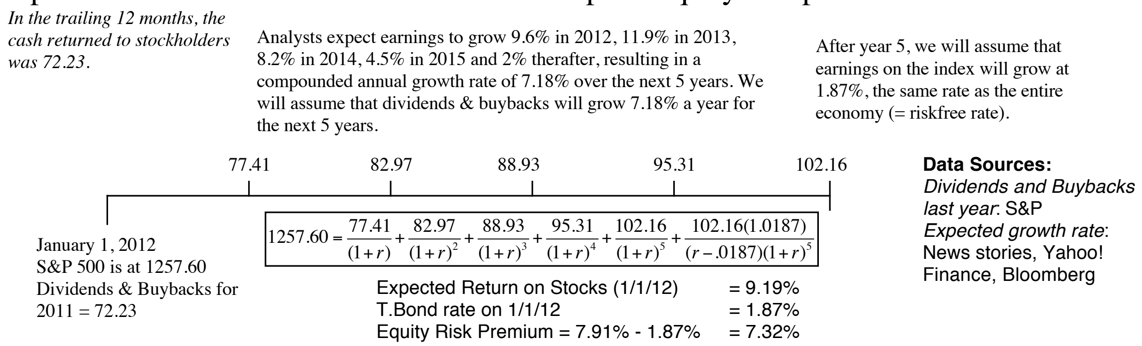
The S&P 500 ended 2011 at 1257.60, almost unchanged from the level at the start of the year. The other inputs into the implied equity risk premium equation changed significantly over the year:

a. The ten-year treasury bond rate dropped during the course of the year from 3.29% to 1.87%, as the European debt crisis caused a "flight to safety". The US did lose its AAA rating with Standard and Poor's during the course of the year, but we will continue to assume that the T.Bond rate is risk free.
b. Companies that had cut back dividends and scaled back stock buybacks in 2009, after the crisis, and only tentatively returned to the fray in 2010, returned to buying back stocks at almost pre-crisis levels. The total dividends and buybacks

for the trailing 12 months leading into January 2012 climbed to 72.23, a significant increase over the previous year.[110]

c. Analysts continued to be optimistic about earnings growth, in the face of signs of a pickup in the US economy, forecasting growth rate of 9.6% for 2012 (year 1), 11.9% in 2013, 8.2% in 2014, 4% in 2015 and 2.5% in 2016, leading to a compounded annual growth rate of 7.18% a year:.

Incorporating these inputs into the implied equity risk premium computation, we get an expected return on stocks of 9.29% and an implied equity risk premium of 7.32%:



Since the index level did not change over the course of the year, the jump in the equity risk premium from 5.20% on January 1, 2011 to 7.32% on January 1, 2012, was precipitated by two factors. The first was the drop in the ten-year treasury bond rate to a historic low of 1.87% and the second was the surge in the cash returned to stockholders, primarily in buybacks. With the experiences of the last decade fresh in our minds, we considered the possibility that the cash returned during the trailing 12 months may reflect cash that had built up during the prior two years, when firms were in their defensive posture. If that were the case, it is likely that buybacks will decline to a more normalized value in future years. To estimate this value, we looked at the total cash yield on the S&P 500 from 2002 to 2011 and computed an average value of 4.69% over the decade in table 20.

Table 20: Dividends and Buybacks on S&P 500 Index: 2002-2011

Year	Dividend Yield	Buybacks/Index	Yield
2002	1.81%	1.58%	3.39%
2003	1.61%	1.23%	2.84%
2004	1.57%	1.78%	3.35%
2005	1.79%	3.11%	4.90%
2006	1.77%	3.39%	5.16%

[110] These represented dividends and stock buybacks from October 1, 2010 to September 30, 2011, based upon the update from S&P on December 22, 2011. The data for the last quarter is not made available until late March of the following year.

2007	1.92%	4.58%	6.49%
2008	3.15%	4.33%	7.47%
2009	1.97%	1.39%	3.36%
2010	1.80%	2.61%	4.42%
2011	2.00%	3.53%	5.54%
Average: Last 10 years =			4.69%

Assuming that the cash returned would revert to this yield provides us with a lower estimate of the cash flow (4.69% of 1257.60= 59.01) and an equity risk premium of 6.01%:

In the trailing 12 months, the cash returned to stockholders was 72.23. Using the average cash yield of 4.69% for 2002-2011 the cash returned would have been 59.01.

Analysts expect earnings to grow 9.6% in 2012, 11.9% in 2013, 8.2% in 2014, 4.5% in 2015 and 2.5% therafter, resulting in a compounded annual growth rate of 7.18% over the next 5 years. We will assume that dividends & buybacks will grow 7.18% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.87%, the same rate as the entire economy (= riskfree rate).

63.24 67.78 72.65 77.87 83.46

January 1, 2012
S&P 500 is at 1257.60
Normalized Dividends & Buybacks for 2011 = 59.01

$$1257.60=\frac{63.24}{(1+r)}+\frac{67.78}{(1+r)^2}+\frac{72.65}{(1+r)^3}+\frac{77.87}{(1+r)^4}+\frac{83.46}{(1+r)^5}+\frac{83.46(1.0287)}{(r-.0187)(1+r)^5}$$

Expected Return on Stocks (1/1/12) = 7.88%
T.Bond rate on 1/1/12 = 1.87%
Equity Risk Premium = 7.91% - 1.87% = 7.32%

Data Sources:
Dividends and Buybacks last year: S&P
Expected growth rate: News stories, Yahoo! Finance, Bloomberg

So, did the equity risk premium for the S&P 500 jump from 5.20% to 7.32%, as suggested by the raw cash yield, or from 5.20% to 6.01%, based upon the normalized yield? We would be more inclined to go with the latter, especially since the index remained unchanged over the year. Note, though, that if the cash returned by firms does not drop back in the next few quarters, we will revisit the assumption of normalization and the resulting lower equity risk premium.

By January 1, 2013, the S&P 500 climbed to 1426.19 and the treasury bond rate had dropped to 1.76%. The dividends and buybacks were almost identical to the prior year and the smoothed out cash returned (using the average yield over the prior 10 years) climbed to 69.46. Incorporating the lower growth expectations leading into 2013, the implied equity risk premium dropped to 5.78% on January 1, 2013:

In 2012, the actual cash returned to stockholders was 72.25. Using the average total yield for the last decade yields 69.46

Analysts expect earnings to grow 7.67% in 2013, 7.28% in 2014, scaling down to 1.76% in 2017, resulting in a compounded annual growth rate of 5.27% over the next 5 years. We will assume that dividends & buybacks will tgrow 5.27% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.76%, the same rate as the entire economy (= riskfree rate).

73.12 76.97 81.03 85.30 89.80

January 1, 2013
S&P 500 is at 1426.19
Adjusted Dividends & Buybacks for base year = 69.46

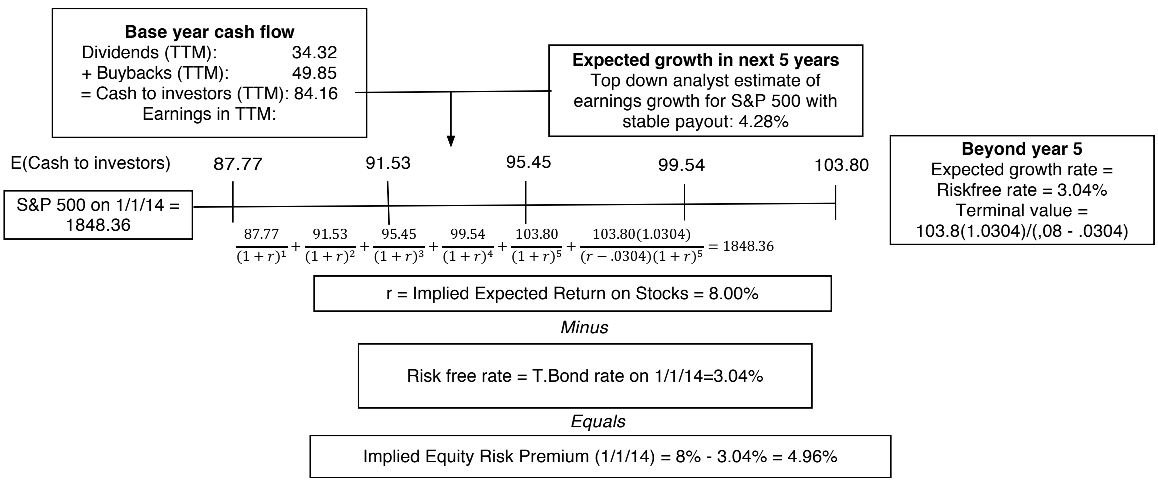
$$1426.19=\frac{73.12}{(1+r)}+\frac{76.97}{(1+r)^2}+\frac{81.03}{(1+r)^3}+\frac{85.30}{(1+r)^4}+\frac{89.80}{(1+r)^5}+\frac{89.80(1.0176)}{(r-.0176)(1+r)^5}$$

Expected Return on Stocks (1/1/13) = 7.54%
T.Bond rate on 1/1/13 = 1.76%
Equity Risk Premium = 7.54% - 1.76% = 5.78%

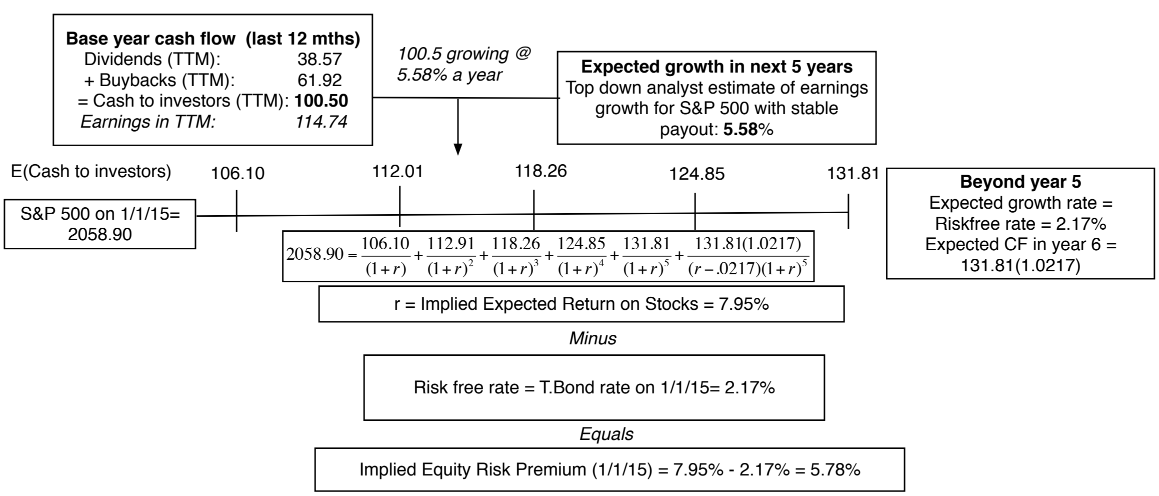
Data Sources:
Dividends and Buybacks last year: S&P
Expected growth rate: S&P, Media reports, Factset, Thomson-Reuters

Note that the chasm between the trailing 12-month cash flow premium and the smoother cash yield premium that had opened up at the start of 2012 had narrowed. The trailing 12-month cash flow premium was 6%, just 0.22% higher than the 5.78% premium obtained with the smoothed out cash flow.

After a good year for stocks, the S&P 500 was at 1848.36 on January 1, 2014, up 29.6% over the prior year, and cash flows also jumped to 84.16 over the trailing 12 months (ending September 30, 2013), up 16.48% over the prior year. Incorporating an increase in the US ten-year treasury bond rate to 3.04%, the implied equity risk premium at the start of 2014 was 4.96%.



During 2014, stocks continued to rise, albeit at a less frenetic pace, and the US ten-year treasury bond rate dropped back again to 2.17%. Since buybacks and dividends grew at higher rate than prices, the net effect was an increase in the implied equity risk premium to 5.78% at the start of 2015:



A Term Structure for Equity Risk Premiums

When we estimate an implied equity risk premium, from the current level of the index and expected future cash flows, we are estimating a compounded average equity risk premium over the long term. Thus, the 5.78% estimate of the equity risk premium at the start of 2015 is the geometric average of the annualized equity risk premiums in future years and is analogous to the yield to maturity on a long term bond.

But is it possible that equity risk premiums have a term structure, just as interest rates do? Absolutely. In a creative attempt to measure the slope of the term structure of equity risk premiums, Binsberger, Brandt and Koijen (2012) use dividend strips, i.e., short term assets that pay dividends for finite time periods (and have no face value), to extract equity risk premiums for the short term as opposed to the long term. Using dividend strips on the S&P 500 to extract expected returns from 1996 to 2009, they find that equity risk premiums are higher for shorter term claims than for longer term claims, by approximately 2.75%.[111] Their findings are contested by Boguth, Carlson, Fisher and Simutin (2011), who note that small market pricing frictions are amplified when valuing synthetic dividend strips and that using more robust return measures results in no significant differences between short term and longer term equity risk premiums.[112]

While this debate will undoubtedly continue, the relevance to valuation and corporate finance practice is questionable. Even if you could compute period-specific equity risk premiums, the effect on value of using these premiums (instead of the compounded average premium) would be small in most valuations. To illustrate, your valuation of an asset, using an equity risk premium of 7% for the first 3 years and 5.5% thereafter[113], at the start of 2015, would be very similar to the value you would have obtained using 5.78% as your equity risk premium for all time periods. The only scenario where using year-specific premiums would make a material difference would be in the valuation of an asset or investment with primarily short-term cash flows, where using a higher short term premium will yield a lower (and perhaps more realistic) value for the asset.

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[111] Binsbergen, J. H. van, Michael W. Brandt, and Ralph S. J. Koijen, 2012, *On the timing and pricing of dividends*, American Economic Review, v102, 1596-1618.

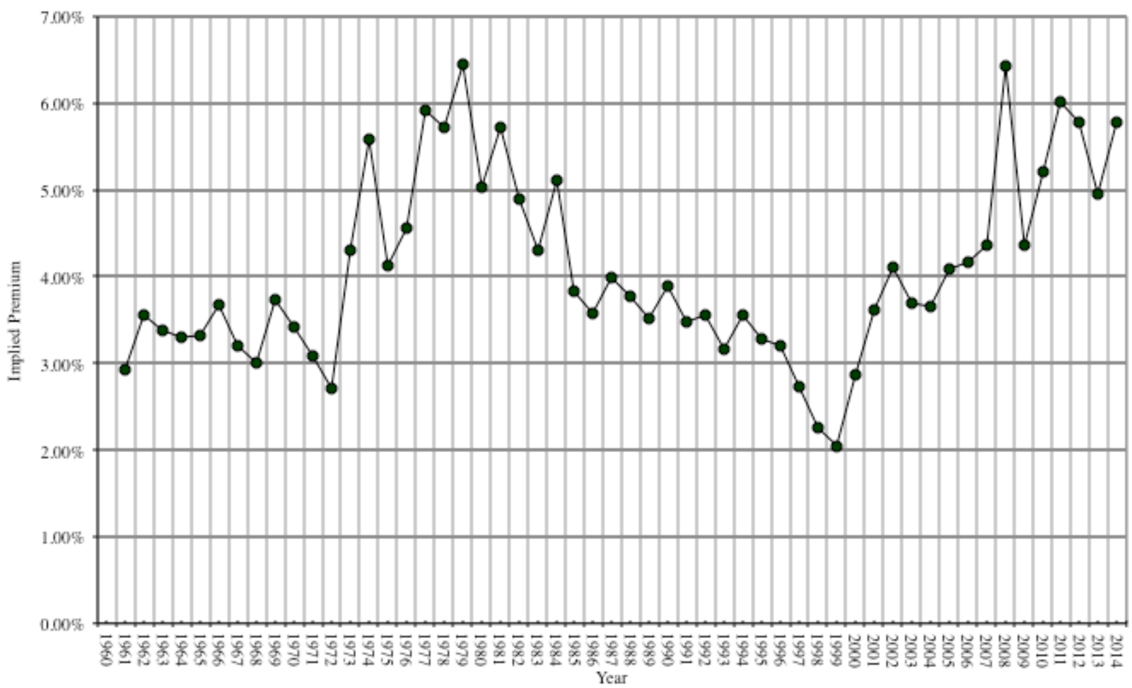
[112] Boguth, O., M. Carlson, A. Fisher and M. Simutin, 2011, *Dividend Strips and the Term Structure of Equity Risk Premia: A Case Study of Limits to Arbitrage*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1931105. In a response, Binsbergen, Brandt and Koijen argue that their results hold even if traded dividend strips (rather than synthetic strips) are used.

[113] The compounded average premium over time, using a 7% equity risk premium for the first 3 years and 5.88% thereafter, is roughly 6.01%.

Time Series Behavior for S&P 500 Implied Premium

As the inputs to the implied equity risk premium, it is quite clear that the value for the premium will change not just from day to day but from one minute to the next. In particular, movements in the index will affect the equity risk premium, with higher (lower) index values, other things remaining equal, translating into lower (higher) implied equity risk premiums. In Figure 9, we chart the implied premiums in the S&P 500 from 1960 to 2014 (year ends):

Figure 9: Implied Premium for US Equity Market: 1960-2014

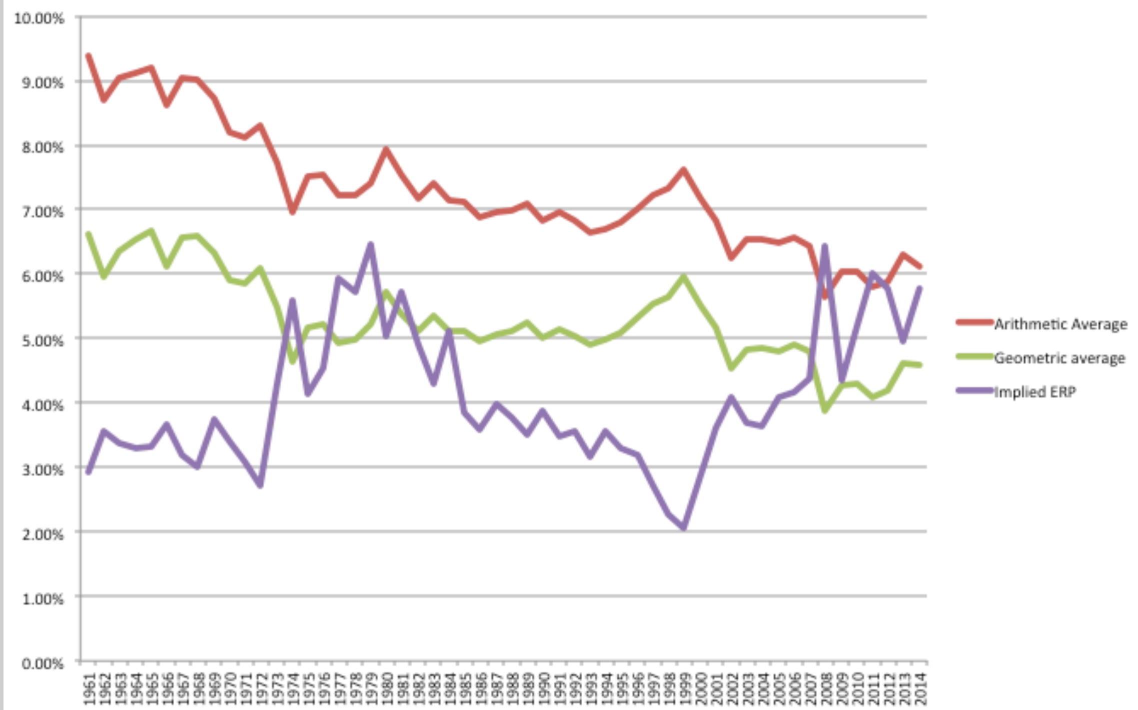


In terms of mechanics, we used potential dividends (including buybacks) as cash flows, and a two-stage discounted cash flow model; the estimates for each year are in appendix 6.[114] Looking at these numbers, we would draw the following conclusions:

- The implied equity premium has generally been lower than the historical risk premium for the US equity market for most of the last few decades. To provide a contrast, we compare the implied equity risk premiums each year to the historical risk premiums for stocks over treasury bonds, using both geometric and arithmetic averages, each year from 1961 to 2014 in figure 10:

[114] We used analyst estimates of growth in earnings for the 5-year growth rate after 1980. Between 1960 and 1980, we used the historical growth rate (from the previous 5 years) as the projected growth, since analyst estimates were difficult to obtain. Prior to the late 1980s, the dividends and potential dividends were very similar, because stock buybacks were uncommon. In the last 20 years, the numbers have diverged.

Figure 10: Historical versus Implied Premium - 1961- 2014



The arithmetic average premium, which is used by many practitioners, has been significantly higher than the implied premium over almost the entire fifty-year period (with 2009 and 2011 being the only exceptions). The geometric premium does provide a more interesting mix of results, with implied premiums exceeding historical premiums in the mid-1970s and again since 2008.

- The implied equity premium did increase during the seventies, as inflation increased. This does have interesting implications for risk premium estimation. Instead of assuming that the risk premium is a constant, and unaffected by the level of inflation and interest rates, which is what we do with historical risk premiums, would it be more realistic to increase the risk premium if expected inflation and interest rates go up? We will come back and address this question in the next section.
- While historical risk premiums have generally drifted down for the last few decades, there is a strong tendency towards mean reversion in implied equity premiums. Thus, the premium, which peaked at 6.5% in 1978, moved down towards the average in the 1980s. By the same token, the premium of 2% that we observed at the end of the dot-com boom in the 1990s quickly reverted back to the average, during the market correction from 2000-2003.[115] Given this tendency, it is possible that we can end up

[115] Arnott, Robert D., and Ronald Ryan, 2001, *The Death of the Risk Premium: Consequences of the*

with a far better estimate of the implied equity premium by looking at not just the current premium, but also at historical trend lines. We can use the average implied equity premium over a longer period, say ten to fifteen years. Note that we do not need as many years of data to make this estimate as we do with historical premiums, because the standard errors tend to be smaller.

Finally, the crisis of 2008 was unprecedented in terms of its impact on equity risk premiums. Implied equity risk premiums rose more during 2008 than in any one of the prior 50 years, with much of the change happening in a fifteen week time period towards the end of the year. While much of that increase dissipated in 2009, as equity risk premiums returned to pre-crisis levels, equity risk premiums have remained more volatile since 2008. In the next section, we will take a closer look at this time period.

Implied Equity Risk Premiums during a Market Crisis and Beyond

When we use historical risk premiums, we are, in effect, assuming that equity risk premiums do not change much over short periods and revert back over time to historical averages. This assumption was viewed as reasonable for mature equity markets like the United States, but was put under a severe test during the market crisis that unfolded with the fall of Lehman Brothers on September 15, and the subsequent collapse of equity markets, first in the US, and then globally.

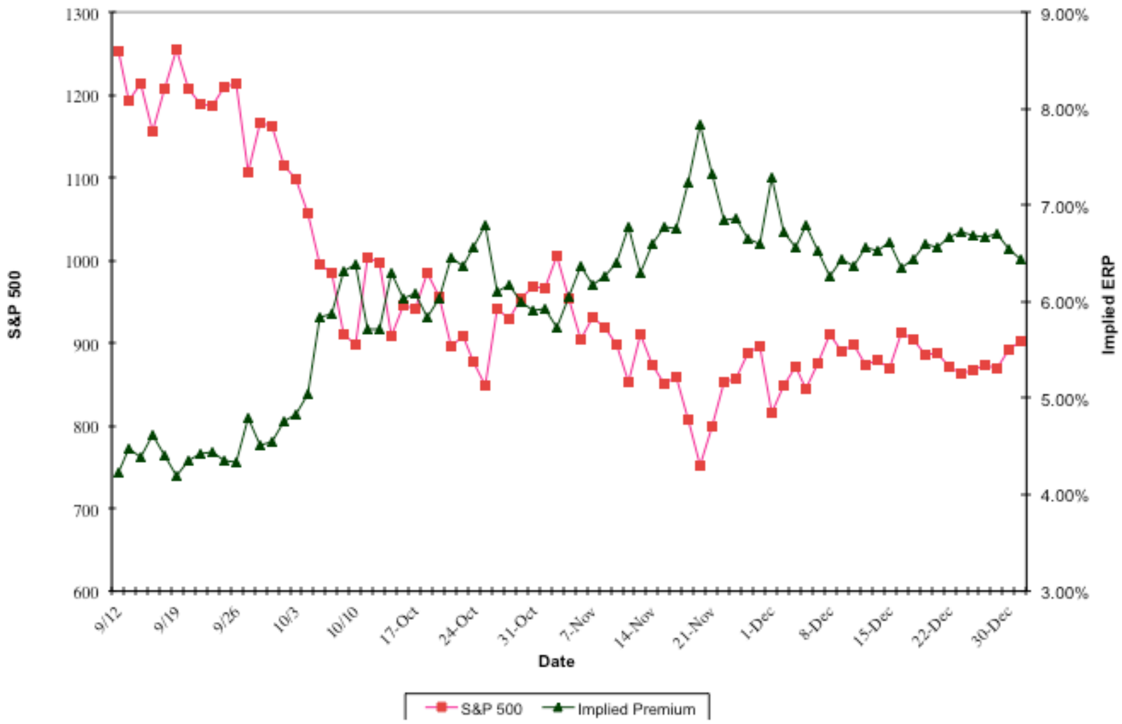
Since implied equity risk premiums reflect the current level of the index, the 75 trading days between September 15, 2008, and December 31, 2008, offer us an unprecedented opportunity to observe how much the price charged for risk can change over short periods. In figure 11, we depict the S&P 500 on one axis and the implied equity risk premium on the other. To estimate the latter, we used the level of the index and the treasury bond rate at the end of each day and used the total dollar dividends and buybacks over the trailing 12 months to compute the cash flows for the most recent year.[116] We also updated the expected growth in earnings for the next 5 years, but that number changed only slowly over the period. For example, the total dollar dividends and buybacks on the index for the trailing 12 months of 52.58 resulted in a dividend yield of 4.20% on September 12 (when the index closed at 1252) but jumped to 4.97% on October 6, when the index closed at 1057.[117]

1990s, Journal of Portfolio Management, v27, 61-74. They make the same point about reduction in implied equity risk premiums that we do. According to their calculations, though, the implied equity risk premium in the late 1990s was negative.

[116] This number, unlike the index and treasury bond rate, is not updated on a daily basis. We did try to modify the number as companies in the index announced dividend suspensions or buyback modifications.

[117] It is possible, and maybe even likely, that the banking crisis and resulting economic slowdown was leading some companies to reassess policies on buybacks. Alcoa, for instance, announced that it was terminating stock buybacks. However, other companies stepped up buybacks in response to lower stock

Figure 11: Implied Equity Risk Premium - 9/12- 12/31/08



In a period of a month, the implied equity risk premium rose from 4.20% on September 12 to 6.39% at the close of trading of October 10 as the S&P moved from 1250 down to 903. Even more disconcertingly, there were wide swings in the equity risk premium within a day; in the last trading hour just on October 10, the implied equity risk premium ranged from a high of 6.6% to a low of 6.1%. Over the rest of the year, the equity risk premium gyrated, hitting a high of 8% in late November, before settling into the year-end level of 6.43%.

The volatility captured in figure 12 was not restricted to just the US equity markets. Global equity markets gyrated with and sometimes more than the US, default spreads widened considerably in corporate bond markets, commercial paper and LIBOR rates soared while the 3-month treasury bill rate dropped close to zero and the implied volatility in option markets rose to levels never seen before. Gold surged but other commodities, such as oil and grains, dropped. Not only did we discover how intertwined equity markets are around the globe but also how markets for all risky assets are tied together. We will explicitly consider these linkages as we go through the rest of the paper.

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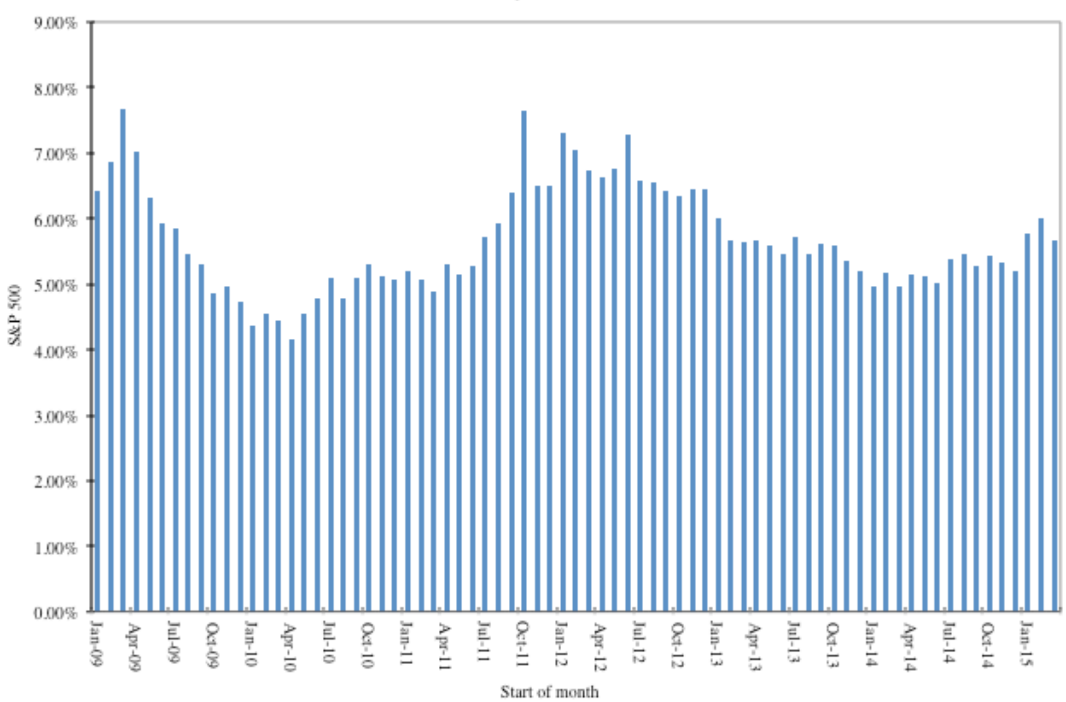
prices. If the total cash return was dropping, as the market was, the implied equity risk premiums should be lower than the numbers that we have computed.

There are two ways in which we can view this volatility. One the one side, proponents of using historical averages (either of actual or implied premiums) will use the day-to-day volatility in market risk premiums to argue for the stability of historical averages. They are implicitly assuming that when the crisis passes, markets will return to the status quo. On the other hand, there will be many who point to the unprecedented jump in implied premiums over a few weeks and note the danger of sticking with a "fixed" premium. They will argue that there are sometimes structural shifts in markets, i.e. big events that change market risk premiums for long periods, and that we should be therefore be modifying the risk premiums that we use in valuation as the market changes around us. In January 2009, in the context of equity risk premiums, the first group would have argued we should ignore history (both in terms of historical returns and implied equity risk premiums) and move to equity risk premiums of 6%+ for mature markets (and higher for emerging markets whereas the second would have made a case for sticking with a historical average, which would have been much lower than 6.43%.

The months since the crisis ended in 2008 have seen ups and downs in the implied premium, with clear evidence that the volatility in the equity risk premium has increased over the last few years. In figure 12, we report on the monthly equity risk premiums for the S&P 500 from January 2009 through March 2015:

Figure 12: Implied ERP by month: S&P 500
January 2009- Current



Note that the equity risk premium dropped from its post-crisis highs in 2010 but climbed back in 2011 to 6% or higher, before dropping back to 5% in 2013, before rising again in the last year.

On a personal note, I believe that the very act of valuing companies requires taking a stand on the appropriate equity risk premium to use. For many years prior to September 2008, I used 4% as my mature market equity risk premium when valuing companies, and assumed that mean reversion to this number (the average implied premium over time) would occur quickly and deviations from the number would be small. Though mean reversion is a powerful force, I think that the banking and financial crisis of 2008 has created a new reality, i.e., that equity risk premiums can change quickly and by large amounts even in mature equity markets. Consequently, I have forsaken my practice of staying with a fixed equity risk premium for mature markets, and I now vary it year-to-year, and even on an intra-year basis, if conditions warrant. After the crisis, in the first half of 2009, I used equity risk premiums of 6% for mature markets in my valuations. As risk premiums came down in 2009, I moved back to using a 4.5% equity risk premium for mature markets in 2010. With the increase in implied premiums at the start of 2011, my valuations for the year were based upon an equity risk premium of 5% for mature markets and I increased that number to 6% for 2012. In 2015, I will be using a lower equity risk premium (5.75%), reflecting the implied premium at the start o the year but will remain vigilant by computing the premium on a monthly basis. While some may view this shifting equity risk premium as a sign of weakness, I would frame it differently. When valuing individual companies, I want my valuations to reflect my assessments of the company and not my assessments of the overall equity market. Using equity risk premiums that are very different from the implied premium will introduce a market view into individual company valuations.

Determinants of Implied Premiums

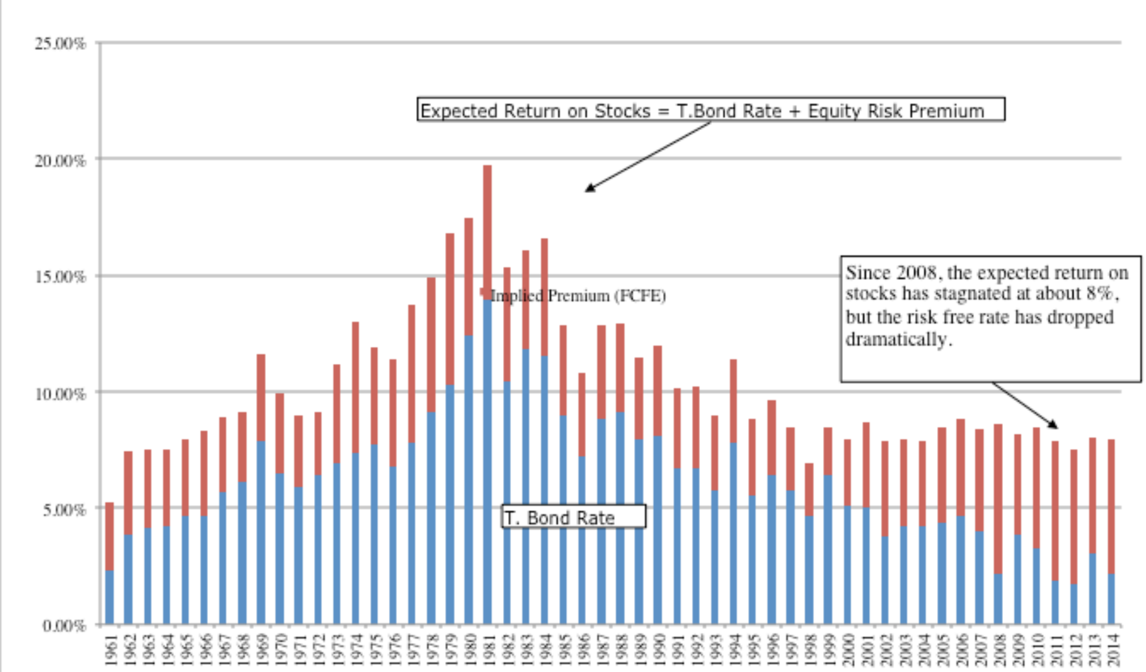
One of the advantages of estimating implied equity risk premiums, by period, is that we can track year to year changes in that number and relate those changes to shifts in interest rates, the macro environment or even to company characteristics. By doing so, not only can we get a better understanding of what causes equity risk premiums to change over time, but we are also able to come up with better estimates of future premiums.

Implied ERP and Interest rates

In much of valuation and corporate finance practice, we assume that the equity risk premium that we compute and use is unrelated to the level of interest rates. In particular, the use of historical risk premiums, where the premium is based upon an average premium earned over shifting risk free rates, implicitly assumes that the level of the premium is unchanged as the risk free rate changes. Thus, we use the same equity risk premium of 4.2% (the historical average for 1928-2012) on a risk free rate of 1.76% in 2012, as we would have, if the risk free rate had been 10%.

But is this a reasonable assumption? How much of the variation in the premium over time can be explained by changes in interest rates? Put differently, do equity risk premiums increase as the risk free rate increases or are they unaffected? To answer this question, we looked at the relationship between the implied equity risk premium and the treasury bond rate (risk free rate). As can be seen in figure 13, the implied equity risk premiums were highest in the 1970s, when interest rates and inflation were also high. However, there is contradictory evidence between 2008 and 2014, when high equity risk premiums accompanied low risk free rates.

Figure 13: Implied ERP and Risk free Rates



To examine the relationship between equity risk premiums and risk free rates, we ran a regression of the implied equity risk premium against both the level of long-term rates (the treasury bond rate) and the slope of the yield curve (captured as the difference between the 10-year treasury bond rate and the 3-month T.Bill rate), with the t statistics reported in brackets below each coefficient:

Implied ERP = 3.62% + 0.0570 (T.Bond Rate) + 0.0731 (T.Bond – T.Bill) R^2= 2.54%
(8.45) (1.05) (0.37)

There is a mildly positive relationship between the T.Bond rate and implied equity risk premiums: every 1% increase in the treasury bond rate increases the equity risk premium by 0.06%. The slope of the yield curve seems to have little impact on the implied equity risk premium. Removing the latter variable and running the regression again:

Implied ERP = 3.74% + 0.0531 (T.Bond Rate) R^2=1.88%
(10.27) (1.00)

This regression does provide very weak support for the view that equity risk premiums should not be constant but should be linked to the level of interest rates. In fact, the regression can be used to estimate an equity risk premium, conditional on current interest rates. On March 14, 2015, for instance, when the 10-year treasury bond rate was 2.75%, the implied equity risk premium would have been computed as follows:

Implied ERP = 3.74% + 0.0531 (2.25%) = 3.86%

This would have been below the observed implied equity risk premium of about 5.78% and the average implied equity risk premium of 4.1% between 1960 and 2014. Put differently, given the low level of risk free rates in 2015 and the historical relationship between equity risk premiums and risk free rates, we would have expected the equity risk premium to be a much lower number (3.86%) than the actual number (5.78%).

Implied ERP and Macroeconomic variables

While we considered the interaction between equity risk premiums and interest rates in the last section, the analysis can be expanded to include other macroeconomic variables including economic growth, inflation rates and exchange rates. Doing so may give us a way of estimating an "intrinsic' equity risk premium, based upon macro economic variables, that is less susceptible to market moods and perceptions.

To explore the relationship, we estimated the correlation, between the implied equity risk premiums that we estimated for the S&P 500 and three macroeconomic variables – real GDP growth for the US, inflation rates (CPI) and exchange rates (trade weighted dollar), using data from 1973 to 2014, in table 21 (t statistics in brackets):

Table 21: Correlation Matrix: ERP and Macroeconomic variables: 1973-2015

	ERP	*Weighted Dollar*	*Real GDP*	*CPI*
ERP	1.0000			
Weighted dollar	-0.3492 (2.33)**	1.0000		
Real GDP	0.3883 (2.63)**	-0.1608 (01.02)	1.0000	
CPI	0.1452	-0.1550	0.0123	1.0000

	(0.92)	(0.98)	(0.08)	

** Statistically significant

The implied equity risk premium is positively correlated with GDP growth, decreasing as GDP growth increases and negatively correlated with the US dollar, with a stronger dollar going with lower implied equity risk premiums. The ERP is also mildly affected by inflation, with higher inflation going hand-in-hand with higher equity risk premiums.[118]

Following up on this analysis, we regressed equity risk premiums against the inflation rate, the weighted dollar and GDP growth, using data from 1974 to 2014:

Implied ERP = 4.21% - 0.1419 Real GDP growth + 0.1204 CPI + 0.0149 Weighted $ R^2= 30.68%
(12.13) (1.90) (2.36) (0.67)

Based on this regression, every 1% increase in the inflation rate increases the equity risk premium by approximately 0.1204%, whereas every 1% increase in the growth rate in real GDP decreases the implied equity risk premium by 0.1419%.

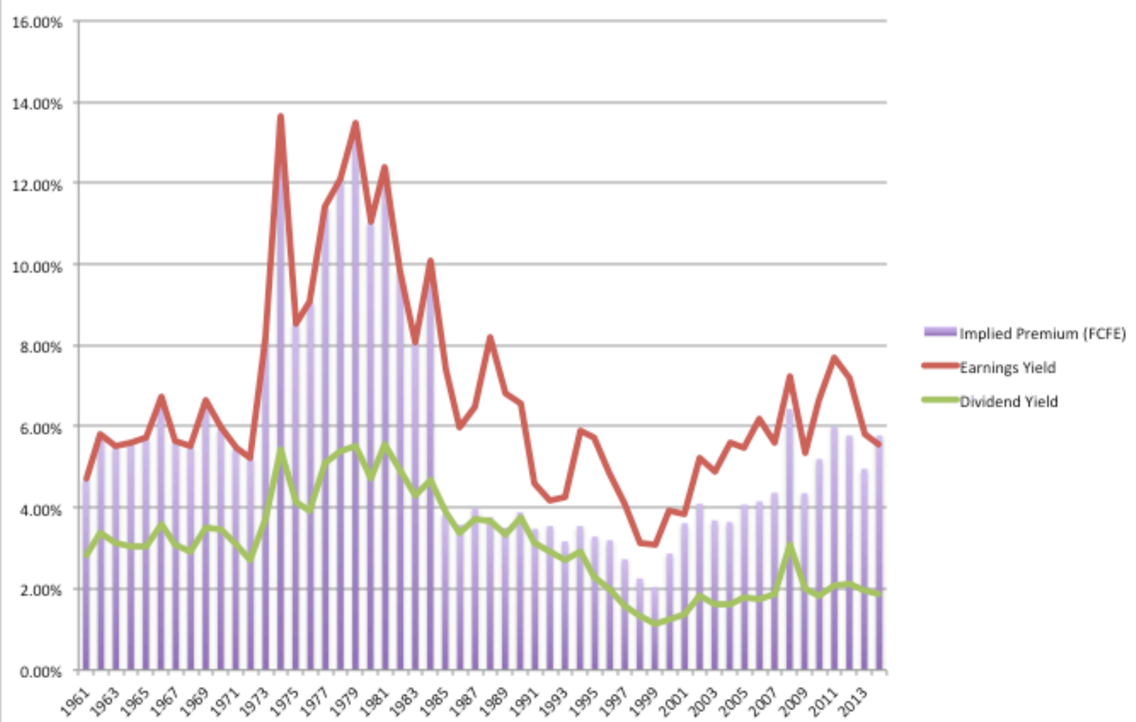
From a risk perspective, it is not the level of GDP growth that matters, but uncertainty about that level; you can have low and stable economic growth and high and unstable economic growth. Since 2008, the economies of both developed and emerging markets have become more unstable over time and upended long held beliefs about developed economies. It will be interesting to see if equity risk premiums become more sensitive to real economic growth in this environment.

Implied ERP, Earnings Yields and Dividend Yields

Earlier in the paper, we noted that the dividend yield and the earnings yield (net of the risk free rate) can be used as proxies for the equity risk premium, if we make assumptions about future growth (stable growth, with the dividend yield) or expected excess returns (zero, with the earnings yield). In figure 14, we compare the implied equity risk premiums that we computed to the earnings and dividend yields for the S&P 500 from 1961 to 2014:

[118] The correlation was also computed for lagged and leading versions of these variables, with two material differences: the equity risk premium is negatively correlated with leading inflation rates and positively correlated with a leading weighted dollar.

Figure 14: Implied ERP, E/P Ratio and Dividend Yield



Note that the dividend yield is a very close proxy for the implied equity risk premium until the late 1980s, when the two measures decoupled, a phenomenon that is best explained by the rise of stock buybacks as an alternative way of returning cash to stockholders.

The earnings yield, with the riskfree rate netted out, has generally not been a good proxy for the implied equity risk premium and would have yielded negative values for the equity risk premium (since you have to subtract out the risk free rate from it) through much of the 1990s. However, it does move with the implied equity risk premium. The difference between the earnings to price measure and the implied ERP can be attributed to a combination of higher earnings growth and excess returns that investors expect companies to deliver in the future. Analysts and academic researchers who use the earnings to price ratio as a proxy for forward-looking equity risk premiums may therefore end up with significant measurement error in their analyses.

Implied ERP and Technical Indicators

Earlier in the paper, we noted that any market timing forecast can be recast as a view on the future direction of the equity risk premium. Thus, a view that the market is under (over) priced and likely to go higher (lower is consistent with a belief that equity risk premiums will decline (increase) in the future. Many market timers do rely on technical indicators, such as moving averages and momentum measures, to make their judgment about market direction. To evaluate whether these approaches have a basis, you would need to look at how these measures are correlated with changes in equity risk premiums.

In a test of the efficacy of technical indicators, Neely, Rapach, Tu and Zhou (2011) compare the predictive power of macroeconomic/fundamental indications (including the interest rate, inflation, GDP growth and earnings/dividend yield numbers) with those of technical indicators (moving average, momentum and trading volume) and conclude that the latter better explain movements in stock returns.[119] They conclude that a composite prediction, that incorporates both macroeconomic and technical indicators, is superior to using just one set or the other of these variables. Note, however, that their study focused primarily on the predictability of stock returns over the next year and not on longer term equity risk premiums.

Extensions of Implied Equity Risk Premium

The process of backing out risk premiums from current prices and expected cashflows is a flexible one. It can be expanded into emerging markets to provide estimates of risk premiums that can replace the country risk premiums we developed in the last section. Within an equity market, it can be used to compute implied equity risk premiums for individual sectors or even classes of companies.

Other Equity Markets

The advantage of the implied premium approach is that it is market-driven and current, and does not require any historical data. Thus, it can be used to estimate implied equity premiums in any market, no matter how short its history, It is, however, bounded by whether the model used for the valuation is the right one and the availability and reliability of the inputs to that model. Earlier in this paper, we estimated country risk premiums for Brazil, using default spreads and equity market volatile. To provide a contrast, we estimated the implied equity risk premium for the Brazilian equity market in September 2009, from the following inputs.

- The index (Bovespa) was trading at 61,172 on September 30, 2009, and the dividend yield on the index over the previous 12 months was approximately 2.2%. While stock buybacks represented negligible cash flows, we did compute the FCFE for companies in the index, and the aggregate FCFE yield across the companies was 4.95%.

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119 Neely, C.J., D.E. Rapach, J. Tu and G. Zhou, 2011, *Forecasting the Equity Risk Premium: The Role of Technical Indicators*, Working Paper, http://ssrn.com/abstract=1787554.

- Earnings in companies in the index are expected to grow 6% (in US dollar terms) over the next 5 years, and 3.45% (set equal to the treasury bond rate) thereafter.
- The riskfree rate is the US 10-year treasury bond rate of 3.45%.

The time line of cash flows is shown below:

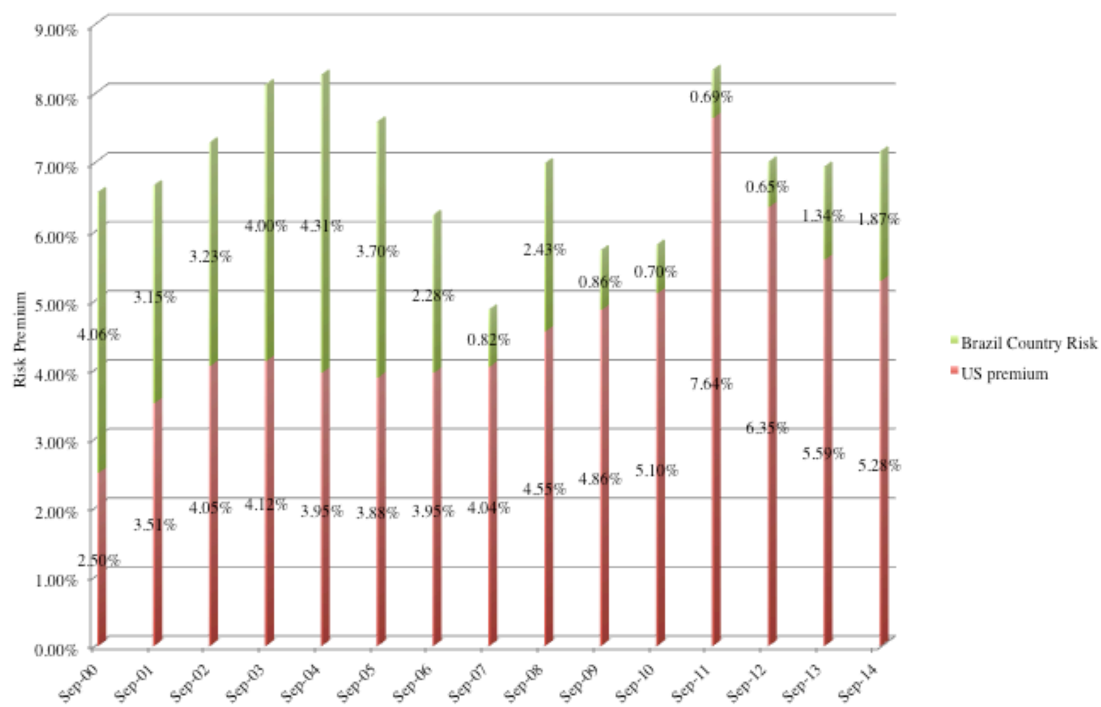
$$61{,}272 = \frac{3210}{(1+r)} + \frac{3{,}402}{(1+r)^2} + \frac{3{,}606}{(1+r)^3} + \frac{3{,}821}{(1+r)^4} + \frac{4{,}052}{(1+r)^5} + \frac{4{,}052(1.0345)}{(r-.0345)(1+r)^5}$$

These inputs yield a required return on equity of 9.17%, which when compared to the treasury bond rate of 3.45% on that day results in an implied equity premium of 5.72%. For simplicity, we have used nominal dollar expected growth rates[120] and treasury bond rates, but this analysis could have been done entirely in the local currency.

One of the advantages of using implied equity risk premiums is that that they are more sensitive to changing market conditions. The implied equity risk premium for Brazil in September 2007, when the Bovespa was trading at 73512, was 4.63%, lower than the premium in September 2009, which in turn was much lower than the premium prevailing in September 2014. In figure 15, we trace the changes in the implied equity risk premium in Brazil from September 2000 to September 2014 and compare them to the implied premium in US equities:

[120] The input that is most difficult to estimate for emerging markets is a long-term expected growth rate. For Brazilian stocks, I used the average consensus estimate of growth in earnings for the largest Brazilian companies which have ADRs listed on them. This estimate may be biased, as a consequence.

Figure 15: Implied Equity Risk Premium - Brazil



Implied equity risk premiums in Brazil declined steadily from 2003 to 2007, with the September 2007 numbers representing a historic low. They surged in September 2008, as the crisis unfolded, fell back in 2009 and 2010 but increased again in 2011. In fact, the Brazil portion of the implied equity risk premium fell to its lowest level in ten years in September 2010, a phenomenon that remained largely unchanged in 2011 and 2012. Political turmoil and corruptions scandals have combined to push the premium back up again in the last year or two.

Computing and comparing implied equity risk premiums across multiple equity markets allows us to pinpoint markets that stand out, either as over priced (because their implied premiums are too low, relative to other markets) or under priced (because their premiums at too high, relative to other markets). In September 2007, for instance, the implied equity risk premiums in India and China were roughly equal to or even lower than the implied premium for the United States, computed at the same time. Even an optimist on future growth these countries would be hard pressed to argue that equity markets in these markets and the United States were of equivalent risk, which would lead us to conclude that these stocks were overvalued relative to US companies.

One final note is worth making. Over the last decade, the implied equity risk premiums in the largest emerging markets – India, China and Brazil- have all declined substantially, relative to developed markets. In table 22, we summarize implied equity risk premiums for developed and emerging markets from 2001 and 2013, making simplistic assumptions about growth and stable growth valuation models:[121]

Table 22: Developed versus Emerging Market Equity Risk Premiums

Start of year	*PBV Developed*	*PBV Emerging*	*ROE (Dev)*	*ROE (Emerg)*	*US T.Bond*	*Cost of Equity (Developed)*	*Cost of Equity (Emerging)*	*Differential ERP*
2004	2.00	1.19	10.81%	11.65%	4.25%	7.28%	10.63%	3.35%
2005	2.09	1.27	11.12%	11.93%	4.22%	7.26%	10.50%	3.24%
2006	2.03	1.44	11.32%	12.18%	4.39%	7.55%	10.11%	2.56%
2007	1.67	1.67	10.87%	12.88%	4.70%	8.19%	10.00%	1.81%
2008	0.87	0.83	9.42%	11.12%	4.02%	10.30%	12.37%	2.07%
2009	1.20	1.34	8.48%	11.02%	2.21%	7.35%	9.04%	1.69%
2010	1.39	1.43	9.14%	11.22%	3.84%	7.51%	9.30%	1.79%
2011	1.12	1.08	9.21%	10.04%	3.29%	8.52%	9.61%	1.09%
2012	1.17	1.18	9.10%	9.33%	1.88%	7.98%	8.35%	0.37%
2013	1.56	1.63	8.67%	10.48%	1.76%	6.02%	7.50%	1.48%
2014	1.95	1.50	9.27%	9.64%	3.04%	6.00%	7.77%	1.77%
2015	1.88	1.56	9.69%	9.75%	2.17%	5.94%	7.39%	1.45%

The trend line from 2004 to 2012 is clear as the equity risk premiums, notwithstanding a minor widening in 2008, have converged in developed and emerging markets, suggesting that globalization has put "emerging market risk" into developed markets, while creating "developed markets stability factors" (more predictable government policies, stronger legal and corporate governance systems, lower inflation and stronger currencies) in emerging markets. In the last two years, we did see a correction in emerging markets that pushed the premium back up, albeit to a level that was still lower than it was prior to 2010.

Sector premiums

Using current prices and expected future cash flows to back out implied risk premiums is not restricted to market indices. We can employ the approach to estimate the implied equity risk premium for a specific sector at a point in time. In September 2008,

[121] We start with the US treasury bond rate as the proxy for global nominal growth (in US dollar terms), and assume that the expected growth rate in developed markets is 0.5% lower than that number and the expected growth rate in emerging markets is 1% higher than that number. The equation used to compute the ERP is a simplistic one, based on the assumptions that the countries are in stable growth and that the return on equity in each country is a predictor of future return on equity:

PBV = (ROE – g)/ (Cost of equity –g)

Cost of equity = (ROE –g + PBV(g))/ PBV

for instance, there was a widely held perception that investors were attaching much higher equity risk premiums to commercial bank stocks, in the aftermath of the failures of Fannie Mae, Freddie Mac, Bear Stearns and Lehman. To test this proposition, we took a look at the S&P Commercial Bank index, which was trading at 318.26 on September 12, 2008, with an expected dividend yield of 5.83% for the next 12 months. Assuming that these dividends will grow at 4% a year for the next 5 years and 3.60% (the treasury bond rate) thereafter, well below the nominal growth rate in the overall economy, we arrived at the following equation:

$$318.26 = \frac{19.30}{(1+r)} + \frac{20.07}{(1+r)^2} + \frac{20.87}{(1+r)^3} + \frac{21.71}{(1+r)^4} + \frac{22.57}{(1+r)^5} + \frac{22.57(1.036)}{(r-.036)(1+r)^5}$$

Solving for the expected return yields a value of 9.74%, which when netted out against the riskfree rate at the time (3.60%) yields an implied premium for the sector:

Implied ERP for Banking in September 2008 = 9.74% - 3.60% = 6.14%

How would we use this number? One approach would be to compare it to the average implied premium in this sector over time, with the underlying assumption that the value will revert back to the historical average for the sector. The implied equity risk premium for commercial banking stocks was close to 4% between 2005 and 2007, which would lead to the conclusion that banking stocks were undervalued in September 2008. The other is to assume that the implied equity premium for a sector is reflective of perceptions of future risk in that sector; in September 2008, there can be no denying that financial service companies faced unique risks and the market was reflecting these risks in prices. As a postscript, the implied equity risk premium for financial service firms was 5.80% in January 2012, just below the market-implied premium at the time (6.01%), suggesting that some of the post-crisis fear about banking stocks had receded.

A note of caution has to be added to about sector-implied premiums. Since these risk premiums consolidate both sector risk and market risk, it would be inappropriate to multiply these premiums by conventional betas, which are measures of sector risk. Thus, multiplying the implied equity risk premium for the technology sector (which will yield a high value) by a market beta for a technology company (which will also be high for the same reason) will result in double counting risk.[122]

Firm Characteristics

Earlier in this paper, we talked about the small firm premium and how it has been estimated using historical data, resulting in backward looking estimates with substantial

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122 You could estimate betas for technology companies against a technology index (rather than the market index) and use these betas with the implied equity risk premium for technology companies.

standard error. We could use implied premiums to arrive at more forward looking estimates, using the following steps:

Step 1: Compute the implied equity risk premium for the overall market, using a broad index such as the S&P 500. Earlier in this paper, we estimated this, as of January 2015, to be 5.78%.

Step 2: Compute the implied equity risk premium for an index containing primarily or only small cap firms, such as the S&P 600 Small Cap Index. On January 1, 2015, the index was trading at 695.08, with an aggregated FCFE yield of about 3.76% (yielding a FCFE for the most recent year of 26.14), and an expected growth rate in earnings of 10.25% for the next 5 years. Using these values, in conjunction with the prevailing riskfree rate of 2.17%, yields the following equation:

$$695.08 = \frac{28.81}{(1+r)} + \frac{31.77}{(1+r)^2} + \frac{35.02}{(1+r)^3} + \frac{38.61}{(1+r)^4} + \frac{42.57}{(1+r)^5} + \frac{42.57\ (1.0217)}{(r-.0217)(1+r)^5}$$

Solving for the expected return, we get:

Expected return on small cap stocks = 7.61%

Implied equity risk premium for small cap stocks = 7.61% -2.17% = 5.44%

Step 3: The forward-looking estimate of the small cap premium should be the difference between the implied premium for small cap stocks (in step 2) and the implied premium for the market (in step 1).

Small cap premium = 5.44% - 5.78% = -0.34%

With the numbers in January 2015, small caps are priced to generate an expected return that is lower than the rest of the market, thus putting into question the wisdom of using the 4-5% small cap premium in computing costs of equity.

This approach to estimating premiums can be extended to other variables. For instance, one of the issues that has challenged analysts in valuation is how to incorporate the illiquidity of an asset into its estimated value. While the conventional approach is to attach an illiquidity discount, an alternative is to adjust the discount rate upwards for illiquid assets. If we compute the implied equity risk premiums for stocks categorized by illiquidity, we may be able to come up with an appropriate adjustment. For instance, you could estimate the implied equity risk premium for the stocks that rank in the lowest decile in terms of illiquidity, defined as turnover ratio.[123] Comparing this value to the implied premium for the S&P 500 of 5.78% should yield an implied illiquidity risk premium. Adding this premium to the cost of equity for relatively illiquid investments will then discount the value of these investments for illiquidity.

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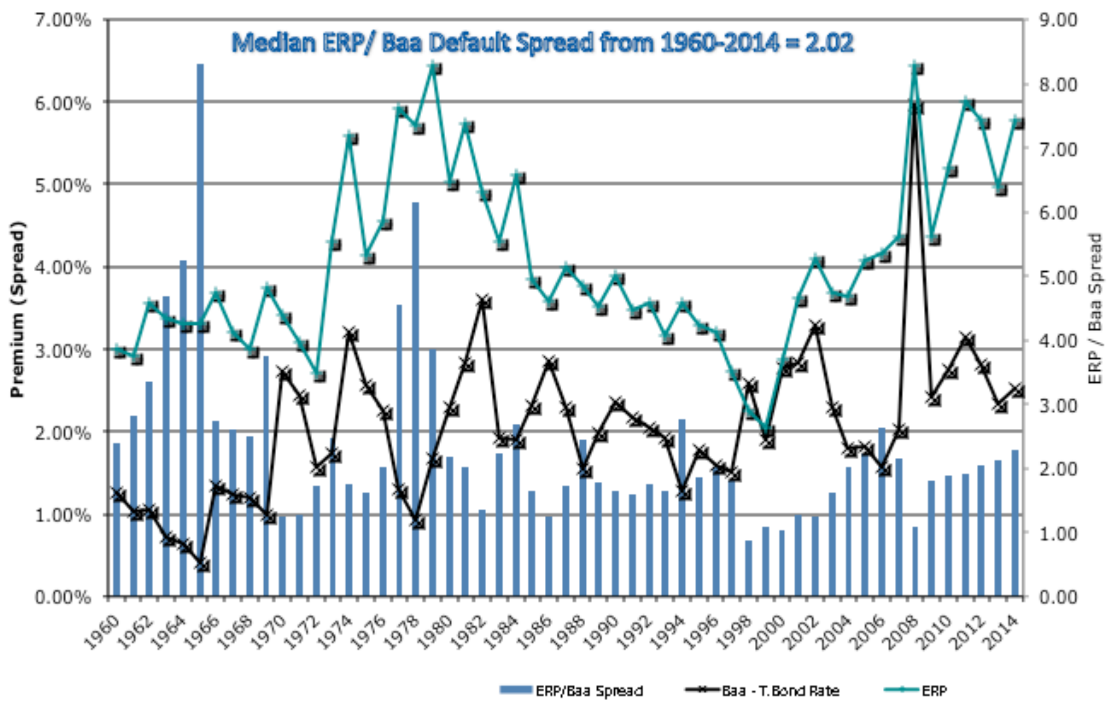
[123] The turnover ratio is obtained by dividing $ trading volume in a stock by its market capitalization at that time.

2. Default Spread Based Equity Risk Premiums

While we think of corporate bonds, stocks and real estate as different asset classes, it can be argued that they are all risky assets and that they should therefore be priced consistently. Put another way, there should be a relationship across the risk premiums in these asset classes that reflect their fundamental risk differences. In the corporate bond market, the default spread, i.e, the spread between the interest rate on corporate bonds and the treasury bond rate, is used as the risk premium. In the equity market, as we have seen through this paper, historical and implied equity premiums have tussled for supremacy as the measure of the equity risk premium. In the real estate market, no mention is made of an explicit risk premium, but real estate valuations draw heavily on the "capitalization rate", which is the discount rate applied to a real estate property's earnings to arrive at an estimate of value. The use of higher (lower) capitalization rates is the equivalent of demanding a higher (lower) risk premium.

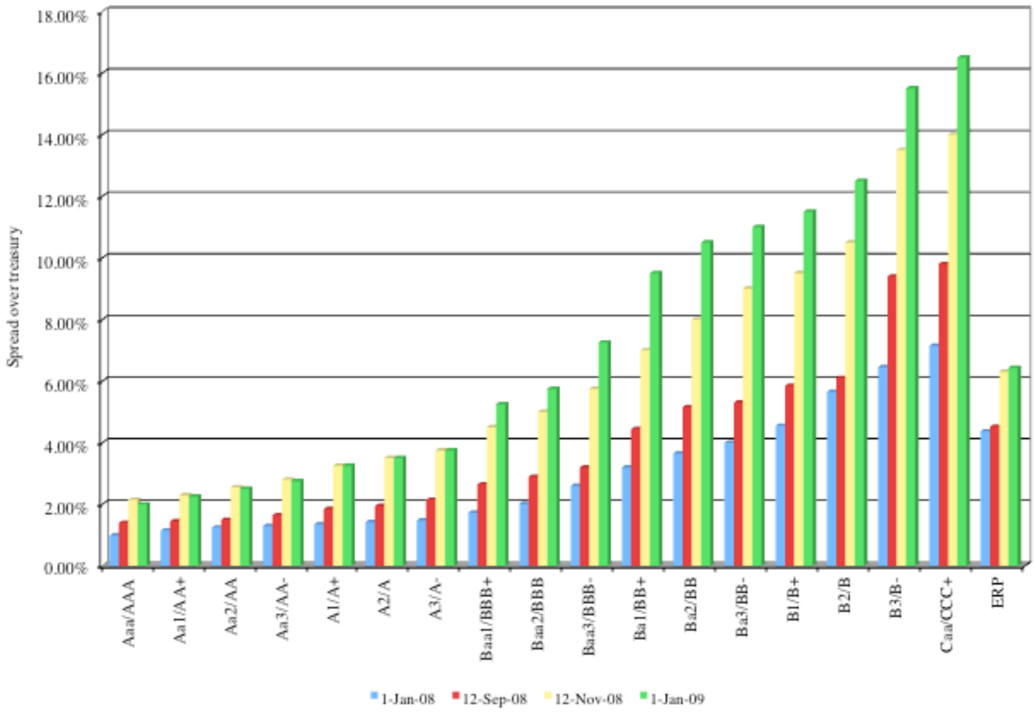
Of these three premiums, the default spread is the less complex and the most widely accessible data item. If equity risk premiums could be stated in terms of the default spread on corporate bonds, the estimation of equity risk premiums would become immeasurably simpler. For instance, assume that the default spread on Baa rated corporate bonds, relative to the ten-year treasury bond, is 2.2% and that equity risk premiums are routinely twice as high as Baa bonds, the equity risk premium would be 4.4%. Is such a rule of thumb even feasible? To answer this question, we looked at implied equity risk premiums and Baa-rated corporate bond default spreads from 1960 to 2014 in Figure 16.

Figure 16: Equity Risk Premiums and Bond Default Spreads



Note that both default spreads and equity risk premiums jumped in 2008, with the former increasing more on a proportionate basis. The ratio of 1.08 (ERP/ Baa Default Spread) at the end of 2008 was close to the lowest value in the entire series, suggesting that either equity risk premiums were too low or default spreads were too high. At the end of 2013, both the equity risk premium and the default spread increased, and the ratio moved back to 2.12, a little higher than the median value of 2.02 for the entire time period. The connection between equity risk premiums and default spreads was most obvious during 2008, where changes in one often were accompanied by changes in the other. Figure 17 graphs out changes in default spreads and ERP over the tumultuous year:

Figure 17: Default Spreads on Ratings Classes



How could we use the historical relationship between equity risk premiums and default spreads to estimate a forward-looking equity risk premium? On January 1, 2015, the default spread on a Baa rated bond was 2.52%. Applying the median ratio of 2.02, estimated from 1960-2014 numbers, to the Baa default spread of 2.52% results in the following estimate of the ERP:

Default Spread on Baa bonds (over treasury) on 1/1/2015 = 2.52%

Imputed Equity Risk Premium = Default Spread * Median ratio or ERP/Spread

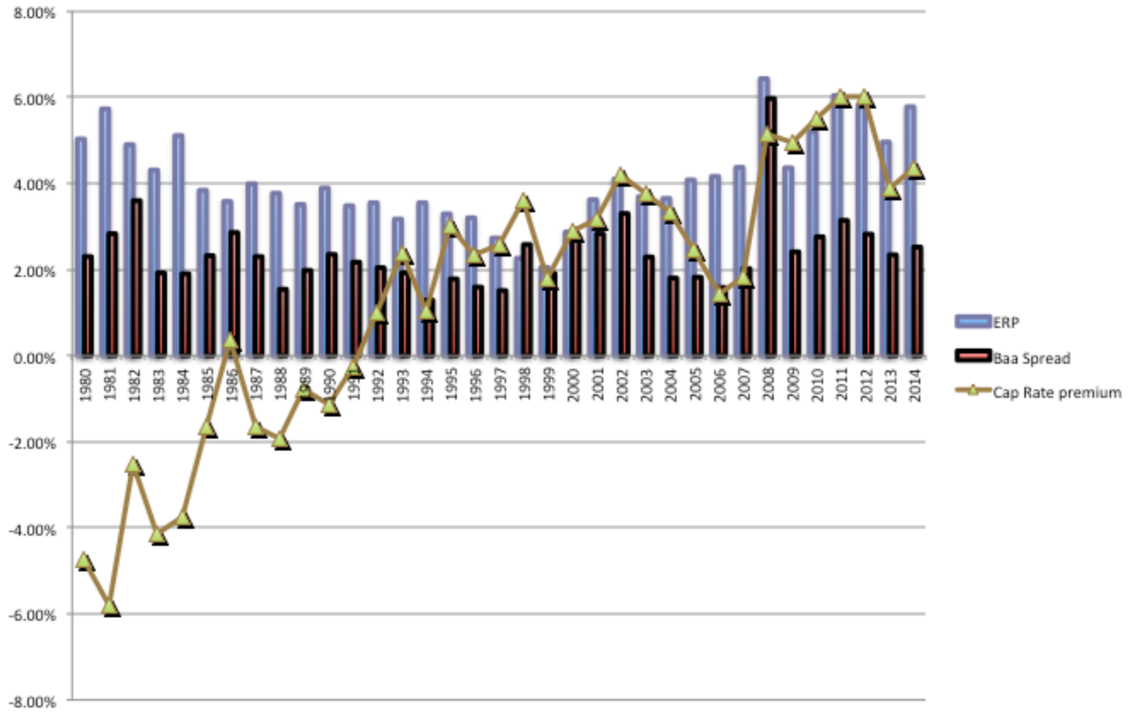
= 2.52%* 2.02 = 5.10%

This is a little lower than the implied equity risk premium of 5.78% that we computed in January 2015. Note that there is significant variation in the ratio (of ERP to default spreads) over time, with the ratio dropping below one at the peak of the dot.com boom (when equity risk premiums dropped to 2%) and rising to as high as 2.63 at the end of 2006; the standard error in the estimate is 0.20. Whenever the ratio has deviated significantly from the average, though, there is reversion back to that median over time.

The capitalization rate in real estate, as noted earlier, is a widely used number in the valuation of real estate properties. For instance, a capitalization rate of 10%, in conjunction with an office building that generates income of $ 10 million, would result in a property value of $ 100 million ($10/.10). The difference between the capitalization ratio and the treasury bond rate can be considered a real estate market risk premium, In

Figure 18, we used the capitalization rate in real estate ventures and compared the risk premiums imputed for real estate with both bond default spreads and implied equity risk premiums between 1980 and 2014.

Figure 18: Equity Risk Premiums, Cap Rates and Bond Spreads



The story in this graph is the convergence of the real estate and financial asset risk premiums. In the early 1980s, the real estate market seems to be operating in a different risk/return universe than financial assets, with the cap rates being less than the treasury bond rate. For instance, the cap rate in 1980 was 8.1%, well below the treasury bond rate of 12.8%, resulting in a negative risk premium for real estate. The risk premiums across the three markets - real estate, equity and bonds - starting moving closer to each other in the late 1980s and the trend accelerated in the 1990s. We would attribute at least some of this increased co-movement to the securitization of real estate in this period. In 2008, the three markets moved almost in lock step, as risk premiums in the markets rose and prices fell. The housing bubble of 2004-2008 is manifested in the drop in the real estate equity risk premium during those years, bottoming out at less than 2% at the 2006. The correction in housing prices since has pushed the premium back up. Both equity and bond premiums have adjusted quickly to pre-crisis levels in 2009 and 2010, and real estate premiums are following, albeit at a slower pace.

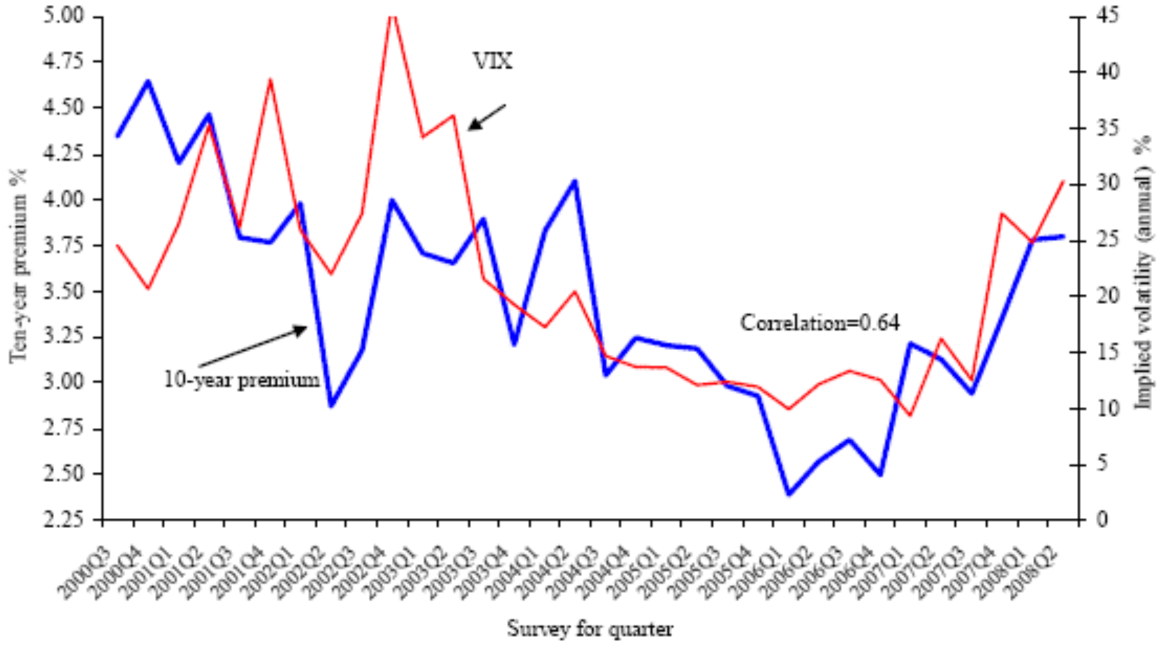
While the noise in the ratios (of ERP to default spreads and cap rates) is too high for us to develop a reliable rule of thumb, there is enough of a relationship here that we would suggest using this approach as a secondary one to test to see whether the equity risk premiums that we are using in practice make sense, given how risky assets are being priced in other markets. Thus, using an equity risk premium of 2%, when the Baa default spread is approximately at the same level strikes us as imprudent, given history. For macro strategists, there is a more activist way of using these premiums. When risk premiums in markets diverge, there is information in the relative pricing. Thus, the drop in equity risk premiums in the late 1990s, as default spreads stayed stable, would have signaled that the equity markets were overvalued (relative to bonds), just as the drop in default spreads between 2004 and 2007, while equity risk premiums were stagnant, would have suggested the opposite.

3. Option Pricing Model based Equity Risk Premium

There is one final approach to estimating equity risk premiums that draws on information in the option market. In particular, option prices can be used to back out implied volatility in the equity market. To the extent that the equity risk premium is our way of pricing in the risk of future stock price volatility, there should be a relationship between the two.

The simplest measure of volatility from the options market is the volatility index (VIX), which is a measure of 30—day volatility constructed using the implied volatilities in traded S&P 500 index options. The CFO survey premium from Graham and Harvey that we referenced earlier in the paper found a high degree of correlation between the premiums demanded by CFOs and the VIX value (see figure 19 below):

Figure 19: Volatility Index (VIX) and Survey Risk Premiums

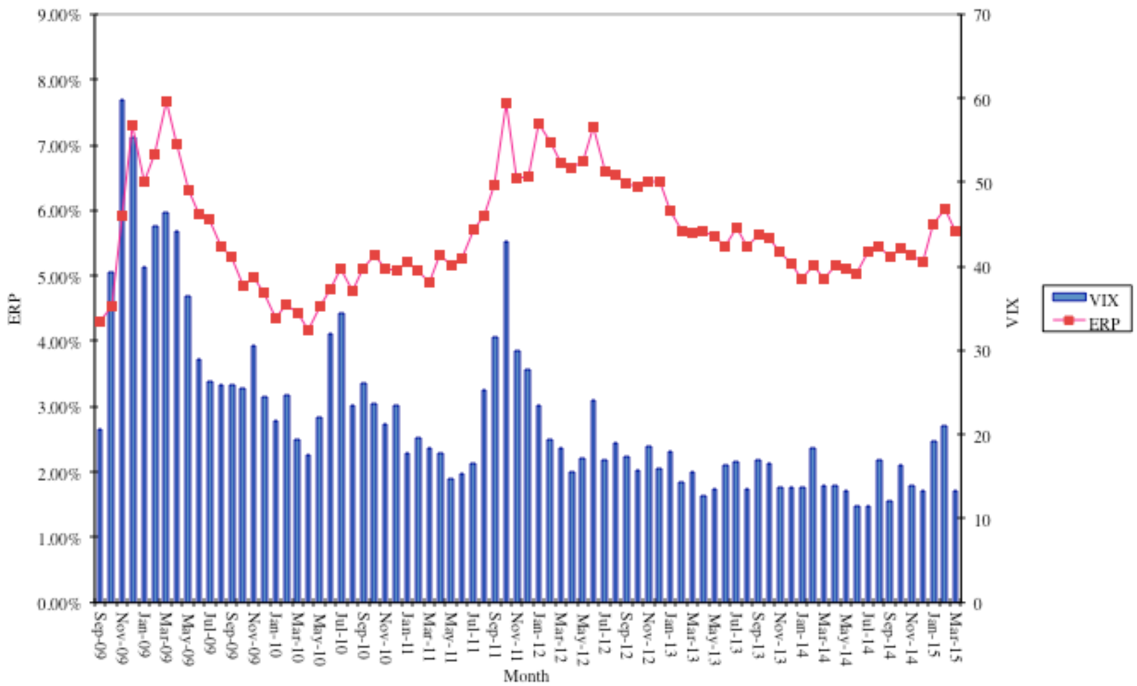


Santa-Clara and Yan (2006) use options on the S&P 500 to estimate the ex-ante risk assessed by investors from 1996 and 2002 and back out an implied equity risk premium on that basis.[124] To estimate the ex-ante risk, they allow for both continuous and discontinuous (or jump) risk in stocks, and use the option prices to estimate the probabilities of both types of risk. They then assume that investors share a specific utility function (power utility) and back out a risk premium that would compensate for this risk. Based on their estimates, investors should have demanded an equity risk premium of 11.8% for their perceived risk and that the perceived risk was about 70% higher than the realized risk over this period.

The link between equity market volatility and the equity risk premium also became clearer during the market meltdown in the last quarter of 2008. Earlier in the paper, we noted the dramatic shifts in the equity risk premiums, especially in the last year, as the financial crisis has unfolded. In Figure 20, we look at the implied equity risk premium each month from September 2008 to March 2014 and the volatility index (VIX) for the S&P 500:

124 Santa-Clara, P. and S. Yan, 2006, *Crashes, Volatility, and the Equity Premium: Lessons from S&P 500 Options*, Review of Economics and Statistics, v92, pg 435-451.

Figure 20: ERP versus VIX



Note that the surge in equity risk premiums between September 2008 and December 2008 coincided with a jump in the volatility index and that both numbers have declined in the years since the crisis. The drop in the VIX between September 2011 and March 2012 was not accompanied by a decrease in the implied equity risk premium, but equity risk premiums drifted down in the year after. While the VIX stayed low for much of 2014, equity risk premiums climbed through the course of the year.

In a paper referenced earlier, Bollerslev, Tauchen and Zhou (2009) take a different tack and argue that it is not the implied volatility per se, but the variance risk, i.e., the difference between the implied variance (in option prices) and the actual variance, that drives expected equity returns.[125] Thus, if the realized variance in a period is far higher (lower) than the implied variance, you should expect to see higher (lower) equity risk premiums demanded for subsequent periods. While they find evidence to back this proposition, they also note the relationship is strongest for short term returns (next quarter) and are weaker for longer-term returns. Bekaert and Hoerova (2013) decomposed the squared VIX into two components, a conditional variance of the stock

[125] Bollerslev, T. G. Tauchen and H. Zhou, 2009, *Expected Stock Returns and Variance Risk Premia*, Review of Financial Studies, v22, 4463-4492.

market and an equity variance premium, and conclude that while the latter is a significant predictor of stock returns but the former is not.[126]

Choosing an Equity Risk Premium

We have looked at three different approaches to estimating risk premiums, the survey approach, where the answer seems to depend on who you ask and what you ask them, the historical premium approach, with wildly different results depending on how you slice and dice historical data and the implied premium approach, where the final number is a function of the model you use and the assumptions you make about the future. Ultimately, thought, we have to choose a number to use in analysis and that number has consequences. In this section, we consider why the approaches give you different numbers and a pathway to use to devise which number is best for you.

Why do the approaches yield different values?

The different ways of estimating equity risk premium provide cover for analysts by providing justification for almost any number they choose to use in practice. No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate. While this may suffice as a legal defense, it does not pass muster on common sense grounds since not all risk premiums are equally justifiable. To provide a measure of how the numbers vary, the values that we have attached to the US equity risk premium, using different approaches, in January 2013 are summarized in table 23.

Table 23: Equity Risk Premium (ERP) for the United States – January 2013

Approach Used	*ERP*	*Additional information*
Survey: CFOs	3.73%	Campbell and Harvey survey of CFOs (2014); Average estimate. Median was 3.4%.
Survey: Global Fund Managers	4.60%	Merrill Lynch (January 2014) survey of global managers
Historical - US	4.60%	Geometric average - Stocks over T.Bonds: 1928-2014
Historical – Multiple Equity Markets	2.80%	Average premium across 20 markets from 1900-2014: Dimson, Marsh and Staunton (2015)
Current Implied premium	5.78%	From S&P 500 – January 1, 2015
Average Implied premium	4.13%	Average of implied equity risk premium: 1960-2014

[126] Bekaert, G. and M. Hoerova, 2013, *The VIX, Variance Premium and Stock Market Volatility*, SSRN Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2342200.

Implied premium adjusted for T.Bond rate and term structure	3.86%	Using regression of implied premium on T.Bond rate
Default spread based premium	5.10%	Baa Default Spread * Median value of (ERP/ Default Spread)

The equity risk premiums, using the different approaches, yield a range, with the lowest value being 2.80% and the highest being 5.78%. Note that the range would have been larger if we used other measures of historical risk premiums: different time periods, arithmetic instead of geometric averages.

There are several reasons why the approaches yield different answers much of time and why they converge sometimes.

1. When stock prices enter an extended phase of upward (downward) movement, the historical risk premium will climb (drop) to reflect past returns. Implied premiums will tend to move in the opposite direction, since higher (lower) stock prices generally translate into lower (higher) premiums. In 1999, for instance, after the technology induced stock price boom of the 1990s, the implied premium was 2% but the historical risk premium was almost 6%.
2. Survey premiums reflect historical data more than expectations. When stocks are going up, investors tend to become more optimistic about future returns and survey premiums reflect this optimism. In fact, the evidence that human beings overweight recent history (when making judgments) and overreact to information can lead to survey premiums overshooting historical premiums in both good and bad times. In good times, survey premiums are even higher than historical premiums, which, in turn, are higher than implied premiums; in bad times, the reverse occurs.
3. When the fundamentals of a market change, either because the economy becomes more volatile or investors get more risk averse, historical risk premiums will not change but implied premiums will. Shocks to the market are likely to cause the two numbers to deviate. After the terrorist attack on the World Trade Center in September 2001, for instance, implied equity risk premiums jumped almost 0.50% but historical premiums were unchanged (at least until the next update).

In summary, we should not be surprised to see large differences in equity risk premiums as we move from one approach to another, and even within an approach, as we change estimation parameters.

Which approach is the "best" approach?

If the approaches yield different numbers for the equity risk premium, and we have to choose one of these numbers, how do we decide which one is the "best" estimate? The answer to this question will depend upon several factors:

a. Predictive Power: In corporate finance and valuation, what we ultimately care about is the equity risk premium for the future. Consequently, the approach that has the best predictive power, i.e. yields forecasts of the risk premium that are closer to realized premiums, should be given more weight. So, which of the approaches does best on this count?

Campbell and Shiller (1988) suggested that the dividend yield, a simplistic measure of the implied equity risk premium, had significant predictive power for future returns.[127] However, Goyal and Welch (2007) examined many of the measures suggested as predictors of the equity risk premium in the literature, including the dividend yield and the earnings to price ratio, and find them all wanting.[128] Using data from 1926 to 2005, they conclude that while the measures do reasonably well in sample, they perform poorly out of sample, suggesting that the relationships in the literature are either spurious or unstable. Campbell and Thompson (2008) disagree, noting that putting simple restrictions on the predictive regressions improve out of sample performance for many predictive variables.[129]

To answer this question, we looked at the implied equity risk premiums from 1960 to 2014 and considered four predictors of this premium – the historical risk premium through the end of the prior year, the implied equity risk premium at the end of the prior year, the average implied equity risk premium over the previous five years and the premium implied by the Baa default spread. Since the survey data does not go back very far, we could not test the efficacy of the survey premium. Our results are summarized in table 24:

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[127] Campbell, J. Y. and R. J. Shiller. 1988, *The Dividend-Price Ratio And Expectations Of Future Dividends And Discount Factors*, Review of Financial Studies, v1(3), 195-228.

[128] Goyal, A. and I. Welch, 2007, *A Comprehensive Look at the Empirical Performance of Equity Premium Prediction,* Review of Financial Studies, v21, 1455-1508.

[129] Campbell, J.Y., and S.B. Thompson, 2008, *Predictive Excess Stock Returns Out of Sample: Can Anything Beat the Historical Average?* Review of Financial Studies, v21, 150-9-1531.

Table 24: Predictive Power of different estimates- 1960 - 2014

Predictor	*Correlation with implied premium next year*	*Correlation with actual return- next 5 years*	*Correlation with actual return – next 10 years*[130]
Current implied premium	0.736	0.352	0.500
Average implied premium: Last 5 years	0.684	0.238	0.449
Historical Premium	-0.460	-0.365	-0.466
Default Spread based premium	0.047	0.148	0.165

Over this period, the implied equity risk premium at the end of the prior period was the best predictor of the implied equity risk premium in the next period, whereas historical risk premiums did worst. If we extend our analysis to make forecasts of the actual return premium earned by stocks over bonds for the next five or ten years, the current implied equity risk premium still yields the best forecast for the future, though default spread based premiums improve as predictors. Historical risk premiums perform even worse as forecasts of actual risk premiums over the next 5 or 10 years. If predictive power were the only test, historical premiums clearly fail the test.

b. Beliefs about markets: Implicit in the use of each approach are assumptions about market efficiency or lack thereof. If you believe that markets are efficient in the aggregate, or at least that you cannot forecast the direction of overall market movements, the current implied equity premium is the most logical choice, since it is estimated from the current level of the index. If you believe that markets, in the aggregate, can be significantly overvalued or undervalued, the historical risk premium or the average implied equity risk premium over long periods becomes a better choice. If you have absolutely no faith in markets, survey premiums will be the choice.

c. Purpose of the analysis: Notwithstanding your beliefs about market efficiency, the task for which you are using equity risk premiums may determine the right risk premium to use. In acquisition valuations and equity research, for instance, you are

130 I computed the compounded average return on stocks in the following five (ten) years and netted out the compounded return earned on T.Bonds over the following five (ten) years. This was a switch from the simple arithmetic average of returns over the next 10 years that I was using until last year's survey.

asked to assess the value of an individual company and not take a view on the level of the overall market. This will require you to use the current implied equity risk premium, since using any other number will bring your market views into the valuation. To see why, assume that the current implied premium is 4% and you decide to use a historical premium of 6% in your company valuation. Odds are that you will find the company to be over valued, but a big reason for your conclusion is that you started off with the assumption that the market itself is over valued by about 25-30%.[131] To make yourself market neutral, you will have to stick with the current implied premium. In corporate finance, where the equity risk premium is used to come up with a cost of capital, which in turn determines the long-term investments of the company, it may be more prudent to build in a long-term average (historical or implied) premium.

In conclusion, there is no one approach to estimating equity risk premiums that will work for all analyses. If predictive power is critical or if market neutrality is a pre-requisite, the current implied equity risk premium is the best choice. For those more skeptical about markets, the choices are broader, with the average implied equity risk premium over a long time period having the strongest predictive power. Historical risk premiums are very poor predictors of both short-term movements in implied premiums or long-term returns on stocks.

As a final note, there are papers that report consensus premiums, often estimated by averaging across approaches. I remain skeptical about these estimates, since the approaches vary not only in terms of accuracy and predictive power but also in their philosophy. Averaging a historical risk premium with an implied premium may give an analyst a false sense of security but it really makes no sense since they represent different views of the world and push in different directions.

Five myths about equity risk premiums

There are widely held misconceptions about equity risk premiums that we would like to dispel in this section.

1. Services "know" the risk premium: When Ibbotson and Sinquefield put together the first database of historical returns on stocks, bonds and bills in the 1970s, the data that they used was unique and not easily replicable, even for professional money managers. The niche they created, based on proprietary data, has led some to believe that Ibbotson Associates, and data services like them, have the capacity to read the

[131] If the current implied premium is 4%, using a 6% premium on the market will reduce the value of the index by about 25-30%.

historical data better than the rest of us, and therefore come up with better estimates. Now that the access to data has been democratized, and we face a much more even playing field, there is no reason to believe that any service has an advantage over any other, when it comes to historical premiums. Analysts should no longer be allowed to hide behind the defense that the equity risk premiums they use come from a reputable service and are thus beyond questioning.

2. There is no right risk premium: The flip side of the "services know it best" argument is that the data is so noisy that no one knows what the right risk premium is, and that any risk premium within a wide range is therefore defensible. As we have noted in this paper, it is indeed possible to arrive at outlandishly high or low premiums, but only if you use estimation approaches that do not hold up to scrutiny. The arithmetic average premium from 2005 to 2014 for stocks over treasury bonds is an equity risk premium estimate, but it is not a good one.
3. The equity risk premium does not change much over time: Equity risk premiums reflect both economic fundamentals and investor risk aversion and they do change over time, sometimes over very short intervals, as evidenced by what happened in the last quarter of 2008. Shocks to the system – a collapse of a large company or sovereign entity or a terrorist attack – can cause premiums to shoot up overnight. A failure to recognize this reality will lead to analyses that lag reality.
4. Using the same premium is more important than using the right premium: Within many investment banks, corporations and consulting firms, the view seems to be that getting all analysts to use the same number as the risk premium is more important than testing to see whether that number makes sense. Thus, if all equity research analysts use 5% as the equity risk premium, the argument is that they are all being consistent. There are two problems with this argument. The first is that using a premium that is too high or low will lead to systematic errors in valuation. For instance, using a 5% risk premium across the board, when the implied premium is 4%, will lead you to find that most stocks are overvalued. . The second is that the impact of using too high a premium can vary across stocks, with growth stocks being affected more negatively than mature companies. A portfolio manager who followed the recommendations of these analysts would then be over invested in mature companies and under invested in growth companies.
5. If you adjust the cash flows for risk, there is no need for a risk premium: While statement is technically correct, adjusting cash flows for risk has to go beyond reflecting the likelihood of negative scenarios in the expected cash flow. The risk adjustment to expected cash flows to make them certainty equivalent cash flows

requires us to answer exactly the same questions that we deal with when adjusting discount rates for risk.

Summary

The risk premium is a fundamental and critical component in portfolio management, corporate finance and valuation. Given its importance, it is surprising that more attention has not been paid in practical terms to estimation issues. In this paper, we began by looking at the determinants of equity risk premiums including macro economic volatility, investor risk aversion and behavioral components. We then looked at the three basic approaches used to estimate equity risk premiums – the survey approach, where investors or managers are asked to provide estimates of the equity risk premium for the future, the historical return approach, where the premium is based upon how well equities have done in the past and the implied approach, where we use future cash flows or observed bond default spreads to estimate the current equity risk premium.

The premiums we estimate can vary widely across approaches, and we considered two questions towards the end of the paper. The first is why the numbers vary across approaches and the second is how to choose the "right" number to use in analysis. For the latter question, we argued that the choice of a premium will depend upon the forecast period, whether your believe markets are efficient and whether you are required to be market neutral in your analysis.

Appendix 1: Historical Returns on Stocks, Bonds and Bills – United States

Year	*Stocks*	*T.Bills*	*T.Bonds*	*Stocks - T. Bills*	*Stocks - T.Bonds*	*Arithmetic Average: Stocks versus T. Bonds*	*Geometric average: Stocks vs T.Bonds*
1928	43.81%	3.08%	0.84%	40.73%	42.98%	42.98%	42.98%
1929	-8.30%	3.16%	4.20%	-11.46%	-12.50%	15.24%	12.33%
1930	-25.12%	4.55%	4.54%	-29.67%	-29.66%	0.27%	-3.60%
1931	-43.84%	2.31%	-2.56%	-46.15%	-41.28%	-10.12%	-15.42%
1932	-8.64%	1.07%	8.79%	-9.71%	-17.43%	-11.58%	-15.81%
1933	49.98%	0.96%	1.86%	49.02%	48.13%	-1.63%	-7.36%
1934	-1.19%	0.32%	7.96%	-1.51%	-9.15%	-2.70%	-7.61%
1935	46.74%	0.18%	4.47%	46.57%	42.27%	2.92%	-2.49%
1936	31.94%	0.17%	5.02%	31.77%	26.93%	5.59%	0.40%
1937	-35.34%	0.30%	1.38%	-35.64%	-36.72%	1.36%	-4.22%
1938	29.28%	0.08%	4.21%	29.21%	25.07%	3.51%	-1.87%
1939	-1.10%	0.04%	4.41%	-1.14%	-5.51%	2.76%	-2.17%
1940	-10.67%	0.03%	5.40%	-10.70%	-16.08%	1.31%	-3.30%
1941	-12.77%	0.08%	-2.02%	-12.85%	-10.75%	0.45%	-3.88%
1942	19.17%	0.34%	2.29%	18.84%	16.88%	1.54%	-2.61%
1943	25.06%	0.38%	2.49%	24.68%	22.57%	2.86%	-1.18%
1944	19.03%	0.38%	2.58%	18.65%	16.45%	3.66%	-0.21%
1945	35.82%	0.38%	3.80%	35.44%	32.02%	5.23%	1.35%
1946	-8.43%	0.38%	3.13%	-8.81%	-11.56%	4.35%	0.63%
1947	5.20%	0.57%	0.92%	4.63%	4.28%	4.35%	0.81%
1948	5.70%	1.02%	1.95%	4.68%	3.75%	4.32%	0.95%
1949	18.30%	1.10%	4.66%	17.20%	13.64%	4.74%	1.49%
1950	30.81%	1.17%	0.43%	29.63%	30.38%	5.86%	2.63%
1951	23.68%	1.48%	-0.30%	22.20%	23.97%	6.61%	3.46%
1952	18.15%	1.67%	2.27%	16.48%	15.88%	6.98%	3.94%
1953	-1.21%	1.89%	4.14%	-3.10%	-5.35%	6.51%	3.57%
1954	52.56%	0.96%	3.29%	51.60%	49.27%	8.09%	4.98%
1955	32.60%	1.66%	-1.34%	30.94%	33.93%	9.01%	5.93%
1956	7.44%	2.56%	-2.26%	4.88%	9.70%	9.04%	6.07%
1957	-10.46%	3.23%	6.80%	-13.69%	-17.25%	8.16%	5.23%
1958	43.72%	1.78%	-2.10%	41.94%	45.82%	9.38%	6.39%
1959	12.06%	3.26%	-2.65%	8.80%	14.70%	9.54%	6.66%
1960	0.34%	3.05%	11.64%	-2.71%	-11.30%	8.91%	6.11%
1961	26.64%	2.27%	2.06%	24.37%	24.58%	9.37%	6.62%
1962	-8.81%	2.78%	5.69%	-11.59%	-14.51%	8.69%	5.97%
1963	22.61%	3.11%	1.68%	19.50%	20.93%	9.03%	6.36%
1964	16.42%	3.51%	3.73%	12.91%	12.69%	9.13%	6.53%
1965	12.40%	3.90%	0.72%	8.50%	11.68%	9.20%	6.66%

Year	*Stocks*	*T.Bills*	*T.Bonds*	*Stocks - T. Bills*	*Stocks - T.Bonds*	*Arithmetic Average: Stocks versus T. Bonds*	*Geometric average: Stocks vs T.Bonds*
1966	-9.97%	4.84%	2.91%	-14.81%	-12.88%	8.63%	6.11%
1967	23.80%	4.33%	-1.58%	19.47%	25.38%	9.05%	6.57%
1968	10.81%	5.26%	3.27%	5.55%	7.54%	9.01%	6.60%
1969	-8.24%	6.56%	-5.01%	-14.80%	-3.23%	8.72%	6.33%
1970	3.56%	6.69%	16.75%	-3.12%	-13.19%	8.21%	5.90%
1971	14.22%	4.54%	9.79%	9.68%	4.43%	8.12%	5.87%
1972	18.76%	3.95%	2.82%	14.80%	15.94%	8.30%	6.08%
1973	-14.31%	6.73%	3.66%	-21.03%	-17.97%	7.73%	5.50%
1974	-25.90%	7.78%	1.99%	-33.68%	-27.89%	6.97%	4.64%
1975	37.00%	5.99%	3.61%	31.01%	33.39%	7.52%	5.17%
1976	23.83%	4.97%	15.98%	18.86%	7.85%	7.53%	5.22%
1977	-6.98%	5.13%	1.29%	-12.11%	-8.27%	7.21%	4.93%
1978	6.51%	6.93%	-0.78%	-0.42%	7.29%	7.21%	4.97%
1979	18.52%	9.94%	0.67%	8.58%	17.85%	7.42%	5.21%
1980	31.74%	11.22%	-2.99%	20.52%	34.72%	7.93%	5.73%
1981	-4.70%	14.30%	8.20%	-19.00%	-12.90%	7.55%	5.37%
1982	20.42%	11.01%	32.81%	9.41%	-12.40%	7.18%	5.10%
1983	22.34%	8.45%	3.20%	13.89%	19.14%	7.40%	5.34%
1984	6.15%	9.61%	13.73%	-3.47%	-7.59%	7.13%	5.12%
1985	31.24%	7.49%	25.71%	23.75%	5.52%	7.11%	5.13%
1986	18.49%	6.04%	24.28%	12.46%	-5.79%	6.89%	4.97%
1987	5.81%	5.72%	-4.96%	0.09%	10.77%	6.95%	5.07%
1988	16.54%	6.45%	8.22%	10.09%	8.31%	6.98%	5.12%
1989	31.48%	8.11%	17.69%	23.37%	13.78%	7.08%	5.24%
1990	-3.06%	7.55%	6.24%	-10.61%	-9.30%	6.82%	5.00%
1991	30.23%	5.61%	15.00%	24.62%	15.23%	6.96%	5.14%
1992	7.49%	3.41%	9.36%	4.09%	-1.87%	6.82%	5.03%
1993	9.97%	2.98%	14.21%	6.98%	-4.24%	6.65%	4.90%
1994	1.33%	3.99%	-8.04%	-2.66%	9.36%	6.69%	4.97%
1995	37.20%	5.52%	23.48%	31.68%	13.71%	6.80%	5.08%
1996	23.82%	5.02%	1.43%	18.79%	22.39%	7.02%	5.32%
1997	31.86%	5.05%	9.94%	26.81%	21.92%	7.24%	5.53%
1998	28.34%	4.73%	14.92%	23.61%	13.42%	7.32%	5.63%
1999	20.89%	4.51%	-8.25%	16.38%	29.14%	7.63%	5.96%
2000	-9.03%	5.76%	16.66%	-14.79%	-25.69%	7.17%	5.51%
2001	-11.85%	3.67%	5.57%	-15.52%	-17.42%	6.84%	5.17%
2002	-21.97%	1.66%	15.12%	-23.62%	-37.08%	6.25%	4.53%
2003	28.36%	1.03%	0.38%	27.33%	27.98%	6.54%	4.82%
2004	10.74%	1.23%	4.49%	9.52%	6.25%	6.53%	4.84%

Year	*Stocks*	*T.Bills*	*T.Bonds*	*Stocks - T. Bills*	*Stocks - T.Bonds*	*Arithmetic Average: Stocks versus T. Bonds*	*Geometric average: Stocks vs T.Bonds*
2005	4.83%	3.01%	2.87%	1.82%	1.97%	6.47%	4.80%
2006	15.61%	4.68%	1.96%	10.94%	13.65%	6.57%	4.91%
2007	5.48%	4.64%	10.21%	0.84%	-4.73%	6.42%	4.79%
2008	-36.55%	1.59%	20.10%	-38.14%	-56.65%	5.65%	3.88%
2009	25.94%	0.14%	-11.12%	25.80%	37.05%	6.03%	4.29%
2010	14.82%	0.13%	8.46%	14.69%	6.36%	6.03%	4.31%
2011	2.10%	0.03%	16.04%	2.07%	-13.94%	5.79%	4.10%
2012	15.89%	0.05%	2.97%	15.84%	12.92%	5.88%	4.20%
2013	32.15%	0.07%	-9.10%	32.08%	41.25%	6.29%	4.62%
2014	13.48%	0.05%	10.75%	13.43%	2.73%	6.11%	4.60%

Appendix 2: Sovereign Ratings by Country- January 2015

Sovereign	*Foreign Currency Rating*	*Local Currency Rating*	*Sovereign*	*Foreign Currency Rating*	*Local Currency Rating*
Abu Dhabi	Aa2	Aa2	Czech Republic	A1	A1
Albania	B1	B1	Democratic Republic of the Congo	B3	B3
Angola	Ba2	Ba2	Denmark	Aaa	Aaa
Argentina	Caa1	Caa1	Dominican Republic	B1	B1
Armenia	Ba2	Ba2	Ecuador	B3	-
Australia	Aaa	Aaa	Egypt	Caa1	Caa1
Austria	Aaa	Aaa	El Salvador	Ba3	-
Azerbaijan	Baa3	Baa3	Estonia	A1	A1
Bahamas	Baa2	Baa2	Ethiopia	B1	B1
Bahrain	Baa2	Baa2	Fiji	B1	B1
Bangladesh	Ba3	Ba3	Finland	Aaa	Aaa
Barbados	B3	B3	France	Aa1	Aa1
Belarus	B3	B3	Gabon	Ba3	Ba3
Belgium	Aa3	Aa3	Georgia	Ba3	Ba3
Belize	Caa2	Caa2	Germany	Aaa	Aaa
Bermuda	A1	A1	Ghana	B2	B2
Bolivia	Ba3	Ba3	Greece	Caa1	Caa1
Bosnia and Herzegovina	B3	B3	Guatemala	Ba1	Ba1
Botswana	A2	A2	Honduras	B3	B3
Brazil	Baa2	Baa2	Hong Kong	Aa1	Aa1
Bulgaria	Baa2	Baa2	Hungary	Ba1	Ba1
Cambodia	B2	B2	Iceland	Baa3	Baa3
Canada	Aaa	Aaa	India	Baa3	Baa3
Cayman Islands	Aa3	-	Indonesia	Baa3	Baa3
Chile	Aa3	Aa3	Ireland	Baa1	Baa1
China	Aa3	Aa3	Isle of Man	Aa1	Aa1
Colombia	Baa2	Baa2	Israel	A1	A1
Costa Rica	Ba1	Ba1	Italy	Baa2	Baa2
Côte d'Ivoire	B1	B1	Jamaica	Caa3	Caa3
Croatia	Ba1	Ba1	Japan	A1	A1
Cuba	Caa2	-	Jordan	B1	B1
Cyprus	B3	B3	Kazakhstan	Baa2	Baa2

Appendix 2: Sovereign Ratings by Country- January 2015 (Continued)

Sovereign	*Foreign Currency Rating*	*Local Currency Rating*	*Sovereign*	*Foreign Currency Rating*	*Local Currency Rating*
Kenya	B1	B1	Qatar	Aa2	Aa2
Korea	Aa3	Aa3	Republic of the Congo	Ba3	Ba3
Kuwait	Aa2	Aa2	Romania	Baa3	Baa3
Latvia	Baa1	Baa1	Russia	Baa2	Baa2
Lebanon	B2	B2	Saudi Arabia	Aa3	Aa3
Lithuania	Baa1	Baa1	Senegal	B1	B1
Luxembourg	Aaa	Aaa	Serbia	B1	B1
Macao	Aa2	Aa2	Sharjah	A3	A3
Malaysia	A3	A3	Singapore	Aaa	Aaa
Malta	A3	A3	Slovakia	A2	A2
Mauritius	Baa1	Baa1	Slovenia	Ba1	Ba1
Mexico	A3	A3	South Africa	Baa2	Baa2
Moldova	B3	B3	Spain	Baa2	Baa2
Mongolia	B2	B2	Sri Lanka	B1	-
Montenegro	Ba3	-	St. Maarten	Baa1	Baa1
Morocco	Ba1	Ba1	St. Vincent & the Grenadines	B3	B3
Mozambique	B1	B1	Suriname	Ba3	Ba3
Namibia	Baa3	Baa3	Sweden	Aaa	Aaa
Netherlands	Aaa	Aaa	Switzerland	Aaa	Aaa
New Zealand	Aaa	Aaa	Taiwan	Aa3	Aa3
Nicaragua	B3	B3	Thailand	Baa1	Baa1
Nigeria	Ba3	Ba3	Trinidad and Tobago	Baa1	Baa1
Norway	Aaa	Aaa	Tunisia	Ba3	Ba3
Oman	A1	A1	Turkey	Baa3	Baa3
Pakistan	Caa1	Caa1	Uganda	B1	B1
Panama	Baa2	-	Ukraine	Caa3	Caa3
Papua New Guinea	B1	B1	United Arab Emirates	Aa2	Aa2
Paraguay	Ba2	Ba2	UK	Aa1	Aa1
Peru	A3	A3	USA	Aaa	Aaa
Philippines	Baa2	Baa2	Uruguay	Baa2	Baa2
Poland	A2	A2	Venezuela	Caa1	Caa1
Portugal	Ba1	Ba1	Vietnam	B1	B1
			Zambia	B1	B1

Appendix 3: Country Risk Scores from the PRS Group – January 2015

Country	*PRS Composite Risk Score*	*Country*	*PRS Composite Risk Score*
Albania	66.3	Egypt	59.0
Algeria	68.3	El Salvador	66.8
Angola	65.8	Estonia	69.5
Argentina	63.8	Ethiopia	59.3
Armenia	63.0	Finland	79.0
Australia	78.5	France	70.8
Austria	79.5	Gabon	71.3
Azerbaijan	75.8	Gambia	62.8
Bahamas	75.8	Germany	84.5
Bahrain	70.5	Ghana	61.3
Bangladesh	64.0	Greece	64.3
Belarus	59.3	Guatemala	66.8
Belgium	76.0	Guinea	47.8
Bolivia	73.8	Guinea-Bissau	62.5
Botswana	79.5	Guyana	61.8
Brazil	67.5	Haiti	61.0
Brunei	87.0	Honduras	64.8
Bulgaria	69.3	Hong Kong	81.0
Burkina Faso	63.0	Hungary	72.3
Cameroon	63.5	Iceland	79.8
Canada	82.0	India	68.8
Chile	75.8	Indonesia	67.3
China, Peoples' Rep.	71.8	Iran	61.3
Colombia	68.5	Iraq	61.8
Congo, Dem. Republic	55.3	Ireland	78.5
Congo, Republic	68.8	Israel	72.3
Costa Rica	73.5	Italy	72.5
Cote d'Ivoire	62.3	Jamaica	68.5
Croatia	68.5	Japan	78.8
Cuba	65.5	Jordan	65.0
Cyprus	69.3	Kazakhstan	70.5
Czech Republic	78.3	Kenya	63.3
Denmark	81.3	Korea, D.P.R.	55.8
Dominican Republic	71.5	Korea, Republic	81.5
Ecuador	67.0	Kuwait	81.5

Appendix 3: Country Risk Scores from the PRS Group – January 2015 (Continued)

Country	*PRS Composite Risk Score*	*Country*	*PRS Composite Risk Score*
Latvia	69.0	Russia	64.3
Lebanon	58.5	Saudi Arabia	78.8
Liberia	50.0	Senegal	62.8
Libya	59.3	Serbia	63.0
Lithuania	76.0	Sierra Leone	61.5
Luxembourg	87.5	Singapore	87.0
Madagascar	63.5	Slovakia	74.3
Malawi	61.0	Slovenia	70.0
Malaysia	78.8	Somalia	37.3
Mali	60.5	South Africa	67.3
Malta	75.8	Spain	70.5
Mexico	68.8	Sri Lanka	62.3
Moldova	63.8	Sudan	50.0
Mongolia	64.3	Suriname	72.0
Morocco	67.3	Sweden	82.0
Mozambique	56.0	Switzerland	89.5
Myanmar	62.8	Syria	41.5
Namibia	75.8	Taiwan	83.0
Netherlands	81.0	Tanzania	62.3
New Zealand	83.0	Thailand	67.0
Nicaragua	64.8	Togo	60.3
Niger	55.8	Trinidad & Tobago	76.8
Nigeria	62.5	Tunisia	63.5
Norway	90.0	Turkey	61.5
Oman	81.0	Uganda	58.0
Pakistan	58.5	Ukraine	54.3
Panama	71.8	United Arab Emirates	82.8
Papua New Guinea	64.8	United Kingdom	78.8
Paraguay	69.5	United States	77.3
Peru	71.5	Uruguay	72.0
Philippines	72.3	Venezuela	54.8
Poland	75.3	Vietnam	70.0
Portugal	73.3	Yemen, Republic	59.5
Qatar	82.3	Zambia	67.0
Romania	71.5	Zimbabwe	54.5

Appendix 4: Equity Market volatility, relative to S&P 500: Total Equity Risk Premiums and Country Risk Premiums (Weekly returns from 2/13-2/15)

Country	*Std deviation in Equities (weekly)*	*Relative Volatility (to US)*	*Total Equity Risk Premium*	*Country risk premium*
Argentina	35.50%	3.27	18.78%	13.03%
Bahrain	7.59%	0.70	4.01%	-1.74%
Bangladesh	16.24%	1.49	8.59%	2.84%
Bosnia	8.99%	0.83	4.76%	-0.99%
Botswana	4.19%	0.39	2.22%	-3.53%
Brazil	22.25%	2.05	11.77%	6.02%
Bulgaria	15.33%	1.41	8.11%	2.36%
Chile	13.91%	1.28	7.36%	1.61%
China	17.82%	1.64	9.43%	3.68%
Colombia	16.00%	1.47	8.46%	2.71%
Costa Rica	8.78%	0.81	4.64%	-1.11%
Croatia	7.42%	0.68	3.93%	-1.82%
Cyprus	36.97%	3.40	19.56%	13.81%
Czech Republic	15.39%	1.42	8.14%	2.39%
Egypt	25.47%	2.34	13.47%	7.72%
Estonia	10.26%	0.94	5.43%	-0.32%
Ghana	9.09%	0.84	4.81%	-0.94%
Greece	40.49%	3.72	21.42%	15.67%
Hungary	17.21%	1.58	9.10%	3.35%
Iceland	10.89%	1.00	5.76%	0.01%
India	14.09%	1.30	7.45%	1.70%
Indonesia	16.49%	1.52	8.72%	2.97%
Ireland	16.07%	1.48	8.50%	2.75%
Israel	8.33%	0.77	4.41%	-1.34%
Italy	20.74%	1.91	10.97%	5.22%
Jamaica	10.04%	0.92	5.31%	-0.44%
Jordan	9.88%	0.91	5.23%	-0.52%
Kazakhastan	28.17%	2.59	14.90%	9.15%
Kenya	10.09%	0.93	5.34%	-0.41%
Korea	11.20%	1.03	5.92%	0.17%
Kuwait	10.47%	0.96	5.54%	-0.21%
Laos	14.18%	1.30	7.50%	1.75%
Latvia	12.11%	1.11	6.41%	0.66%
Lebanon	5.89%	0.54	3.12%	-2.63%
Lithuania	8.54%	0.79	4.52%	-1.23%
Macedonia	13.64%	1.25	7.22%	1.47%

Malaysia	8.61%	0.79	4.55%	-1.20%
Malta	6.91%	0.64	3.66%	-2.09%
Mauritius	5.42%	0.50	2.87%	-2.88%
Mexico	14.81%	1.36	7.83%	2.08%
Mongolia	20.05%	1.84	10.61%	4.86%
Montenegro	13.26%	1.22	7.01%	1.26%
Morocco	8.26%	0.76	4.37%	-1.38%
Namibia	15.33%	1.41	8.11%	2.36%
Nigeria	24.07%	2.21	12.73%	6.98%
Oman	17.68%	1.63	9.35%	3.60%
Pakistan	15.07%	1.39	7.97%	2.22%
Palestine	14.08%	1.30	7.45%	1.70%
Panama	6.18%	0.57	3.27%	-2.48%
Peru	16.15%	1.49	8.54%	2.79%
Philippines	14.69%	1.35	7.77%	2.02%
Poland	15.08%	1.39	7.98%	2.23%
Portugal	21.66%	1.99	11.46%	5.71%
Qatar	20.25%	1.86	10.71%	4.96%
Romania	12.29%	1.13	6.50%	0.75%
Russia	21.02%	1.93	11.12%	5.37%
Saudi Arabia	19.02%	1.75	10.06%	4.31%
Serbia	8.58%	0.79	4.54%	-1.21%
Singapore	9.68%	0.89	5.12%	-0.63%
Slovakia	17.07%	1.57	9.03%	3.28%
Slovenia	15.26%	1.40	8.07%	2.32%
South Africa	13.79%	1.27	7.29%	1.54%
Spain	19.38%	1.78	10.25%	4.50%
Sri Lanka	12.40%	1.14	6.56%	0.81%
Taiwan	10.97%	1.01	5.80%	0.05%
Tanzania	18.22%	1.68	9.64%	3.89%
Thailand	16.87%	1.55	8.92%	3.17%
Tunisia	8.23%	0.76	4.35%	-1.40%
Turkey	25.06%	2.31	13.26%	7.51%
UAE	32.50%	2.99	17.19%	11.44%
Ukraine	27.07%	2.49	14.32%	8.57%
US	**10.87%**	**1.00**	**5.75%**	**0.00%**
Venezuela	40.04%	3.68	21.18%	15.43%
Vietnam	16.75%	1.54	8.86%	3.11%

Appendix 5: Equity Market Volatility versus Bond Market/CDS volatility

Standard deviation in equity index (σ_{Equity}) and government bond price (σ_{Bond}) was computed, using 100 trading weeks, where available. To compute the σ_{CDS}, we first computed the standard deviation of the CDS in basis points over 100 weeks and then divided by the level of the CDS to get a coefficient of variation.

Country	σ_{Equity}	σ_{Bond}	$\sigma_{Equity}/\sigma_{Bond}$	σ_{CDS}	$\sigma_{Equity}/\sigma_{CDS}$
Argentina	35.50%		NA	2.95%	12.05
Bahrain	7.59%		NA	14.65%	0.66
Bangladesh	16.24%		NA	NA	NA
Bosnia	8.99%		NA	NA	NA
Botswana	4.19%		NA	NA	NA
Brazil	22.25%	11.97%	1.86	12.78%	1.87
Bulgaria	15.33%	17.49%	0.88	18.69%	1.01
Chile	13.91%	6.66%	2.09	32.46%	0.75
China	17.82%		NA	28.11%	0.92
Colombia	16.00%	6.67%	2.40	23.79%	0.91
Costa Rica	8.78%		NA	11.91%	0.86
Croatia	7.42%		NA	1.05%	7.07
Cyprus	36.97%		NA	16.74%	2.38
Czech Republic	15.39%	7.26%	2.12	5.19%	3.02
Egypt	25.47%		NA	1.08%	23.49
Estonia	10.26%		NA	54.97%	0.74
Ghana	9.09%		NA	NA	NA
Greece	40.49%	56.23%	0.72	12.17%	3.45
Hungary	17.21%		NA	24.13%	0.95
Iceland	10.89%	4.04%	2.70	16.14%	0.84
India	14.09%	3.49%	4.04	11.35%	1.35
Indonesia	16.49%	9.45%	1.74	18.87%	1.06
Ireland	16.07%	5.00%	3.21	7.19%	2.31
Israel	8.33%	5.90%	1.41	220.40%	2.24
Italy	20.74%	7.40%	2.80	31.74%	0.97
Jamaica	10.04%		NA	NA	NA
Jordan	9.88%		NA	NA	NA
Kazakhastan	28.17%		NA	16.96%	1.83
Kenya	10.09%		NA	NA	NA
Korea	11.20%	6.59%	1.70	49.83%	0.72
Kuwait	10.47%		NA	NA	NA
Laos	14.18%		NA	NA	NA
Latvia	12.11%		NA	20.87%	0.79
Lebanon	5.89%	4.44%	1.33	11.82%	0.62
Lithuania	8.54%		NA	21.35%	0.61
Macedonia	13.64%		NA	NA	NA
Malaysia	8.61%		NA	30.24%	0.59

Malta	6.91%		NA	NA	NA
Mauritius	5.42%		NA		
Mexico	14.81%	9.51%	1.56	21.85%	0.90
Mongolia	20.05%		NA	NA	NA
Montenegro	13.26%		NA	NA	NA
Morocco	8.26%		NA	17.27%	0.65
Namibia	15.33%		NA	NA	NA
Nigeria	24.07%		NA	NA	NA
Oman	17.68%		NA	NA	NA
Pakistan	15.07%		NA	15.93%	1.11
Palestine	14.08%		NA	NA	NA
Panama	6.18%		NA	19.13%	0.51
Peru	16.15%	8.51%	1.90	20.04%	1.01
Philippines	14.69%	30.36%	0.48	33.29%	0.77
Poland	15.08%	11.71%	1.29	30.94%	0.80
Portugal	21.66%	10.18%	2.13	36.42%	0.96
Qatar	20.25%		NA	26.85%	1.02
Romania	12.29%		NA	21.61%	0.78
Russia	21.02%	40.10%	0.52	22.87%	1.15
Saudi Arabia	19.02%		NA	36.45%	0.89
Serbia	8.58%		NA	NA	NA
Singapore	9.68%		NA	NA	NA
Slovakia	17.07%	7.91%	2.16	23.18%	0.97
Slovenia	15.26%	13.06%	1.17	8.18%	1.95
South Africa	13.79%		NA	14.78%	1.08
Spain	19.38%	7.30%	2.65	49.92%	0.89
Sri Lanka	12.40%		NA	NA	NA
Taiwan	10.97%		NA	NA	NA
Tanzania	18.22%		NA	NA	NA
Thailand	16.87%	6.49%	2.60	26.79%	0.90
Tunisia	8.23%		NA	13.41%	0.75
Turkey	25.06%	13.17%	1.90	14.83%	1.84
UAE	32.50%		NA	NA	NA
Ukraine	27.07%		NA	6.66%	4.13
US	10.87%		NA	283.38%	2.87
Venezuela	40.04%	36.25%	1.10	10.62%	3.88
Vietnam	16.75%		NA	11.81%	1.54

Appendix 6: Year-end Implied Equity Risk Premiums: 1961-2013

Year	*S&P 500*	*Earnings*[a]	*Dividends*[a]	*T.Bond Rate*	*Estimated Growth*	*Implied Premium*
1961	71.55	3.37	2.04	2.35%	2.41%	2.92%
1962	63.1	3.67	2.15	3.85%	4.05%	3.56%
1963	75.02	4.13	2.35	4.14%	4.96%	3.38%
1964	84.75	4.76	2.58	4.21%	5.13%	3.31%
1965	92.43	5.30	2.83	4.65%	5.46%	3.32%
1966	80.33	5.41	2.88	4.64%	4.19%	3.68%
1967	96.47	5.46	2.98	5.70%	5.25%	3.20%
1968	103.86	5.72	3.04	6.16%	5.32%	3.00%
1969	92.06	6.10	3.24	7.88%	7.55%	3.74%
1970	92.15	5.51	3.19	6.50%	4.78%	3.41%
1971	102.09	5.57	3.16	5.89%	4.57%	3.09%
1972	118.05	6.17	3.19	6.41%	5.21%	2.72%
1973	97.55	7.96	3.61	6.90%	8.30%	4.30%
1974	68.56	9.35	3.72	7.40%	6.42%	5.59%
1975	90.19	7.71	3.73	7.76%	5.99%	4.13%
1976	107.46	9.75	4.22	6.81%	8.19%	4.55%
1977	95.1	10.87	4.86	7.78%	9.52%	5.92%
1978	96.11	11.64	5.18	9.15%	8.48%	5.72%
1979	107.94	14.55	5.97	10.33%	11.70%	6.45%
1980	135.76	14.99	6.44	12.43%	11.01%	5.03%
1981	122.55	15.18	6.83	13.98%	11.42%	5.73%
1982	140.64	13.82	6.93	10.47%	7.96%	4.90%
1983	164.93	13.29	7.12	11.80%	9.09%	4.31%
1984	167.24	16.84	7.83	11.51%	11.02%	5.11%
1985	211.28	15.68	8.20	8.99%	6.75%	3.84%
1986	242.17	14.43	8.19	7.22%	6.96%	3.58%
1987	247.08	16.04	9.17	8.86%	8.58%	3.99%
1988	277.72	24.12	10.22	9.14%	7.67%	3.77%
1989	353.4	24.32	11.73	7.93%	7.46%	3.51%
1990	330.22	22.65	12.35	8.07%	7.19%	3.89%
1991	417.09	19.30	12.97	6.70%	7.81%	3.48%
1992	435.71	20.87	12.64	6.68%	9.83%	3.55%
1993	466.45	26.90	12.69	5.79%	8.00%	3.17%
1994	459.27	31.75	13.36	7.82%	7.17%	3.55%
1995	615.93	37.70	14.17	5.57%	6.50%	3.29%
1996	740.74	40.63	14.89	6.41%	7.92%	3.20%
1997	970.43	44.09	15.52	5.74%	8.00%	2.73%
1998	1229.23	44.27	16.20	4.65%	7.20%	2.26%

1999	1469.25	51.68	16.71	6.44%	12.50%	2.05%
2000	1320.28	56.13	16.27	5.11%	12.00%	2.87%
2001	1148.09	38.85	15.74	5.05%	10.30%	3.62%
2002	879.82	46.04	16.08	3.81%	8.00%	4.10%
2003	1111.91	54.69	17.88	4.25%	11.00%	3.69%
2004	1211.92	67.68	19.407	4.22%	8.50%	3.65%
2005	1248.29	76.45	22.38	4.39%	8.00%	4.08%
2006	1418.3	87.72	25.05	4.70%	12.50%	4.16%
2007	1468.36	82.54	27.73	4.02%	5.00%	4.37%
2008	903.25	65.39	28.05	2.21%	4.00%	6.43%
2009	1115.10	59.65	22.31	3.84%	7.20%	4.36%
2010	1257.64	83.66	23.12	3.29%	6.95%	5.20%
2011	1257.60	97.05	26.02	1.87%	7.18%	6.01%
2012	1426.19	102.47	30.44	1.76%	5.27%	5.78%
2013	1848.36	107.45	36.28	3.04%	4.28%	4.96%
2014	2058.90	114.74	38.57	2.17%	5.58%	5.78%

[a] The earnings and dividend numbers for the S&P 500 represent the estimates that would have been available at the start of each of the years and thus may not match up to the actual numbers for the year. For instance, in January 2011, the estimated earnings for the S&P 500 index included actual earnings for three quarters of 2011 and the estimated earnings for the last quarter of 2011. The actual earnings for the last quarter would not have been available until March of 2011.

Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2016 Edition

Updated: March 2016

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Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2016 Edition

Equity risk premiums are a central component of every risk and return model in finance and are a key input in estimating costs of equity and capital in both corporate finance and valuation. Given their importance, it is surprising how haphazard the estimation of equity risk premiums remains in practice. We begin this paper by looking at the economic determinants of equity risk premiums, including investor risk aversion, information uncertainty and perceptions of macroeconomic risk. In the standard approach to estimating the equity risk premium, historical returns are used, with the difference in annual returns on stocks versus bonds over a long time period comprising the expected risk premium. We note the limitations of this approach, even in markets like the United States, which have long periods of historical data available, and its complete failure in emerging markets, where the historical data tends to be limited and volatile. We look at two other approaches to estimating equity risk premiums – the survey approach, where investors and managers are asked to assess the risk premium and the implied approach, where a forward-looking estimate of the premium is estimated using either current equity prices or risk premiums in non-equity markets. In the next section, we look at the relationship between the equity risk premium and risk premiums in the bond market (default spreads) and in real estate (cap rates) and how that relationship can be mined to generated expected equity risk premiums. We close the paper by examining why different approaches yield different values for the equity risk premium, and how to choose the "right" number to use in analysis.
(This is the ninth update of this piece. The first update was in the midst of the financial crisis in 2008 and there have been annual updates at the start of each year from 2009 through 2015)

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The notion that risk matters, and that riskier investments should have higher expected returns than safer investments, to be considered good investments, is intuitive and central to risk and return models in finance. Thus, the expected return on any investment can be written as the sum of the riskfree rate and a risk premium to compensate for the risk. The disagreement, in both theoretical and practical terms, remains on how to measure the risk in an investment, and how to convert the risk measure into an expected return that compensates for risk. A central number in this debate is the premium that investors demand for investing in the 'average risk' equity investment (or for investing in equities as a class), i.e., the equity risk premium.

In this paper, we begin by examining competing risk and return models in finance and the role played by equity risk premiums in each of them. We argue that equity risk premiums are central components in every one of these models and consider what the determinants of these premiums might be. We follow up by looking at three approaches for estimating the equity risk premium in practice. The first is to survey investors or managers with the intent of finding out what they require as a premium for investing in equity as a class, relative to the riskfree rate. The second is to look at the premiums earned historically by investing in stocks, as opposed to riskfree investments. The third is to back out an equity risk premium from market prices today. We consider the pluses and minuses of each approach and how to choose between the very different numbers that may emerge from these approaches.

Equity Risk Premiums: Importance and Determinants

Since the equity risk premium is a key component of every valuation, we should begin by looking at not only why it matters in the first place but also the factors that influence its level at any point in time and why that level changes over time. In this section, we look at the role played by equity risk premiums in corporate financial analysis, valuation and portfolio management, and then consider the determinants of equity risk premiums.

Why does the equity risk premium matter?

The equity risk premium reflects fundamental judgments we make about how much risk we see in an economy/market and what price we attach to that risk. In the process, it affects the expected return on every risky investment and the value that we estimate for that investment. Consequently, it makes a difference in both how we allocate wealth across different asset classes and which specific assets or securities we invest in within each asset class.

A Price for Risk

To illustrate why the equity risk premium is the price attached to risk, consider an alternate (though unrealistic) world where investors are risk neutral. In this world, the value of an asset would be the present value of expected cash flows, discounted back at a risk free rate. The expected cash flows would capture the cash flows under all possible scenarios (good and bad) and there would be no risk adjustment needed. In the real world, investors are risk averse and will pay a lower price for risky cash flows than for riskless cash flows, with the same expected value. How much lower? That is where equity risk premiums come into play. In effect, the equity risk premium is the premium that investors demand for the average risk investment, and by extension, the discount that they apply to expected cash flows with average risk. When equity risk premiums rise, investors are charging a higher price for risk and will therefore pay lower prices for the same set of risky expected cash flows.

Expected Returns and Discount Rates

Building on the theme that the equity risk premium is the price for taking risk, it is a key component into the expected return that we demand for a risky investment. This expected return, is a determinant of both the cost of equity and the cost of capital, essential inputs into corporate financial analysis and valuation.

While there are several competing risk and return models in finance, they all share some common assumptions about risk. First, they all define risk in terms of variance in actual returns around an expected return; thus, an investment is riskless when actual returns are always equal to the expected return. Second, they argue that risk has to be measured from the perspective of the marginal investor in an asset, and that this marginal investor is well diversified. Therefore, the argument goes, it is only the risk that an investment adds on to a diversified portfolio that should be measured and compensated. In fact, it is this view of risk that leads us to break the risk in any investment into two components. There is a firm-specific component that measures risk that relates only to that investment or to a few investments like it, and a market component that contains risk that affects a large subset or all investments. It is the latter risk that is not diversifiable and should be rewarded.

All risk and return models agree on this fairly crucial distinction, but they part ways when it comes to how to measure this market risk. In the capital asset pricing model (CAPM), the market risk is measured with a beta, which when multiplied by the equity risk premium yields the total risk premium for a risky asset. In the competing models, such as the arbitrage pricing and multi-factor models, betas are estimated against individual market risk factors, and each factor has it own price (risk premium). Table 1 summarizes four models, and the role that equity risk premiums play in each one:

Table 1: Equity Risk Premiums in Risk and Return Models

	Model	*Equity Risk Premium*
	Expected Return = Riskfree Rate + $\text{Beta}_{\text{Asset}}$ (Equity Risk Premium)	Risk Premium for investing in the market portfolio, which includes all risky assets, relative to the riskless rate.
Arbitrage pricing model (APM)	$\text{Expected Return} = \text{Riskfree Rate} + \sum_{j=1}^{j=k} \beta_j (\text{Risk Premium}_j)$	Risk Premiums for individual (unspecified) market risk factors.
Multi-Factor Model	$\text{Expected Return} = \text{Riskfree Rate} + \sum_{j=1}^{j=k} \beta_j (\text{Risk Premium}_j)$	Risk Premiums for individual (specified) market risk factors
Proxy Models	Expected Return = a + b (Proxy 1) + c (Proxy 2) (where the proxies are firm characteristics such as market capitalization, price to book ratios or return momentum)	No explicit risk premium computation, but coefficients on proxies reflect risk preferences.

All of the models other than proxy models require three inputs. The first is the riskfree rate, simple to estimate in currencies where a default free entity exists, but more complicated in markets where there are no default free entities. The second is the beta (in the CAPM) or betas (in the APM or multi-factor models) of the investment being analyzed, and the third is the appropriate risk premium for the portfolio of all risky assets (in the CAPM) and the factor risk premiums for the market risk factors in the APM and multi-factor models. While I examine the issues of riskfree rate and beta estimation in companion pieces, I will concentrate on the measurement of the risk premium in this paper.

Note that the equity risk premium in all of these models is a market-wide number, in the sense that it is not company specific or asset specific but affects expected returns on all risky investments. Using a larger equity risk premium will increase the expected returns for all risky investments, and by extension, reduce their value. Consequently, the choice of an equity risk premium may have much larger consequences for value than firm-specific inputs such as cash flows, growth and even firm-specific risk measures (such as betas).

Investment and Policy Implications

It may be tempting for those not in the midst of valuation or corporate finance analysis to pay little heed to the debate about equity risk premium, but it would be a mistake to do so, since its effects are far reaching.

- The amounts set aside by both corporations and governments to meet future pension fund and health care obligations are determined by their expectations of returns from investing in equity markets, i.e., their views on the equity risk premium. Assuming that the equity risk premium is 6% will lead to far less being set aside each year to cover future obligations than assuming a premium of 4%. If the actual premium delivered by equity markets is only 2%, the fund's assets will be insufficient to meet its liabilities, leading to fund shortfalls which have to be met by raising taxes (for governments) or reducing profits (for corporations) In some cases, the pension benefits can be put at risk, if plan administrators use unrealistically high equity risk premiums, and set aside too little each year.
- Business investments in new assets and capacity is determined by whether the businesses think they can generate higher returns on those investments than the cost that they attach to the capital in that investment. If equity risk premiums increase, the cost of equity and capital will have to increase with them, leading to less overall investment in the economy and lower economic growth.
- Regulated monopolies, such as utility companies, are often restricted in terms of the prices that they charge for their products and services. The regulatory commissions that determine "reasonable" prices base them on the assumption that these companies have to earn a fair rate of return for their equity investors. To come up with this fair rate of

return, they need estimates of equity risk premiums; using higher equity risk premiums will translate into higher prices for the customers in these companies.[1]

- Judgments about how much you should save for your retirement or health care and where you should invest your savings are clearly affected by how much return you think you can make on your investments. Being over optimistic about equity risk premiums will lead you to save too little to meet future needs and to over investment in risky asset classes.

Thus, the debate about equity risk premiums has implications for almost every aspect of our lives.

Market Timing and Risk Premiums

Any one who invests has a view on equity risk premiums, though few investors are explicit about their views. In particular, if you believe that markets are efficient, you are arguing that the equity risk premiums built into market prices today are correct. If you believe that stock markets are over valued or in a bubble, you are asserting that the equity risk premiums built into prices today are too low, relative to what they should be (based on the risk in equities and investor risk aversion). Conversely, investors who believe that stocks are collectively underpriced or cheap are also making a case that the equity risk premium in the market today is much higher than what you should be making (again based on the risk in equities and investor risk aversion). Thus, every debate about the overall equity market can be translated into a debate about equity risk premiums.

Put differently, asset allocation decisions that investors make are explicitly or implicitly affected by investor views on risk premiums and how they vary across asset classes and geographically. Thus, if you believe that equity risk premiums are low, relative to the risk premiums in corporate bond markets (which take the form or default spreads on bonds), you will allocated more of your overall portfolio to bonds. Your allocation of equities across geographical markets are driven by your perceptions of equity risk premiums in those markets, with more of your portfolio going into markets where the

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[1] The Society of Utility and Regulatory Financial Analysts (SURFA) has annual meetings of analysts involved primarily in this debate. Not surprisingly, they spend a good chunk of their time discussing equity risk premiums, with analysts working for the utility firms arguing for higher equity risk premiums and analysts working for the state or regulatory authorities wanting to use lower risk premiums.

equity risk premium is higher than it should be (given the risk of those markets). Finally, if you determine that the risk premiums in financial assets (stocks and bonds) are too low, relative to what you can earn in real estate or other real assets, you will redirect more of your portfolio into the latter.

By making risk premiums the focus of asset allocation decisions, you give focus to those decisions. While it is very difficult to compare PE ratios for stocks to interest rates on bonds and housing price indicators, you can compare equity risk premiums to default spreads to real estate capitalization rates to make judgments about where you get the best trade off on risk and return. In fact, we will make these comparisons later in this paper.

What are the determinants of equity risk premiums?

Before we consider different approaches for estimating equity risk premiums, we should examine the factors that determine equity risk premiums. After all, equity risk premiums should reflect not only the risk that investors see in equity investments but also the price they attach to that risk.

Risk Aversion and Consumption Preferences

The first and most critical factor, obviously, is the risk aversion of investors in the markets. As investors become more risk averse, equity risk premiums will climb, and as risk aversion declines, equity risk premiums will fall. While risk aversion will vary across investors, it is the collective risk aversion of investors that determines equity risk premium, and changes in that collective risk aversion will manifest themselves as changes in the equity risk premium. While there are numerous variables that influence risk aversion, we will focus on the variables most likely to change over time.

a. Investor Age: There is substantial evidence that individuals become more risk averse as they get older. The logical follow up to this proposition is that markets with older investors, in the aggregate, should have higher risk premiums than markets with younger investors, for any given level of risk. Bakshi and Chen (1994), for instance, examined risk premiums in the United States and noted an increase in risk premiums as investors aged.[2] Liu and Spiegel computed the ratio of the middle-age cohort (40-49

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[2] Bakshi, G. S., and Z. Chen, 1994, *Baby Boom, Population Aging, and Capital Markets*, The Journal of Business, LXVII, 165-202.

years) to the old-age cohort (60-69) and found that PE ratios are closely and positively related to the Middle-age/Old-age ratio for the US equity market from 1954 to 2010; since the equity risk premium is inversely related to the PE, this would suggest that investor age does play a role in determining equity risk premiums.[3]

b. Preference for current consumption: We would expect the equity risk premium to increase as investor preferences for current over future consumption increase. Put another way, equity risk premiums should be lower, other things remaining equal, in markets where individuals are net savers than in markets where individuals are net consumers. Consequently, equity risk premiums should increase as savings rates decrease in an economy. Rieger, Wang and Hens (2012) compare equity risk premiums and time discount factors across 27 countries and find that premiums are higher in countries where investors are more short term.[4]

Relating risk aversion to expected equity risk premiums is not straightforward. While the direction of the relationship is simple to establish – higher risk aversion should translate into higher equity risk premiums- getting beyond that requires us to be more precise in our judgments about investor utility functions, specifying how investor utility relates to wealth (and variance in that wealth). As we will see later in this paper, there has been a significant angst among financial economics that most conventional utility models do not do a good job of explaining observed equity risk premiums.

Economic Risk

The risk in equities as a class comes from more general concerns about the health and predictability of the overall economy. Put in more intuitive terms, the equity risk premium should be lower in an economy with predictable inflation, interest rates and economic growth than in one where these variables are volatile. Lettau, Ludwigson and Wachter (2008) link the changing equity risk premiums in the United States to shifting volatility in the real economy.[5] In particular, they attribute that that the lower equity risk

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[3] Liu, Z. and M.M. Siegel, 2011, *Boomer Retirement: Headwinds for US Equity Markets?* FRBSF Economic Letters, v26.

[4] Rieger, M.O., M. Wang and T. Hens, 2012, International Evidence on the Equity Risk Premium Puzzle and Time Discounting, SSRN Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2120442

[5] Lettau, M., S.C. Ludvigson and J.A. Wachter, 2008. *The Declining Equity Risk Premium: What role does macroeconomic risk play?* Review of Financial Studies, v21, 1653-1687.

premiums of the 1990s (and higher equity values) to reduced volatility in real economic variables including employment, consumption and GDP growth. One of the graphs that they use to illustrate the correlation looks at the relationship between the volatility in GDP growth and the dividend/ price ratio (which is the loose estimate that they use for equity risk premiums), and it is reproduced in figure 1.

Figure 1: Volatility in GDP growth and Equity Risk Premiums (US)

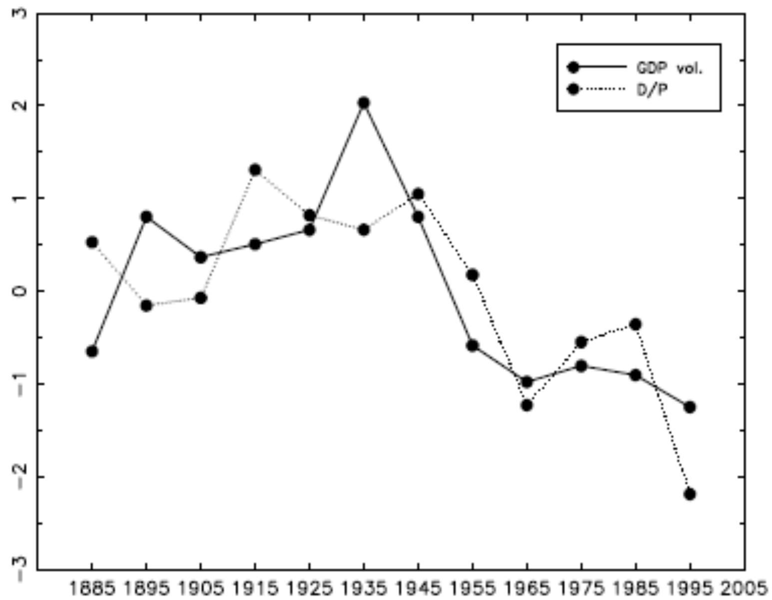

Figure 3
GDP volatility and the D/P ratio—Prewar evidence
This figure plots the standard deviations of GDP growth and the mean D/P ratio by decade starting in 1880 until 2000. Both series are demeaned and divided by their standard deviation. The GDP data are from Ray Fair's website (http://fairmodel.econ.yale.edu/RAYFAIR/PDF/2002DTBL.HTM) based on Balke and Gordon (1989). The dividend yield data is from Robert Shiller's website (http://aida.econ.yale.edu/~shiller/data/ie_data.htm).

Note how closely the dividend yield has tracked the volatility in the real economy over this very long time period.

Gollier (2001) noted that the linear absolute risk tolerance often assumed in standard models breaks down when there is income inequality and the resulting concave absolute risk tolerance should lead to higher equity risk premiums.[6] Hatchondo (2008) attempted to quantify the impact on income inequality on equity risk premiums. In his model, which is narrowly structured, the equity risk premium is higher in an economy with

6 Gollier, C., 2001. *Wealth Inequality and Asset Pricing*, Review of Economic Studies, v68, 181–203.

unequal income than in an egalitarian setting, but only by a modest amount (less than 0.50%).[7]

A related strand of research examines the relationship between equity risk premium and inflation, with mixed results. Studies that look at the relationship between the level of inflation and equity risk premiums find little or no correlation. In contrast, Brandt and Wang (2003) argue that news about inflation dominates news about real economic growth and consumption in determining risk aversion and risk premiums.[8] They present evidence that equity risk premiums tend to increase if inflation is higher than anticipated and decrease when it is lower than expected. Another strand of research on the Fisher equation, which decomposes the riskfree rate into expected inflation and a real interest rate, argues that when inflation is stochastic, there should be a third component in the risk free rate: an inflation risk premium, reflecting uncertainty about future inflation.[9] Reconciling the findings, it seems reasonable to conclude that it is not so much the level of inflation that determines equity risk premiums but uncertainty about that level, and that some of the inflation uncertainty premium may be captured in the risk free rate, rather than in the equity risk premiums.

Since the 2008 crisis, with its aftermath oflow government bond rates and a simmering economic crisis, equity risk premiums in the United States have behaved differently than they have historically. Connolly and Dubofsky (2015) find that equity risk premiums have increased (decreased) as US treasury bond rates decrease (increase), and have moved inversely with inflation (with higher inflation leading to lower equity risk premiums), both behaviors at odds with the relationship in the pre-2008 time period, suggesting a structural break in 2008.[10]

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[7] Hatchondo, J.C., 2008, *A Quantitative Study of the Role of Income Inequality on Asset Prices*, Economic Quarterly, v94, 73–96.
[8] Brandt, M.W. and K.Q. Wang. 2003. *Time-varying risk aversion and unexpected inflation*, Journal of Monetary Economics, v50, pp. 1457-1498.
[9] Benninga, S., and A. Protopapadakis, 1983, *Real and Nominal Interest Rates under Uncertainty: The Fisher Problem and the Term Structure*, Journal of Political Economy, vol. 91, pp. 856–67.
[10] Connolly, R. and D. Dubofsky, 2015, *Risk Perceptions, Inflation and Financial Asset Returns: A Tale of Two Connections*, Working Paper, SSRN #2527213.

Information

When you invest in equities, the risk in the underlying economy is manifested in volatility in the earnings and cash flows reported by individual firms in that economy. Information about these changes is transmitted to markets in multiple ways, and it is clear that there have been significant changes in both the quantity and quality of information available to investors over the last two decades. During the market boom in the late 1990s, there were some who argued that the lower equity risk premiums that we observed in that period were reflective of the fact that investors had access to more information about their investments, leading to higher confidence and lower risk premiums in 2000. After the accounting scandals that followed the market collapse, there were others who attributed the increase in the equity risk premium to deterioration in the quality of information as well as information overload. In effect, they were arguing that easy access to large amounts of information of varying reliability was making investors less certain about the future.

As these contrary arguments suggest, the relationship between information and equity risk premiums is complex. More precise information should lead to lower equity risk premiums, other things remaining equal. However, precision here has to be defined in terms of what the information tells us about future earnings and cash flows. Consequently, it is possible that providing more information about last period's earnings may create more uncertainty about future earnings, especially since investors often disagree about how best to interpret these numbers. Yee (2006) defines earnings quality in terms of volatility of future earnings and argues that equity risk premiums should increase (decrease) as earnings quality decreases (increases).[11]

Empirically, is there a relationship between earnings quality and observed equity risk premiums? The evidence is mostly anecdotal, but there are several studies that point to the deteriorating quality of earnings in the United States, with the blame distributed widely. First, the growth of technology and service firms has exposed inconsistencies in accounting definitions of earnings and capital expenditures – the treatment of R&D as an operating expense is a prime example. Second, audit firms have been accused of conflicts of interest leading to the abandonment of their oversight responsibility. Finally, the

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[11] Yee, K. K.,, 2006, *Earnings Quality and the Equity Risk Premium: A Benchmark Model*, Contemporary Accounting Research, 23: 833–877.

earnings game, where analysts forecast what firms will earn and firms then try to beat these forecasts has led to the stretching (and breaking) of accounting rules and standards. If earnings have become less informative in the aggregate, it stands to reason that equity investors will demand large equity risk premiums to compensate for the added uncertainty.

Information differences may be one reason why investors demand larger risk premiums in some emerging markets than in others. After all, markets vary widely in terms of transparency and information disclosure requirements. Markets like Russia, where firms provide little (and often flawed) information about operations and corporate governance, should have higher risk premiums than markets like India, where information on firms is not only more reliable but also much more easily accessible to investors. Lau, Ng and Zhang (2011) look at time series variation in risk premiums in 41 countries and conclude that countries with more information disclosure, measured using a variety of proxies, have less volatile risk premiums and that the importance of information is heightened during crises (illustrated using the 1997 Asian financial crisis and the 2008 Global banking crisis).[12]

Liquidity and Fund Flows

In addition to the risk from the underlying real economy and imprecise information from firms, equity investors also have to consider the additional risk created by illiquidity. If investors have to accept large discounts on estimated value or pay high transactions costs to liquidate equity positions, they will be pay less for equities today (and thus demand a large risk premium).

The notion that market for publicly traded stocks is wide and deep has led to the argument that the net effect of illiquidity on aggregate equity risk premiums should be small. However, there are two reasons to be skeptical about this argument. The first is that not all stocks are widely traded and illiquidity can vary widely across stocks; the cost of trading a widely held, large market cap stock is very small but the cost of trading an over-the-counter stock will be much higher. The second is that the cost of illiquidity in the aggregate can vary over time, and even small variations can have significant effects on

[12] Lau. S.T., L. Ng and B. Zhang, 2011, *Information Environment and Equity Risk Premium Volatility around the World*, Management Science, Forthcoming.

equity risk premiums. In particular, the cost of illiquidity seems to increase when economies slow down and during periods of crisis, thus exaggerating the effects of both phenomena on the equity risk premium.

While much of the empirical work on liquidity has been done on cross sectional variation across stocks (and the implications for expected returns), there have been attempts to extend the research to look at overall market risk premiums. Gibson and Mougeot (2004) look at U.S. stock returns from 1973 to 1997 and conclude that liquidity accounts for a significant component of the overall equity risk premium, and that its effect varies over time.[13] Baekart, Harvey and Lundblad (2006) present evidence that the differences in equity returns (and risk premiums) across emerging markets can be partially explained by differences in liquidity across the markets.[14]

Another way of framing the liquidity issue is in terms of funds flows, where the equity risk premium is determined by funds flows into and out of equities. Thus, if more funds are flowing into an equity market, either from other asset classes or other geographies, other things remaining equal, the equity risk premium should decrease, whereas funds flowing out of an equity market will lead to higher equity risk premiums.

Catastrophic Risk

When investing in equities, there is always the potential for catastrophic risk, i.e. events that occur infrequently but can cause dramatic drops in wealth. Examples in equity markets would include the great depression from 1929-30 in the United States and the collapse of Japanese equities in the last 1980s. In cases like these, many investors exposed to the market declines saw the values of their investments drop so much that it was unlikely that they would be made whole again in their lifetimes.[15] While the possibility of catastrophic events occurring may be low, they cannot be ruled out and the equity risk premium has to reflect that risk.

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[13] Gibson R., Mougeot N., 2004, *The Pricing of Systematic Liquidity Risk: Empirical Evidence from the US Stock Market*. Journal of Banking and Finance, v28: 157–78.

[14] Bekaert G., Harvey C. R., Lundblad C., 2006, *Liquidity and Expected Returns: Lessons from Emerging Markets*, The Review of Financial Studies.

[15] An investor in the US equity markets who invested just prior to the crash of 1929 would not have seen index levels return to pre-crash levels until the 1940s. An investor in the Nikkei in 1987, when the index was at 40000, would still be facing a deficit of 50% (even after counting dividends) in 2008,

Rietz (1988) uses the possibility of catastrophic events to justify higher equity risk premiums and Barro (2006) extends this argument. In the latter's paper, the catastrophic risk is modeled as both a drop in economic output (an economic depression) and partial default by the government on its borrowing.[16] Gabaix (2009) extends the Barro-Rietz model to allow for time varying losses in disasters.[17] Barro, Nakamura, Steinsson and Ursua (2009) use panel data on 24 countries over more than 100 years to examine the empirical effects of disasters.[18] They find that the average length of a disaster is six years and that half of the short run impact is reversed in the long term. Investigating the asset pricing implications, they conclude that the consequences for equity risk premiums will depend upon investor utility functions, with some utility functions (power utility, for instance) yielding low premiums and others generating much higher equity risk premiums. Barro and Ursua (2008) look back to 1870 and identify 87 crises through 2007, with an average impact on stock prices of about 22%, and estimate that investors would need to generate an equity risk premium of 7% to compensate for risk taken.[19] Wachter (2012) builds a consumption model, where consumption follows a normal distribution with low volatility most of the time, with a time-varying probability of disasters that explains high equity risk premiums.[20]

There have been attempts to measure the likelihood of catastrophic risk and incorporate them into models that predict equity risk premiums. In a series of papers with different co-authors, Bollerslev uses the variance risk premium, i.e., the difference between the implied variance in stock market options and realized variance, as a proxy for expectations of catastrophic risk, and documents a positive correlation with equity risk premiums.[21] Kelly (2012) looks at extreme stock market movements as a measure of

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[16] Rietz, T. A., 1988, *The equity premium~: A solution*, Journal of Monetary Economics, v22, 117-131; Barro R J., 2006, *Rare Disasters and Asset Markets in the Twentieth Century*, Quarterly Journal of Economics, August, 823-866.

[17]Gabaix, Xavier, 2012, *Variable Rare Disasters: An Exactly Solved Framework for Ten Puzzles in Macro-Finance*, The Quarterly Journal of Economics, v127, 645-700.

[18] Barro, R., E. Nakamura, J. Steinsson and J. Ursua, 2009, *Crises and Recoveries in an Empirical Model of Consumption Disasters*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1594554.

[19] Barro, R. and J. Ursua, 2008, Macroeconomic Crises since 1870, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1124864.

[20] Wachter, J.A., 2013, *Can time-varying risk of rare disasters explain aggregate stock market volatility?* Journal of Finance, v68, 987-1035. See also Tsai, J. and J. Wachter, 2015, *Disaster Risk and its Implications for Asset Pricing*, Annual Review of Financial Economics, Vol. 7, pp. 219-252, 2015.

[21] Bollerslev, T. M., T. H. Law, and G. Tauchen, 2008, *Risk, Jumps, and Diversification*, Journal of

expected future jump (catastrophic) risk and finds a positive link between jump risk and equity risk premiums.[22] Guo, Liu, Wang, Zhou and Zuo (2014) refine this analysis by decomposing jumps into bad (negative) and good (positive) ones and find that it is the risk of downside jumps that determines equity risk premiums..[23] Maheu, McCurdy and Zhao (2013) used a time-varying jump-arrival process and a two-component GARCH model on US stock market data from 1926 to 2011, and estimated that each additional jump per year increased the equity risk premium by 0.1062% and that there were, on average, 34 jumps a year, leading to a jump equity risk premium of 3.61%.[24]

The banking and financial crisis of 2008, where financial and real estate markets plunged in the last quarter of the year, has provided added ammunition to this school. As we will see later in the paper, risk premiums in all markets (equity, bond and real estate) climbed sharply during the weeks of the market crisis. In fact, the series of macro crises in the last four years that have affected markets all over the world has led some to hypothesize that the globalization may have increased the frequency and probability of disasters and by extension, equity risk premiums, in all markets.

Government Policy

The prevailing wisdom, at least until 2008, was that while government policy affected equity risk premiums in emerging markets, it was not a major factor in determining equity risk premiums in developed markets. The banking crisis of 2008 and the government responses to it have changed some minds, as both the US government and European governments have made policy changes that at times have calmed markets and at other times roiled them, potentially affecting equity risk premiums.

Pastor and Veronesi (2012) argue that uncertainty about government policy can translate into higher equity risk premiums.[25] The model they develop has several testable

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Econometrics, 144, 234-256; Bollerslev, T. M., G. Tauchen, and H. Zhou, 2009, *Expected Stock Returns and Variance Risk Premia*, Review of Financial Studies, 101-3, 552-573; Bollerselv, T.M., and V. Todorov, 2011, *Tails, Fears, and Risk Premia*, Journal of Finance, 66-6, 2165-2211.

[22] Kelly, B., 2012, *Tail Risk and Asset Prices*, Working Paper, University of Chicago.

[23] Guo, H., Z. Liu, K. Wang, H. Zhou and H. Zuo, 2014, *Good Jumps, Bad Jumps and Conditional Equity Risk Premium*, Working Paper, SSRN #2516074.

[24] Maheu, J.M., T.H. McCurdy and X. Wang, 2013, *Do Jumps Contribute to the Dynamics of the Equity Premium,* Journal of Financial Economics, v110, 457-477.

[25] Pástor, L. and P. Veronesi, 2012. *Uncertainty about Government policy and Stock Prices*. Journal of Finance 67: 1219-1264.

implications. First, government policy changes will be more likely just after economic downturns, thus adding policy uncertainty to general economic uncertainty and pushing equity risk premiums upwards. Second, you should expect to see stock prices fall, on average, across all policy changes, with the magnitude of the negative returns increasing for policy changes create more uncertainty. Third, policy changes will increase stock market volatility and the correlation across stocks.

Lam and Zhang (2014) try to capture the potential policy shocks from either an unstable government (government stability) or an incompetent bureaucracy (bureaucracy quality) in 49 countries from 1995 to 2006, using two measures of policy uncertainty drawn from the international country risk guide (ICG). They do find that equity risk premiums are higher in countries with more policy risk from either factor, with more bureaucratic risk increasing the premium by approximately 8%.[26]

Monetary Policy

Do central banks affect equity risk premiums? While the conventional channel for the influence has always been through macro economic variables, i.e., the effects that monetary policy has on inflation and real growth, and through these variables, n equity risk premiums, increased activism on the part of central banks since the 2008 crisis has started on a debate on whether central banking policy can affect equity risk premiums. This has significant policy implications, since the notion that lower interest rates will give rise to higher prices for financial assets and more investment by businesses is built on the predication that equity risk premiums don't change when rates are lowered.

One argument for a feedback effect is that when central banks act aggressively to lower interest rates, using the mechanisms that they control, they send signals to investors and businesses about future growth and perhaps even about future risk in investing. In particular, as central bank move the rates they control to zero and below, markets may push up equity risk premiums and default spreads in bond markets, neutralizing or even countering whatever positive benefits might have been expected to flow from lower rates.

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[26] Lam, S.S. and W. Zhang, 2014, *Does Policy Uncertainty matter for International Equity Markets?* Working Paper, SSRN #2297133.

Peng and Zervou (2015) argue that monetary policy rules can have substantial effects on equity risk premiums and that an inflation-targeting policy will create more volatility in equity risk premiums and a higher equity risk premium than alternate rules that generate more stability.[27]

The behavioral/ irrational component

Investors do not always behave rationally, and there are some who argue that equity risk premiums are determined, at least partially, by quirks in human behavior. While there are several strands to this analysis, we will focus on three:

a. The Money Illusion: As equity prices declined significantly and inflation rates increased in the late 1970s, Modigliani and Cohn (1979) argued that low equity values of that period were the consequence of investors being inconsistent about their dealings with inflation. They argued that investors were guilty of using historical growth rates in earnings, which reflected past inflation, to forecast future earnings, but current interest rates, which reflected expectations of future inflation, to estimate discount rates.[28] When inflation increases, this will lead to a mismatch, with high discount rates and low cash flows resulting in asset valuations that are too low (and risk premiums that are too high). In the Modigliani-Cohn model, equity risk premiums will rise in periods when inflation is higher than expected and drop in periods when inflation in lower than expected. Campbell and Voulteenaho (2004) update the Modigliani-Cohn results by relating changes in the dividend to price ratio to changes in the inflation rate over time and find strong support for the hypothesis.[29]

b. Narrow Framing: In conventional portfolio theory, we assume that investors assess the risk of an investment in the context of the risk it adds to their overall portfolio, and demand a premium for this risk. Behavioral economists argue that investors offered new gambles often evaluate those gambles in isolation, separately from

[27] Peng, Y. and A. S. Zervou, 2015, Monetary Policy Rules and the Equity Risk Premium, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2498684.

[28] Modigliani, Franco and Cohn, Richard. 1979, *Inflation, Rational Valuation, and the Market*, Financial Analysts Journal, v37(3), pp. 24-44.

[29] Campbell, J.Y. and T. Vuolteenaho, 2004, *Inflation Illusion and Stock Prices,* American Economic Review, v94, 19-23.

other risks that they face in their portfolio, leading them to over estimate the risk of the gamble. In the context of the equity risk premium, Benartzi and Thaler (1995) use this "narrow framing" argument to argue that investors over estimate the risk in equity, and Barberis, Huang and Santos (2001) build on this theme.[30]

The Equity Risk Premium Puzzle

While many researchers have focused on individual determinants of equity risk premiums, there is a related question that has drawn almost as much attention. Are the equity risk premiums that we have observed in practice compatible with the theory? Mehra and Prescott (1985) fired the opening shot in this debate by arguing that the observed historical risk premiums (which they estimated at about 6% at the time of their analysis) were too high, and that investors would need implausibly high risk-aversion coefficients to demand these premiums.[31] In the years since, there have been many attempts to provide explanations for this puzzle:

1. Statistical artifact: The historical risk premium obtained by looking at U.S. data is biased upwards because of a survivor bias (induced by picking one of the most successful equity markets of the twentieth century). The true premium, it is argued, is much lower. This view is backed up by a study of large equity markets over the twentieth century, which concluded that the historical risk premium is closer to 4% than the 6% cited by Mehra and Prescott.[32] However, even the lower risk premium would still be too high, if we assumed reasonable risk aversion coefficients.
2. Disaster Insurance: A variation on the statistical artifact theme, albeit with a theoretical twist, is that the observed volatility in an equity market does not fully capture the potential volatility, which could include rare but disastrous events that reduce consumption and wealth substantially. Reitz, referenced earlier, argues that investments that have dividends that are proportional to consumption (as stocks do) should earn much higher returns than riskless investments to compensate for the

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[30] Benartzi, S. and R. Thaler, 1995, *Myopic Loss Aversion and the Equity Premium Puzzle*, Quarterly Journal of Economics; Barberis, N., M. Huang, and T. Santos, 2001, *Prospect Theory and Asset Prices*, Quarterly Journal of Economics, v 116(1), 1-53.

[31] Mehra, Rajnish, and Edward C.Prescott, 1985, *The Equity Premium: A Puzzle*, Journal of Monetary Economics, v15, 145–61. Using a constant relative risk aversion utility function and plausible risk aversion coefficients, they demonstrate the equity risk premiums should be much lower (less than 1%).

[32] Dimson, E., P. March and M. Staunton, 2002, *Triumph of the Optimists*, Princeton University Press.

possibility of a disastrous drop in consumption. Prescott and Mehra (1988) counter than the required drops in consumption would have to be of such a large magnitude to explain observed premiums that this solution is not viable. [33] Berkman, Jacobsen and Lee (2011) use data from 447 international political crises between 1918 and 2006 to create a crisis index and note that increases in the index increase equity risk premiums, with disproportionately large impacts on the industries most exposed to the crisis.[34]

3. Taxes: One possible explanation for the high equity returns in the period after the Second World War is the declining marginal tax rate during that period. McGrattan and Prescott (2001), for instance, provide a hypothetical illustration where a drop in the tax rate on dividends from 50% to 0% over 40 years would cause equity prices to rise about 1.8% more than the growth rate in GDP; adding the dividend yield to this expected price appreciation generates returns similar to the observed equity risk premium.[35] In reality, though, the drop in marginal tax rates was much smaller and cannot explain the surge in equity risk premiums.
4. Alternative Preference Structures: There are some who argue that the equity risk premium puzzle stems from its dependence upon conventional expected utility theory to derive premiums. In particular, the constant relative risk aversion (CRRA) function used by Mehra and Prescott in their paper implies that if an investor is risk averse to variation in consumption across different states of nature at a point in time, he or she will also be equally risk averse to consumption variation across time. Epstein and Zin consider a class of utility functions that separate risk aversion (to consumption variation at a point in time) from risk aversion to consumption variation across time. They argue that individuals are much more risk averse when it comes to the latter and claim that this phenomenon explain the larger equity risk premiums.[36] Put in more intuitive terms, individuals will choose a lower and more

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[33] Mehra, R. and E.C. Prescott, 1988, *The Equity Risk Premium: A Solution?* Journal of Monetary Economics, v22, 133-136.
[34] Berkman, H., B. Jacobsen and J. Lee, 2011, *Time-varying Disaster Risk and Stock Returns*, Journal of Financial Economics, v101, 313-332
[35] McGrattan, E.R., and E.C. Prescott. 2001, *Taxes, Regulations, and Asset Prices*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=292522.
[36] Epstein, L.G., and S.E. Zin. 1991. *Substitution, Risk Aversion, and the Temporal Behavior of*

stable level of wealth and consumption that they can sustain over the long term over a higher level of wealth and consumption that varies widely from period to period. Constantinides (1990) adds to this argument by noting that individuals become used to maintaining past consumption levels and that even small changes in consumption can cause big changes in marginal utility. The returns on stocks are correlated with consumption, decreasing in periods when people have fewer goods to consume (recessions, for instance); the additional risk explains the higher observed equity risk premiums.[37]

5. Myopic Loss Aversion: Myopic loss aversion refers to the finding in behavioral finance that the loss aversion already embedded in individuals becomes more pronounced as the frequency of their monitoring increases. Thus, investors who receive constant updates on equity values actually perceive more risk in equities, leading to higher risk premiums. The paper that we cited earlier by Benartzi and Thaler yields estimates of the risk premium very close to historical levels using a one-year time horizon for investors with plausible loss aversion characteristics (of about 2, which is backed up by the experimental research).

In conclusion, it is not quite clear what to make of the equity risk premium puzzle. It is true that historical risk premiums are higher than could be justified using conventional utility models for wealth. However, that may tell us more about the dangers of using historical data and the failures of classic utility models than they do about equity risk premiums. In fact, the last decade of poor stock returns in the US and declining equity risk premiums may have made the equity risk premium puzzle less of a puzzle, since explaining a historical premium of 4% (the premium in 2011) is far easier than explaining a historical premium of 6% (the premium in 1999).

Estimation Approaches

There are three broad approaches used to estimate equity risk premiums. One is to survey subsets of investors and managers to get a sense of their expectations about equity returns in the future. The second is to assess the returns earned in the past on equities

Consumption and Asset Returns: An Empirical Analysis, Journal of Political Economy, v99, 263–286.

[37] Constantinides, G.M. 1990. *Habit Formation: A Resolution of the Equity Premium Puzzle*, Journal of Political Economy, v98, no. 3 (June):519–543.

relative to riskless investments and use this historical premium as the expectation. The third is to attempt to estimate a forward-looking premium based on the market rates or prices on traded assets today; we will categorize these as implied premiums.

Survey Premiums

If the equity risk premium is what investors demand for investing in risky assets today, the most logical way to estimate it is to ask these investors what they require as expected returns. Since investors in equity markets number in the millions, the challenge is often finding a subset of investors that best reflects the aggregate market. In practice, se see surveys of investors, managers and even academics, with the intent of estimating an equity risk premium.

Investors

When surveying investors, we can take one of two tacks. The first is to focus on individual investors and get a sense of what they expect returns on equity markets to be in the future. The second is to direct the question of what equities will deliver as a premium at portfolio managers and investment professionals, with the rationale that their expectations should matter more in the aggregate, since they have the most money to invest.

a. Individual Investors: The oldest continuous index of investor sentiment about equities was developed by Robert Shiller in the aftermath of the crash of 1987 and has been updated since.[38] UBS/Gallup has also polled individual investors since 1996 about their optimism about future stock prices and reported a measure of investor sentiment.[39] While neither survey provides a direct measure of the equity risk premium, they both yield broad measure of where investors expect stock prices to go in the near future. The Securities Industry Association (SIA) surveyed investors from 1999 to 2004 on the expected return on stocks and yields numbers that can be used to extract equity risk premiums. In the 2004 survey, for instance, they found that the median expected return

[38] The data is available at http://bit.ly/NcgTW7.
[39] The data is available at http://www.ubs.com/us/en/wealth/misc/investor-watch.html

across the 1500 U.S. investors they questioned was 12.8%, yielding a risk premium of roughly 8.3% over the treasury bond rate at that time.[40]

b. Institutional Investors/ Investment Professionals: Investors Intelligence, an investment service, tracks more than a hundred newsletters and categorizes them as bullish, bearish or neutral, resulting in a consolidated advisor sentiment index about the future direction of equities. Like the Shiller and UBS surveys, it is a directional survey that does not yield an equity risk premium. Merrill Lynch, in its monthly survey of institutional investors globally, explicitly poses the question about equity risk premiums to these investors. In its February 2007 report, for instance, Merrill reported an average equity risk premium of 3.5% from the survey, but that number jumped to 4.1% by March, after a market downturn.[41] As markets settled down in 2009, the survey premium has also settled back to 3.76% in January 2010. Through much of 2010, the survey premium stayed in a tight range (3.85% - 3.90%) but the premium climbed to 4.08% in the January 2012 update. In February 2014, the survey yielded a risk premium of 4.6%, though it may not be directly comparable to the earlier numbers because of changes in the survey.[42]

While survey premiums have become more accessible, very few practitioners seem to be inclined to use the numbers from these surveys in computations and there are several reasons for this reluctance:

1. Survey risk premiums are responsive to recent stock prices movements, with survey numbers generally increasing after bullish periods and decreasing after market decline. Thus, the peaks in the SIA survey premium of individual investors occurred in the bull market of 1999, and the more moderate premiums of 2003 and 2004 occurred after the market collapse in 2000 and 2001.
2. Survey premiums are sensitive not only to whom the question is directed at but how the question is asked. For instance, individual investors seem to have higher (and

[40] See http://www.sifma.org/research/surveys.aspx. The 2004 survey seems to be the last survey done by SIA. The survey yielded expected stock returns of 10% in 2003, 13% in 2002, 19% in 2001, 33% in 2000 and 30% in 1999.
[41] See http://www.ml.com/index.asp?id=7695_8137_47928.
[42] Global Fund Manager Survey, Bank of America Merrill Lynch, February 2014. In more recent surveys, we were unable to find this premium.

more volatile) expected returns on equity than institutional investors and the survey numbers vary depending upon the framing of the question.[43]

3. In keeping with other surveys that show differences across sub-groups, the premium seems to vary depending on who gets surveyed. Kaustia, Lehtoranta and Puttonen (2011) surveyed 1,465 Finnish investment advisors and note that not only are male advisors more likely to provide an estimate but that their estimated premiums are roughly 2% lower than those obtained from female advisors, after controlling for experience, education and other factors.[44]
4. Studies that have looked at the efficacy of survey premiums indicate that if they have any predictive power, it is in the wrong direction. Fisher and Statman (2000) document the negative relationship between investor sentiment (individual and institutional) and stock returns.[45] In other words, investors becoming more optimistic (and demanding a larger premium) is more likely to be a precursor to poor (rather than good) market returns.

As technology aids the process, the number and sophistication of surveys of both individual and institutional investors will also increase. However, it is also likely that these survey premiums will be more reflections of the recent past rather than good forecasts of the future.

Managers

As noted in the first section, equity risk premiums are a key input not only in investing but also in corporate finance. The hurdle rates used by companies – costs of equity and capital – are affected by the equity risk premiums that they use and have significant consequences for investment, financing and dividend decisions. Graham and Harvey have been conducting annual surveys of Chief Financial Officers (CFOs) or companies for roughly the last decade with the intent of estimating what these CFOs think is a reasonable equity risk premium (for the next 10 years over the ten-year bond rate). In their March 2015 survey, they report an average equity risk premium of 4.51% across

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[43] Asking the question "What do you think stocks will do next year?" generates different numbers than asking "What should the risk premium be for investing in stocks?"

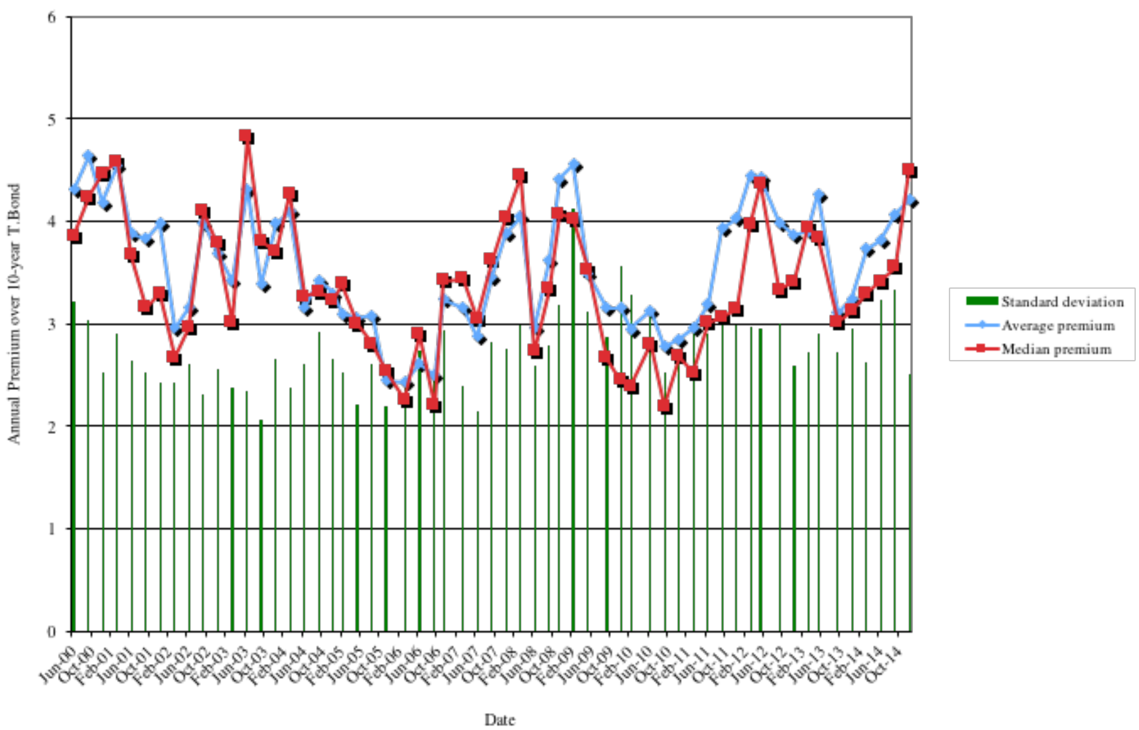
[44] Kaustia, M., A. Lehtoranta and V. Puttonen, 2011, *Sophistication and Gender Effects in Financial Advisers Expectations*, Working Paper, Aalto University.

[45] Fisher, K.L., and M. Statman, 2000, *Investor Sentiment and Stock Returns*, Financial Analysts Journal, v56, 16-23.

survey respondents, up from the average premium of 3.73% a year earlier. The median premium in the March 2015 survey was 3.88%.[46]

To get a sense of how these assessed equity risk premiums have behaved over time, we have graphed the average and median values of the premium and the cross sectional standard deviation in the estimates in each CFO survey, from 2001 to 2015, in Figure 2.

Figure 2: CFO Survey Premiums



Note the survey premium peak was 4.56% in February 2009, right after the crisis, and had its lowest recording (2.5%) in September 2006. The average across all 15 years of surveys (more than 10,000 responses) was 3.58%, but the standard deviation in the survey responses did increase after the 2008 crisis.

Academics

Most academics are neither big players in equity markets, nor do they make many major corporate finance decisions. Notwithstanding this lack of real world impact, what

[46] Graham, J.R. and C.R. Harvey, 2015, *The Equity Risk Premium in 2015*, Working paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2611793 . See also Graham, J.R. and C.R. Harvey, 2009, *The Equity Risk Premium amid a Global Financial Crisis*, Working paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1405459.

they think about equity risk premiums may matter for two reasons. The first is that many of the portfolio managers and CFOs that were surveyed in the last two sub-sections received their first exposure to the equity risk premium debate in the classroom and may have been influenced by what was presented as the right risk premium in that setting. The second is that practitioners often offer academic work (textbooks and papers) as backing for the numbers that they use.

Welch (2000) surveyed 226 financial economists on the magnitude of the equity risk premium and reported interesting results. On average, economists forecast an average annual risk premium (arithmetic) of about 7% for a ten-year time horizon and 6-7% for one to five-year time horizons. As with the other survey estimates, there is a wide range on the estimates, with the premiums ranging from 2% at the pessimistic end to 13% at the optimistic end. Interestingly, the survey also indicates that economists believe that their estimates are higher than the consensus belief and try to adjust the premiums down to reflect that view.[47]

Fernandez (2010) examined widely used textbooks in corporate finance and valuation and noted that equity risk premiums varied widely across the books and that the moving average premium has declined from 8.4% in 1990 to 5.7% in 2010.[48] In another survey, Fernandez, Aguirreamalloa and L. Corres (2011) compared both the level and standard deviation of equity risk premium estimates for analysts, companies and academics in the United States:[49]

Group	*Average Equity Risk Premium*	*Standard deviation in Equity Risk Premium estimates*
Academics	5.6%	1.6%
Analysts	5.0%	1.1%
Companies	5.5%	1.6%

[47] Welch, I., 2000, *Views of Financial Economists on the Equity Premium and on Professional Controversies*, Journal of Business, v73, 501-537.

[48] Fernandez, P., 2010, *The Equity Premium in 150 Textbooks*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1473225. He notes that the risk premium actually varies within the book in as many as a third of the textbooks surveyed.

[49] Fernandez, P., J. Aguirreamalloa and L. Corres, 2011, Equity Premium used in 2011 for the USA by Analysts, Companies and Professors: A Survey, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1805852&rec=1&srcabs=1822182.

The range on equity risk premiums in use is also substantial, with a low of 1.5% and a high of 15%, often citing the same sources. The same authors also report survey responses from the same groups (academics, analysts and companies) in 88 countries in 2014 and note that those in emerging markets use higher risk premiums (not surprisingly) than those in developed markets.[50] In a 2015 survey, Fernandez, Ortiz and Acin report big differences in equity risk premiums across analysts within the same country; in the US, for instance, they note that while the average ERP across analysts was 5.8%, the numbers used ranged from 3.2% to 10.5%.[51]

Historical Premiums

While our task is to estimate equity risk premiums in the future, much of the data we use to make these estimates is in the past. Most investors and managers, when asked to estimate risk premiums, look at historical data. In fact, the most widely used approach to estimating equity risk premiums is the historical premium approach, where the actual returns earned on stocks over a long time period is estimated, and compared to the actual returns earned on a default-free (usually government security). The difference, on an annual basis, between the two returns is computed and represents the historical risk premium. In this section, we will take a closer look at the approach.

Estimation Questions and Consequences

While users of risk and return models may have developed a consensus that historical premium is, in fact, the best estimate of the risk premium looking forward, there are surprisingly large differences in the actual premiums we observe being used in practice, with the numbers ranging from 3% at the lower end to 12% at the upper end. Given that we are almost all looking at the same historical data, these differences may seem surprising. There are, however, three reasons for the divergence in risk premiums: different time periods for estimation, differences in riskfree rates and market indices and differences in the way in which returns are averaged over time.

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[50] Fernandez, P., P. Linares and I.F. Acin, 2014, Market Risk Premium used in 88 countries in 2014, A Survey with 8228 Answers, http://ssrn.com/abstract=2450452.

[51] Fernandez, P., A. Ortiz and I.F. Acin, 2015, Huge dispersion of the Risk-Free Rate and Market Risk Premium used by analysts in USA and Europe in 2015, SSRN Working Paper: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2684740.

1. Time Period

Even if we agree that historical risk premiums are the best estimates of future equity risk premiums, we can still disagree about how far back in time we should go to estimate this premium. For decades, Ibbotson Associates was the most widely used estimation service, reporting stock return data and risk free rates going back to 1926,[52] and Duff and Phelps now provides the same service[53]. There are other less widely used databases that go further back in time to 1871 or even to 1792.[54]

While there are many analysts who use all the data going back to the inception date, there are almost as many analysts using data over shorter time periods, such as fifty, twenty or even ten years to come up with historical risk premiums. The rationale presented by those who use shorter periods is that the risk aversion of the average investor is likely to change over time, and that using a shorter and more recent time period provides a more updated estimate. This has to be offset against a cost associated with using shorter time periods, which is the greater noise in the risk premium estimate. In fact, given the annual standard deviation in stock returns[55] between 1928 and 2015 of 19.81% (approximated to 20%), the standard error associated with the risk premium estimate can be estimated in table 2 follows for different estimation periods:[56]

Table 2: Standard Errors in Historical Risk Premiums

Estimation Period	*Standard Error of Risk Premium Estimate*
5 years	$20\%/\sqrt{5} = 8.94\%$
10 years	$20\%/\sqrt{10} = 6.32\%$
25 years	$20\% / \sqrt{25} = 4.00\%$

[52] Ibbotson Stocks, Bonds, Bills and Inflation Yearbook (SBBI), 2011 Edition, Morningstar.

[53] Duff and Phelps, 2015 Valuation Handbook, Industry Cost of Capital.

[54] Siegel, in his book, Stocks for the Long Run, estimates the equity risk premium from 1802-1870 to be 2.2% and from 1871 to 1925 to be 2.9%. (Siegel, Jeremy J., Stocks for the Long Run, Second Edition, McGraw Hill, 1998). Goetzmann and Ibbotson estimate the premium from 1792 to 1925 to be 3.76% on an arithmetic average basis and 2.83% on a geometric average basis. Goetzmann. W.N. and R. G. Ibbotson, 2005, History and the Equity Risk Premium, Working Paper, Yale University. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=702341.

[55] For the historical data on stock returns, bond returns and bill returns check under "updated data" in http://www.damodaran.com.

[56] The standard deviation in annual stock returns between 1928 and 2014 is 19.90%; the standard deviation in the risk premium (stock return – bond return) is a little higher at 21.59%. These estimates of the standard error are probably understated, because they are based upon the assumption that annual returns are uncorrelated over time. There is substantial empirical evidence that returns are correlated over time, which would make this standard error estimate much larger. The raw data on returns is provided in Appendix 1.

50 years	20% / √50 = 2.83%
80 years	20% / √80 = 2.23%

Even using all of the entire data (about 85 years) yields a substantial standard error of 2.2%. Note that that the standard errors from ten-year and twenty-year estimates are likely to be almost as large or larger than the actual risk premium estimated. This cost of using shorter time periods seems, in our view, to overwhelm any advantages associated with getting a more updated premium.

What are the costs of going back even further in time (to 1871 or before)? First, the data is much less reliable from earlier time periods, when trading was lighter and record keeping more haphazard. Second, and more important, the market itself has changed over time, resulting in risk premiums that may not be appropriate for today. The U.S. equity market in 1871 more closely resembled an emerging market, in terms of volatility and risk, than a mature market. Consequently, using the earlier data may yield premiums that have little relevance for today's markets.

There are two other solutions offered by some researchers. The first is to break the annual data down into shorter return intervals – quarters or even months – with the intent of increasing the data points over any given time period. While this will increase the sample size, the effect on the standard error will be minimal.[57] The second is to use the entire data but to give a higher weight to more recent data, thus getting more updated premiums while preserving the data. While this option seems attractive, weighting more recent data will increase the standard error of the estimate. After all, using only the last ten years of data is an extreme form of time weighting, with the data during that period being weighted at one and the data prior to the period being weighted at zero.

2. Riskfree Security and Market Index

The second estimation question we face relates to the riskfree rate. We can compare the expected return on stocks to either short-term government securities (treasury bills) or long term government securities (treasury bonds) and the risk premium for stocks can be estimated relative to either. Given that the yield curve in the United States has been upward sloping for most of the last eight decades, the risk premium is larger when estimated

[57] If returns are uncorrelated over time, the variance in quarterly (monthly) risk premiums will be approximately one-quarter (one twelfth) the variance in annual risk premiums.

relative to short term government securities (such as treasury bills) than when estimated against treasury bonds.

Some practitioners and a surprising number of academics (and textbooks) use the treasury bill rate as the riskfree rate, with the alluring logic that there is no price risk in a treasury bill, whereas the price of a treasury bond can be affected by changes in interest rates over time. That argument does make sense, but only if we are interested in a single period equity risk premium (say, for next year). If your time horizon is longer (say 5 or 10 years), it is the treasury bond that provides the more predictable returns.[58] Investing in a 6-month treasury bill may yield a guaranteed return for the next six months, but rolling over this investment for the next five years will create reinvestment risk. In contrast, investing in a ten-year treasury bond, or better still, a ten-year zero coupon bond will generate a guaranteed return for the next ten years.[59]

The riskfree rate chosen in computing the premium has to be consistent with the riskfree rate used to compute expected returns. Thus, if the treasury bill rate is used as the riskfree rate, the premium has to be the premium earned by stocks over that rate. If the treasury bond rate is used as the riskfree rate, the premium has to be estimated relative to that rate. For the most part, in corporate finance and valuation, the riskfree rate will be a long-term default-free (government) bond rate and not a short-term rate. Thus, the risk premium used should be the premium earned by stocks over treasury bonds.

The historical risk premium will also be affected by how stock returns are estimated. Using an index with a long history, such as the Dow 30, seems like an obvious solution, but returns on the Dow may not be a good reflection of overall returns on stocks. In theory, at least, we would like to use the broadest index of stocks to compute returns, with two caveats. The first is that the index has to be market-weighted, since the overall returns on equities will be tilted towards larger market cap stocks. The second is that the returns should be free of survivor bias; estimating returns only on stocks that have survived that last 80 years will yield returns that are too high. Stock returns should incorporate those

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[58] For more on risk free rates, see Damodaran, A., 2008, *What is the riskfree rate?* Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1317436.

[59] There is a third choice that is sometimes employed, where the short term government security (treasury bills) is used as the riskfree rate and a "term structure spread" is added to this to get a normalized long term rate.

equity investments from earlier years that did not make it through the estimation period, either because the companies in question went bankrupt or were acquired.

Finally, there is some debate about whether the equity risk premiums should be computed using nominal returns or real returns. While the choice clearly makes a difference, if we estimate the return on stocks or the government security return standing alone, it is less of an issue, when computing equity risk premiums, where we look at the difference between the two values. Put simply, subtracting out the inflation rate from both stock and bond returns each years should yield roughly the same premium as what you would have obtained with the nominal returns.

3. Averaging Approach

The final sticking point when it comes to estimating historical premiums relates to how the average returns on stocks, treasury bonds and bills are computed. The arithmetic average return measures the simple mean of the series of annual returns, whereas the geometric average looks at the compounded return[60]. Many estimation services and academics argue for the arithmetic average as the best estimate of the equity risk premium. In fact, if annual returns are uncorrelated over time, and our objective was to estimate the risk premium for the next year, the arithmetic average is the best and most unbiased estimate of the premium. There are, however, strong arguments that can be made for the use of geometric averages. First, empirical studies seem to indicate that returns on stocks are negatively correlated[61] over time. Consequently, the arithmetic average return is likely to over state the premium. Second, while asset pricing models may be single period models, the use of these models to get expected returns over long periods (such as five or ten years) suggests that the estimation period may be much longer than a year. In this context, the argument for geometric average premiums becomes stronger. Indro and Lee (1997)

[60] The compounded return is computed by taking the value of the investment at the start of the period (Value_0) and the value at the end (Value_N), and then computing the following:

$$\text{Geometric Average} = \left(\frac{\text{Value}_N}{\text{Value}_0}\right)^{1/N} - 1$$

[61] In other words, good years are more likely to be followed by poor years, and vice versa. The evidence on negative serial correlation in stock returns over time is extensive, and can be found in Fama and French (1988). While they find that the one-year correlations are low, the five-year serial correlations are strongly negative for all size classes. Fama, E.F. and K.R. French, 1992, *The Cross-Section of Expected Returns*, Journal of Finance, Vol 47, 427-466.

compare arithmetic and geometric premiums, find them both wanting, and argue for a weighted average, with the weight on the geometric premium increasing with the time horizon.[62]

In closing, the averaging approach used clearly matters. Arithmetic averages will be yield higher risk premiums than geometric averages, but using these arithmetic average premiums to obtain discount rates, which are then compounded over time, seems internally inconsistent. In corporate finance and valuation, at least, the argument for using geometric average premiums as estimates is strong.

Estimates for the United States

The questions of how far back in time to go, what risk free rate to use and how to average returns (arithmetic or geometric) may seem trivial until you see the effect that the choices you make have on your equity risk premium. Rather than rely on the summary values that are provided by data services, we will use raw return data on stocks, treasury bills and treasury bonds from 1928 to 2015 to make this assessment.[63] In figure 3, we begin with a chart of the annual returns on stock, treasury bills and bonds for each year:

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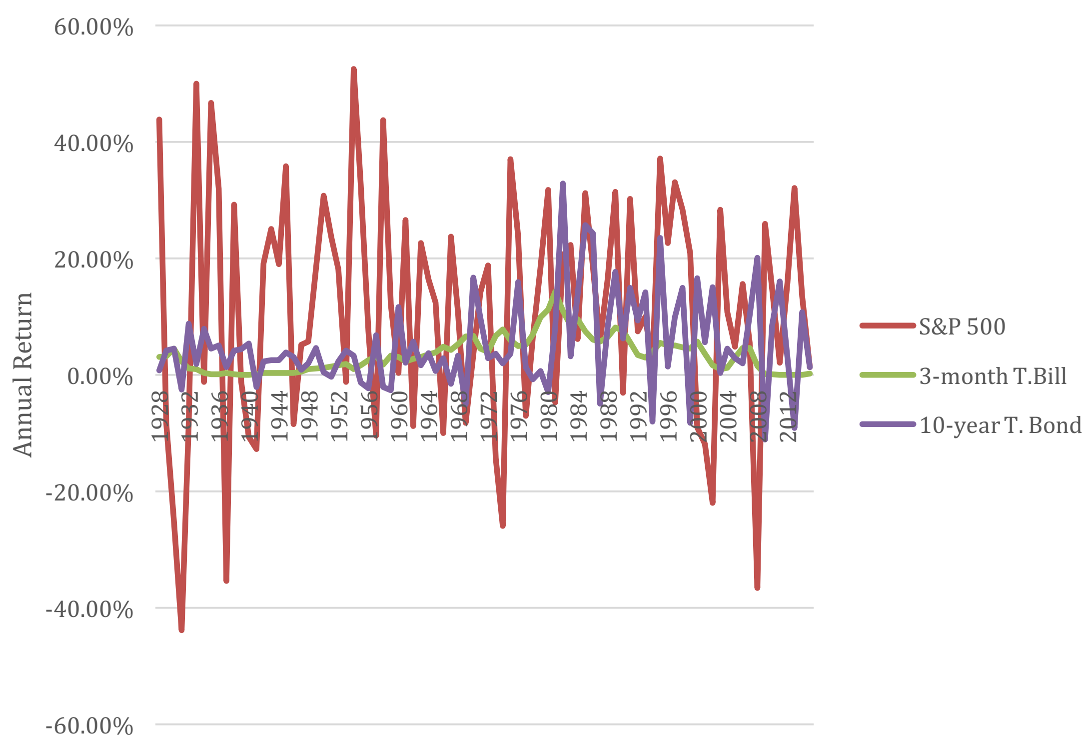
[62] Indro, D.C. and W. Y. Lee, 1997, *Biases in Arithmetic and Geometric Averages as Estimates of Long-run Expected Returns and Risk Premium*, Financial Management, v26, 81-90.

[63] The raw data for treasury rates is obtained from the Federal Reserve data archive (http://research.stlouisfed.org/fred2/) at the Fed site in St. Louis, with the 3-month treasury bill rate used for treasury bill returns and the 10-year treasury bond rate used to compute the returns on a constant maturity 10-year treasury bond. The stock returns represent the returns on the S&P 500. Appendix 1 provides the returns by year on stocks, bonds and bills, by year, from 1928 through the current year.

Figure 3: Annual Returns on Stocks, T.Bonds and T.Bills



It is difficult to make much of this data other than to state the obvious, which is that stock returns are volatile, which is at the core of the demand for an equity risk premium in the first place. In table 3, we present summary statistics for stock, 3-month Treasury bill and ten-year Treasury bond returns from 1928 to 2015:

Table 3: Summary Statistics- U.S. Stocks, T.Bills and T. Bonds- 1928-2015

	Stocks	*T. Bills*	*T. Bonds*
Mean	11.41%	3.49%	5.23%
Standard Error	2.11%	0.33%	0.83%
Median	13.87%	3.10%	3.45%
Standard Deviation	19.82%	3.07%	7.78%
Kurtosis	2.98	3.82	4.44
Skewness	-0.39	0.97	0.96
Minimum	-43.84%	0.03%	-11.12%
Maximum	52.56%	14.30%	32.81%
25th percentile	-1.20%	0.96%	1.12%
75th percentile	25.28%	5.16%	8.55%

While U.S. equities have delivered much higher returns than treasuries over this period, they have also been more volatile, as evidenced both by the higher standard deviation in returns and by the extremes in the distribution. Using this table, we can take a first shot at estimating a risk premium by taking the difference between the average returns on stocks and the average return on treasuries, yielding a risk premium of 7.92% for stocks over T.Bills (11.41%-3.49%) and 6.18% for stocks over T.Bonds (11.41%-5.23%). Note, though, that these represent arithmetic average, long-term premiums for stocks over treasuries.

How much will the premium change if we make different choices on historical time periods, riskfree rates and averaging approaches? To answer this question, we estimated the arithmetic and geometric risk premiums for stocks over both treasury bills and bonds over different time periods in table 4, with standard errors reported in brackets below the arithmetic averages:

Table 4: Historical Equity Risk Premiums (ERP) –Estimation Period, Riskfree Rate and Averaging Approach

	Arithmetic Average		*Geometric Average*	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2015	7.92%	6.18%	6.05%	4.54%
	(2.15%)	*(2.29%)*		
1966-2015	6.05%	3.89%	4.69%	2.90%
	(2.42%)	*(2.74%)*		
2006-2015	7.87%	3.88%	6.11%	2.53%
	(6.06%)	*(8.66%)*		

Note that even with only three slices of history considered, the premiums range from 2.53% to 7.92%, depending upon the choices made. If we take the earlier discussion about the "right choices" to heart, and use a long-term geometric average premium over the long-term rate as the risk premium to use in valuation and corporate finance, the equity risk premium that we would use would be 4.54%. The caveats that we would offer, though, are that this estimate comes with significant standard error and is reflective of time periods (such as 1920s and 1930s) when the U.S. equity market (and investors in it) had very different characteristics.

There have been attempts to extend the historical time period to include years prior to 1926 (the start of the Ibbotson database). Goetzmann and Jorion (1999) estimate the returns on stocks and bonds between 1792 and 1925 and report an arithmetic average premium, for stocks over bonds, of 2.76% and a geometric average premium of 2.83%.[64] The caveats about data reliability and changing market characteristics that we raised in an earlier section apply to these estimates.

There is one more troublesome (or at least counter intuitive) characteristic of historical risk premiums. The geometric average equity risk premium through the end of 2007 was 4.79%, higher than the 3.88% estimated though the end of 2008; in fact, every single equity risk premium number in this table would have been much higher, if we had stopped with 2007 as the last year. Adding the data for 2008, an abysmal year for stocks and a good year for bonds, lowers the historical premium dramatically, even when computed using a long period of history. In effect, the historical risk premium approach would lead investors to conclude, after one of worst stock market crisis in several decades, that stocks were less risky than they were before the crisis and that investors should therefore demand lower premiums. In contrast, adding the data for 2009, a good year for stocks (+25.94%) and a bad year for bonds (-11.12%) would have increased the equity risk premium from 3.88% to 4.29%. As a general rule, historical risk premiums will tend to rise when markets are buoyant and investors are less risk averse and will fall as markets collapse and investor fears rise.

Global Estimates

If it is difficult to estimate a reliable historical premium for the US market, it becomes doubly so, when looking at markets with short, volatile and transitional histories. This is clearly true for emerging markets, where equity markets have often been in existence for only short time periods (Eastern Europe, China) or have seen substantial changes over the last few years (Latin America, India). It also true for many West European equity markets. While the economies of Germany, Italy and France can be categorized as mature, their equity markets did not share the same characteristics until recently. They

[64] Jorion, Philippe and William N. Goetzmann, 1999, *Global Stock Markets in the Twentieth Century*, Journal of Finance, 54(3), 953-980.

tended to be dominated by a few large companies, many businesses remained private, and trading was thin except on a few stocks.

Notwithstanding these issues, services have tried to estimate historical risk premiums for non-US markets with the data that they have available. To capture some of the danger in this practice, Table 5 summarizes historical arithmetic average equity risk premiums for major non-US markets below for 1976 to 2001, and reports the standard error in each estimate:[65]

Table 5: Risk Premiums for non-US Markets: 1976- 2001

Country	*Weekly average*	*Weekly standard deviation*	*Equity Risk Premium*	*Standard error*
Canada	0.14%	5.73%	1.69%	3.89%
France	0.40%	6.59%	4.91%	4.48%
Germany	0.28%	6.01%	3.41%	4.08%
Italy	0.32%	7.64%	3.91%	5.19%
Japan	0.32%	6.69%	3.91%	4.54%
UK	0.36%	5.78%	4.41%	3.93%
India	0.34%	8.11%	4.16%	5.51%
Korea	0.51%	11.24%	6.29%	7.64%
Chile	1.19%	10.23%	15.25%	6.95%
Mexico	0.99%	12.19%	12.55%	8.28%
Brazil	0.73%	15.73%	9.12%	10.69%

Before we attempt to come up with rationale for why the equity risk premiums vary across countries, it is worth noting the magnitude of the standard errors on the estimates, largely because the estimation period includes only 25 years. Based on these standard errors, we cannot even reject the hypothesis that the equity risk premium in each of these countries is zero, let alone attach a value to that premium.

If the standard errors on these estimates make them close to useless, consider how much more noise there is in estimates of historical risk premiums for some emerging market equity markets, which often have a reliable history of ten years or less, and very large standard deviations in annual stock returns. Historical risk premiums for emerging markets may provide for interesting anecdotes, but they clearly should not be used in risk and return models.

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[65] Salomons, R. and H. Grootveld, 2003, *The equity risk premium: Emerging vs Developed Markets,* Emerging Markets Review, v4, 121-144.

The survivor bias

Given how widely the historical risk premium approach is used, it is surprising that the flaws in the approach have not drawn more attention. Consider first the underlying assumption that investors' risk premiums have not changed over time and that the average risk investment (in the market portfolio) has remained stable over the period examined. We would be hard pressed to find anyone who would be willing to sustain this argument with fervor. The obvious fix for this problem, which is to use a more recent time period, runs directly into a second problem, which is the large noise associated with historical risk premium estimates. While these standard errors may be tolerable for very long time periods, they clearly are unacceptably high when shorter periods are used.

Even if there is a sufficiently long time period of history available, and investors' risk aversion has not changed in a systematic way over that period, there is a final problem. Markets such as the United States, which have long periods of equity market history, represent "survivor markets". In other words, assume that one had invested in the largest equity markets in the world in 1926, of which the United States was one.[66] In the period extending from 1926 to 2000, investments in many of the other equity markets would have earned much smaller premiums than the US equity market, and some of them would have resulted in investors earning little or even negative returns over the period. Thus, the survivor bias will result in historical premiums that are larger than expected premiums for markets like the United States, even assuming that investors are rational and factor risk into prices.

How can we mitigate the survivor bias? One solution is to look at historical risk premiums across multiple equity markets across very long time periods. In the most comprehensive attempt of this analysis, Dimson, Marsh and Staunton (2002, 2008) estimated equity returns for 17 markets and obtained both local and a global equity risk

[66] Jorion, Philippe and William N. Goetzmann, 1999, *Global Stock Markets in the Twentieth Century*, Journal of Finance, 54(3), 953-980. They looked at 39 different equity markets and concluded that the US was the best performing market from 1921 to the end of the century. They estimated a geometric average premium of 3.84% across all of the equity markets that they looked at, rather than just the US and estimated that the survivor bias added 1.5% to the US equity risk premium (with arithmetic averages) and 0.9% with geometric averages.

premium.[67] In their most recent update in 2016, they provide the risk premiums from 1900 to 2015 for 20 markets, with standard errors on each estimate (reported in table 6):[68]

Table 6: Historical Risk Premiums across Equity Markets – 1900 – 2015 (in %)

	Stocks minus Short term Governments				*Stocks minus Long term Governments*			
Country	*Geometric Mean*	*Arithmetic Mean*	*Standard Error*	*Standard Deviation*	*Geometric Mean*	*Arithmetic Mean*	*Standard Error*	*Standard Deviation*
Australia	6.0%	7.4%	1.5%	16.4%	5.0%	6.6%	1.7%	18.2%
Austria	5.5%	10.4%	3.5%	37.2%	2.6%	21.5%	14.3%	152.8%
Belgium	3.1%	5.5%	2.2%	23.8%	2.4%	4.5%	2.0%	21.0%
Canada	4.1%	5.5%	1.6%	16.9%	3.3%	4.9%	1.7%	18.2%
Denmark	3.4%	5.3%	1.9%	20.6%	2.3%	3.8%	1.7%	18.0%
Finland	5.9%	9.5%	2.8%	29.8%	5.2%	8.8%	2.8%	30.0%
France	6.2%	8.7%	2.2%	24.1%	3.0%	5.4%	2.1%	22.7%
Germany	6.1%	9.9%	2.9%	31.3%	5.1%	9.1%	2.7%	28.4%
Ireland	3.7%	6.0%	2.0%	21.4%	2.8%	4.8%	1.8%	19.8%
Italy	5.8%	9.6%	2.9%	31.4%	3.1%	6.5%	2.7%	29.3%
Japan	6.2%	9.3%	2.6%	27.5%	5.1%	9.1%	3.0%	32.4%
Netherlands	4.4%	6.6%	2.1%	22.4%	3.3%	5.6%	2.1%	22.2%
New Zealand	4.4%	6.0%	1.7%	18.1%	4.0%	5.5%	1.7%	17.8%
Norway	3.1%	5.9%	2.4%	26.0%	2.3%	5.2%	2.6%	27.6%
South Africa	6.3%	8.3%	2.0%	21.7%	5.4%	7.2%	1.8%	19.5%
Spain	3.3%	5.4%	2.0%	21.6%	1.8%	3.8%	1.9%	20.6%
Sweden	3.9%	6.0%	1.9%	20.4%	3.1%	5.4%	2.0%	21.4%
Switzerland	3.7%	5.3%	1.7%	18.7%	2.1%	3.6%	1.6%	17.5%
U.K.	4.3%	6.0%	1.8%	19.6%	3.6%	5.0%	1.6%	17.2%
U.S.	5.5%	7.4%	1.8%	19.6%	4.3%	6.4%	1.9%	20.9%
Europe	3.4%	5.1%	1.8%	19.2%	3.2%	4.5%	1.5%	16.1%
World-ex U.S.	3.5%	5.1%	1.7%	18.5%	2.8%	3.9%	1.4%	14.6%
World	4.2%	5.6%	1.6%	17.0%	3.2%	4.4%	1.4%	15.5%

Source: Credit Suisse Global Investment Returns Sourcebook, 2016

[67] Dimson, E.,, P Marsh and M Staunton, 2002, *Triumph of the Optimists: 101 Years of Global Investment Returns,* Princeton University Press, NJ; Dimson, E.,, P Marsh and M Staunton, 2008, The Worldwide Equity Risk Premium: a smaller puzzle, Chapter 11 in the Handbook of the Equity Risk Premium, edited by R. Mehra, Elsevier.

[68] *Credit Suisse Global Investment Returns Sourcebook,* 2016, Credit Suisse/ London Business School. Summary data is accessible at the Credit Suisse website.

In making comparisons of the numbers in this table to prior years, note that this database was modified in two ways: the world estimates are now weighted by market capitalization and the issue of survivorship bias has been dealt with frontally by incorporating the return histories of three markets (Austria, China and Russia) where equity investors would have lost their entire investment during the century. Note that the risk premiums, averaged across the markets, are lower than risk premiums in the United States. For instance, the geometric average risk premium for stocks over long-term government bonds, across the non-US markets, is 2.8%, lower than the 4.3% for the US markets. The results are similar for the arithmetic average premium, with the average premium of 3.9% across non-US markets being lower than the 6.4% for the United States. In effect, the difference in returns captures the survivorship bias, implying that using historical risk premiums based only on US data will results in numbers that are too high for the future. Note that the "noise" problem persists, even with averaging across 20 markets and over 115 years. The standard error in the global equity risk premium estimate is 1.4%, suggesting that the range for the historical premium remains a large one.

Decomposing the historical equity risk premium

As the data to compute historical risk premiums has become richer, those who compute historical risk premiums have also become more creative, breaking down the historical risk premiums into its component parts, partly to understand the drivers of the premiums and partly to get better predictors for the future. Ibbotson and Chen (2013) started this process by breaking down the historical risk premium into four components:[69]

1. The income return is the return earned by stockholders from dividends and stock buybacks.
2. The second is the inflation rate during the estimation time period
3. The third is the growth rate in real earnings (earnings cleansed of inflation) during the estimation period
4. The change in PE ratio over the period, since an increase (decrease) in the PE ratio will raise (lower) the realized return on stocks during an estimation period.

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[69] Ibbotson, R. and P. Chen, 2003, *Long-Run Stock Returns: Participating in the Real Economy*, Financial Analysts Journal, pp.88-98.

Using the argument that the first three are sustainable and generated by “the productivity of corporations in the economy” and the fourth is not, they sum up the first three components to arrive at what they term a “supply-side” equity risk premium.

Following the same playbook, Dimson, Marsh and Staunton decompose the realized equity risk premium in each market into three components: the level of dividends, the growth in those dividends and the effects on stock price of a changing multiple for dividend (price to dividend ratio). For the United States, they attribute 1.65% of the overall premium of 5.46% (for stocks over treasury bills) to growth in real dividends and 0.43% to expansion in the price to dividend ratio. Of the global premium of 4.20%, 0.51% can be attributed to growth in dividends and 0.48% to increases in the price to dividend ratio.

While there is some value in breaking down a historical risk premium, notice that none of these decompositions remove the basic problems with historical risk premiums, which is that they are backward looking and noisy. Thus, a supply side premium has to come with all of the caveats that a conventional historical premium with the added noise created by the decomposition, i.e., in measuring inflation and real earnings.

Historical Premium Plus

If we accept the proposition that historical risk premiums are the best way to estimate future risk premiums and also come to terms with the statistical reality that we need long time periods of history to get reliable estimates, we are trapped when it comes to estimating risk premiums in most emerging markets, where historical data is either non-existent or unreliable. Furthermore, the equity risk premium that we estimate becomes the risk premium that we use for all stocks within a market, no matter what their differences are on market capitalization and growth potential; in effect, we assume that the betas we use will capture differences in risk across companies.

In this section, we consider one way out of this box, where we begin with the US historical risk premium (4.54%) or the global premium from the DMS data (3.20%) as the base premium for a mature equity market and then build additional premiums for riskier markets or classes of stock. For the first part of this section, we stay within the US equity market and consider the practice of adjusting risk premiums for company-specific characteristics, with market capitalization being the most common example. In the second part, we extend the analysis to look at emerging markets in Asia, Latin American and

Eastern Europe, and take a look at the practice of estimating country risk premiums that augment the US equity risk premium. Since many of these markets have significant exposures to political and economic risk, we consider two fundamental questions in this section. The first relates to whether there should be an additional risk premium when valuing equities in these markets, because of the country risk. As we will see, the answer will depend upon whether we think country risk is diversifiable or non-diversifiable, view markets to be open or segmented and whether we believe in a one-factor or a multi-factor model. The second question relates to estimating equity risk premiums for emerging markets. Depending upon our answer to the first question, we will consider several solutions.

Small cap and other risk premiums

In computing an equity risk premium to apply to all investments in the capital asset pricing model, we are essentially assuming that betas carry the weight of measuring the risk in individual firms or assets, with riskier investments having higher betas than safer investments. Studies of the efficacy of the capital asset pricing model over the last three decades have cast some doubt on whether this is a reasonable assumption, finding that the model understates the expected returns of stocks with specific characteristics; small market cap companies and companies low price to book ratios, in particular, seem to earn much higher returns than predicted by the CAPM. It is to counter this finding that many practitioners add an additional premium to the required returns (and costs of equity) of smaller market cap companies.

The CAPM and Market Capitalization

In one of very first studies to highlight the failure of the traditional capital asset pricing model to explain returns at small market cap companies, Banz (1981) looked returns on stocks from 1936-1977 and concluded that investing in the smallest companies (the bottom 20% of NYSE firms in terms of capitalization) would have generated about 6% more, after adjusting for beta risk, than larger cap companies.[70] In the years since,

[70] Banz, R., 1981, *The Relationship between Return and Market Value of Common Stocks*, Journal of Financial Economics, v9.

there has been substantial research on both the origins and durability of the small cap premium, with mixed conclusions.

1. It exists globally, but it is more pronounced in developed markets: There is evidence of a small firm premium in markets outside the United States as well. Studies find small cap premiums of about 7% from 1955 to 1984 in the United Kingdom,[71] 8.8% in France and 3% in Germany,[72] and a premium of 5.1% for Japanese stocks between 1971 and 1988.[73] Dimson, March and Staunton (2016), in their updated assessment of equity risk premiums in global markets, also compute small cap premiums in 23 markets over long time periods (which range from 115 years for some markets to less for others). Of the 23 markets, small cap stocks have not outperformed the rest of the market in only Norway, Finland and the Netherlands; the small cap premium, over the long term, has been higher in developed markets than in emerging markets. On average, across the markets, they estimate the small cap premium to be 0.31% a month (or about 3.78% a year).
2. There is a premium over a long history, but it is volatile: While the small cap premium has been persistent in US equity markets, it has also been volatile, with large cap stocks outperforming small cap stocks for extended periods. In figure 4, we look at the difference in returns between small cap (defined as bottom 10% of firms in terms of market capitalization) and all US stocks between 1927 and 2015.[74]

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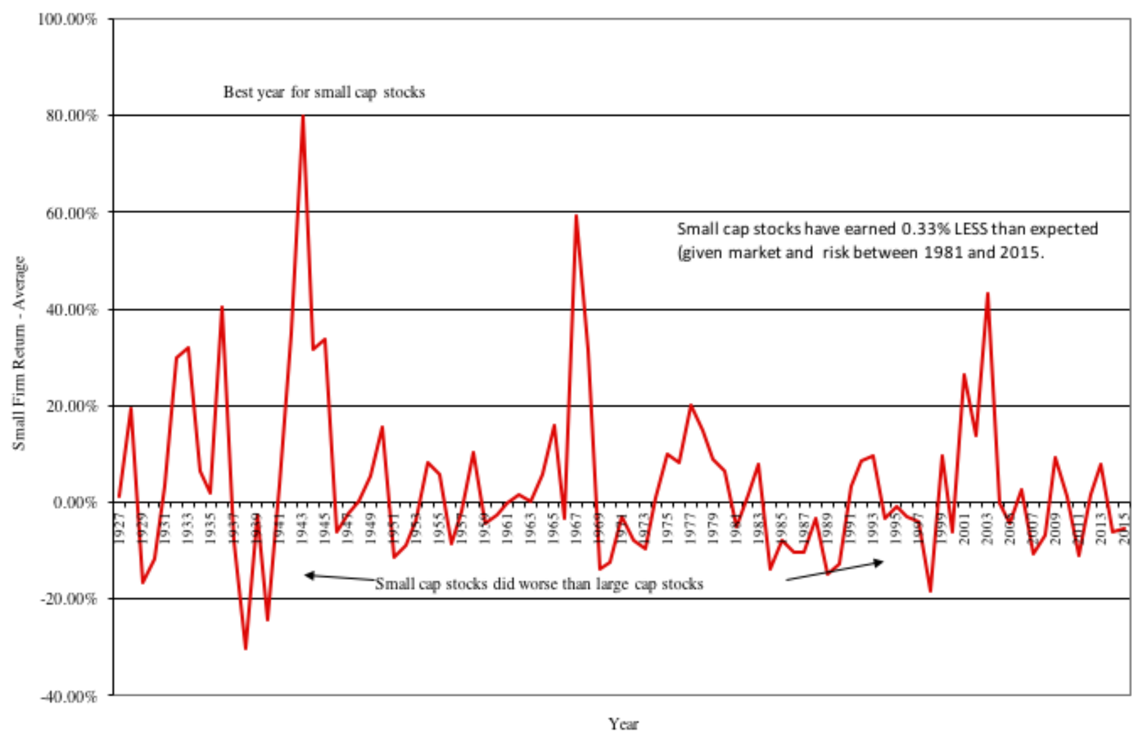
[71] Dimson, E. and P.R. Marsh, 1986, *Event Studies and the Size Effect: The Case of UK Press Recommendations*, Journal of Financial Economics, v17, 113-142.

[72] Bergstrom,G.L., R.D. Frashure and J.R. Chisholm, 1991, *The Gains from international small-company diversification* in Global Portfolios: Quantiative Strategies for Maximum Performance, Edited By R.Z. Aliber and B.R. Bruce, Business One Irwin, Homewood.

[73] Chan, L.K., Y. Hamao, and J. Lakonishok, 1991, *Fundamentals and Stock Returns in Japan*, Journal of Finance. v46. 1739-1789.

[74] The raw data for this table is obtained from Professor Ken French's website at Dartmouth. These premiums are based on value weighted portfolios. If equally weighted portfolios are used, the small cap premium is larger.

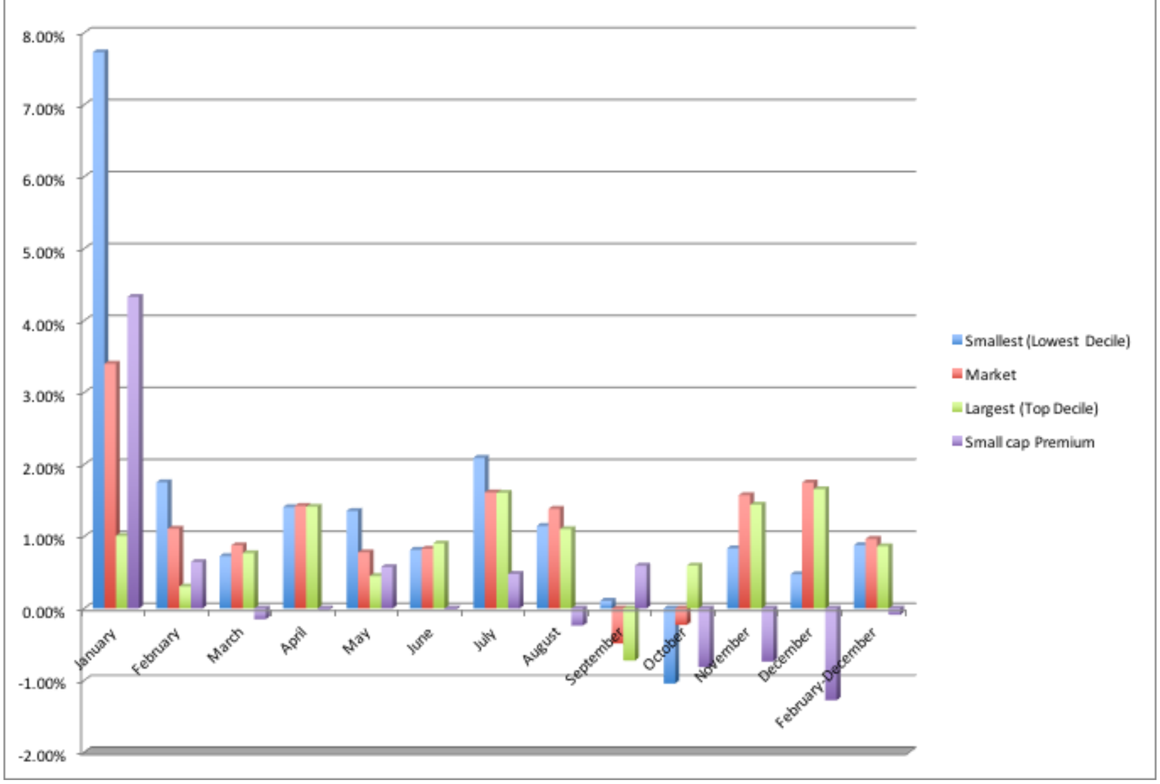
Figure 4: Small Firm Premium over time- 1927 -2015



The average premium for stocks in the smallest companies, in terms of market capitalization, between 1926 and 2015 was 3.82%, but the standard error in that estimate is 1.91%. However, the small cap premium from 1981 to 2015 is -0.33%, though it enjoyed a brief resurgence between 2001 and 2005.

3. <u>It is a January Premium</u>: Much of the premium is generated in one month of the year: January. As Figure 5 shows, eliminating that month from our calculations would essentially dissipate the entire small stock premium. That would suggest that size itself is not the source of risk, since small firms in January remain small firms in the rest of the year, but that the small firm premium, if it exists, comes from some other risk that is more pronounced or prevalent in January than in the rest of the year.

Figure 5: Small Cap Premium by Month of Year - 1926-2015



Source: Raw data from Ken French

Finally, a series of studies have argued that market capitalization, by itself, is not the reason for excess returns but that it is a proxy for other ignored risks such as illiquidity and poor information.

In summary, while the empirical evidence over a very long period supports the notion that small cap stocks have earned higher returns after adjusting for beta risk than large cap stocks, it is not as conclusive, nor as clean as it was initially thought to be. The argument that there is, in fact, no small cap premium and that we have observed over time is just an artifact of history should be given credence.

The Small Cap Premium

If we accept the notion that there is a small cap premium, there are two ways in which we can respond to the empirical evidence that small market cap stocks seem to earn higher returns than predicted by the traditional capital asset pricing model. One is to view this as a market inefficiency that can be exploited for profit: this, in effect, would require us to load up our portfolios with small market cap stocks that would then proceed to deliver higher than expected returns over long periods. The other is to take the excess returns as evidence that betas are inadequate measures of risk and view the additional returns are compensation for the missed risk. The fact that the small cap premium has endured for as long as it has suggests that the latter is the more reasonable path to take.

If CAPM betas understate the true risk of small cap stocks, what are the solutions? The first is to try and augment the model to reflect the missing risk, but this would require being explicit about this risk. For instance, there are models that include additional factors for illiquidity and imperfect information that claim to do better than the CAPM in predicting future returns. The second and simpler solution that is adopted by many practitioners is to add a premium to the expected return (from the CAPM) of small cap stocks. To arrive at this premium, analysts look at historical data on the returns on small cap stocks and the market, adjust for beta risk, and attribute the excess return to the small cap effect. As we noted earlier, using the data from 1926-2015, we would estimate a small cap premium of 3.82%.

Duff and Phelps present a richer set of estimates, where the premiums are computed for stocks in 25 different size classes (with size measured on eight different dimensions including market capitalization, book value and net income). Using the Fama/French data, we present excess returns for firms broken down by ten market value classes in Table 7, with the standard error for each estimate.

Table 7: Excess Returns by Market Value Class: US Stocks from 1927 – 2015

Excess Return = Return on Portfolio – Return on Market

Decile	*Average*	*Standard Error*	*Maximum*	*Minimum*
Smallest	3.82%	1.91%	79.77%	-30.42%
2	1.87%	1.31%	70.44%	-17.87%
3	1.22%	0.63%	25.00%	-16.83%
4	0.82%	0.56%	16.66%	-8.72%
5	0.03%	0.51%	8.98%	-15.99%
6	0.13%	0.49%	11.63%	-13.72%
7	-0.59%	0.55%	7.52%	-22.59%
8	-1.32%	0.78%	10.53%	-30.27%
9	-2.14%	1.04%	22.07%	-40.14%
Largest	-3.83%	1.55%	31.31%	-65.79%

Note that the market capitalization effect shows up at both extremes – the smallest firms earn higher returns than expected whereas the largest firms earn lower returns than expected. The small firm premium is statistically significant only for the lowest and three highest size deciles. In fact, it is the large cap discount that is more pronounced (mathematically and statistically) than the small cap premium.

Perils of the approach

While the small cap premium may seem like a reasonable way of dealing with the failure of the CAPM to capture the risk in smaller companies, there are significant costs to using the approach.

a. Standard Error on estimates: One of the dangers we noted with using historical risk premiums is the high standard error in our estimates. This danger is magnified when we look at sub-sets of stocks, based on market capitalization or any other characteristic, and extrapolate past returns. The standard errors on the small cap premiums that are estimated are likely to be significant, as is evidenced in table 7.
b. Small versus Large Cap: At least in its simplest form, the small cap premium adjustment requires us to divide companies into small market companies and the rest of the market, with stocks falling on one side of the line having much higher required returns (and costs of equity) than stocks falling on the other side.
c. Understanding Risk: Even in its more refined format, where the required returns are calibrated to market cap, using small cap premiums allows analysts to evade basic questions about what it is that makes smaller cap companies riskier, and whether these factors may vary across companies.
d. Small cap companies become large cap companies over time: When valuing companies, we attach high growth rates to revenues, earnings and value over time. Consequently, companies that are small market cap companies now grow to become large market cap companies over time. Consistency demands that we adjust the small cap premium as we go further into a forecast period.
e. Other risk premiums: Using a small cap premium opens the door to other premiums being used to augment expected returns. Thus, we could adjust expected returns upwards for stocks with price momentum and low price to book ratios, reflecting the excess returns that these characteristics seem to deliver, at least on paper. Doing so will deliver values that are closer to market prices, across assets, but undercuts the rationale for intrinsic valuation, i.e., finding market mistakes.

There is another reason why we are wary about adjusting costs of equity for a small cap effect. If, as is the practice now, we add a small cap premium of between 4% to 5% to the cost of equity of small companies, without attributing this premium to any specific risk factor, we are exposed to the risk of double counting risk. For instance, assume that the small cap premium that we have observed over the last few decades is attributable to the lower liquidity (and higher transactions costs) of trading small cap stocks. Adding that premium on to the discount rate will reduce the estimated values of small cap and private businesses. If we attach an illiquidity discount to this value, we are double counting the effect of illiquidity.

The small cap premium is firmly entrenched in practice, with analysts generally adding on 3% to 5% to the conventional cost of equity for small companies, with the definition of small shifting from analyst to analyst. Even if you believe that small cap companies are more exposed to market risk than large cap ones, this is an extremely sloppy and lazy way of dealing with that risk, since risk ultimately has to come from something fundamental (and size is not a fundamental factor). Thus, if you believe that small cap stocks are more prone to failure or distress, it behooves you to measure that risk directly and incorporate it into the cost of equity. If it is illiquidity that is at the heart of the small cap premium, then you should be measuring liquidity risk and incorporating it into the cost of equity and you certainly should not be double counting the risk by first incorporating a small cap premium into the discount rate and then applying an illiquidity discount to value.

The question of whether there is a small cap premium ultimately is not a theoretical one but a practical one. While those who incorporate a small cap premium justify the practice with the historical data, we will present a more forward-looking approach, where we use market pricing of small capitalization stocks to see if the market builds in a small cap premium, later in this paper.

Country Risk Premiums

As both companies and investors get used to the reality of a global economy, they have also been forced to confront the consequences of globalization for equity risk premiums and hurdle rates. Should an investor putting his money in Indian stocks demand a higher risk premium for investing in equities that one investing in German stocks? Should a US consumer product company investing in Brazil demand the same hurdle rates for its

Brazilian investments as it does for its US investments? In effect, should we demand one global equity risk premium that we use for investments all over the world or should we use higher equity risk premiums in some markets than in others?

The arguments for no country risk premium

Is there more risk in investing in a Malaysian or Brazilian stock than there is in investing in the United States? The answer, to most, seems to be obviously affirmative, with the solution being that we should use higher equity risk premiums when investing in riskier emerging markets. There are, however, three distinct and different arguments offered against this practice.

1. Country risk is diversifiable

In the risk and return models that have developed from conventional portfolio theory, and in particular, the capital asset pricing model, the only risk that is relevant for purposes of estimating a cost of equity is the market risk or risk that cannot be diversified away. The key question in relation to country risk then becomes whether the additional risk in an emerging market is diversifiable or non-diversifiable risk. If, in fact, the additional risk of investing in Malaysia or Brazil can be diversified away, then there should be no additional risk premium charged. If it cannot, then it makes sense to think about estimating a country risk premium.

But diversified away by whom? Equity in a publicly traded Brazilian, or Malaysian, firm can be held by hundreds or even thousands of investors, some of whom may hold only domestic stocks in their portfolio, whereas others may have more global exposure. For purposes of analyzing country risk, we look at the marginal investor – the investor most likely to be trading on the equity. If that marginal investor is globally diversified, there is at least the potential for global diversification. If the marginal investor does not have a global portfolio, the likelihood of diversifying away country risk declines substantially. Stulz (1999) made a similar point using different terminology.[75] He differentiated between segmented markets, where risk premiums can be different in each market, because investors cannot or will not invest outside their domestic markets, and open markets, where

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[75] Stulz, R.M., *Globalization, Corporate finance, and the Cost of Capital,* Journal of Applied Corporate Finance, v12. 8-25.

investors can invest across markets. In a segmented market, the marginal investor will be diversified only across investments in that market, whereas in an open market, the marginal investor has the opportunity (even if he or she does not take it) to invest across markets. It is unquestionable that investors today in most markets have more opportunities to diversify globally than they did three decades ago, with international mutual funds and exchange traded funds, and that many more of them take advantage of these opportunities. It is also true still that a significant home bias exists in most investors' portfolios, with most investors over investing in their home markets.

Even if the marginal investor is globally diversified, there is a second test that has to be met for country risk to be diversifiable. All or much of country risk should be country specific. In other words, there should be low correlation across markets. Only then will the risk be diversifiable in a globally diversified portfolio. If, on the other hand, the returns across countries have significant positive correlation, country risk has a market risk component, is not diversifiable and can command a premium. Whether returns across countries are positively correlated is an empirical question. Studies from the 1970s and 1980s suggested that the correlation was low, and this was an impetus for global diversification.[76] Partly because of the success of that sales pitch and partly because economies around the world have become increasingly intertwined over the last decade, more recent studies indicate that the correlation across markets has risen. The correlation across equity markets has been studied extensively over the last two decades and while there are differences, the overall conclusions are as follows:

1. <u>The correlation across markets has increased over time</u>, as both investors and firms have globalized. Yang, Tapon and Sun (2006) report correlations across eight, mostly developed markets between 1988 and 2002 and note that the correlation in the 1998-2002 time period was higher than the correlation between 1988 and 1992 in every single market; to illustrate, the correlation between the Hong Kong and US markets increased from 0.48 to 0.65 and the correlation between the UK and the US markets increased from 0.63 to 0.82.[77] In the global returns sourcebook, from Credit Suisse,

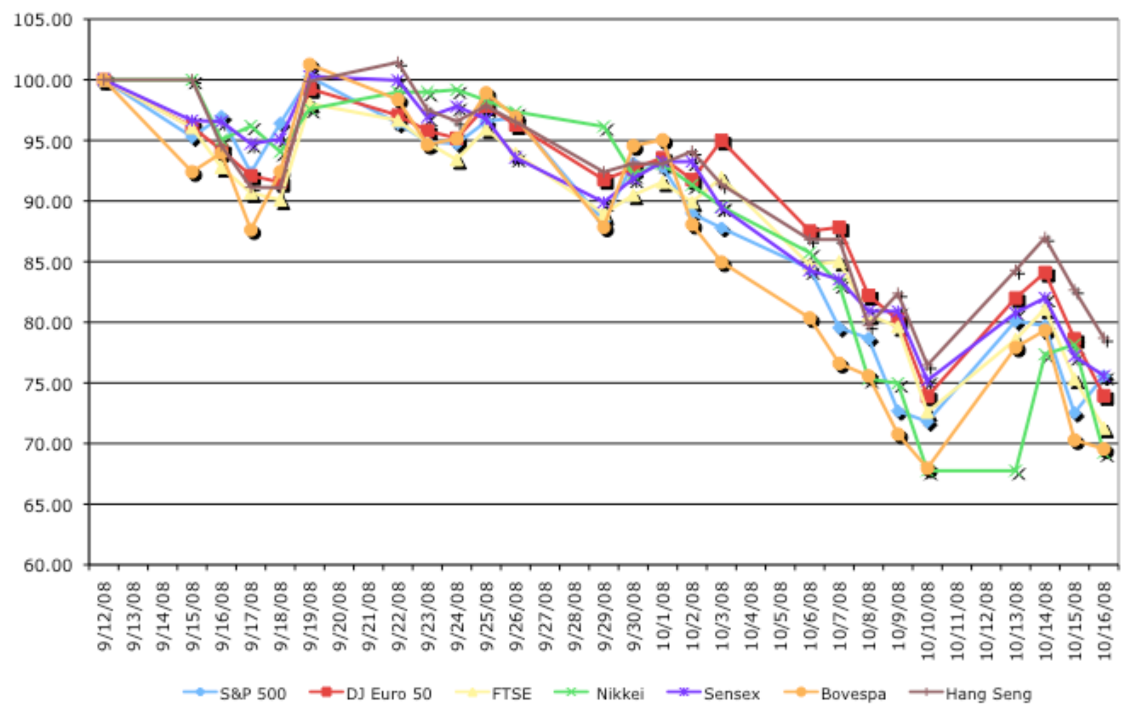
[76] Levy, H. and M. Sarnat, 1970, *International Diversification of Investment Portfolios*, American Economic Review 60(4), 668-75.

[77] Yang, Li , Tapon, Francis and Sun, Yiguo, 2006, *International correlations across stock markets and industries: trends and patterns 1988-2002*, Applied Financial Economics, v16: 16, 1171-1183

referenced earlier for historical risk premiums for different markets, the authors estimate the correlation between developed and emerging markets between 1980 and 2013, and note that it has increased from 0.57 in 1980 to 0.88 in 2013.

2. The correlation across equity markets increases during periods of extreme stress or high volatility.[78] This is borne out by the speed with which troubles in one market, say Russia, can spread to a market with little or no obvious relationship to it, say Brazil. The contagion effect, where troubles in one market spread into others is one reason to be skeptical with arguments that companies that are in multiple emerging markets are protected because of their diversification benefits. In fact, the market crisis in the last quarter of 2008 illustrated how closely bound markets have become, as can be seen in figure 6:

Figure 6: The globalization of risk



Between September 12, 2008 and October 16, 2008, markets across the globe moved up and down together, with emerging markets showing slightly more volatility.

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[78] Ball, C. and W. Torous, 2000, *Stochastic correlation across international stock markets*, Journal of Empirical Finance. v7, 373-388.

3. <u>The downside correlation increases more than upside correlation</u>: In a twist on the last point, Longin and Solnik (2001) report that it is not high volatility per se that increases correlation, but downside volatility. Put differently, the correlation between global equity markets is higher in bear markets than in bull markets.[79]
4. <u>Globalization increases exposure to global political uncertainty, while reducing exposure to domestic political uncertainty</u>: In the most direct test of whether we should be attaching different equity risk premiums to different countries due to systematic risk exposure, Brogaard, Dai, Ngo and Zhang (2014) looked at 36 countries from 1991-2010 and measured the exposure of companies in these countries to global political uncertainty and domestic political uncertainty.[80] They find that the costs of capital of companies in integrated markets are more highly influenced by global uncertainty (increasing as uncertainty increases) and those in segmented markets are more highly influenced by domestic uncertainty.[81]

2. A Global Capital Asset Pricing Model

The other argument against adjusting for country risk comes from theorists and practitioners who believe that the traditional capital asset pricing model can be adapted fairly easily to a global market. In their view, all assets, no matter where they are traded, should face the same global equity risk premium, with differences in risk captured by differences in betas. In effect, they are arguing that if Malaysian stocks are riskier than US stocks, they should have higher betas and expected returns.

While the argument is reasonable, it flounders in practice, partly because betas do not seem capable of carry the weight of measuring country risk.

1. If betas are estimated against local indices, as is usually the case, the average beta within each market (Brazil, Malaysia, US or Germany) has to be one. Thus, it would be mathematically impossible for betas to capture country risk.

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[79] Longin, F. and B. Solnik, 2001, *Extreme Correlation of International Equity Markets*, Journal of Finance, v56 , pg 649-675.

[80] Brogaard, J., L. Dai, P.T.H. Ngo, B. Zhuang, 2014, *The World Price of Political Uncertainty*, SSRN #2488820.

[81] The implied costs of capital for companies in the 36 countries were computed and related to global political uncertainty, measured using the US economic policy uncertainty index, and to domestic political uncertainty, measured using domestic national elections.

2. If betas are estimated against a global equity index, such as the Morgan Stanley Capital Index (MSCI), there is a possibility that betas could capture country risk but there is little evidence that they do in practice. Since the global equity indices are market weighted, it is the companies that are in developed markets that have higher betas, whereas the companies in small, very risky emerging markets report low betas. Table 8 reports the average beta estimated for the ten largest market cap companies in Brazil, India, the United States and Japan against the MSCI.[82]

Table 8: Betas against MSCI – Large Market Cap Companies

Country	*Average Beta (against local index)*	*Average Beta (against MSCI Global)*
India	0.97	0.83
Brazil	0.98	0.81
United States	0.96	1.05
Japan	0.94	1.03

The emerging market companies consistently have lower betas, when estimated against global equity indices, than developed market companies. Using these betas with a global equity risk premium will lead to lower costs of equity for emerging market companies than developed market companies. While there are creative fixes that practitioners have used to get around this problem, they seem to be based on little more than the desire to end up with higher expected returns for emerging market companies.[83]

3. *Country risk is better reflected in the cash flows*

The essence of this argument is that country risk and its consequences are better reflected in the cash flows than in the discount rate. Proponents of this point of view argue that bringing in the likelihood of negative events (political chaos, nationalization and economic meltdowns) into the expected cash flows effectively risk adjusts the cashflows, thus eliminating the need for adjusting the discount rate.

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[82] The betas were estimated using two years of weekly returns from January 2006 to December 2007 against the most widely used local index (Sensex in India, Bovespa in Brazil, S&P 500 in the US and the Nikkei in Japan) and the MSCI Global Equity Index.

[83] There are some practitioners who multiply the local market betas for individual companies by a beta for that market against the US. Thus, if the beta for an Indian chemical company is 0.9 and the beta for the Indian market against the US is 1.5, the global beta for the Indian company will be 1.35 (0.9*1.5). The beta for the Indian market is obtained by regressing returns, in US dollars, for the Indian market against returns on a US index (say, the S&P 500).

This argument is alluring but it is wrong. The expected cash flows, computed by taking into account the possibility of poor outcomes, is not risk adjusted. In fact, this is exactly how we should be calculating expected cash flows in any discounted cash flow analysis. Risk adjustment requires us to adjust the expected cash flow further for its risk, i.e. compute certainty equivalent cash flows in capital budgeting terms. To illustrate why, consider a simple example where a company is considering making the same type of investment in two countries. For simplicity, let us assume that the investment is expected to deliver $ 90, with certainty, in country 1 (a mature market); it is expected to generate $ 100 with 90% probability in country 2 (an emerging market) but there is a 10% chance that disaster will strike (and the cash flow will be $0). The expected cash flow is $90 on both investments, but only a risk neutral investor would be indifferent between the two. A risk averse investor would prefer the investment in the mature market over the emerging market investment, and would demand a premium for investing in the emerging market.

In effect, a full risk adjustment to the cash flows will require us to go through the same process that we have to use to adjust discount rates for risk. We will have to estimate a country risk premium, and use that risk premium to compute certainty equivalent cash flows.[84]

The arguments for a country risk premium

There are elements in each of the arguments in the previous section that are persuasive but none of them is persuasive enough.

- Investors have become more globally diversified over the last three decades and portions of country risk can therefore be diversified away in their portfolios. However, the significant home bias that remains in investor portfolios exposes investors disproportionately to home country risk, and the increase in correlation across markets has made a portion of country risk into non-diversifiable or market risk.
- As stocks are traded in multiple markets and in many currencies, it is becoming more feasible to estimate meaningful global betas, but it also is still true that these

[84] In the simple example above, this is how it would work. Assume that we compute a country risk premium of 3% for the emerging market to reflect the risk of disaster. The certainty equivalent cash flow on the investment in that country would be $90/1.03 = $87.38.

betas cannot carry the burden of capturing country risk in addition to all other macro risk exposures.

- Finally, there are certain types of country risk that are better embedded in the cash flows than in the risk premium or discount rates. In particular, risks that are discrete and isolated to individual countries should be incorporated into probabilities and expected cash flows; good examples would be risks associated with nationalization or related to acts of God (hurricanes, earthquakes etc.).

After you have diversified away the portion of country risk that you can, estimated a meaningful global beta and incorporated discrete risks into the expected cash flows, you will still be faced with residual country risk that has only one place to go: the equity risk premium.

There is evidence to support the proposition that you should incorporate additional country risk into equity risk premium estimates in riskier markets:

1. Historical equity risk premiums: Donadelli and Prosperi (2011) look at historical risk premiums in 32 different countries (13 developed and 19 emerging markets) and conclude that emerging market companies had both higher average returns and more volatility in these returns between 1988 and 2010 (see table 9).

Table 9: Historical Equity Risk Premiums (Monthly) by Region

Region	*Monthly ERP*	*Standard deviation*
Developed Markets	0.62%	4.91%
Asia	0.97%	7.56%
Latin America	2.07%	8.18%
Eastern Europe	2.40%	15.66%
Africa	1.41%	6.03%

While we remain cautious about using historical risk premiums over short time periods (and 22 years is short in terms of stock market history), the evidence is consistent with the argument that country risk should be incorporated into a larger equity risk premium.[85]

[85] Donadelli, M. and L. Prosperi, 2011, *The Equity Risk Premium: Empirical Evidence from Emerging Markets*, Working Paper, http://ssrn.com/abstract=1893378.

2. <u>Survey premiums:</u> Earlier in the paper, we referenced a paper by Fernandez et al (2014) that surveyed academics, analysts and companies in 88 countries on equity risk premiums. The reported average premiums vary widely across markets and are higher for riskier emerging markets, as can be seen in table 10.

Table 10: Survey Estimates of Equity Risk Premium: By Region

Region	Number	Average	Median
Africa	11	10.14%	9.85%
Developed Markets	20	5.44%	5.29%
Eastern Europe	15	8.29%	8.25%
Emerging Asia	12	8.33%	8.08%
EU Troubled	7	8.36%	8.31%
Latin America	15	9.45%	9.39%
Middle East	8	7.14%	6.79%
Grand Total	**88**	**7.98%**	**7.82%**

Again, while this does not conclusively prove that country risk commands a premium, it does indicate that those who do valuations in emerging market countries seem to act like it does. Ultimately, the question of whether country risk matters and should affect the equity risk premium is an empirical one, not a theoretical one, and for the moment, at least, the evidence seems to suggest that you should incorporate country risk into your discount rates. This could change as we continue to move towards a global economy, with globally diversified investors and a global equity market, but we are not there yet.

Estimating a Country Risk Premium

If country risk is not diversifiable, either because the marginal investor is not globally diversified or because the risk is correlated across markets, we are then left with the task of measuring country risk and considering the consequences for equity risk premiums. In this section, we will consider three approaches that can be used to estimate country risk premiums, all of which build off the historical risk premiums estimated in the last section. To approach this estimation question, let us start with the basic proposition that the risk premium in any equity market can be written as:

Equity Risk Premium = Base Premium for Mature Equity Market + Country Risk Premium

The country premium could reflect the extra risk in a specific market. This boils down our estimation to estimating two numbers – an equity risk premium for a mature equity market and the additional risk premium, if any, for country risk. To estimate a mature market equity risk premium, we can look at one of two numbers. The first is the historical risk premium that we estimated for the United States, which yielded 4.54% as the geometric average premium for stocks over treasury bonds from 1928 to 2015. If we do this, we are arguing that the US equity market is a mature market, and that there is sufficient historical data in the United States to make a reasonable estimate of the risk premium. The other is the average historical risk premium across 20 equity markets, approximately 3.3%, that was estimated by Dimson et al (see earlier reference), as a counter to the survivor bias that they saw in using the US risk premium. Consistency would then require us to use this as the equity risk premium, in every other equity market that we deem mature; the equity risk premium in January 2015 would be 4.60% in Germany, France and the UK, for instance. For markets that are not mature, however, we need to measure country risk and convert the measure into a country risk premium, which will augment the mature market premium.

Measuring Country Risk

There are at least three measures of country risk that we can use. The first is the sovereign rating attached to a country by ratings agencies. The second is to subscribe to services that come up with broader measures of country risk that explicitly factor in the economic, political and legal risks in individual countries. The third is go with a market-based measure such as the volatility in the country's currency or markets.

i. Sovereign Ratings

One of the simplest and most accessible measures of country risk is the rating assigned to a country's debt by a ratings agency (S&P, Moody's and Fitch, among others, all provide country ratings). These ratings measure default risk (rather than equity risk) but they are affected by many of the factors that drive equity risk – the stability of a country's currency, its budget and trade balances and political uncertainty, among other variables[86].

[86] The process by which country ratings are obtained in explained on the S&P web site at http://www.ratings.standardpoor.com/criteria/index.htm.

To get a measure of country ratings, consider six countries – Germany, Brazil, China, India, Russia and Greece. In January 2016, the Moody's ratings for the countries are summarized in table 11:

Table 11: Sovereign Ratings in January 2016 – Moody's

Country	*Foreign Currency Rating*	*Local Currency Rating*
Brazil	Baa3	Baa3
China	Aa3	Aa3
Germany	Aaa	Aaa
Greece	Caa3	Caa3
India	Baa3	Baa3
Russia	Ba1	Ba1

What do these ratings tell us? First, the local currency and foreign currency ratings are identical for all of the countries on the list. There are a few countries (not on this list) where the two ratings diverge, and when they do, the local currency ratings tend to be higher (or at worst equal to) the foreign currency ratings for most countries, because a country should be in a better position to pay off debt in the local currency than in a foreign currency. Second, at least based on Moody's assessments in 2016, Germany is the safest company in this group, followed by China, Brazil, India, Russia and Greece, in that order. Third, ratings do change over time. In fact, Brazil's rating from B1 in 2001 to its Baa2 in 2015, reflecting both strong economic growth and a more robust political system, but it dropped back to Baa3 in 2016, in the midst of political and economic problems. Appendix 2 contains the current ratings – local currency and foreign currency – for the countries that are tracked by Moody's in January 2016.[87]

While ratings provide a convenient measure of country risk, there are costs associated with using them as the only measure. First, ratings agencies often lag markets when it comes to responding to changes in the underlying default risk. The ratings for India, according to Moody's, were unchanged from 2004 to 2007, though the Indian economy grew at double-digit rates over that period. Similarly, Greece's ratings did not plummet until the middle of 2011, though their financial problems were visible well before

[87] In a disquieting reaction to the turmoil of the market crisis in the last quarter of 2008, Moody's promoted the notion that Aaa countries were not all created equal and slotted these countries into three groups – resistant Aaa (the stongest), resilient Aaa (weaker but will probably survive intact) and vulnerable Aaa (likely to face additional default risk.

that time. Second, the ratings agency focus on default risk may obscure other risks that could still affect equity markets. For instance, rising commodity (and especially oil) prices pushed up the ratings for commodity supplying countries (like Russia), even though there was little improvement in the rest of the economy. In the same vein, you could argue that the risk in many oil-rich Middle Eastern countries will not be captured in the default risk measure. Finally, not all countries have ratings; much of sub-Saharan Africa, for instance, is unrated as are a host of markets on the front lines of warfare or tumult.

ii. Country Risk Scores

Rather than focus on just default risk, as rating agencies do, some services have developed numerical country risk scores that take a more comprehensive view of risk. These risk scores are often estimated from the bottom-up by looking at economic fundamentals in each country. This, of course, requires significantly more information and, as a consequence, most of these scores are available only to commercial subscribers.

The Political Risk Services (PRS) group, for instance, considers political, financial and economic risk indicators to come up with a composite measure of risk (ICRG) for each country that ranks from 0 to 100, with 0 being highest risk and 100 being the lowest risk.[88] Appendix 3 lists countries with their composite country risk measures from the PRS Group in January 2016.[89] Harvey (2005) examined the efficacy of these scores and found that they were correlated with costs of capital, but only for emerging market companies.

The Economist, the business newsmagazine, also operates a country risk assessment unit that measures risk from 0 to 100, with 0 being the least risk and 100 being the most risk. In September 2008, Table 12 the following countries were ranked as least and most risky by their measure:

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[88] The PRS group considers three types of risk – political risk, which accounts for 50% of the index, financial risk, which accounts for 25%, and economic risk, which accounts for the balance. While this table is dated, updated numbers are available for a hefty price. We have used the latest information in the public domain. Some university libraries have access to the updated data. While we have not updated the numbers, out of concerns about publishing proprietary data, you can get the latest PRS numbers by paying $99 on their website (http://www.prsgroup.com).

[89] Harvey, C.R., *Country Risk Components, the Cost of Capital, and Returns in Emerging Markets*, Working paper, Duke University. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=620710.

Table 12: Country Risk Scores – The Economist

Economist.com rankings

Country risk

Selected countries and territories, September 2008 (except where noted)

Least risky

Rank		Score*
1	Switzerland †	12
2	Finland **	14
	Norway **	14
	Sweden ††	14
5	Canada **	17
	Denmark †	17
	Netherlands §	17
8	Germany ††	18
9	Austria **	19
	France ††	19
11	Belgium ††	20
12	Singapore	21
13	Japan **	23
14	Ireland #	24
	Britain	24
	United States †	24

Most risky

Rank		Score
120	Zimbabwe	86
119	Iraq	80
118	Sudan	76
117	Myanmar	75
116	Nicaragua	69
115	Jamaica	68
114	Kenya	66
113	Cuba	64
112	Cambodia	62
111	Côte d'Ivoire	61
	Ecuador	61
	Pakistan	61
	Venezuela	61
	Vietnam	61
106	Syria	60

*Out of 100, with higher numbers indicating more risk. Scores are based on indicators from three categories: currency risk, sovereign debt risk and banking risk.

† May 2008; ** July 2008; †† June 2008; § August 2008; # February 2008

In fact, comparing the PRS and Economist measures of country risk provides some insight into the problems with using their risk measures. The first is that the measures may be internally consistent but are not easily comparable across different services. The Economist, for instance, assigns its lowest scores to the safest countries whereas PRS assigns the highest scores to these countries. The second is that, by their very nature, a significant component of these measures have to be black boxes to prevent others from replicating them at no cost. Third, the measures are not linear and the services do not claim that they are; a country with a risk score of 60 in the Economist measure is not twice as risky as a country with a risk score of 30.

iii. Market-based Measures

To those analysts who feel that ratings agencies are either slow to respond to changes in country risk or take too narrow a view of risk, there is always the alternative of using market based measures.

- Bond default spread: We can compute a default spread for a country if it has bonds that are denominated in currencies such as the US dollar, Euro or Yen, where there is a riskfree rate to compare it to. In January 2016, for instance, a 10-year US dollar denominated bond issued by the Brazilian government had a yield to maturity of 6.72%, giving it a default spread of 4.45% over the 10-year US treasury bond rate (2.27%), as of the same time.
- Credit Default Swap Spreads: In the last few years, credit default swaps (CDS) markets have developed, allowing us to obtain updated market measures of default risk in different entities. In particular, there are CDS spreads for countries (governments) that yield measures of default risk that are more updated and precise, at least in some cases, than bond default spreads.[90] Table 13 summarizes the CDS spreads for all countries where a CDS spread was available, in January 2016:

Table 13: Credit Default Swap Spreads (in basis points)– January 2016

Country	CDS	CDS(net US)	Country	CDS	CDS(net US)	Country	CDS	CDS(net US)
Abu Dhabi	1.21%	0.82%	Hungary	2.15%	1.76%	Peru	2.45%	2.06%
Australia	0.73%	0.34%	Iceland	0.80%	0.41%	Philippines	1.73%	1.34%
Austria	0.51%	0.12%	India	2.11%	1.72%	Poland	1.22%	0.83%
Bahrain	3.91%	3.52%	Indonesia	3.25%	2.86%	Portugal	2.44%	2.05%
Belgium	0.71%	0.32%	Ireland	0.80%	0.41%	Qatar	1.32%	0.93%
Brazil	5.58%	5.19%	Israel	1.26%	0.87%	Romania	1.74%	1.35%
Bulgaria	2.20%	1.81%	Italy	1.54%	1.15%	Russia	3.48%	3.09%
Chile	1.66%	1.27%	Japan	0.93%	0.54%	Saudi Arabia	1.93%	1.54%
China	1.62%	1.23%	Kazakhstan	3.30%	2.91%	Slovakia	0.94%	0.55%
Colombia	3.02%	2.63%	Korea	0.79%	0.40%	Slovenia	1.68%	1.29%
Costa Rica	4.83%	4.44%	Latvia	1.29%	0.90%	South Africa	3.88%	3.49%
Croatia	3.39%	3.00%	Lebanon	4.87%	4.48%	Spain	1.44%	1.05%
Cyprus	3.10%	2.71%	Lithuania	1.29%	0.90%	Sweden	0.35%	0.00%
Czech Republic	0.93%	0.54%	Malaysia	2.50%	2.11%	Switzerland	0.42%	0.03%

[90] The spreads are usually stated in US dollar or Euro terms.

Denmark	0.39%	0.00%	Mexico	2.30%	1.91%	Thailand	2.00%	1.61%
Egypt	5.27%	4.88%	Morocco	2.26%	1.87%	Tunisia	4.58%	4.19%
Estonia	0.85%	0.46%	Netherlands	0.37%	0.00%	Turkey	3.29%	2.90%
Finland	0.46%	0.07%	New Zealand	0.77%	0.38%	United Kingdom	0.42%	0.03%
France	0.60%	0.21%	Norway	0.35%	0.00%	United States of America	0.39%	0.00%
Germany	0.34%	0.00%	Pakistan	5.92%	5.53%	Vietnam	3.53%	3.14%
Hong Kong	0.78%	0.39%	Panama	2.33%	1.94%			

Source: Bloomberg; Spreads are for 10-year US $ CDS.

In January 2016, for instance, the CDS market yielded a spread of 5.58% for the Brazilian Government, higher than the 4.45% that we obtained from the 10-year dollar denominated Brazilian bond. However, the CDS market does have some counterparty risk exposure and there is no country with a zero CDS spread, indicating either that there is no entity with default risk or that the CDS spread is not a pure default spread. To counter that problem, we netted the US CDS spread of 0.39% from each country's CDS to get a modified measure of country default risk.[91] Using this approach for Brazil, for instance, yields a netted CDS spread of 5.19% (5.58% minus 0.39%) for the country.

- Market volatility: In portfolio theory, the standard deviation in returns is generally used as the proxy for risk. Extending that measure to emerging markets, there are some analysts who argue that the best measure of country risk is the volatility in local stock prices. Stock prices in emerging markets will be more volatile that stock prices in developed markets, and the volatility measure should be a good indicator of country risk. While the argument makes intuitive sense, the practical problem with using market volatility as a measure of risk is that it is as much a function of the underlying risk as it is a function of liquidity. Markets that are risky and illiquid often have low volatility, since you need trading to move stock prices. Consequently, using volatility measures will understate the risk of emerging markets that are illiquid and overstate the risk of liquid markets.

[91] If we assume that there is default risk in the US, we would subtract the default spread associated with this risk from the 0.67% first, before netting the value against other CDS spreads. Thus, if the default spread for the US is 0.15%, we would subtract out only 0.52% (0.67% - 0.15%) from each country's CDS spread to get to a corrected default spread for that country.

Market-based numbers have the benefit of constant updating and reflect the points of view of investors at any point in time. However, they also are also afflicted with all of the problems that people associate with markets – volatility, mood shifts and at times, irrationality. They tend to move far more than the other two measures – sovereign ratings and country risk scores – sometimes for good reasons and sometimes for no reason at all.

Estimating Country Risk Premium (for Equities)

How do we link a country risk measure to a country risk premium? In this section, we will look at three approaches. The first uses default spreads, based upon country bonds or ratings, whereas the latter two use equity market volatility as an input in estimating country risk premiums.

1. Default Spreads

The simplest and most widely used proxy for the country risk premium is the default spread that investors charge for buying bonds issued by the country. This default spread can be estimated in one of three ways.

a. Current Default Spread on Sovereign Bond or CDS market: As we noted in the last section, the default spread comes from either looking at the yields on bonds issued by the country in a currency where there is a default free bond yield to which it can be compared or spreads in the CDS market.[92] With the 10-year US dollar denominated Brazilian bond that we cited as an example in the last section, the default spread would have amounted to 4.45% in January 2016: the difference between the interest rate on the Brazilian bond and a treasury bond of the same maturity. The netted CDS market spread on the same day for the default spread was 5.19%. Bekaert, Harvey, Lundblad and Siegel (2014) break down the sovereign bond default spread into four components, including global economic conditions, country-specific economic factors, sovereign bond liquidity and policial risk, and find that it is the political risk component that best explain money flows into and out of the country equity markets.[93]

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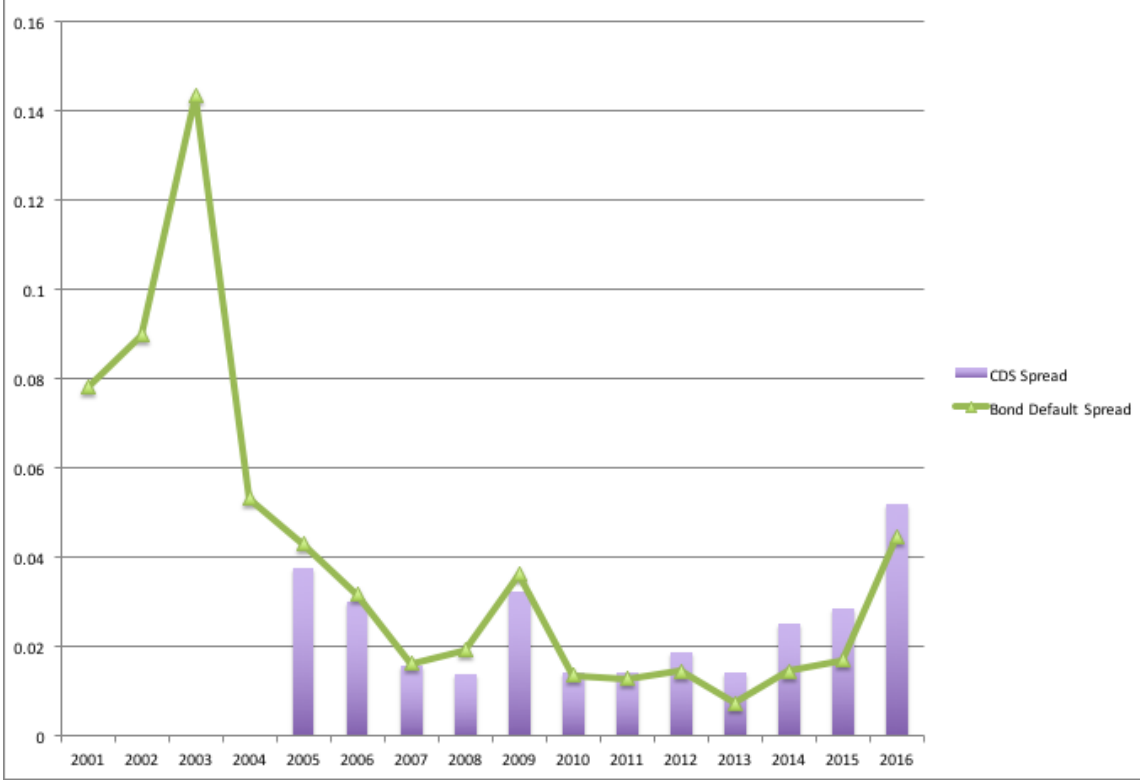
[92] You cannot compare interest rates across bonds in different currencies. The interest rate on a peso bond cannot be compared to the interest rate on a dollar denominated bond.

[93] Bekaert, G., C.R. Harvey, C.T. Lundblad and S. Siegel, 2014, *Political Risk Spreads*, Journal of International Business Studies, v45, 471-493.

<u>b. Average (Normalized) spread on bond</u>: While we can make the argument that the default spread in the dollar denominated is a reasonable measure of the default risk in Brazil, it is also a volatile measure. In figure 7, we have graphed the yields on the dollar denominated ten-year Brazilian Bond and the U.S. ten-year treasury bond and highlighted the default spread (as the difference between the two yields) from January 2000 to January 2016. In the same figure, we also show the 10-year CDS spreads and those spreads have not only changed over time, but they move with bond default spreads.[94]

Figure 7: Brazil - Bond Default Spread vs Sovereign CDS



Note that the bond default spread widened dramatically during 2002, mostly as a result of uncertainty in neighboring Argentina and concerns about the Brazilian presidential elections in that year.[95] After those elections, the spreads decreased just as quickly and continued on a downward trend through the middle of last year. Between 2004 and 2013, they stabilized, with a downward trend; they spiked during the market crisis in the last

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[94] Data for the sovereign CDS market is available only from the last part of 2004.

[95] The polls throughout 2002 suggested that Lula Da Silva who was perceived by the market to be a leftist would beat the establishment candidate. Concerns about how he would govern roiled markets and any poll that showed him gaining would be followed by an increase in the default spread.

quarter of 2008 but then settled back into pre-crisis levels. In the last three years, the spreads have widened in both markets as the country has been hit with a series of political and corporate scandals. Given this volatility, there are some who make the arguments we should consider the average spread over a period of time rather than the default spread at the moment. If we accept this argument, the normalized default spread, using the average spreads over the last 5 years of data would be 1.96% (bond default spread) or 2.78% (CDS spread). Using this approach makes sense only if the economic fundamentals of the country have not changed significantly (for the better or worse) during the period but will yield misleading values, if there have been structural shifts in the economy. In 2008, for instance, it would have made sense to use averages over time for a country like Nigeria, where oil price movements created volatility in spreads over time, but not for countries like China and India, which saw their economies expand and mature dramatically over the period or Venezuela, where government capriciousness made operating private businesses a hazardous activity (with a concurrent tripling in default spreads). In fact, the last year has seen a spike in the Brazilian default spread, partly the result of another election and partly because of worries about political corruption and worse in large Brazilian companies.

c. Imputed or Synthetic Spread: The two approaches outlined above for estimating the default spread can be used only if the country being analyzed has bonds denominated in US dollars, Euros or another currency that has a default free rate that is easily accessible. Most emerging market countries, though, do not have government bonds denominated in another currency and some do not have a sovereign rating. For the first group (that have sovereign rating but no foreign currency government bonds), there are two solutions. If we assume that countries with the similar default risk should have the same sovereign rating, we can use the typical default spread for other countries that have the same rating as the country we are analyzing and dollar denominated or Euro denominated bonds outstanding. Thus, Bulgaria, with a Baa2 rating, would be assigned the same default spread as Brazil, which also had a Baa2 rating in January 2016. For the second group, we are on even more tenuous grounds. Assuming that there is a country risk score from the Economist or PRS for the country, we could look for other countries that are rated and have similar scores and assign the default spreads that these countries face. For instance, we could assume that Cuba and Cameroon, which fall within the same score grouping from PRS, have similar country risk; this would lead us to attach Cuba's rating of Caa1 to Cameroon (which is not rated) and to use the same default spread (based on this rating) for both countries.

In table 14, we have estimated the typical default spreads for bonds in different sovereign ratings classes in January 2016. One problem that we had in obtaining the numbers for this table is that relatively few emerging markets have dollar or Euro denominated bonds outstanding. Consequently, there were some ratings classes where there was only one country with data and several ratings classes where there were none. To mitigate this problem, we used spreads from the CDS market, referenced in the earlier section. We were able to get default spreads for 65 countries, categorized by rating class, and we averaged the spreads across multiple countries in the same ratings class.[96] An alternative approach to estimating default spread is to assume that sovereign ratings are comparable to corporate ratings, i.e., a Ba1 rated country bond and a Ba1 rated corporate bond have equal default risk. In this case, we can use the default spreads on corporate bonds for different ratings classes. Table 14 summarizes the typical default spreads by sovereign rating class in January 2016, and compares it to the default spreads for similar corporate ratings.

Table 14: Default Spreads by Ratings Class – Sovereign vs. Corporate in January 2016

Rating	*Sovereign Bonds*	*Corporate Bonds*
Aaa/AAA	0.00%	0.75%
Aa1/AA+	0.44%	0.90%
Aa2/AA	0.55%	1.00%
Aa3/AA-	0.67%	1.05%
A1/A+	0.78%	1.10%
A2/A	0.94%	1.25%
A3/A-	1.33%	1.75%
Baa1/BBB+	1.77%	2.00%
Baa2/BBB	2.11%	2.25%
Baa3/BBB-	2.44%	2.75%
Ba1/BB+	2.77%	3.25%
Ba2/BB	3.33%	4.25%
Ba3/BB-	3.99%	4.50%
B1/B+	4.99%	5.50%

96 There were thirteen Baa2 rated countries, with ten-year CDS spreads, in January 2016. The average spread a these countries is 2.11%.

B2/B	6.10%	6.00%
B3/B-	7.21%	7.50%
Caa1/ CCC+	8.31%	8.25%
Caa2/CCC	9.98%	9.00%
Caa3/ CCC-	11.08%	10.00%
Ca/CC	13.30%	12.00%

Note that the corporate bond spreads, at least in January 2016, were slightly larger than the sovereign spreads for the higher ratings classes and were slightly lower at the lowest ratings. Using this approach to estimate default spreads for Brazil, with its rating of Baa2 would result in a spread of 2.11% (2.25%), if we use sovereign spreads (corporate spreads). These spreads are much smaller than the market-based spreads that we estimated for Brazil in the prior approaches, reflecting either the slowness of ratings agencies to adjust to reality on the ground or over reaction by markets.

Figure 8 depicts the alternative approaches to estimating default spreads for four countries, Brazil, China, India and Poland, in early 2016:

Figure 8: Approaches for estimating Sovereign Default Spreads

Estimating a default spread for a country or sovereign entity

Market Based estimates

Sovereign Bond spread
1. Find a bond issued by the country, denominated in US$ or Euros.
2. Compute the default spread by comparing to US treasury bond (if US $) or German Euro bond (if Euros).

CDS Market
1. Find a 10-year CDS for the country (if one exists)
2. Net out US CDS
2. This is your default spread.

	Sovereign Bond Yield	Currency	Risk free Rate	Default Spread	CDS Spread
Brazil	6.72%	US $	2.27%	4.45%	5.19%
China	NA	NA	NA	NA	1.23%
Russia	5.10%	US $	2.27%	2.83%	3.09%
India	NA	NA	NA	NA	1.72%

Rating/Risk score based estimates
Step 1: Find a sovereign rating (local currency) for the country (on Moody's or S&P)
Step 2: Look up the default spread for that rating in the lookup table below:

Rating	Typical Spread
Aaa/AAA	0.00%
Aa1/AA+	0.44%
Aa2/AA	0.55%
Aa3/AA-	0.67%
A1/A+	0.78%
A2/A	0.94%
A3/A-	1.33%
Baa1/BBB+	1.77%
Baa2/BBB	2.11%
Baa3/BBB-	2.44%
Ba1/BB+	2.77%
Ba2/BB	3.33%
Ba3/BB-	3.99%
B1/B+	4.99%
B2/B	6.10%
B3/B-	7.21%
Caa1/ CCC+	8.31%
Caa2/CCC	9.98%
Caa3/ CCC-	11.08%
Ca/CC	13.30%

Country	Moody's Rating	Default Spread (Lookup)
Brazil	Baa2	2.11%
China	Aa3	0.67%
Russia	Ba1	2.77%
India	Baa3	2.44%

With some countries, without US-dollar (or Euro) denominated sovereign bonds or CDS spreads, you don't have a choice since the only estimate of the default spread comes from the sovereign rating. With some countries, such as Brazil, you have multiple estimates of the default spreads: 4.45% from the dollar denominated bond, 5.58% from the CDS spread, 5.19% from the netted CDS spread and 2.11% from the sovereign rating look up table (table 14). When the numbers they yield are similar, as is the case with Russia (2.83% from the government bond, 3.09% from the CDS and 2.77% from the rating-based spread), you can pick any one of them and stay consistent through the analysis. When they yield very different estimates, as they did for Brazil in January 2016, you have to choose between the "updated but noisy" market number and the "stable but stagnant" rating-based spread.

Analysts who use default spreads as measures of country risk typically add them on to both the cost of equity and debt of every company traded in that country. Thus, the cost of equity for an Indian company, estimated in U.S. dollars, will be 2.44% higher than the cost of equity of an otherwise similar U.S. company, using the January 2016 measure of the default spread, based upon the rating. In some cases, analysts add the default spread to the U.S. risk premium and multiply it by the beta. This increases the cost of equity for high beta companies and lowers them for low beta firms.[97]

While many analysts use default spreads as proxies for country risk, the evidence for its use is still thin. Abuaf (2011) examines ADRs from ten emerging markets and relates the returns on these ADRs to returns on the S&P 500 (which yields a conventional beta) and to the CDS spreads for the countries of incorporation. He finds that ADR returns as well as multiples (such as PE ratios) are correlated with movement in the CDS spreads over time and argues for the addition of the CDS spread (or some multiple of it) to the costs of equity and capital to incorporate country risk.[98]

2. Relative Equity Market Standard Deviations

There are some analysts who believe that the equity risk premiums of markets should reflect the differences in equity risk, as measured by the volatilities of these markets. A conventional measure of equity risk is the standard deviation in stock prices; higher standard deviations are generally associated with more risk. If you scale the standard deviation of one market against another, you obtain a measure of relative risk. For instance, the relative standard deviation for country X (against the US) would be computed as follows:

$$\text{Relative Standard Deviation}_{\text{Country X}} = \frac{\text{Standard Deviation}_{\text{Country X}}}{\text{Standard Deviation}_{\text{US}}}$$

If we assume a linear relationship between equity risk premiums and equity market standard deviations, and we assume that the risk premium for the US can be computed (using historical data, for instance) the equity risk premium for country X follows:

$$\text{Equity risk premium}_{\text{Country X}} = \text{Risk Premum}_{\text{US}} * \text{Relative Standard Deviation}_{\text{Country X}}$$

[97] In a companion paper, I argue for a separate measure of company exposure to country risk called lambda that is scaled around one (just like beta) that is multiplied by the country risk premium to estimate the cost of equity. See Damodaran, A., 2007, Measuring Company Risk Exposure to Country Risk, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=889388.

[98] Abuaf, N., 2011, *Valuing Emerging Market Equities – The Empirical Evidence*, Journal of Applied Finance, v21, 123-138.

Assume, for the moment, that you are using an equity risk premium for the United States of 6.00%. The annualized standard deviation in the S&P 500 in two years preceding January 2016, using weekly returns, was 12.69%, whereas the standard deviation in the Bovespa (the Brazilian equity index) over the same period was 23.52%.[99] Using these values, the estimate of a total risk premium for Brazil would be as follows.

$$\text{Equity Risk Premium}_{Brazil} = 6.00\% * \frac{23.52\%}{12.69\%} = 11.12\%$$

The country risk premium for Brazil can be isolated as follows:

$$\text{Country Risk Premium}_{Brazil} = 11.12\% - 6.00\% = 5.12\%$$

Table 15 lists country volatility numbers for some of the Latin American markets and the resulting total and country risk premiums for these markets, based on the assumption that the equity risk premium for the United States is 6.00%. Appendix 4 contains a more complete list of emerging markets, with equity risk premiums and country risk premiums estimated for each.

Table 15: Equity Market Volatilities and Risk Premiums (Weekly returns: Jan 1, 2014-Jan 1, 2016): Latin American Countries

Country	*Standard deviation in Equities (weekly)*	*Relative Volatility (to US)*	*Total Equity Risk Premium*	*Country risk premium*
Argentina	38.11%	3.00	18.02%	12.02%
Brazil	23.52%	1.85	11.12%	5.12%
Chile	12.29%	0.97	5.81%	-0.19%
Colombia	17.48%	1.38	8.26%	2.26%
Costa Rica	8.31%	0.65	3.93%	-2.07%
Mexico	13.68%	1.08	6.47%	0.47%
Panama	4.69%	0.37	2.22%	-3.78%
Peru	15.94%	1.26	7.54%	1.54%
US	**12.69%**	1.00	**6.00%**	0.00%
Venezuela	51.23%	4.04	24.22%	18.22%

99 If the dependence on historical volatility is troubling, the options market can be used to get implied volatilities for both the US market (14.16%) and for the Bovespa (24.03%).

While this approach has intuitive appeal, there are problems with using standard deviations computed in markets with widely different market structures and liquidity. Since equity market volatility is affected by liquidity, with more liquid markets often showing higher volatility, this approach will understate premiums for illiquid markets and overstate the premiums for liquid markets. For instance, the standard deviations for Chile, Panama and Costa Rica are lower than the standard deviation in the S&P 500, leading to equity risk premiums for those countries that are lower than the US. The second problem is related to currencies since the standard deviations are usually measured in local currency terms; the standard deviation in the U.S. market is a dollar standard deviation, whereas the standard deviation in the Brazilian market is based on nominal Brazilian Real returns. This is a relatively simple problem to fix, though, since the standard deviations can be measured in the same currency – you could estimate the standard deviation in dollar returns for the Brazilian market.

3. Default Spreads + Relative Standard Deviations

In the first approach to computing equity risk premiums, we assumed that the default spreads (actual or implied) for the country were good measures of the additional risk we face when investing in equity in that country. In the second approach, we argued that the information in equity market volatility can be used to compute the country risk premium. In the third approach, we will meld the first two, and try to use the information in both the country default spread and the equity market volatility.

The country default spreads provide an important first step in measuring country equity risk, but still only measure the premium for default risk. Intuitively, we would expect the country equity risk premium to be larger than the country default risk spread. To address the issue of how much higher, we look at the volatility of the equity market in a country relative to the volatility of the bond market used to estimate the spread. This yields the following estimate for the country equity risk premium.

$$\text{Country Risk Premium} = \text{Country Default Spread} * \left(\frac{\sigma_{\text{Equity}}}{\sigma_{\text{Country Bond}}} \right)$$

To illustrate, consider again the case of Brazil. As noted earlier, the default spread for Brazil in January 2016, based upon its sovereign rating, was 2.11%. We computed annualized standard deviations, using two years of weekly returns, in both the equity market and the government bond, in January 2016. The annualized standard deviation in the Brazilian dollar denominated ten-year bond was 11.69%, well below the standard deviation in the Brazilian equity index of 23.52%. The resulting country equity risk premium for Brazil is as follows:

$$\text{Brazil Country Risk Premium} = 2.11\% * \frac{23.52\%}{11.69\%} = 4.25\%$$

Unlike the equity standard deviation approach, this premium is in addition to a mature market equity risk premium. Thus, assuming a 6.00% mature market premium, we would compute a total equity risk premium for Brazil of 10.25%:

Brazil's Total Equity Risk Premium = 6.00% + 4.25% = 10.25%

Note that this country risk premium will increase if the country rating drops or if the relative volatility of the equity market increases.

Why should equity risk premiums have any relationship to country bond spreads? A simple explanation is that an investor who can make 2.11% risk premium on a dollar-denominated Brazilian government bond would not settle for an additional risk premium of 2.11% (in dollar terms) on Brazilian equity. Playing devil's advocate, however, a critic could argue that the interest rate on a country bond, from which default spreads are extracted, is not really an expected return since it is based upon the promised cash flows (coupon and principal) on the bond rather than the expected cash flows. In fact, if we wanted to estimate a risk premium for bonds, we would need to estimate the expected return based upon expected cash flows, allowing for the default risk. This would result in a lower default spread and equity risk premium. Both this approach and the last one use the standard deviation in equity of a market to make a judgment about country risk premium, but they measure it relative to different bases. This approach uses the country bond as a base, whereas the previous one uses the standard deviation in the U.S. market. This approach assumes that investors are more likely to choose between Brazilian bonds and Brazilian equity, whereas the previous approach assumes that the choice is across equity markets.

There are three potential measurement problems with using this approach. The first is that the relative standard deviation of equity is a volatile number, both across countries and across time. The second is that computing the relative volatility requires us to estimate volatility in the government bond, which, in turn, presupposes that long-term government bonds not only exist but are also traded.[100] The third is that even if an emerging market meet the conditions of having a government bond that is traded, the trading is often so light that the standard deviation is too low (and the relative volatility value is too high). To illustrate the volatility in this number, note the range of values in the estimates of relative volatility at the start of 2015:

Table 16: Relative Equity Market Volatility – Government Bonds and CDS

	$\sigma_{Equity} / \sigma_{Bond}$	$\sigma_{Equity} / \sigma_{CDS}$
Number of countries with data	26	46
Average	2.15	1.14
Median	2.01	0.87
Maximum	5.65	5.08
Minimum	0.48	0.21

Note that there were only 24 markets, where volatility estimates on government bonds were available, and even in those markets, the relative volatility measure ranged from a high of 5.65 to a low of 0.37. There is some promise in the sovereign CDS market, both because you have more countries where you have traded CDS, but also because it is a more volatile market. In fact, the relative volatility measure there has a median value less than one, but the range in relative equity volatility values is even higher.

The problems associated with computing country-specific government bond or sovereign CDS volatility are increasingly overwhelming its intuitive appeal and it is worth looking at two alternatives.[101] One is to revert back to the first approach of using the default spreads as country risk premiums. The other is to compare the standard deviation of an emerging market equity index and that of a an emerging market government bond index and to use this use this ratio as the scaling variable for all emerging market default spreads. While there will be some loss of information at the country level, the use of indices should allow for aggregation across multiple countries and perhaps give a more reliable and stable

[100] One indication that the government bond is not heavily traded is an abnormally low standard deviation on the bond yield.

[101] Thanks are due to the Value Analysis team at Temasek, whose detailed and focused work on the imprecision of government bond volatility finally led to this break.

measure of relative risk in equity markets. To this end, we computed the standard deviations in the S&P BMI Emerging Market Index (for equity) and the Bank of America Merrill Lynch Emerging Market Public Sector Bond Index (for sovereign debt) as of January 1, 2016, and computed a relative equity market volatility of 1.39:

$$\text{Relative Equity Volatility}_{EM} = \frac{Standard\ Deviation\ of\ S\&P\ BMI\ Emerging\ Markets}{Standard\ Deviation\ of\ BAML\ Emerging\ Market\ Public\ Bonds}$$

$$= 15.32\%/\ 11.00\% = 1.39$$

Applying this multiple to each country's default spread, you can estimate a country risk premium for that country, which when added on to the base premium for a mature market should yield an equity risk premium for that country. In fact, with this multiple applied to Brazil's default spread of 2.11% in January 2016, you would have obtained a country risk premium of 2.93% for Brazil and a total equity risk premium of 8.93% (using 6% as the estimate for a mature market premium).

Country Risk Premium for Brazil = 2.11% *1.39 = 2.93%

Equity Risk Premium for Brazil = 6% + 2.93% = 8.93%

Choosing between the approaches

It is ironic that as investors and companies go global, our approaches for dealing with country risk remain unpolished. Each of the approaches described in this section come with perils and can yield very different values. Table 17 summarizes the estimates of country risk and total equity risk premiums, using the three approaches, with sub-variants, for Brazil in January 2016:

Table 17: Country and Total Equity Risk Premium: Brazil in January 2016

Approach	*ERP*	*CRP*
Rating-based Default Spread	8.11%	2.11%
$-Bond based Default Spread	10.45%	4.45%
CDS-based Default Spread	11.19%	5.19%
Relative Equity Market Volatility	11.12%	5.12%
Default Spread, scaled for equity risk with Brazil Govt Bond	10.25%	4.25%
Default Spread, scaled for equity risk with EM multiple	8.93%	2.93%

The CDS and relative equity market approaches yield similar equity risk premiums, but that is more the exception than the rule. Fro the moment, we will be using the last estimate of 8.93%, with the default spread scaled to a emerging market multiple of 1.39. With all the approaches, just as companies mature and become less risky over time, countries can mature and become less risky as well and it is reasonable to assume that country risk premiums decrease over time, especially for risky and rapidly evolving markets. One way to adjust country risk premiums over time is to begin with the premium that emerges from the melded approach and to adjust this premium down towards either the country bond default spread or even a regional average. Thus, the equity risk premium will converge to the country bond default spread as we look at longer term expected returns. As an illustration, the country risk premium for Brazil would be 2.93% for the next year but decline over time to 2.11% (country default spread) or perhaps even lower, depending upon your assessment of how Brazil's economy will evolve over time.

Implied Equity Premiums

The problem with any historical premium approach, even with substantial modifications, is that it is backward looking. Given that our objective is to estimate an updated, forward-looking premium, it seems foolhardy to put your faith in mean reversion and past data. In this section, we will consider three approaches for estimating equity risk premiums that are more forward looking.

1. DCF Model Based Premiums

When investors price assets, they are implicitly telling you what they require as an expected return on that asset. Thus, if an asset has expected cash flows of $15 a year in perpetuity, and an investor pays $75 for that asset, he is announcing to the world that his required rate of return on that asset is 20% (15/75). In this section, we expand on this intuition and argue that the current market prices for equity, in conjunction with expected cash flows, should yield an estimate on the equity risk premium.

A Stable Growth DDM Premium

It is easiest to illustrated implied equity premiums with a dividend discount model (DDM). In the DDM, the value of equity is the present value of expected dividends from the investment. In the special case where dividends are assumed to grow at a constant rate forever, we get the classic stable growth (Gordon) model:

$$\text{Value of equity} = \frac{\text{Expected Dividends Next Period}}{\text{(Required Return on Equity - Expected Growth Rate)}}$$

This is essentially the present value of dividends growing at a constant rate. Three of the four inputs in this model can be obtained or estimated - the current level of the market (value), the expected dividends next period and the expected growth rate in earnings and dividends in the long term. The only "unknown" is then the required return on equity; when we solve for it, we get an implied expected return on stocks. Subtracting out the riskfree rate will yield an implied equity risk premium.

To illustrate, assume that the current level of the S&P 500 Index is 900, the expected dividend yield on the index is 2% and the expected growth rate in earnings and dividends in the long term is 7%. Solving for the required return on equity yields the following:

$$900 = (.02*900) /(r - .07)$$

Solving for r,

$$r = (18+63)/900 = 9\%$$

If the current riskfree rate is 6%, this will yield a premium of 3%.

In fact, if we accept the stable growth dividend discount model as the base model for valuing equities and assume that the expected growth rate in dividends should equate to the riskfree rate in the long term, the dividend yield on equities becomes a measure of the equity risk premium:

$$\text{Value of equity} = \frac{\text{Expected Dividends Next Period}}{\text{(Required Return on Equity - Expected Growth Rate)}}$$

Dividends/ Value of Equity = Required Return on Equity – Expected Growth rate

Dividend Yield = Required Return on Equity – Riskfree rate

= Equity Risk Premium

Rozeff (1984) made this argument[102] and empirical support has been claimed for dividend yields as predictors of future returns in many studies since.[103] Note that this simple equation

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[102] Rozeff, M. S. 1984. *Dividend yields are equity risk premiums*, Journal of Portfolio Management, v11, 68-75.

[103] Fama, E. F., and K. R. French. 1988. *Dividend yields and expected stock returns*. Journal of Financial Economics, v22, 3-25.

will break down if (a) companies do not pay out what they can afford to in dividends, i.e., they hold back cash or (b) if earnings are expected to grow at extraordinary rates for the short term.

There is another variant of this model that can be used, where we focus on earnings instead of dividends. To make this transition, though, we have to state the expected growth rate as a function of the payout ratio and return on equity (ROE) :[104]

Growth rate = (1 – Dividends/ Earnings) (Return on equity)

= (1 – Payout ratio) (ROE)

Substituting back into the stable growth model,

$$\text{Value of equity} = \frac{\text{Expected Earnings Next Period (Payout ratio)}}{\text{(Required Return on Equity - (1-Payout ratio) (ROE))}}$$

If we assume that the return on equity (ROE) is equal to the required return on equity (cost of equity), i.e., that the firm does not earn excess returns, this equation simplifies as follows:

$$\text{Value of equity} = \frac{\text{Expected Earnings Next Period}}{\text{Required Return on Equity}}$$

In this case, the required return on equity can be written as:

$$\text{Required return on equity} = \frac{\text{Expected Earnings Next Period}}{\text{Value of Equity}}$$

In effect, the inverse of the PE ratio (also referenced as the earnings yield) becomes the required return on equity, <u>if firms are in stable growth and earning no excess returns</u>. Subtracting out the riskfree rate should yield an implied premium:

Implied premium (EP approach) = Earnings Yield on index – Riskfree rate

In January 2015, the first of these approaches would have delivered a very low equity risk premium for the US market.

Dividend Yield = 1.87%

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[104] This equation for sustainable growth is discussed more fully in Damodaran, A., 2002, Investment Valuation, John Wiley and Sons.

The second approach of netting the earnings yield against the risk free rate would have generated a more plausible number[105]:

Earnings Yield = 5.57%:

Implied premium = Earnings yield – 10-year US Treasury Bond rate

= 5.57% - 2.17% = 3.40%

Both approaches, though, draw on the dividend discount model and make strong assumptions about firms being in stable growth and/or long-term excess returns.

A Generalized Model: Implied Equity Risk Premium

To expand the model to fit more general specifications, we would make the following changes: Instead of looking at the actual dividends paid as the only cash flow to equity, we would consider potential dividends instead of actual dividends. In my earlier work (2002, 2006), the free cash flow to equity (FCFE), i.e, the cash flow left over after taxes, reinvestment needs and debt repayments, was offered as a measure of potential dividends.[106] Over the last decade, for instance, firms have paid out only about half their FCFE as dividends. If this poses too much of an estimation challenge, there is a simpler alternative. Firms that hold back cash build up large cash balances that they use over time to fund stock buybacks. Adding stock buybacks to aggregate dividends paid should give us a better measure of total cash flows to equity. The model can also be expanded to allow for a high growth phase, where earnings and dividends can grow at rates that are very different (usually higher, but not always) than stable growth values. With these changes, the value of equity can be written as follows:

$$\text{Value of Equity} = \sum_{t=1}^{t=N} \frac{E(FCFE_t)}{(1+k_e)^t} + \frac{E(FCFE_{N+1})}{(k_e - g_N)\,(1+k_e)^N}$$

In this equation, there are N years of high growth, $E(FCFE_t)$ is the expected free cash flow to equity (potential dividend) in year t, k_e is the rate of return expected by equity investors and g_N is the stable growth rate (after year N). We can solve for the rate of return equity

[105] The earnings yield in January 2015 is estimated by dividing the aggregated earnings for the index by the index level.

[106] Damodaran, A., 2002, *Investment Valuation*, John Wiley and Sons; Damodaran, A., 2006, *Damodaran on Valuation*, John Wiley and Sons.

investors need, given the expected potential dividends and prices today. Subtracting out the riskfree rate should generate a more realistic equity risk premium.

In a variant of this approach, the implied equity risk premium can be computed from excess return or residual earnings models. In these models, the value of equity today can be written as the sum of capital invested in assets in place and the present value of future excess returns:[107]

$$\text{Value of Equity} = \text{Book Equity today} + \sum_{t=1}^{t=\infty} \frac{\text{Net Income}_t - k_e(\text{Book Equity}_{t-1})}{(1+k_e)^t}$$

If we can make estimates of the book equity and net income in future periods, we can then solve for the cost of equity and use that number to back into an implied equity risk premium. Claus and Thomas (2001) use this approach, in conjunction with analyst forecasts of earnings growth, to estimate implied equity risk premiums of about 3% for the market in 2000.[108] Easton (2007) provides a summary of possible limitations of models that attempt to extract costs of equity from accounting data including the unreliability of book value numbers and the use of optimistic estimates of growth from analysts.[109]

Implied Equity Risk Premium: S&P 500

Given its long history and wide following, the S&P 500 is a logical index to use to try out the implied equity risk premium measure. In this section, we will begin by estimating implied equity risk premiums at the start of the years 2008 to 2016, and follow up by looking at the volatility in that estimate over time.

Implied Equity Risk Premiums: Annual Estimates from 2008 to 2016

On December 31, 2007, the S&P 500 Index closed at 1468.36, and the dividend yield on the index was roughly 1.89%. In addition, the consensus estimate of growth in earnings for companies in the index was approximately 5% for the next 5 years.[110] Since this is not a growth rate that can be sustained forever, we employ a two-stage valuation

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[107] For more on excess return models, see Damodaran, A, 2006, *Valuation Approaches and Metrics: A Survey of the Theory and Evidence,* Working Paper, www.damodaran.com.

[108] Claus, J. and J. Thomas, 2001,'*Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets*, Journal of Finance 56(5), 1629–1666.

[109] Easton, P., 2007, *Estimating the cost of equity using market prices and accounting data*, Foundations and Trends in Accounting, v2, 241-364.

[110] We used the average of the analyst estimates for individual firms (bottom-up). Alternatively, we could have used the top-down estimate for the S&P 500 earnings.

model, where we allow growth to continue at 5% for 5 years, and then lower the growth rate to 4.02% (the riskfree rate) after that.[111] Table 18 summarizes the expected dividends for the next 5 years of high growth, and for the first year of stable growth thereafter:

Table 18: Estimated Dividends on the S&P 500 Index – January 1, 2008

Year	*Dividends on Index*
1	29.12
2	30.57
3	32.10
4	33.71
5	35.39
6	36.81

[a]Dividends in the first year = 1.89% of 1468.36 (1.05)

If we assume that these are reasonable estimates of the expected dividends and that the index is correctly priced, the value can be written as follows:

$$1468.36 = \frac{29.12}{(1+r)} + \frac{30.57}{(1+r)^2} + \frac{32.10}{(1+r)^3} + \frac{33.71}{(1+r)^4} + \frac{35.39}{(1+r)^5} + \frac{36.81}{(r-.0402)(1+r)^5}$$

Note that the last term in the equation is the terminal value of the index, based upon the stable growth rate of 4.02%, discounted back to the present. Solving for required return in this equation yields us a value of 6.04%. Subtracting out the ten-year treasury bond rate (the riskfree rate) yields an implied equity premium of 2.02%.

The focus on dividends may be understating the premium, since the companies in the index have bought back substantial amounts of their own stock over the last few years. In 2007, for instance, firms collectively returned more than twice as much in the form of buybacks than they paid out in dividends. Since buybacks are volatile over time, and 2007 may represent a high-water mark for the phenomenon, we recomputed the expected cash flows, in table 19, for the next 6 years using the average total yield (dividends + buybacks) of 4.11%, instead of the actual dividends, and the growth rates estimated earlier (5% for the next 5 years, 4.02% thereafter):

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[111] The treasury bond rate is the sum of expected inflation and the expected real rate. If we assume that real growth is equal to the real interest rate, the long term stable growth rate should be equal to the treasury bond rate.

Table 19: Cashflows on S&P 500 Index

Year	*Dividends+ Buybacks on Index*
1	63.37
2	66.54
3	69.86
4	73.36
5	77.02

Using these cash flows to compute the expected return on stocks, we derive the following:

$$1468.36 = \frac{63.37}{(1+r)} + \frac{66.54}{(1+r)^2} + \frac{69.86}{(1+r)^3} + \frac{73.36}{(1+r)^4} + \frac{77.02}{(1+r)^5} + \frac{77.02(1.0402)}{(r-.0402)(1+r)^5}$$

Solving for the required return and the implied premium with the higher cash flows:

Required Return on Equity = 8.39%

Implied Equity Risk Premium = Required Return on Equity - Riskfree Rate

= 8.48% - 4.02% = 4.46%

This value (4.46%) would have been our estimate of the equity risk premium on January 1, 2008.

During 2008, the S&P 500 lost just over a third of its value and ended the year at 903.25 and the treasury bond rate plummeted to close at 2.21% on December 31, 2008. Firms also pulled back on stock buybacks and financial service firms in particular cut dividends during the year. The inputs to the equity risk premium computation reflect these changes:

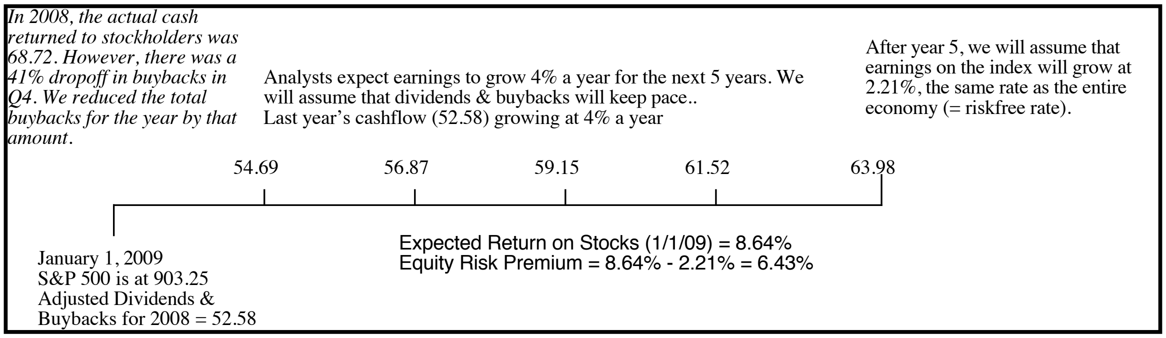
Level of the index = 903.25 (Down from 1468.36)

Treasury bond rate = 2.21% (Down from 4.02%)

Updated dividends and buybacks on the index = 52.58 (Down about 15%)

Expected growth rate = 4% for next 5 years (analyst estimates) and 2.21% thereafter (set equal to riskfree rate).

The computation is summarized below:



The resulting equation is below:

$$903.25 = \frac{54.69}{(1+r)} + \frac{56.87}{(1+r)^2} + \frac{59.15}{(1+r)^3} + \frac{61.52}{(1+r)^4} + \frac{63.98}{(1+r)^5} + \frac{63.98(1.0221)}{(r-.0221)(1+r)^5}$$

Solving for the required return and the implied premium with the higher cash flows:

Required Return on Equity = 8.64%

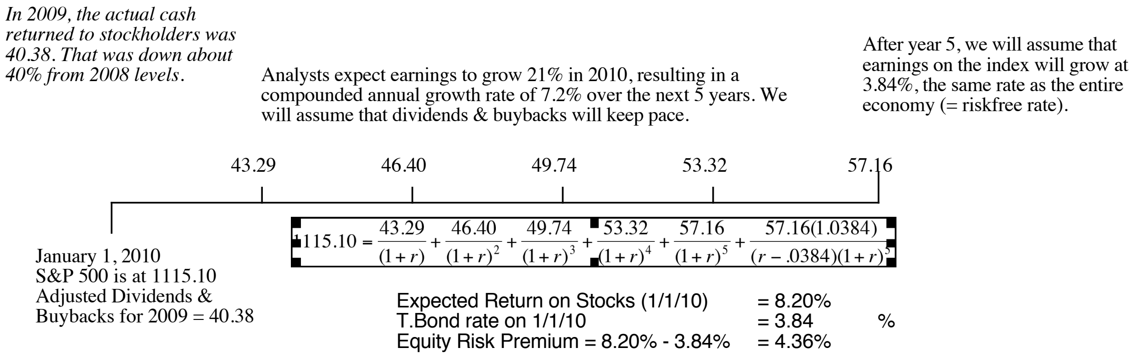
Implied Equity Risk Premium = Required Return on Equity - Riskfree Rate

= 8.64% - 2.21% = 6.43%

The implied premium rose more than 2%, from 4.37% to 6.43%, over the course of the year, indicating that investors perceived more risk in equities at the end of the year, than they did at the start and were demanding a higher premium to compensate.

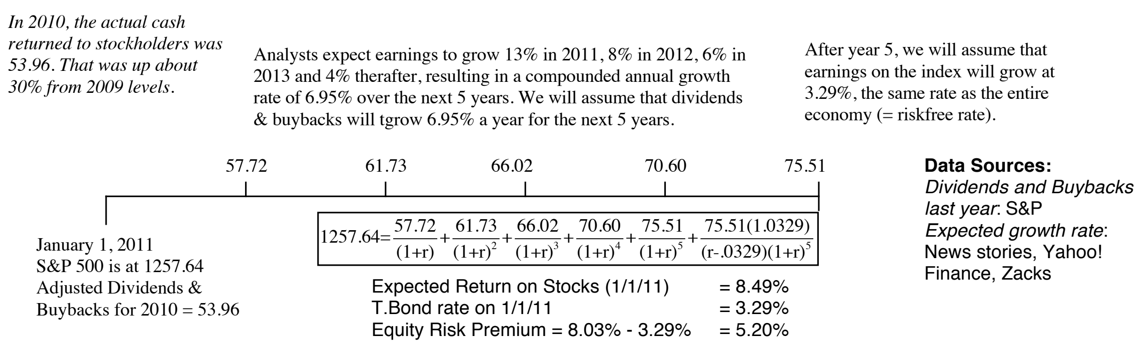
By January 2010, the fears of a banking crisis had subsided and the S&P 500 had recovered to 1115.10. However, a combination of dividend cuts and a decline in stock buybacks had combined to put the cash flows on the index down to 40.38 in 2009. That was partially offset by increasing optimism about an economic recovery and expected earnings growth for the next 5 years had bounced back to 7.2%.[112] The resulting equity risk premium is 4.36%:

[112] The expected earnings growth for just 2010 was 21%, primarily driven by earnings bouncing back to pre-crisis levels, followed by a more normal 4% earnings growth in the following years. The compounded average growth rate is $((1.21)\,(1.04)^4)^{1/5}-1= .072$ or 7.2%.



In effect, equity risk premiums have reverted back to what they were before the 2008 crisis.

Updating the numbers to January 2011, the S&P 500 had climbed to 1257.64, but cash flows on the index, in the form of dividends and buybacks, made an even more impressive comeback, increasing to 53.96 from the depressed 2009 levels. The implied equity risk premium computation is summarized below:



The implied equity risk premium climbed to 5.20%, with the higher cash flows more than offsetting the rise in equity prices.

The S&P 500 ended 2011 at 1257.60, almost unchanged from the level at the start of the year. The other inputs into the implied equity risk premium equation changed significantly over the year:

a. The ten-year treasury bond rate dropped during the course of the year from 3.29% to 1.87%, as the European debt crisis caused a "flight to safety". The US did lose its AAA rating with Standard and Poor's during the course of the year, but we will continue to assume that the T.Bond rate is risk free.
b. Companies that had cut back dividends and scaled back stock buybacks in 2009, after the crisis, and only tentatively returned to the fray in 2010, returned to buying

back stocks at almost pre-crisis levels. The total dividends and buybacks for the trailing 12 months leading into January 2012 climbed to 72.23, a significant increase over the previous year.[113]

c. Analysts continued to be optimistic about earnings growth, in the face of signs of a pickup in the US economy, forecasting growth rate of 9.6% for 2012 (year 1), 11.9% in 2013, 8.2% in 2014, 4% in 2015 and 2.5% in 2016, leading to a compounded annual growth rate of 7.18% a year.

Incorporating these inputs into the implied equity risk premium computation, we get an expected return on stocks of 9.29% and an implied equity risk premium of 7.32%:

In the trailing 12 months, the cash returned to stockholders was 72.23.

Analysts expect earnings to grow 9.6% in 2012, 11.9% in 2013, 8.2% in 2014, 4.5% in 2015 and 2% therafter, resulting in a compounded annual growth rate of 7.18% over the next 5 years. We will assume that dividends & buybacks will grow 7.18% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.87%, the same rate as the entire economy (= riskfree rate).

77.41 | 82.97 | 88.93 | 95.31 | 102.16

January 1, 2012
S&P 500 is at 1257.60
Dividends & Buybacks for 2011 = 72.23

$$1257.60 = \frac{77.41}{(1+r)} + \frac{82.97}{(1+r)^2} + \frac{88.93}{(1+r)^3} + \frac{95.31}{(1+r)^4} + \frac{102.16}{(1+r)^5} + \frac{102.16(1.0187)}{(r-.0187)(1+r)^5}$$

Expected Return on Stocks (1/1/12) = 9.19%
T.Bond rate on 1/1/12 = 1.87%
Equity Risk Premium = 7.91% - 1.87% = 7.32%

Data Sources:
Dividends and Buybacks last year: S&P
Expected growth rate: News stories, Yahoo! Finance, Bloomberg

Since the index level did not change over the course of the year, the jump in the equity risk premium from 5.20% on January 1, 2011 to 7.32% on January 1, 2012, was precipitated by two factors. The first was the drop in the ten-year treasury bond rate to a historic low of 1.87% and the second was the surge in the cash returned to stockholders, primarily in buybacks. With the experiences of the last decade fresh in our minds, we considered the possibility that the cash returned during the trailing 12 months may reflect cash that had built up during the prior two years, when firms were in their defensive posture. If that were the case, it is likely that buybacks will decline to a more normalized value in future years. To estimate this value, we looked at the total cash yield on the S&P 500 from 2002 to 2011 and computed an average value of 4.69% over the decade in table 20.

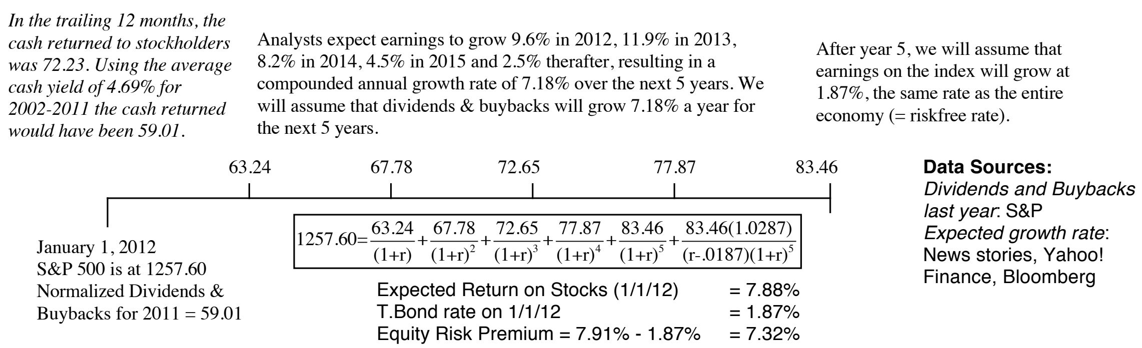
Table 20: Dividends and Buybacks on S&P 500 Index: 2002-2011

Year	Dividend Yield	Buybacks/Index	Yield

[113] These represented dividends and stock buybacks from October 1, 2010 to September 30, 2011, based upon the update from S&P on December 22, 2011. The data for the last quarter is not made available until late March of the following year.

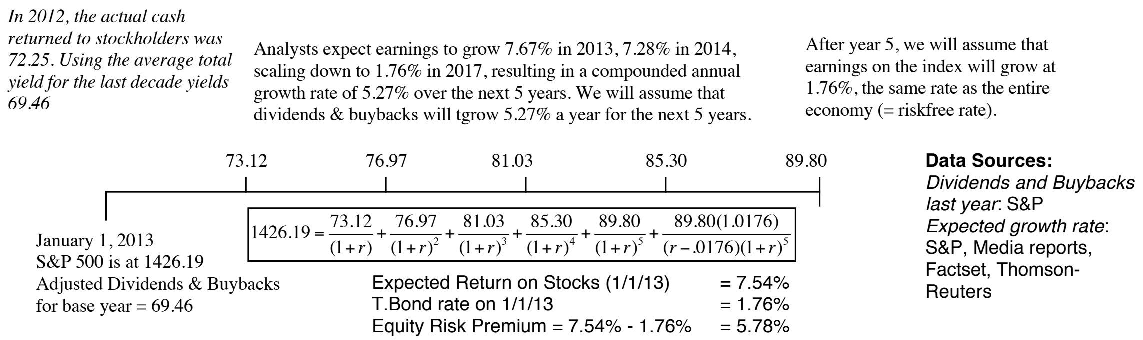
2002	1.81%	1.58%	3.39%
2003	1.61%	1.23%	2.84%
2004	1.57%	1.78%	3.35%
2005	1.79%	3.11%	4.90%
2006	1.77%	3.39%	5.16%
2007	1.92%	4.58%	6.49%
2008	3.15%	4.33%	7.47%
2009	1.97%	1.39%	3.36%
2010	1.80%	2.61%	4.42%
2011	2.00%	3.53%	5.54%
Average: Last 10 years =			4.69%

Assuming that the cash returned would revert to this yield provides us with a lower estimate of the cash flow (4.69% of 1257.60= 59.01) and an equity risk premium of 6.01%:



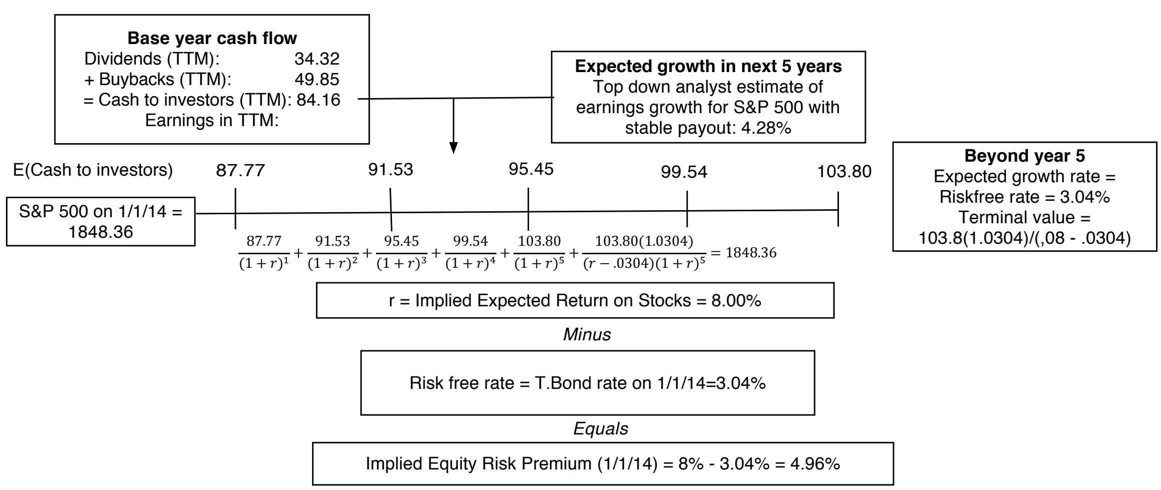
So, did the equity risk premium for the S&P 500 jump from 5.20% to 7.32%, as suggested by the raw cash yield, or from 5.20% to 6.01%, based upon the normalized yield? We would be more inclined to go with the latter, especially since the index remained unchanged over the year. Note, though, that if the cash returned by firms does not drop back in the next few quarters, we will revisit the assumption of normalization and the resulting lower equity risk premium.

By January 1, 2013, the S&P 500 climbed to 1426.19 and the treasury bond rate had dropped to 1.76%. The dividends and buybacks were almost identical to the prior year and the smoothed out cash returned (using the average yield over the prior 10 years) climbed to 69.46. Incorporating the lower growth expectations leading into 2013, the implied equity risk premium dropped to 5.78% on January 1, 2013:

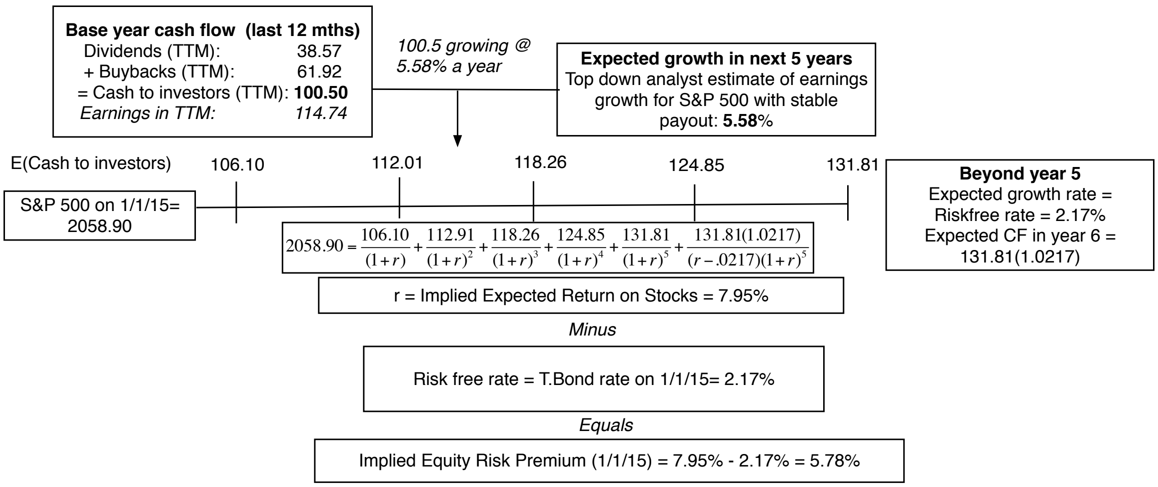


Note that the chasm between the trailing 12-month cash flow premium and the smoother cash yield premium that had opened up at the start of 2012 had narrowed. The trailing 12-month cash flow premium was 6%, just 0.22% higher than the 5.78% premium obtained with the smoothed out cash flow.

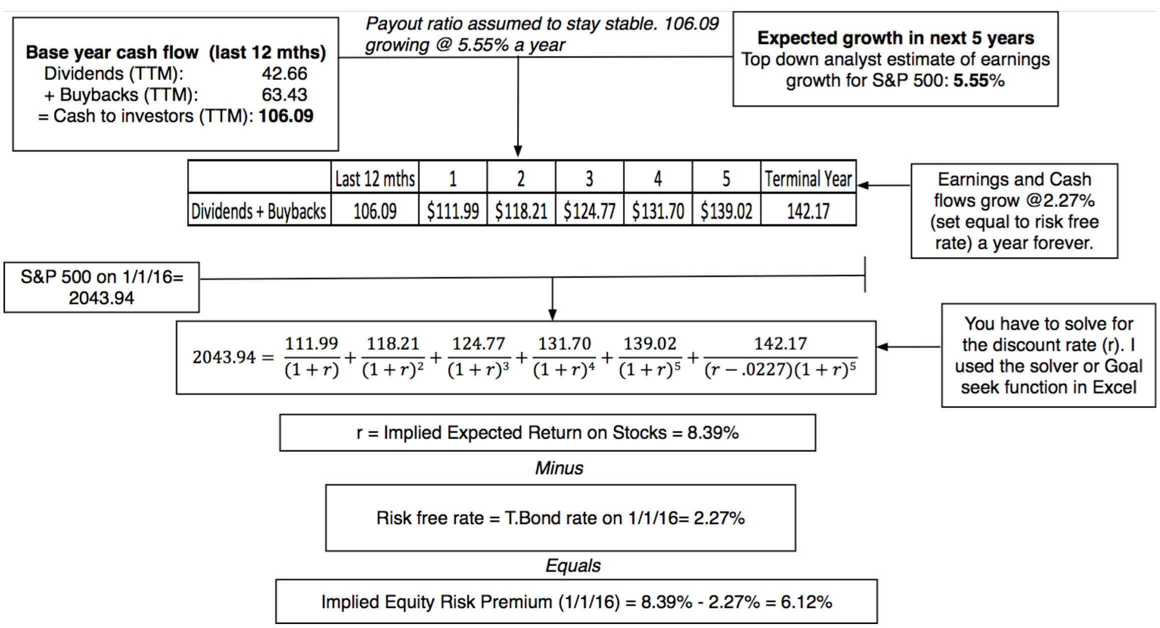
After a good year for stocks, the S&P 500 was at 1848.36 on January 1, 2014, up 29.6% over the prior year, and cash flows also jumped to 84.16 over the trailing 12 months (ending September 30, 2013), up 16.48% over the prior year. Incorporating an increase in the US ten-year treasury bond rate to 3.04%, the implied equity risk premium at the start of 2014 was 4.96%.



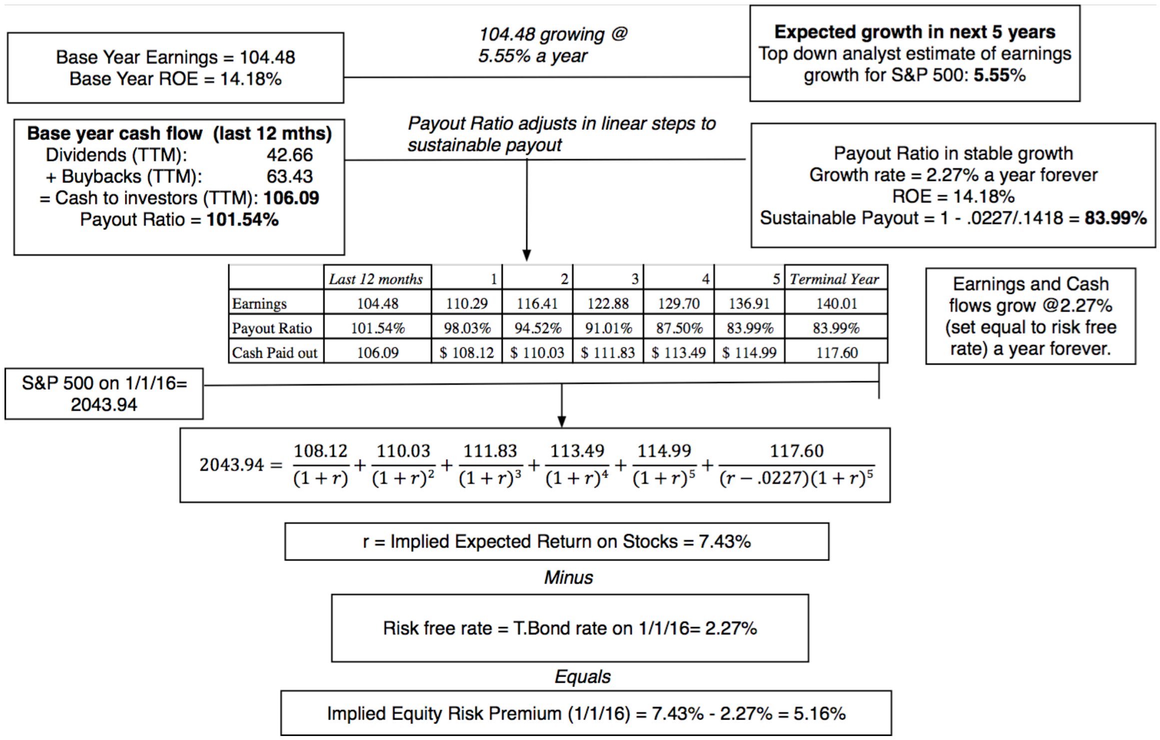
During 2014, stocks continued to rise, albeit at a less frenetic pace, and the US ten-year treasury bond rate dropped back again to 2.17%. Since buybacks and dividends grew at higher rate than prices, the net effect was an increase in the implied equity risk premium to 5.78% at the start of 2015:



At the start of 2016, we updated the implied equity risk premium after a year in which stocks were flat and the treasury bond rate moved up slightly to 2.27%. The resulting implied premium was 6.12%:



One troubling aspect of cash flows in the twelve months leading into January 1, 2016, was that the companies in the S&P 500 collectively returned 106.09 in cash flows, 101.54% of earnings during the period and inconsistent with the assumption that earnings would continue to grow over time. To correct for this, I recomputed the equity risk premium with the assumption that the cash payout would decrease over time to a sustainable level and came up with an equity risk premium of 5.16%.



This recomputed premium, though, cannot be compared easily with my estimates of the risk premiums with earlier years (since I did not use the same payout adjustment assumption in earlier years) but it does indicate the reasons why there can be differences in estimated implied premiums across investors.

A Term Structure for Equity Risk Premiums

When we estimate an implied equity risk premium, from the current level of the index and expected future cash flows, we are estimating a compounded average equity risk premium over the long term. Thus, the 5.78% estimate of the equity risk premium at the start of 2015 is the geometric average of the annualized equity risk premiums in future years and is analogous to the yield to maturity on a long term bond.

But is it possible that equity risk premiums have a term structure, just as interest rates do? Absolutely. In a creative attempt to measure the slope of the term structure of equity risk premiums, Binsberger, Brandt and Koijen (2012) use dividend strips, i.e., short term assets that pay dividends for finite time periods (and have no face value), to extract equity risk premiums for the short term as opposed to the long term. Using dividend strips on the S&P 500 to extract expected returns from 1996 to 2009, they find that equity risk premiums are higher for shorter term claims than for longer term claims, by approximately 2.75%.[114] Their findings are contested by Boguth, Carlson, Fisher and Simutin (2011), who note that small market pricing frictions are amplified when valuing synthetic dividend strips and that using more robust return measures results in no significant differences between short term and longer term equity risk premiums.[115] Schulz (2015) argues that the finding of a term structure in equity risk premiums may arise from a failure to consider differential tax treatment of dividends, as opposed to capital gains, and that incorporating those tax differences flattens out the equity risk premium term structure.[116]

While this debate will undoubtedly continue, the relevance to valuation and corporate finance practice is questionable. Even if you could compute period-specific equity risk premiums, the effect on value of using these premiums (instead of the compounded average premium) would be small in most valuations. To illustrate, your valuation of an asset, using an equity risk premium of 7% for the first 3 years and 5.5% thereafter[117], at the start of 2015, would be very similar to the value you would have obtained using 5.78% as your equity risk premium for all time periods. The only scenario where using year-specific premiums would make a material difference would be in the valuation of an asset or investment with primarily short-term cash flows, where using a higher short term premium will yield a lower (and perhaps more realistic) value for the asset.

Time Series Behavior for S&P 500 Implied Premium

As the inputs to the implied equity risk premium, it is quite clear that the value for the premium will change not just from day to day but from one minute to the next. In particular, movements in the index will affect the equity risk premium, with higher (lower) index values, other things remaining equal, translating into lower (higher) implied equity

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[114] Binsbergen, J. H. van, Michael W. Brandt, and Ralph S. J. Koijen, 2012, *On the timing and pricing of dividends*, American Economic Review, v102, 1596-1618.

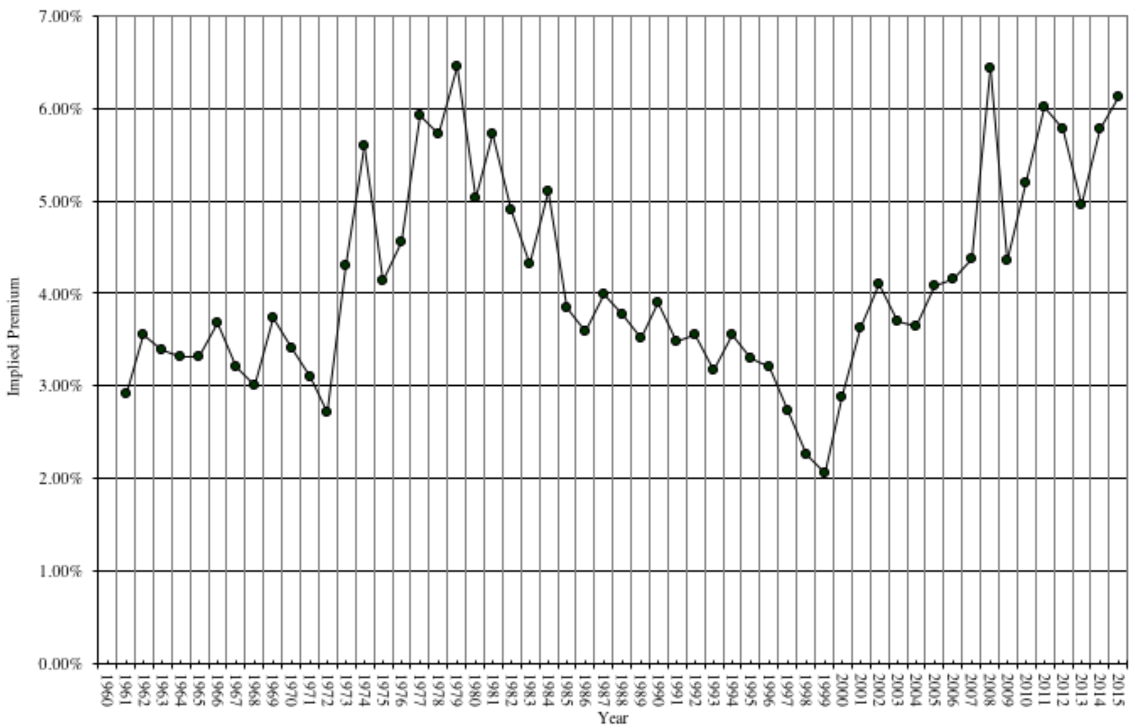
[115] Boguth, O., M. Carlson, A. Fisher and M. Simutin, 2011, *Dividend Strips and the Term Structure of Equity Risk Premia: A Case Study of Limits to Arbitrage*, Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1931105. In a response, Binsbergen, Brandt and Koijen argue that their results hold even if traded dividend strips (rather than synthetic strips) are used.

[116] Schulz, F., 2015, On the Timing and Pricing of Dividends, SSRN Working paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2705909

[117] The compounded average premium over time, using a 7% equity risk premium for the first 3 years and 5.88% thereafter, is roughly 6.01%.

risk premiums. In Figure 9, we chart the implied premiums in the S&P 500 from 1960 to 2015 (year ends):

Figure 9: Implied Premium for US Equity Market: 1960-2015

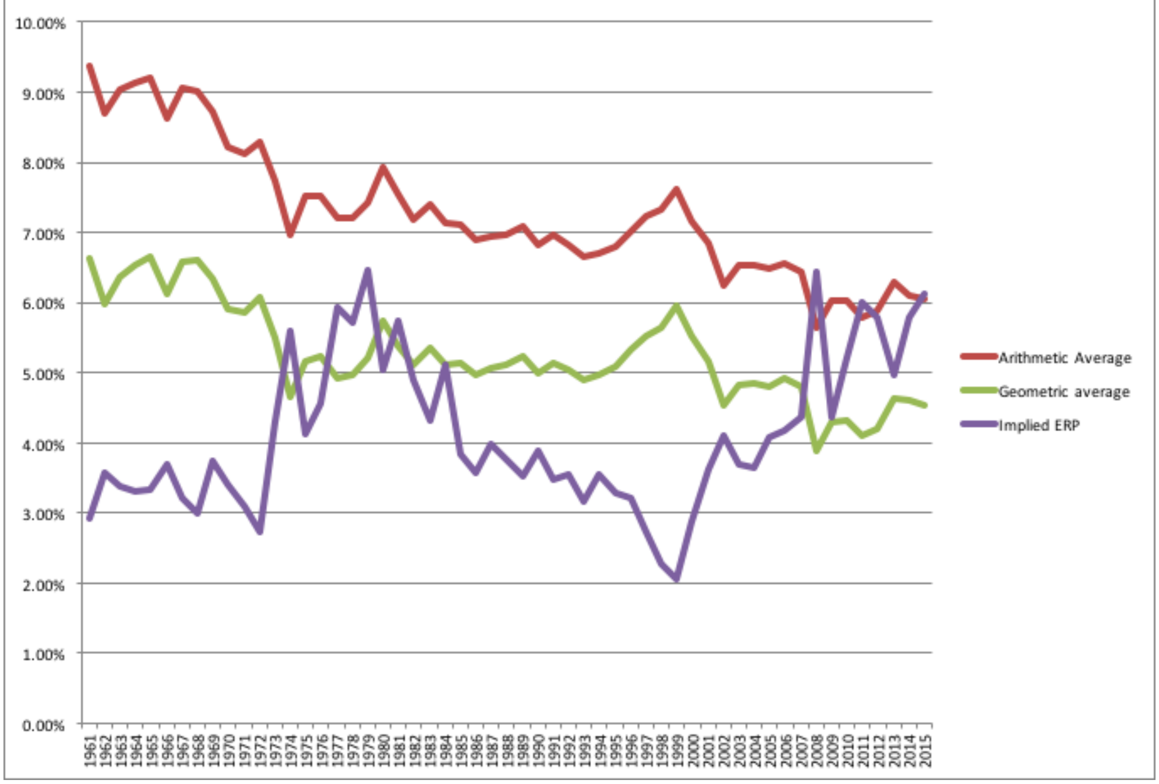


In terms of mechanics, we used potential dividends (including buybacks) as cash flows, and a two-stage discounted cash flow model; the estimates for each year are in appendix 6.[118] Looking at these numbers, we would draw the following conclusions:

- The implied equity premium has deviated from the historical premium for the US equity market for most of the last few decades. To provide a contrast, we compare the implied equity risk premiums each year to the historical risk premiums for stocks over treasury bonds, using both geometric and arithmetic averages, each year from 1961 to 2015 in figure 10:

118 We used analyst estimates of growth in earnings for the 5-year growth rate after 1980. Between 1960 and 1980, we used the historical growth rate (from the previous 5 years) as the projected growth, since analyst estimates were difficult to obtain. Prior to the late 1980s, the dividends and potential dividends were very similar, because stock buybacks were uncommon. In the last 20 years, the numbers have diverged.

Figure 10: Historical versus Implied Premium - 1961- 2015



The arithmetic average premium, which is used by many practitioners, has been significantly higher than the implied premium over almost the entire fifty-year period (with 2009 and 2011 being the only exceptions). The geometric premium does provide a more interesting mix of results, with implied premiums exceeding historical premiums in the mid-1970s and again since 2008.

- The implied equity premium did increase during the seventies, as inflation increased. This does have implications for risk premium estimation. Instead of assuming that the risk premium is a constant, and unaffected by the level of inflation and interest rates, which is what we do with historical risk premiums, would it be more realistic to increase the risk premium if expected inflation and interest rates go up? We will come back and address this question in the next section.
- While historical risk premiums have generally drifted down for the last few decades, there is a strong tendency towards mean reversion in implied equity premiums. Thus, the premium, which peaked at 6.5% in 1978, moved down towards the average in the 1980s. By the same token, the premium of 2% that we observed at the end of the dot-com boom in the 1990s quickly reverted back to the average, during the market

correction from 2000-2003.[119] Given this tendency, it is possible that we can end up with a far better estimate of the implied equity premium by looking at not just the current premium, but also at historical trend lines. We can use the average implied equity premium over a longer period, say ten to fifteen years. Note that we do not need as many years of data to make this estimate as we do with historical premiums, because the standard errors tend to be smaller.

Finally, the crisis of 2008 was unprecedented in terms of its impact on equity risk premiums. Implied equity risk premiums rose more during 2008 than in any one of the prior 50 years, with much of the change happening in a fifteen-week time period towards the end of the year. While much of that increase dissipated in 2009, as equity risk premiums returned to pre-crisis levels, equity risk premiums have remained more volatile since 2008. In the next section, we will take a closer look at the 2008 crisis.

Implied Equity Risk Premiums during a Market Crisis and Beyond

When we use historical risk premiums, we are, in effect, assuming that equity risk premiums do not change much over short periods and revert back over time to historical averages. This assumption was viewed as reasonable for mature equity markets like the United States, but was put under a severe test during the market crisis that unfolded with the fall of Lehman Brothers on September 15, and the subsequent collapse of equity markets, first in the US, and then globally.

Since implied equity risk premiums reflect the current level of the index, the 75 trading days between September 15, 2008, and December 31, 2008, offer us an unprecedented opportunity to observe how much the price charged for risk can change over short periods. In figure 11, we depict the S&P 500 on one axis and the implied equity risk premium on the other. To estimate the latter, we used the level of the index and the treasury bond rate at the end of each day and used the total dollar dividends and buybacks over the trailing 12 months to compute the cash flows for the most recent year.[120] We also updated the expected growth in earnings for the next 5 years, but that number changed only slowly

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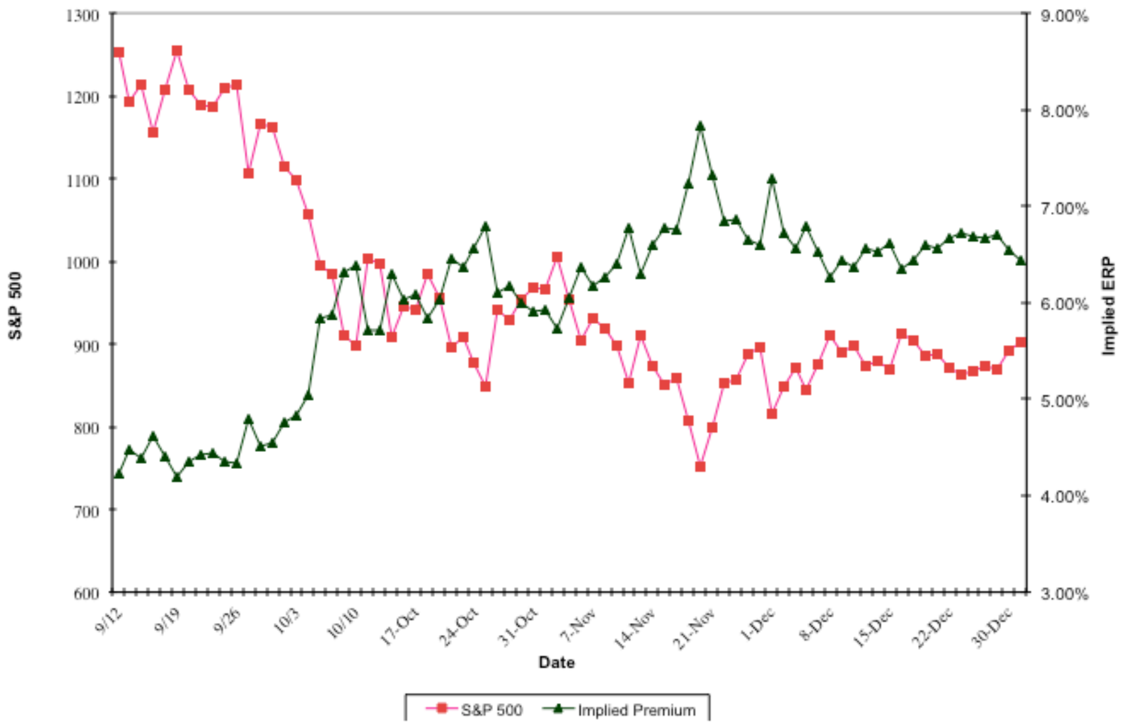
[119] Arnott, Robert D., and Ronald Ryan, 2001, *The Death of the Risk Premium: Consequences of the 1990s*, Journal of Portfolio Management, v27, 61-74. They make the same point about reduction in implied equity risk premiums that we do. According to their calculations, though, the implied equity risk premium in the late 1990s was negative.

[120] This number, unlike the index and treasury bond rate, is not updated on a daily basis. We did try to modify the number as companies in the index announced dividend suspensions or buyback modifications.

over the period. For example, the total dollar dividends and buybacks on the index for the trailing 12 months of 52.58 resulted in a dividend yield of 4.20% on September 12 (when the index closed at 1252) but jumped to 4.97% on October 6, when the index closed at 1057.[121]

Figure 11: Implied Equity Risk Premium - 9/12- 12/31/08



In a period of a month, the implied equity risk premium rose from 4.20% on September 12 to 6.39% at the close of trading of October 10 as the S&P moved from 1250 down to 903. Even more disconcertingly, there were wide swings in the equity risk premium within a day; in the last trading hour just on October 10, the implied equity risk premium ranged from a high of 6.6% to a low of 6.1%. Over the rest of the year, the equity risk premium gyrated, hitting a high of 8% in late November, before settling into the year-end level of 6.43%.

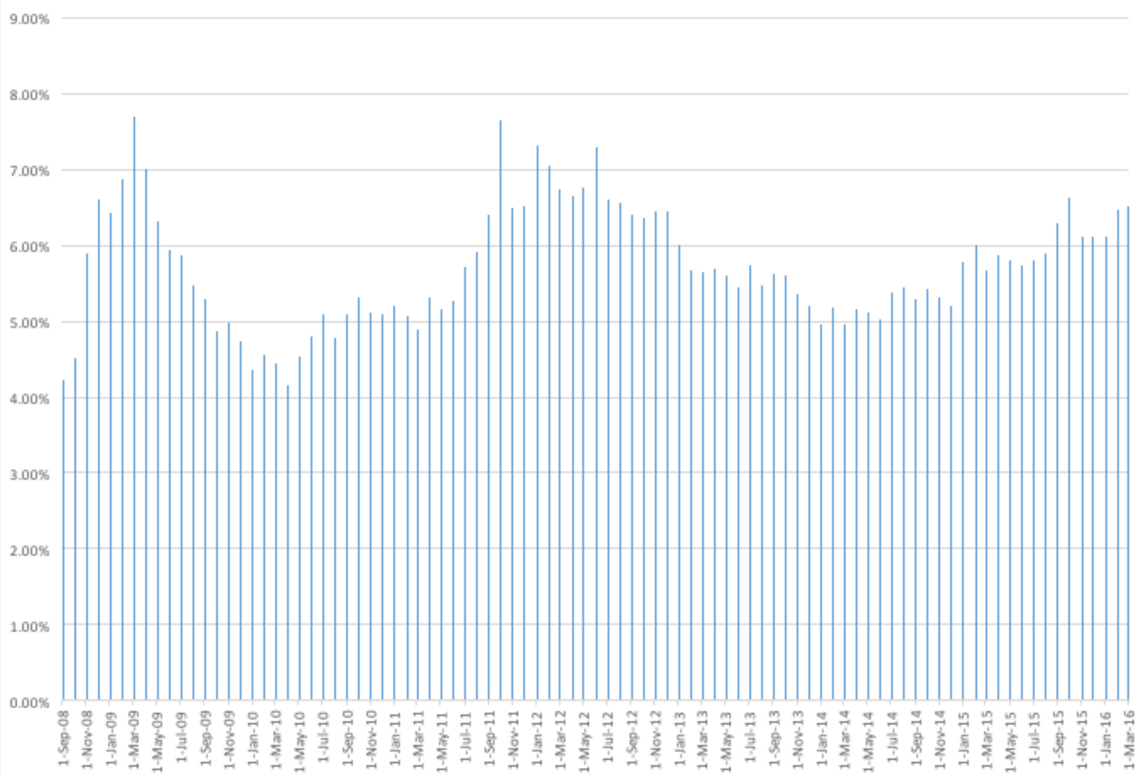
[121] It is possible, and maybe even likely, that the banking crisis and resulting economic slowdown was leading some companies to reassess policies on buybacks. Alcoa, for instance, announced that it was terminating stock buybacks. However, other companies stepped up buybacks in response to lower stock prices. If the total cash return was dropping, as the market was, the implied equity risk premiums should be lower than the numbers that we have computed.

The volatility captured in figure 12 was not restricted to just the US equity markets. Global equity markets gyrated with and sometimes more than the US, default spreads widened considerably in corporate bond markets, commercial paper and LIBOR rates soared while the 3-month treasury bill rate dropped close to zero and the implied volatility in option markets rose to levels never seen before. Gold surged but other commodities, such as oil and grains, dropped. Not only did we discover how intertwined equity markets are around the globe but also how markets for all risky assets are tied together. We will explicitly consider these linkages as we go through the rest of the paper.

There are two ways in which we can view this volatility. One the one side, proponents of using historical averages (either of actual or implied premiums) will use the day-to-day volatility in market risk premiums to argue for the stability of historical averages. They are implicitly assuming that when the crisis passes, markets will return to the status quo. On the other hand, there will be many who point to the unprecedented jump in implied premiums over a few weeks and note the danger of sticking with a "fixed" premium. They will argue that there are sometimes structural shifts in markets, i.e. big events that change market risk premiums for long periods, and that we should be therefore be modifying the risk premiums that we use in valuation as the market changes around us. In January 2009, in the context of equity risk premiums, the first group would have argued we should ignore history (both in terms of historical returns and implied equity risk premiums) and move to equity risk premiums of 6%+ for mature markets (and higher for emerging markets whereas the second would have made a case for sticking with a historical average, which would have been much lower than 6.43%.

The months since the crisis ended in 2008 have seen ups and downs in the implied premium, with clear evidence that the volatility in the equity risk premium has increased over the last few years. In figure 12, we report on the monthly equity risk premiums for the S&P 500 from January 2009 through March 2016:

Figure 12: Monthly ERP - September 2008 - March 2016



Note that the equity risk premium dropped from its post-crisis highs in 2010 but climbed back in 2011 to 6% or higher, before dropping back to 5% in 2013, before rising again in the last year.

On a personal note, I believe that the very act of valuing companies requires taking a stand on the appropriate equity risk premium to use. For many years prior to September 2008, I used 4% as my mature market equity risk premium when valuing companies, and assumed that mean reversion to this number (the average implied premium over time) would occur quickly and deviations from the number would be small. Though mean reversion is a powerful force, I think that the banking and financial crisis of 2008 has created a new reality, i.e., that equity risk premiums can change quickly and by large amounts even in mature equity markets. Consequently, I have forsaken my practice of staying with a fixed equity risk premium for mature markets, and I now vary it year-to-year, and even on an intra-year basis, if conditions warrant. After the crisis, in the first half of 2009, I used equity risk premiums of 6% for mature markets in my valuations. As risk premiums came down in 2009, I moved back to using a 4.5% equity risk premium for mature markets in 2010. With the increase in implied premiums at the start of 2011, my valuations for the year were based upon an equity risk premium of 5% for mature markets and I increased that number to 6% for 2012. In 2016, I will start with an equity risk premium of 6.12%, reflecting the implied premium at the start of the year but will remain vigilant by computing the premium on a monthly basis. While some may view this shifting equity risk premium as a sign of weakness, I would frame it differently. When valuing individual companies, I want my valuations to reflect my assessments of the company and not my assessments of the overall equity market. Using equity risk premiums that are very different from the implied premium will introduce a market view into individual company valuations.

Determinants of Implied Premiums

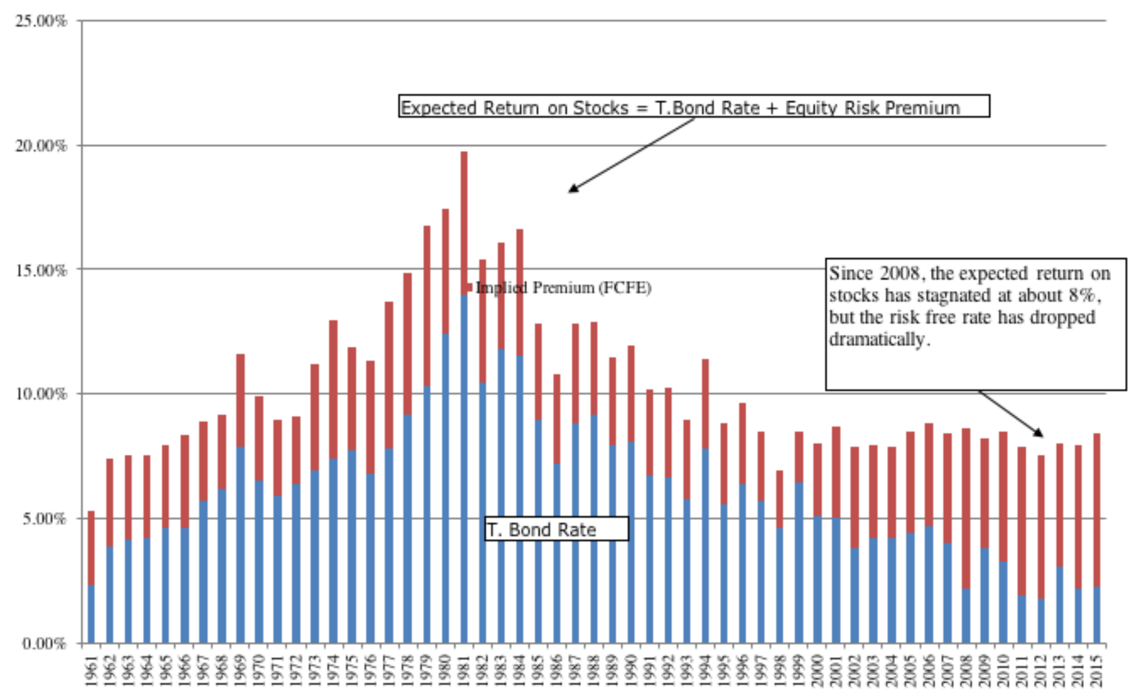
One of the advantages of estimating implied equity risk premiums, by period, is that we can track year to year changes in that number and relate those changes to shifts in interest rates, the macro environment or even to company characteristics. By doing so, not only can we get a better understanding of what causes equity risk premiums to change over time, but we are also able to come up with better estimates of future premiums.

Implied ERP and Interest rates

In much of valuation and corporate finance practice, we assume that the equity risk premium that we compute and use is unrelated to the level of interest rates. In particular, the use of historical risk premiums, where the premium is based upon an average premium earned over shifting risk free rates, implicitly assumes that the level of the premium is unchanged as the risk free rate changes. Thus, we use the same equity risk premium of 4.52% (the historical average for 1928-2015) on a risk free rate of 2.27% in 2016, as we would have, if the risk free rate had been 10%.

But is this a reasonable assumption? How much of the variation in the premium over time can be explained by changes in interest rates? Put differently, do equity risk premiums increase as the risk free rate increases or are they unaffected? To answer this question, we looked at the relationship between the implied equity risk premium and the treasury bond rate (risk free rate). As can be seen in figure 13, the implied equity risk premiums were highest in the 1970s, when interest rates and inflation were also high. However, there is contradictory evidence between 2008 and 2015, when high equity risk premiums accompanied low risk free rates.

Figure 13: Implied ERP and Risk free Rates



To examine the relationship between equity risk premiums and risk free rates, we ran a regression of the implied equity risk premium against both the level of long-term rates (the treasury bond rate) and the slope of the yield curve (captured as the difference between the 10-year treasury bond rate and the 3-month T.Bill rate), with the t statistics reported in brackets below each coefficient:

Implied ERP = 3.76% + 0.0372 (T.Bond Rate) + 0.0876 (T.Bond – T.Bill) R^2= 1.56%

(8.85) (0.68) (0.69)

Looking across the time period (1961-2015), neither the level of rates nor the slope of the yield curve seem to have much impact on the implied equity risk premium in that year. Though the coefficients are positive, suggesting that implied risk premiums tend o be higher when the T.Bond rate is higher and the yield curve is upward sloping, the t statistics are not significant. Removing the yield curve variable and running the regression again:

Implied ERP = 3.91% + 0.0320 (T.Bond Rate) R^2=0.66%

(10.72) (0.60)

This regression does not provide support for the view that equity risk premiums should not be constant but should be linked to the level of interest rates. In earlier versions of the paper, this regression has yielded a mildly positive relationship between the implied ERP and the T.Bond rate, but the combination of low rates and high equity risk premiums since 2008 seems to have eliminated even that mild connection between the two.

The rising equity risk premiums, in conjunction with low risk free rates, can be viewed paradoxically as both an indicator of how much and how little power central banks have over asset pricing. To the extent that the lower US treasury bond rate is the result of the Fed's quantitative easing policies since the 2008 crisis, they underscore the effect that central banks can have on equity risk premiums. At the same time, the stickiness of the overall expected return on stocks, which has not gone down with the risk free rate, is a testimonial that central banking policy is not pushing up the prices of financial assets. To the extent that this failure to move expected returns is also happening in real businesses, in the form of sticky hurdle rates for investments, the Fed's hope of increasing real investment at businesses with lower interest rates is not coming to fruition.

Implied ERP and Macroeconomic variables

While we considered the interaction between equity risk premiums and interest rates in the last section, the analysis can be expanded to include other macroeconomic variables including economic growth, inflation rates and exchange rates. Doing so may give us a way of estimating an "intrinsic' equity risk premium, based upon macro economic variables, that is less susceptible to market moods and perceptions.

To explore the relationship, we estimated the correlation, between the implied equity risk premiums that we estimated for the S&P 500 and three macroeconomic variables – real GDP growth for the US, inflation rates (CPI) and exchange rates (trade weighted dollar), using data from 1973 to 2015, in table 21 (t statistics in brackets):

Table 21: Correlation Matrix: ERP and Macroeconomic variables: 1973-2015

	ERP	*Real GDP*	*CPI*	*Weighted Dollar*
ERP	1.0000			
Real GDP	-0.3586	1.0000		

	(2.41)**			
CPI	0.3313 (2.22)**	-0.1416 (0.90)	1.0000	
Weighted Dollar	0.1972 (1.27)	-0.1676 (1.08)	-0.0293 (0.85)	1.0000

** Statistically significant

The implied equity risk premium is negatively correlated with GDP growth, increasing as GDP growth increases and is positively correlated with both inflation and the weighted dollar, with a stronger dollar going with higher implied equity risk premiums.[122]

Following up on this analysis, we regressed equity risk premiums against the inflation rate, the weighted dollar and GDP growth, using data from 1974 to 2015:

Implied ERP = 4.33% - 0.1510 Real GDP growth + 0.1057 CPI + 0.0241 Weighted $ R^2= 23.17%
(12.47) (1.98) (2.05) (1.09)

Based on this regression, every 1% increase in the inflation rate increases the equity risk premium by approximately 0.1057%, whereas every 1% increase in the growth rate in real GDP decreases the implied equity risk premium by 0.1510%.

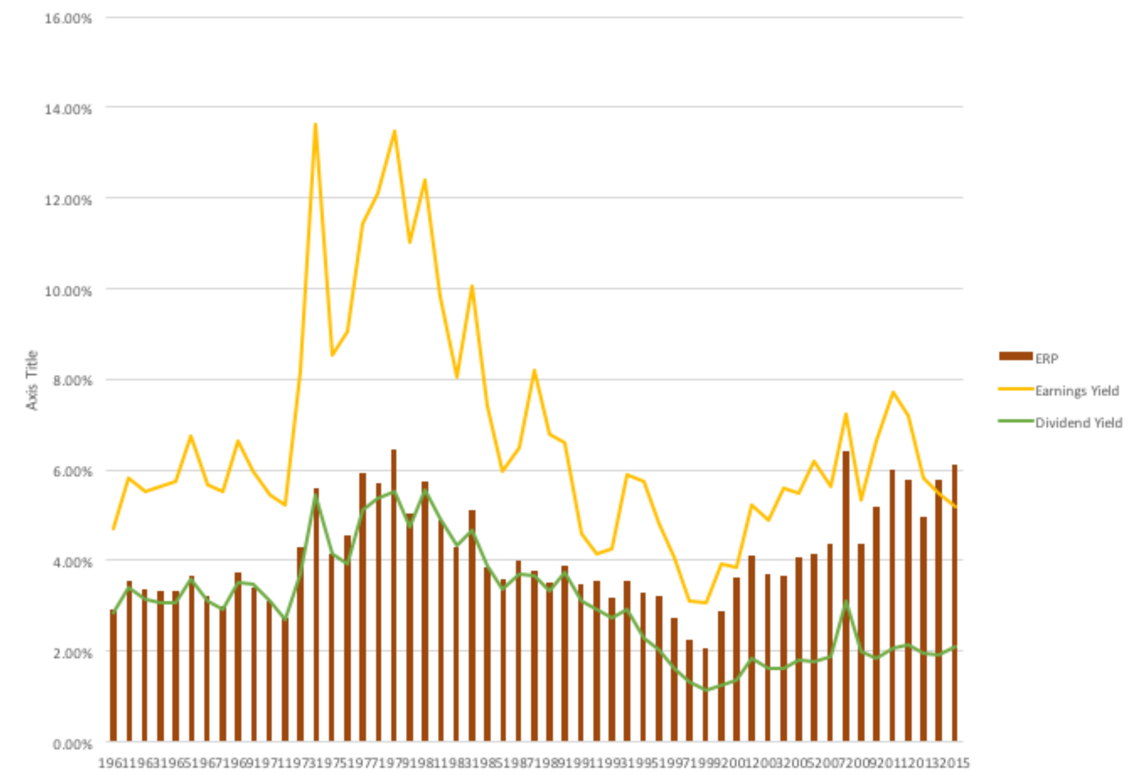
From a risk perspective, it is not the level of GDP growth that matters, but uncertainty about that level; you can have low and stable economic growth and high and unstable economic growth. Since 2008, the economies of both developed and emerging markets have become more unstable over time and upended long held beliefs about developed economies. It will be interesting to see if equity risk premiums become more sensitive to real economic growth in this environment.

Implied ERP, Earnings Yields and Dividend Yields

Earlier in the paper, we noted that the dividend yield and the earnings yield (net of the risk free rate) can be used as proxies for the equity risk premium, if we make assumptions about future growth (stable growth, with the dividend yield) or expected excess returns (zero, with the earnings yield). In figure 14, we compare the implied equity risk premiums that we computed to the earnings and dividend yields for the S&P 500 from 1961 to 2015:

122 The correlation was also computed for lagged and leading versions of these variables, with little material change to the relationship.

Figure 14: Implied ERP, Earnings Yield (E/P) and Dividend Yield (D/P)



Note that the dividend yield is a very close proxy for the implied equity risk premium until the late 1980s, when the two measures decoupled, a phenomenon that is best explained by the rise of stock buybacks as an alternative way of returning cash to stockholders.

The earnings yield, with the riskfree rate netted out, has generally not been a good proxy for the implied equity risk premium and would have yielded negative values for the equity risk premium (since you have to subtract out the risk free rate from it) through much of the 1990s. However, it does move with the implied equity risk premium. The difference between the earnings to price measure and the implied ERP can be attributed to a combination of higher earnings growth and excess returns that investors expect companies to deliver in the future. Analysts and academic researchers who use the earnings to price ratio as a proxy for forward-looking costs of equity may therefore end up with significant measurement error in their analyses.

Implied ERP and Technical Indicators

Earlier in the paper, we noted that any market timing forecast can be recast as a view on the future direction of the equity risk premium. Thus, a view that the market is under (over) priced and likely to go higher (lower is consistent with a belief that equity risk premiums will decline (increase) in the future. Many market timers do rely on technical indicators, such as moving averages and momentum measures, to make their judgment about market direction. To evaluate whether these approaches have a basis, you would need to look at how these measures are correlated with changes in equity risk premiums.

In a test of the efficacy of technical indicators, Neely, Rapach, Tu and Zhou (2011) compare the predictive power of macroeconomic/fundamental indications (including the interest rate, inflation, GDP growth and earnings/dividend yield numbers) with those of technical indicators (moving average, momentum and trading volume) and conclude that the latter better explain movements in stock returns.[123] They conclude that a composite prediction, that incorporates both macroeconomic and technical indicators, is superior to using just one set or the other of these variables. Note, however, that their study focused primarily on the predictability of stock returns over the next year and not on longer term equity risk premiums.

Extensions of Implied Equity Risk Premium

The process of backing out risk premiums from current prices and expected cashflows is a flexible one. It can be expanded into emerging markets to provide estimates of risk premiums that can replace the country risk premiums we developed in the last section. Within an equity market, it can be used to compute implied equity risk premiums for individual sectors or even classes of companies.

Other Equity Markets

The advantage of the implied premium approach is that it is market-driven and current, and does not require any historical data. Thus, it can be used to estimate implied equity premiums in any market, no matter how short its history, It is, however, bounded by whether the model used for the valuation is the right one and the availability and reliability of the inputs to that model. Earlier in this paper, we estimated country risk premiums for Brazil, using default spreads and equity market volatile. To provide a contrast, we estimated the implied equity risk premium for the Brazilian equity market in September 2009, from the following inputs.

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[123] Neely, C.J., D.E. Rapach, J. Tu and G. Zhou, 2011, *Forecasting the Equity Risk Premium: The Role of Technical Indicators*, Working Paper, http://ssrn.com/abstract=1787554.

- The index (Bovespa) was trading at 61,172 on September 30, 2009, and the dividend yield on the index over the previous 12 months was approximately 2.2%. While stock buybacks represented negligible cash flows, we did compute the FCFE for companies in the index, and the aggregate FCFE yield across the companies was 4.95%.
- Earnings in companies in the index are expected to grow 6% (in US dollar terms) over the next 5 years, and 3.45% (set equal to the treasury bond rate) thereafter.
- The riskfree rate is the US 10-year treasury bond rate of 3.45%.

The time line of cash flows is shown below:

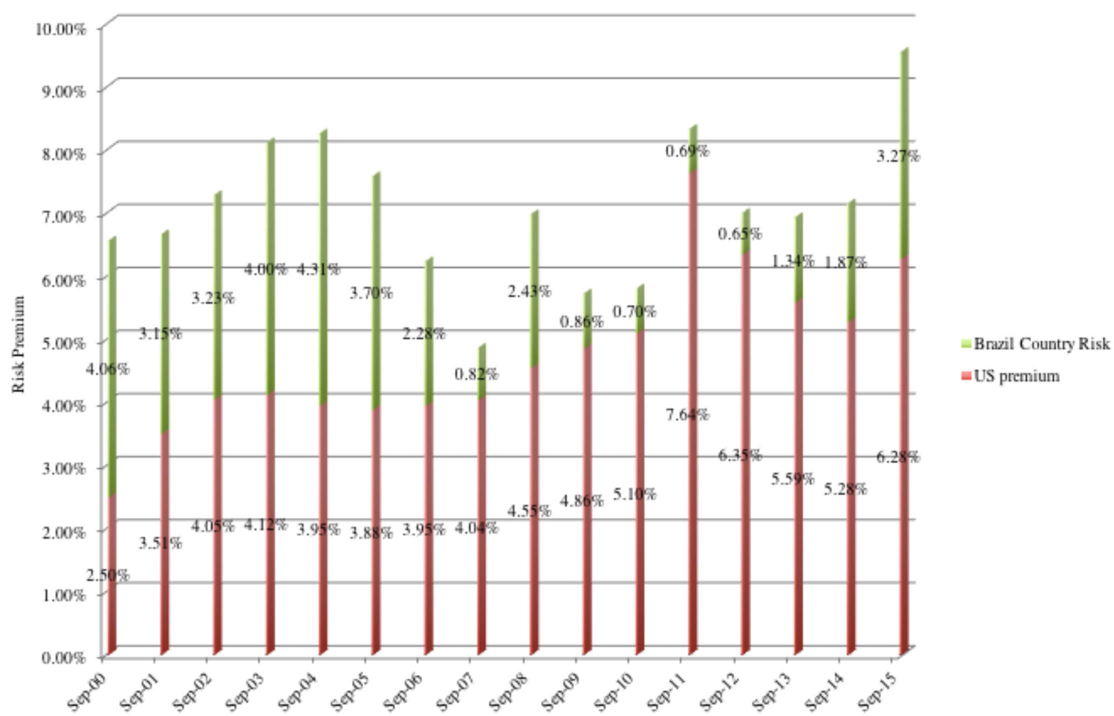
$$61,272 = \frac{3210}{(1+r)} + \frac{3,402}{(1+r)^2} + \frac{3,606}{(1+r)^3} + \frac{3,821}{(1+r)^4} + \frac{4,052}{(1+r)^5} + \frac{4,052(1.0345)}{(r-.0345)(1+r)^5}$$

These inputs yield a required return on equity of 9.17%, which when compared to the treasury bond rate of 3.45% on that day results in an implied equity premium of 5.72%. For simplicity, we have used nominal dollar expected growth rates[124] and treasury bond rates, but this analysis could have been done entirely in the local currency.

One of the advantages of using implied equity risk premiums is that that they are more sensitive to changing market conditions. The implied equity risk premium for Brazil in September 2007, when the Bovespa was trading at 73512, was 4.63%, lower than the premium in September 2009, which in turn was much lower than the premium prevailing in September 2015. In figure 15, we trace the changes in the implied equity risk premium in Brazil from September 2000 to September 2015 and compare them to the implied premium in US equities:

[124] The input that is most difficult to estimate for emerging markets is a long-term expected growth rate. For Brazilian stocks, I used the average consensus estimate of growth in earnings for the largest Brazilian companies which have ADRs listed on them. This estimate may be biased, as a consequence.

Figure 15: Implied Equity Risk Premium - Brazil



Implied equity risk premiums in Brazil declined steadily from 2003 to 2007, with the September 2007 numbers representing a historic low. They surged in September 2008, as the crisis unfolded, fell back in 2009 and 2010 but increased again in 2011. In fact, the Brazil portion of the implied equity risk premium fell to its lowest level in ten years in September 2010, a phenomenon that remained largely unchanged in 2011 and 2012. Political turmoil and corruptions scandals have combined to push the premium back up again in the last two years.

Computing and comparing implied equity risk premiums across multiple equity markets allows us to pinpoint markets that stand out, either as over priced (because their implied premiums are too low, relative to other markets) or under priced (because their premiums at too high, relative to other markets). In September 2007, for instance, the implied equity risk premiums in India and China were roughly equal to or even lower than the implied premium for the United States, computed at the same time. Even an optimist on future growth these countries would be hard pressed to argue that equity markets in these markets and the United States were of equivalent risk, which would lead us to conclude that these stocks were overvalued relative to US companies.

One final note is worth making. Over the last decade, the implied equity risk premiums in the largest emerging markets – India, China and Brazil- have all declined substantially, relative to developed markets. In table 22, we summarize implied equity risk premiums for developed and emerging markets from 2001 and 2016, making simplistic assumptions about growth and stable growth valuation models:[125]

Table 22: Developed versus Emerging Market Equity Risk Premiums

Start of year	PBV Developed	PBV Emerging	ROE Developed	ROE Emerging	US T.Bond rate	Growth Rate Developed	Growth Rate Emerging	Cost of Equity (Developed)	Cost of Equity (Emerging)	Differential ERP
2004	2.00	1.19	10.81%	11.65%	4.25%	3.75%	5.25%	7.28%	10.63%	3.35%
2005	2.09	1.27	11.12%	11.93%	4.22%	3.72%	5.22%	7.26%	10.50%	3.24%
2006	2.03	1.44	11.32%	12.18%	4.39%	3.89%	5.39%	7.55%	10.11%	2.56%
2007	1.67	1.67	10.87%	12.88%	4.70%	4.20%	5.70%	8.19%	10.00%	1.81%
2008	0.87	0.83	9.42%	11.12%	4.02%	3.52%	5.02%	10.30%	12.37%	2.07%
2009	1.20	1.34	8.48%	11.02%	2.21%	1.71%	3.21%	7.35%	9.04%	1.69%
2010	1.39	1.43	9.14%	11.22%	3.84%	3.34%	4.84%	7.51%	9.30%	1.79%
2011	1.12	1.08	9.21%	10.04%	3.29%	2.79%	4.29%	8.52%	9.61%	1.09%
2012	1.17	1.18	9.10%	9.33%	1.88%	1.38%	2.88%	7.98%	8.35%	0.37%
2013	1.56	1.63	8.67%	10.48%	1.76%	1.26%	2.76%	6.02%	7.50%	1.48%
2014	1.95	1.50	9.27%	9.64%	3.04%	2.54%	4.04%	6.00%	7.77%	1.77%
2015	1.88	1.56	9.69%	9.75%	2.17%	1.67%	3.17%	5.94%	7.39%	1.45%
2016	1.89	1.59	9.24%	10.16%	2.27%	1.77%	3.27%	5.72%	7.60%	1.88%

The trend line from 2004 to 2012 is clear as the equity risk premiums, notwithstanding a minor widening in 2008, have converged in developed and emerging markets, suggesting that globalization has put "emerging market risk" into developed markets, while creating "developed markets stability factors" (more predictable government policies, stronger legal and corporate governance systems, lower inflation and stronger currencies) in emerging markets. In the last four years, we did see a correction in emerging markets that pushed the premium back up, albeit to a level that was still lower than it was prior to 2010.

125 We start with the US treasury bond rate as the proxy for global nominal growth (in US dollar terms), and assume that the expected growth rate in developed markets is 0.5% lower than that number and the expected growth rate in emerging markets is 1% higher than that number. The equation used to compute the ERP is a simplistic one, based on the assumptions that the countries are in stable growth and that the return on equity in each country is a predictor of future return on equity:

PBV = (ROE – g)/ (Cost of equity –g)

Cost of equity = (ROE –g + PBV(g))/ PBV

Sector premiums

Using current prices and expected future cash flows to back out implied risk premiums is not restricted to market indices. We can employ the approach to estimate the implied equity risk premium for a specific sector at a point in time. In September 2008, for instance, there was a widely held perception that investors were attaching much higher equity risk premiums to commercial bank stocks, in the aftermath of the failures of Fannie Mae, Freddie Mac, Bear Stearns and Lehman. To test this proposition, we took a look at the S&P Commercial Bank index, which was trading at 318.26 on September 12, 2008, with an expected dividend yield of 5.83% for the next 12 months. Assuming that these dividends will grow at 4% a year for the next 5 years and 3.60% (the treasury bond rate) thereafter, well below the nominal growth rate in the overall economy, we arrived at the following equation:

$$318.26 = \frac{19.30}{(1+r)} + \frac{20.07}{(1+r)^2} + \frac{20.87}{(1+r)^3} + \frac{21.71}{(1+r)^4} + \frac{22.57}{(1+r)^5} + \frac{22.57(1.036)}{(r-.036)(1+r)^5}$$

Solving for the expected return yields a value of 9.74%, which when netted out against the riskfree rate at the time (3.60%) yields an implied premium for the sector:

Implied ERP for Banking in September 2008 = 9.74% - 3.60% = 6.14%

How would we use this number? One approach would be to compare it to the average implied premium in this sector over time, with the underlying assumption that the value will revert back to the historical average for the sector. The implied equity risk premium for commercial banking stocks was close to 4% between 2005 and 2007, which would lead to the conclusion that banking stocks were undervalued in September 2008. The other is to assume that the implied equity premium for a sector is reflective of perceptions of future risk in that sector; in September 2008, there can be no denying that financial service companies faced unique risks and the market was reflecting these risks in prices. As a postscript, the implied equity risk premium for financial service firms was 5.80% in January 2012, just below the market-implied premium at the time (6.01%), suggesting that some of the post-crisis fear about banking stocks had receded.

A note of caution has to be added to about sector-implied premiums. Since these risk premiums consolidate both sector risk and market risk, it would be inappropriate to multiply these premiums by conventional betas, which are measures of sector risk. Thus, multiplying the implied equity risk premium for the technology sector (which will yield a high value) by a market beta for a technology company (which will also be high for the same reason) will result in double counting risk.[126]

Firm Characteristics

Earlier in this paper, we talked about the small firm premium and how it has been estimated using historical data, resulting in backward looking estimates with substantial standard error. We could use implied premiums to arrive at more forward looking estimates, using the following steps:

Step 1: Compute the implied equity risk premium for the overall market, using a broad index such as the S&P 500. Earlier in this paper, we estimated this, as of January 2016, to be 6.12%, using the cash returned last year as a base, and 5.16%, adjusting the cashflows for lower payout in the future..

Step 2: Compute the implied equity risk premium for an index containing primarily or only small cap firms, such as the S&P 600 Small Cap Index. On January 1, 2015, the index was trading at 671.74, with aggregated dividends and buybacks amounting to 1.80% of the index in the trailing 12 months, and an expected growth rate in earnings of 8.97% for the next 5 years. Allowing for an increase in cash payout, as the growh rate decreases over time, yields the following equation:

$$671.74 = \frac{16.90}{(1+r)} + \frac{22.48}{(1+r)^2} + \frac{28.92}{(1+r)^3} + \frac{36.34}{(1+r)^4} + \frac{44.86}{(1+r)^5} + \frac{44.86\,(1.0227)}{(r-.0227)(1+r)^5}$$

Solving for the expected return, we get:

Expected return on small cap stocks = 7.91%

Implied equity risk premium for small cap stocks = 7.91% -2.27% = 5.64%

Step 3: The forward-looking estimate of the small cap premium should be the difference between the implied premium for small cap stocks (in step 2) and the implied premium for the market (in step 1). Since we did use the adjusted buyback for small cap stocks, we will compare the small cap premium to the 5.16% that we estimated for the S&P 500 using the same approach.

Small cap premium = 5.64% - 5.16% = 0.48%

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[126] You could estimate betas for technology companies against a technology index (rather than the market index) and use these betas with the implied equity risk premium for technology companies.

With the numbers in January 2016, small caps are priced to generate an expected return that is slightly higher than the rest of the market, thus putting into question the wisdom of using the 4-5% small cap premium in computing costs of equity.

This approach to estimating premiums can be extended to other variables. For instance, one of the issues that has challenged analysts in valuation is how to incorporate the illiquidity of an asset into its estimated value. While the conventional approach is to attach an illiquidity discount, an alternative is to adjust the discount rate upwards for illiquid assets. If we compute the implied equity risk premiums for stocks categorized by illiquidity, we may be able to come up with an appropriate adjustment. For instance, you could estimate the implied equity risk premium for the stocks that rank in the lowest decile in terms of illiquidity, defined as turnover ratio.[127] Comparing this value to the implied premium for the S&P 500 of 5.78% should yield an implied illiquidity risk premium. Adding this premium to the cost of equity for relatively illiquid investments will then discount the value of these investments for illiquidity.

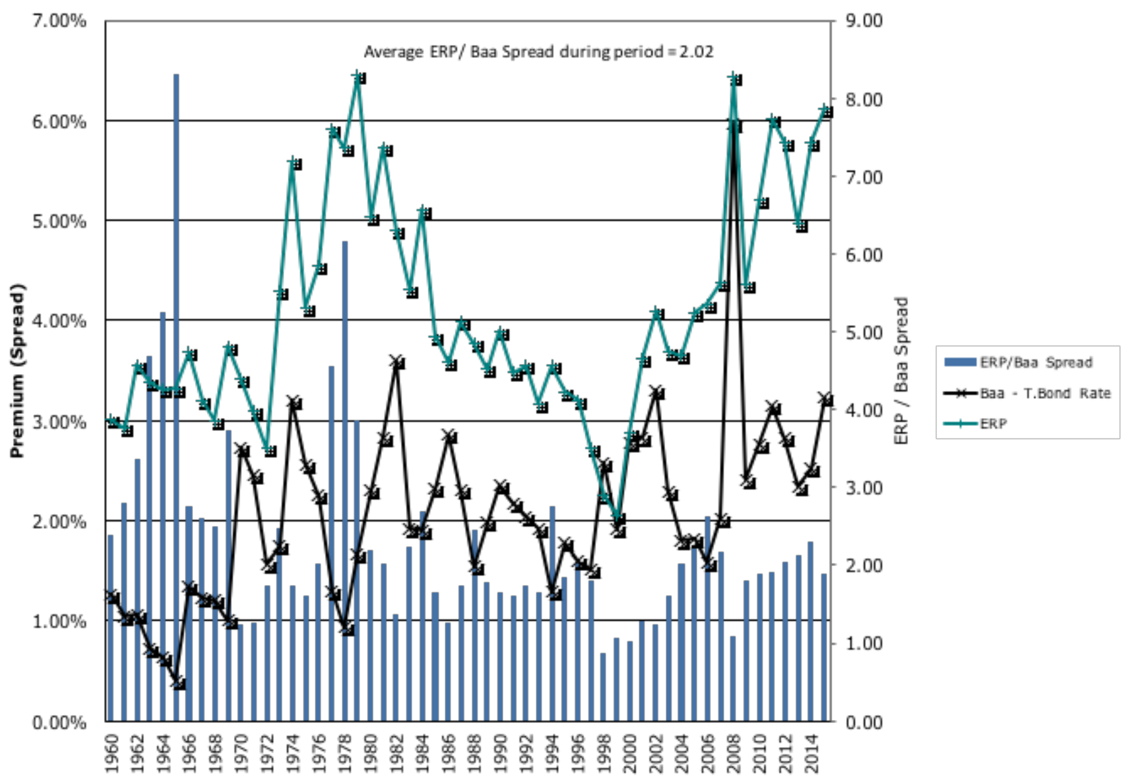
2. Default Spread Based Equity Risk Premiums

While we think of corporate bonds, stocks and real estate as different asset classes, it can be argued that they are all risky assets and that they should therefore be priced consistently. Put another way, there should be a relationship across the risk premiums in these asset classes that reflect their fundamental risk differences. In the corporate bond market, the default spread, i.e, the spread between the interest rate on corporate bonds and the treasury bond rate, is used as the risk premium. In the equity market, as we have seen through this paper, historical and implied equity premiums have tussled for supremacy as the measure of the equity risk premium. In the real estate market, no mention is made of an explicit risk premium, but real estate valuations draw heavily on the "capitalization rate", which is the discount rate applied to a real estate property's earnings to arrive at an estimate of value. The use of higher (lower) capitalization rates is the equivalent of demanding a higher (lower) risk premium.

[127] The turnover ratio is obtained by dividing $ trading volume in a stock by its market capitalization at that time.

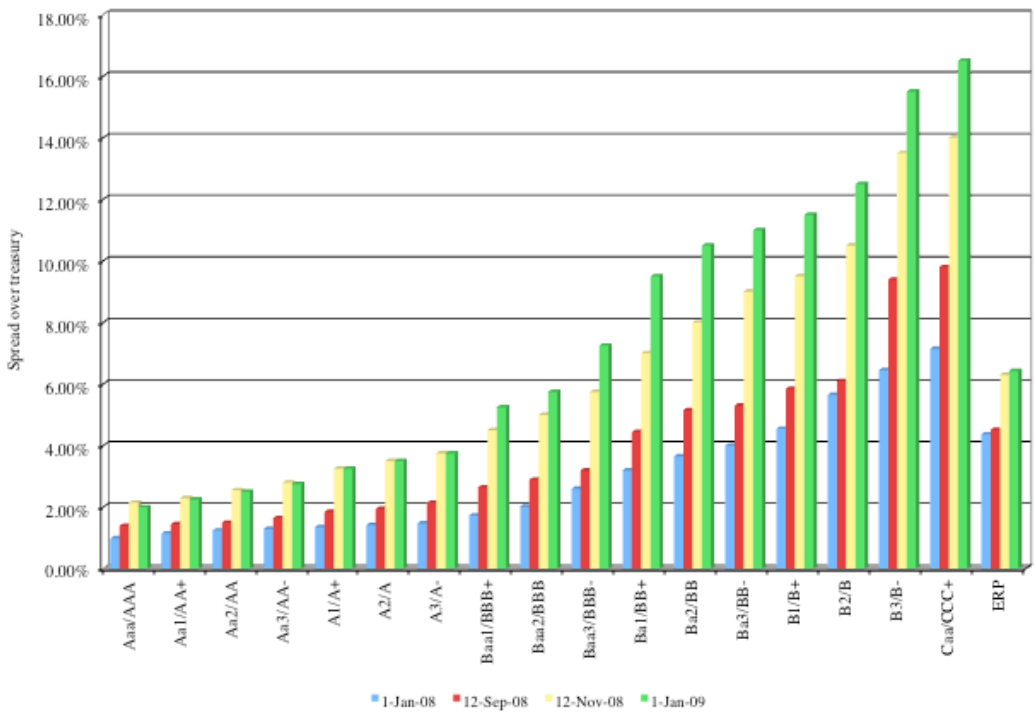
Of these three premiums, the default spread is the less complex and the most widely accessible data item. If equity risk premiums could be stated in terms of the default spread on corporate bonds, the estimation of equity risk premiums would become immeasurably simpler. For instance, assume that the default spread on Baa rated corporate bonds, relative to the ten-year treasury bond, is 2.2% and that equity risk premiums are routinely twice as high as Baa bonds, the equity risk premium would be 4.4%. Is such a rule of thumb even feasible? To answer this question, we looked at implied equity risk premiums and Baa-rated corporate bond default spreads from 1960 to 2015 in Figure 16.

Figure 16: Equity Risk Premiums and Bond Default Spreads



Note that both default spreads and equity risk premiums jumped in 2008, with the former increasing more on a proportionate basis. The ratio of 1.08 (ERP/ Baa Default Spread) at the end of 2008 was close to the lowest value in the entire series, suggesting that either equity risk premiums were too low or default spreads were too high. At the end of 2015, both the equity risk premium and the default spread increased, and the ratio moved back to 1.89, a little lower than the median value of 2.02 for the entire time period. The connection between equity risk premiums and default spreads was most obvious during 2008, where changes in one often were accompanied by changes in the other. Figure 17 graphs out changes in default spreads and ERP over the tumultuous year:

Figure 17: Default Spreads on Ratings Classes



How could we use the historical relationship between equity risk premiums and default spreads to estimate a forward-looking equity risk premium? On January 1, 2016, the default spread on a Baa rated bond was 3.23%. Applying the median ratio of 2.02, estimated from 1960-2015 numbers, to the Baa default spread of 3.23% results in the following estimate of the ERP:

Default Spread on Baa bonds (over treasury) on 1/1/2016 = 3.23%

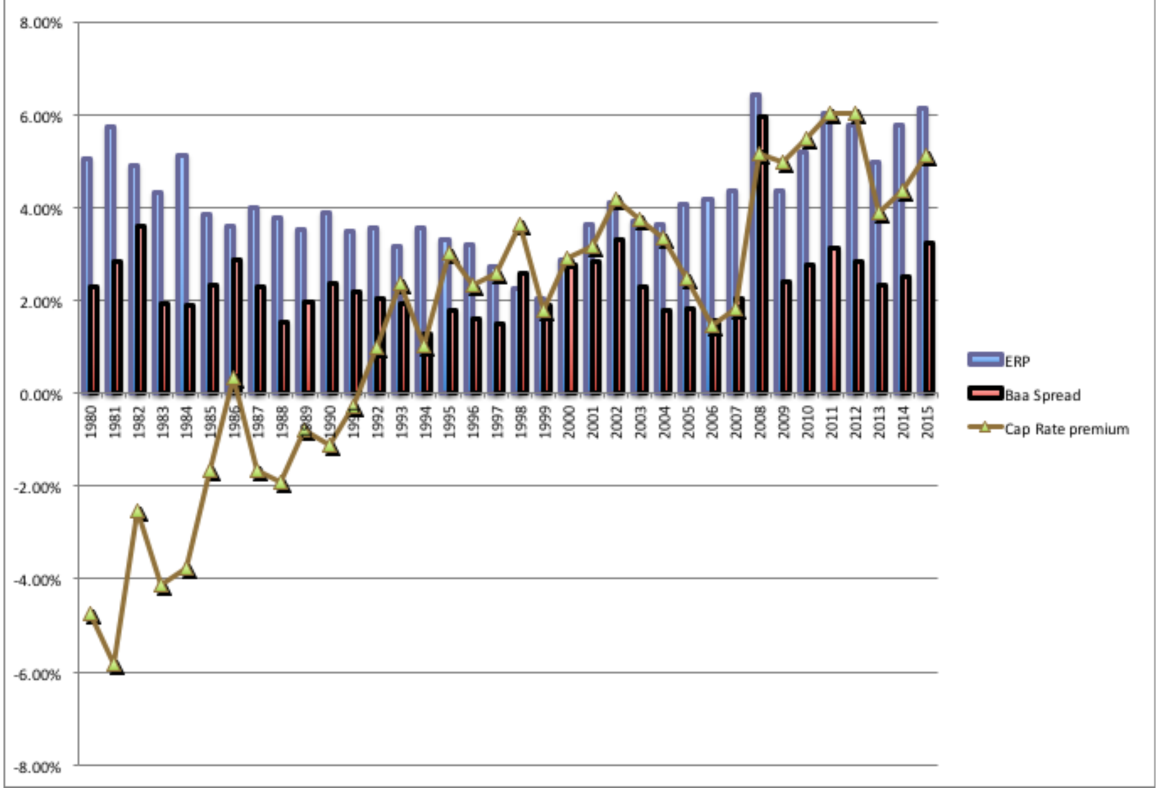
Imputed Equity Risk Premium = Default Spread * Median ratio or ERP/Spread

= 3.23%* 2.02 = 6.52%

This is higher than the implied equity risk premium of 6.12% that we computed in January 2016. Note that there is significant variation in the ratio (of ERP to default spreads) over time, with the ratio dropping below one at the peak of the dot.com boom (when equity risk premiums dropped to 2%) and rising to as high as 2.63 at the end of 2006; the standard error in the estimate is 0.20. Whenever the ratio has deviated significantly from the average, though, there is reversion back to that median over time.

The capitalization rate in real estate, as noted earlier, is a widely used number in the valuation of real estate properties. For instance, a capitalization rate of 10%, in conjunction with an office building that generates income of $ 10 million, would result in a property value of $ 100 million ($10/.10). The difference between the capitalization ratio and the treasury bond rate can be considered a real estate market risk premium, In Figure 18, we used the capitalization rate in real estate ventures and compared the risk premiums imputed for real estate with both bond default spreads and implied equity risk premiums between 1980 and 2015.

Figure 18: Equity Risk Premiums, Cap Rates and Bond Spreads



The story in this graph is the convergence of the real estate and financial asset risk premiums. In the early 1980s, the real estate market seems to be operating in a different risk/return universe than financial assets, with the cap rates being less than the treasury bond rate. For instance, the cap rate in 1980 was 8.1%, well below the treasury bond rate of 12.8%, resulting in a negative risk premium for real estate. The risk premiums across the three markets - real estate, equity and bonds - starting moving closer to each other in the late 1980s and the trend accelerated in the 1990s. We would attribute at least some of this increased co-movement to the securitization of real estate in this period. In 2008, the three markets moved almost in lock step, as risk premiums in the markets rose and prices fell. The housing bubble of 2004-2008 is manifested in the drop in the real estate equity risk premium during those years, bottoming out at less than 2% at the 2006. The correction in housing prices since has pushed the premium back up. Both equity and bond premiums adjusted quickly to pre-crisis levels in 2009 and 2010, and real estate premiums followed, albeit at a slower pace. Between 2013 and 2015, the risk premiums in the three markets have moved in tandem, all rising over the period.

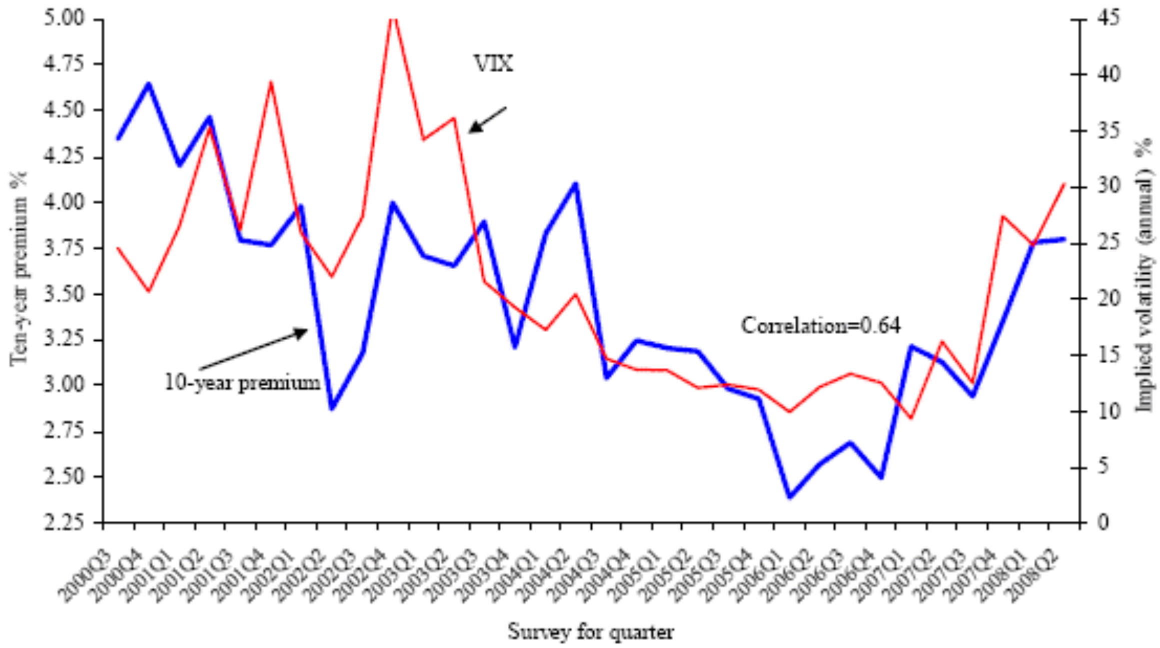
While the noise in the ratios (of ERP to default spreads and cap rates) is too high for us to develop a reliable rule of thumb, there is enough of a relationship here that we would suggest using this approach as a secondary one to test to see whether the equity risk premiums that we are using in practice make sense, given how risky assets are being priced in other markets. Thus, using an equity risk premium of 2%, when the Baa default spread is approximately at the same level strikes us as imprudent, given history. For macro strategists, there is a more activist way of using these premiums. When risk premiums in markets diverge, there is information in the relative pricing. Thus, the drop in equity risk premiums in the late 1990s, as default spreads stayed stable, would have signaled that the equity markets were overvalued (relative to bonds), just as the drop in default spreads between 2004 and 2007, while equity risk premiums were stagnant, would have suggested the opposite.

3. Option Pricing Model based Equity Risk Premium

There is one final approach to estimating equity risk premiums that draws on information in the option market. In particular, option prices can be used to back out implied volatility in the equity market. To the extent that the equity risk premium is our way of pricing in the risk of future stock price volatility, there should be a relationship between the two.

The simplest measure of volatility from the options market is the volatility index (VIX), which is a measure of 30—day volatility constructed using the implied volatilities in traded S&P 500 index options. The CFO survey premium from Graham and Harvey that we referenced earlier in the paper found a high degree of correlation between the premiums demanded by CFOs and the VIX value (see figure 19 below):

Figure 19: Volatility Index (VIX) and Survey Risk Premiums

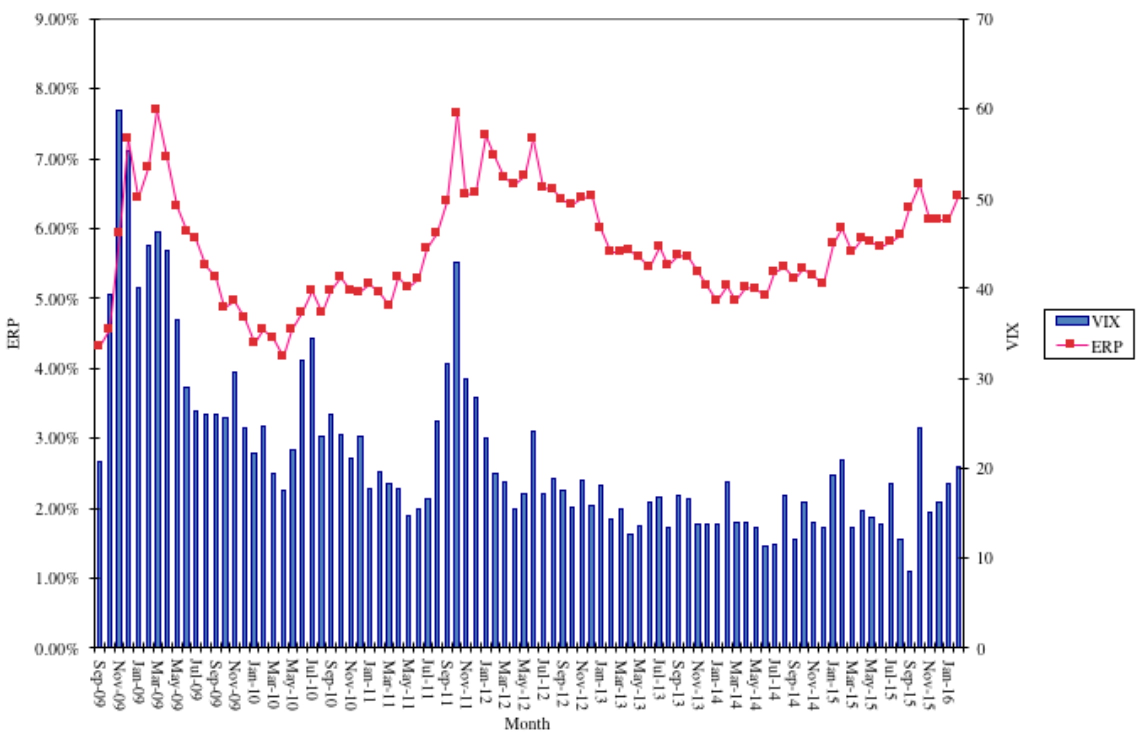


Santa-Clara and Yan (2006) use options on the S&P 500 to estimate the ex-ante risk assessed by investors from 1996 and 2002 and back out an implied equity risk premium on that basis.[128] To estimate the ex-ante risk, they allow for both continuous and discontinuous (or jump) risk in stocks, and use the option prices to estimate the probabilities of both types of risk. They then assume that investors share a specific utility function (power utility) and back out a risk premium that would compensate for this risk. Based on their estimates, investors should have demanded an equity risk premium of 11.8% for their perceived risk and that the perceived risk was about 70% higher than the realized risk over this period.

The link between equity market volatility and the equity risk premium also became clearer during the market meltdown in the last quarter of 2008. Earlier in the paper, we noted the dramatic shifts in the equity risk premiums, especially in the last year, as the financial crisis has unfolded. In Figure 20, we look at the implied equity risk premium each month from September 2008 to March 2016 and the volatility index (VIX) for the S&P 500:

[128] Santa-Clara, P. and S. Yan, 2006, *Crashes, Volatility, and the Equity Premium: Lessons from S&P 500 Options*, Review of Economics and Statistics, v92, pg 435-451.

Figure 20: ERP versus VIX



Note that the surge in equity risk premiums between September 2008 and December 2008 coincided with a jump in the volatility index and that both numbers have declined in the years since the crisis. The drop in the VIX between September 2011 and March 2012 was not accompanied by a decrease in the implied equity risk premium, but equity risk premiums drifted down in the year after. While the VIX stayed low for much of 2014, equity risk premiums climbed through the course of the year. In the last few months of 2015, the VIX spiked again on global market crises and the equity risk premium also went up.

In a paper referenced earlier, Bollerslev, Tauchen and Zhou (2009) take a different tack and argue that it is not the implied volatility per se, but the variance risk, i.e., the difference between the implied variance (in option prices) and the actual variance, that drives expected equity returns.[129] Thus, if the realized variance in a period is far higher (lower) than the implied variance, you should expect to see higher (lower) equity risk premiums demanded for subsequent periods. While they find evidence to back this

[129] Bollerslev, T. G. Tauchen and H. Zhou, 2009, *Expected Stock Returns and Variance Risk Premia*, Review of Financial Studies, v22, 4463-4492.

proposition, they also note the relationship is strongest for short term returns (next quarter) and are weaker for longer-term returns. Bekaert and Hoerova (2013) decomposed the squared VIX into two components, a conditional variance of the stock market and an equity variance premium, and conclude that while the latter is a significant predictor of stock returns but the former is not.[130]

Choosing an Equity Risk Premium

We have looked at three different approaches to estimating risk premiums, the survey approach, where the answer seems to depend on who you ask and what you ask them, the historical premium approach, with wildly different results depending on how you slice and dice historical data and the implied premium approach, where the final number is a function of the model you use and the assumptions you make about the future. Ultimately, thought, we have to choose a number to use in analysis and that number has consequences. In this section, we consider why the approaches give you different numbers and a pathway to use to devise which number is best for you.

Why do the approaches yield different values?

The different ways of estimating equity risk premium provide cover for analysts by providing justification for almost any number they choose to use in practice. No matter what the premium used by an analyst, whether it be 3% or 12%, there is back-up evidence offered that the premium is appropriate. While this may suffice as a legal defense, it does not pass muster on common sense grounds since not all risk premiums are equally justifiable. To provide a measure of how the numbers vary, the values that we have attached to the US equity risk premium, using different approaches, in January 2013 are summarized in table 23.

Table 23: Equity Risk Premium (ERP) for the United States – January 2013

Approach Used	*ERP*	*Additional information*
Survey: CFOs	4.51%	Campbell and Harvey survey of CFOs (2015); Average estimate. Median was 3.88%.

[130] Bekaert, G. and M. Hoerova, 2013, *The VIX, Variance Premium and Stock Market Volatility*, SSRN Working Paper, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2342200.

Survey: Global Fund Managers	4.60%	Merrill Lynch (January 2014) survey of global managers
Historical - US	4.54%	Geometric average - Stocks over T.Bonds: 1928-2015
Historical – Multiple Equity Markets	3.20%	Average premium across 20 markets from 1900-2015: Dimson, Marsh and Staunton (2016)
Current Implied premium	6.12%	From S&P 500 – January 1, 2016
Average Implied premium	4.11%	Average of implied equity risk premium: 1960-2015
Default spread based premium	6.52%	Baa Default Spread * Median value of (ERP/ Default Spread)

The equity risk premiums, using the different approaches, yield a range, with the lowest value being 2.80% and the highest being 5.78%. Note that the range would have been larger if we used other measures of historical risk premiums: different time periods, arithmetic instead of geometric averages.

There are several reasons why the approaches yield different answers much of time and why they converge sometimes.

1. When stock prices enter an extended phase of upward (downward) movement, the historical risk premium will climb (drop) to reflect past returns. Implied premiums will tend to move in the opposite direction, since higher (lower) stock prices generally translate into lower (higher) premiums. In 1999, for instance, after the technology induced stock price boom of the 1990s, the implied premium was 2% but the historical risk premium was almost 6%.
2. Survey premiums reflect historical data more than expectations. When stocks are going up, investors tend to become more optimistic about future returns and survey premiums reflect this optimism. In fact, the evidence that human beings overweight recent history (when making judgments) and overreact to information can lead to survey premiums overshooting historical premiums in both good and bad times. In

good times, survey premiums are even higher than historical premiums, which, in turn, are higher than implied premiums; in bad times, the reverse occurs.

3. When the fundamentals of a market change, either because the economy becomes more volatile or investors get more risk averse, historical risk premiums will not change but implied premiums will. Shocks to the market are likely to cause the two numbers to deviate. After the terrorist attack on the World Trade Center in September 2001, for instance, implied equity risk premiums jumped almost 0.50% but historical premiums were unchanged (at least until the next update).

In summary, we should not be surprised to see large differences in equity risk premiums as we move from one approach to another, and even within an approach, as we change estimation parameters.

Which approach is the "best" approach?

If the approaches yield different numbers for the equity risk premium, and we have to choose one of these numbers, how do we decide which one is the "best" estimate? The answer to this question will depend upon several factors:

a. Predictive Power: In corporate finance and valuation, what we ultimately care about is the equity risk premium for the future. Consequently, the approach that has the best predictive power, i.e. yields forecasts of the risk premium that are closer to realized premiums, should be given more weight. So, which of the approaches does best on this count?

Campbell and Shiller (1988) suggested that the dividend yield, a simplistic measure of the implied equity risk premium, had significant predictive power for future returns.[131] However, Goyal and Welch (2007) examined many of the measures suggested as predictors of the equity risk premium in the literature, including the dividend yield and the earnings to price ratio, and find them all wanting.[132] Using data from 1926 to 2005, they conclude that while the measures do reasonably well in sample, they perform poorly out of sample, suggesting that the relationships in the literature are either spurious or unstable. Campbell and Thompson (2008) disagree,

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131 Campbell, J. Y. and R. J. Shiller. 1988, *The Dividend-Price Ratio And Expectations Of Future Dividends And Discount Factors*, Review of Financial Studies, v1(3), 195-228.

132 Goyal, A. and I. Welch, 2007, *A Comprehensive Look at the Empirical Performance of Equity Premium Prediction,* Review of Financial Studies, v21, 1455-1508.

noting that putting simple restrictions on the predictive regressions improve out of sample performance for many predictive variables.[133]

To answer this question, we looked at the implied equity risk premiums from 1960 to 2015 and considered four predictors of this premium – the historical risk premium through the end of the prior year, the implied equity risk premium at the end of the prior year, the average implied equity risk premium over the previous five years and the premium implied by the Baa default spread. Since the survey data does not go back very far, we could not test the efficacy of the survey premium. Our results are summarized in table 24:

Table 24: Predictive Power of different estimates- 1960 - 2015

Predictor	*Correlation with implied premium next year*	*Correlation with actual return- next 5 years*	*Correlation with actual return – next 10 years*[134]
Current implied premium	0.750	0.475	0.541
Average implied premium: Last 5 years	0.703	0.541	0.747
Historical Premium	-0.476	-0.442	-0.469
Default Spread based premium	0.035	0.234	0.225

Over this period, the implied equity risk premium at the end of the prior period was the best predictor of the implied equity risk premium in the next period, whereas historical risk premiums did worst. If we extend our analysis to make forecasts of the actual return premium earned by stocks over bonds for the next five or ten years, the average implied equity risk premium over the last five years yields the best forecast for the future,

[133] Campbell, J.Y., and S.B. Thompson, 2008, *Predictive Excess Stock Returns Out of Sample: Can Anything Beat the Historical Average?* Review of Financial Studies, v21, 150-9-1531.

[134] I computed the compounded average return on stocks in the following five (ten) years and netted out the compounded return earned on T.Bonds over the following five (ten) years. This was a switch from the simple arithmetic average of returns over the next 10 years that I was using until last year's survey.

though default spread based premiums improve as predictors. Historical risk premiums perform even worse as forecasts of actual risk premiums over the next 5 or 10 years. If predictive power were the only test, historical premiums clearly fail the test.

b. Beliefs about markets: Implicit in the use of each approach are assumptions about market efficiency or lack thereof. If you believe that markets are efficient in the aggregate, or at least that you cannot forecast the direction of overall market movements, the current implied equity premium is the most logical choice, since it is estimated from the current level of the index. If you believe that markets, in the aggregate, can be significantly overvalued or undervalued, the historical risk premium or the average implied equity risk premium over long periods becomes a better choice. If you have absolutely no faith in markets, survey premiums will be the choice.

c. Purpose of the analysis: Notwithstanding your beliefs about market efficiency, the task for which you are using equity risk premiums may determine the right risk premium to use. In acquisition valuations and equity research, for instance, you are asked to assess the value of an individual company and not take a view on the level of the overall market. This will require you to use the current implied equity risk premium, since using any other number will bring your market views into the valuation. To see why, assume that the current implied premium is 4% and you decide to use a historical premium of 6% in your company valuation. Odds are that you will find the company to be over valued, but a big reason for your conclusion is that you started off with the assumption that the market itself is over valued by about 25-30%.[135] To make yourself market neutral, you will have to stick with the current implied premium. In corporate finance, where the equity risk premium is used to come up with a cost of capital, which in turn determines the long-term investments of the company, it may be more prudent to build in a long-term average (historical or implied) premium.

In conclusion, there is no one approach to estimating equity risk premiums that will work for all analyses. If predictive power is critical or if market neutrality is a pre-requisite, the current implied equity risk premium is the best choice. For those more skeptical about markets, the choices are broader, with the average implied equity risk premium over a long

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[135] If the current implied premium is 4%, using a 6% premium on the market will reduce the value of the index by about 25-30%.

time period having the strongest predictive power. Historical risk premiums are very poor predictors of both short-term movements in implied premiums or long-term returns on stocks.

As a final note, there are papers that report consensus premiums, often estimated by averaging across approaches. I remain skeptical about these estimates, since the approaches vary not only in terms of accuracy and predictive power but also in their philosophy. Averaging a historical risk premium with an implied premium may give an analyst a false sense of security but it really makes no sense since they represent different views of the world and push in different directions.

Five myths about equity risk premiums

There are widely held misconceptions about equity risk premiums that we would like to dispel in this section.

1. Estimation services "know" the risk premium: When Ibbotson and Sinquefield put together the first database of historical returns on stocks, bonds and bills in the 1970s, the data that they used was unique and not easily replicable, even for professional money managers. The niche they created, based on proprietary data, has led some to believe that Ibbotson Associates, and data services like them, have the capacity to read the historical data better than the rest of us, and therefore come up with better estimates. Now that the access to data has been democratized, and we face a much more even playing field, there is no reason to believe that any service has an advantage over any other, when it comes to historical premiums. Analysts should no longer be allowed to hide behind the defense that the equity risk premiums they use come from a reputable service and are thus beyond questioning.
2. There is no right risk premium: The flip side of the "services know it best" argument is that the data is so noisy that no one knows what the right risk premium is, and that any risk premium within a wide range is therefore defensible. As we have noted in this paper, it is indeed possible to arrive at outlandishly high or low premiums, but only if you use estimation approaches that do not hold up to scrutiny. The arithmetic average premium from 2006 to 2015 for stocks over treasury bonds is an equity risk premium estimate, but it is not a good one.

3. The equity risk premium does not change much over time: Equity risk premiums reflect both economic fundamentals and investor risk aversion and they do change over time, sometimes over very short intervals, as evidenced by what happened in the last quarter of 2008. Shocks to the system – a collapse of a large company or sovereign entity or a terrorist attack – can cause premiums to shoot up overnight. A failure to recognize this reality will lead to analyses that lag reality.
4. Using the same premium is more important than using the right premium: Within many investment banks, corporations and consulting firms, the view seems to be that getting all analysts to use the same number as the risk premium is more important than testing to see whether that number makes sense. Thus, if all equity research analysts use 5% as the equity risk premium, the argument is that they are all being consistent. There are two problems with this argument. The first is that using a premium that is too high or low will lead to systematic errors in valuation. For instance, using a 5% risk premium across the board, when the implied premium is 4%, will lead you to find that most stocks are overvalued. . The second is that the impact of using too high a premium can vary across stocks, with growth stocks being affected more negatively than mature companies. A portfolio manager who followed the recommendations of these analysts would then be over invested in mature companies and under invested in growth companies.
5. If you adjust the cash flows for risk, there is no need for a risk premium: While statement is technically correct, adjusting cash flows for risk has to go beyond reflecting the likelihood of negative scenarios in the expected cash flow. The risk adjustment to expected cash flows to make them certainty equivalent cash flows requires us to answer exactly the same questions that we deal with when adjusting discount rates for risk.

Summary

The risk premium is a fundamental and critical component in portfolio management, corporate finance and valuation. Given its importance, it is surprising that more attention has not been paid in practical terms to estimation issues. In this paper, we began by looking at the determinants of equity risk premiums including macro economic volatility, investor risk aversion and behavioral components. We then looked at the three basic approaches used to estimate equity risk premiums – the survey approach, where investors or managers are asked to provide estimates of the equity risk premium for the future, the historical return approach, where the premium is based upon how well equities have done in the past and the implied approach, where we use future cash flows or observed bond default spreads to estimate the current equity risk premium.

The premiums that we estimate can vary widely across approaches, and we considered two questions towards the end of the paper. The first is why the numbers vary across approaches and the second is how to choose the "right" number to use in analysis. For the latter question, we argued that the choice of a premium will depend upon the forecast period, whether your believe markets are efficient and whether you are required to be market neutral in your analysis.

Appendix 1: Historical Returns on Stocks, Bonds and Bills – United States

The historical returns on stocks include dividends each year and the historical returns on T.Bonds are computed for a constant-maturity 10-year treasury bond and include both price change and coupon each year.

Year	*S&P 500*	*3-month T.Bill*	*10-year T. Bond*	*Stocks - Bills*	*Stocks - Bonds*	*Arithmetic Average: Stocks minus T.Bonds*	*Geometric Average: Stocks minus T. Bonds*
1928	43.81%	3.08%	0.84%	40.73%	42.98%	42.98%	42.98%
1929	-8.30%	3.16%	4.20%	-11.46%	-12.50%	15.24%	12.33%
1930	-25.12%	4.55%	4.54%	-29.67%	-29.66%	0.27%	-3.60%
1931	-43.84%	2.31%	-2.56%	-46.15%	-41.28%	-10.12%	-15.42%
1932	-8.64%	1.07%	8.79%	-9.71%	-17.43%	-11.58%	-15.81%
1933	49.98%	0.96%	1.86%	49.02%	48.13%	-1.63%	-7.36%
1934	-1.19%	0.32%	7.96%	-1.51%	-9.15%	-2.70%	-7.61%
1935	46.74%	0.18%	4.47%	46.57%	42.27%	2.92%	-2.49%
1936	31.94%	0.17%	5.02%	31.77%	26.93%	5.59%	0.40%
1937	-35.34%	0.30%	1.38%	-35.64%	-36.72%	1.36%	-4.22%
1938	29.28%	0.08%	4.21%	29.21%	25.07%	3.51%	-1.87%
1939	-1.10%	0.04%	4.41%	-1.14%	-5.51%	2.76%	-2.17%
1940	-10.67%	0.03%	5.40%	-10.70%	-16.08%	1.31%	-3.30%
1941	-12.77%	0.08%	-2.02%	-12.85%	-10.75%	0.45%	-3.88%
1942	19.17%	0.34%	2.29%	18.84%	16.88%	1.54%	-2.61%
1943	25.06%	0.38%	2.49%	24.68%	22.57%	2.86%	-1.18%
1944	19.03%	0.38%	2.58%	18.65%	16.45%	3.66%	-0.21%
1945	35.82%	0.38%	3.80%	35.44%	32.02%	5.23%	1.35%
1946	-8.43%	0.38%	3.13%	-8.81%	-11.56%	4.35%	0.63%
1947	5.20%	0.57%	0.92%	4.63%	4.28%	4.35%	0.81%
1948	5.70%	1.02%	1.95%	4.68%	3.75%	4.32%	0.95%
1949	18.30%	1.10%	4.66%	17.20%	13.64%	4.74%	1.49%
1950	30.81%	1.17%	0.43%	29.63%	30.38%	5.86%	2.63%
1951	23.68%	1.48%	-0.30%	22.20%	23.97%	6.61%	3.46%
1952	18.15%	1.67%	2.27%	16.48%	15.88%	6.98%	3.94%
1953	-1.21%	1.89%	4.14%	-3.10%	-5.35%	6.51%	3.57%
1954	52.56%	0.96%	3.29%	51.60%	49.27%	8.09%	4.98%
1955	32.60%	1.66%	-1.34%	30.94%	33.93%	9.01%	5.93%
1956	7.44%	2.56%	-2.26%	4.88%	9.70%	9.04%	6.07%
1957	-10.46%	3.23%	6.80%	-13.69%	-17.25%	8.16%	5.23%
1958	43.72%	1.78%	-2.10%	41.94%	45.82%	9.38%	6.39%

1959	12.06%	3.26%	-2.65%	8.80%	14.70%	9.54%	6.66%
1960	0.34%	3.05%	11.64%	-2.71%	-11.30%	8.91%	6.11%
1961	26.64%	2.27%	2.06%	24.37%	24.58%	9.37%	6.62%
1962	-8.81%	2.78%	5.69%	-11.59%	-14.51%	8.69%	5.97%
1963	22.61%	3.11%	1.68%	19.50%	20.93%	9.03%	6.36%
1964	16.42%	3.51%	3.73%	12.91%	12.69%	9.13%	6.53%
1965	12.40%	3.90%	0.72%	8.50%	11.68%	9.20%	6.66%
1966	-9.97%	4.84%	2.91%	-14.81%	-12.88%	8.63%	6.11%
1967	23.80%	4.33%	-1.58%	19.47%	25.38%	9.05%	6.57%
1968	10.81%	5.26%	3.27%	5.55%	7.54%	9.01%	6.60%
1969	-8.24%	6.56%	-5.01%	-14.80%	-3.23%	8.72%	6.33%
1970	3.56%	6.69%	16.75%	-3.12%	-13.19%	8.21%	5.90%
1971	14.22%	4.54%	9.79%	9.68%	4.43%	8.12%	5.87%
1972	18.76%	3.95%	2.82%	14.80%	15.94%	8.30%	6.08%
1973	-14.31%	6.73%	3.66%	-21.03%	-17.97%	7.73%	5.50%
1974	-25.90%	7.78%	1.99%	-33.68%	-27.89%	6.97%	4.64%
1975	37.00%	5.99%	3.61%	31.01%	33.39%	7.52%	5.17%
1976	23.83%	4.97%	15.98%	18.86%	7.85%	7.53%	5.22%
1977	-6.98%	5.13%	1.29%	-12.11%	-8.27%	7.21%	4.93%
1978	6.51%	6.93%	-0.78%	-0.42%	7.29%	7.21%	4.97%
1979	18.52%	9.94%	0.67%	8.58%	17.85%	7.42%	5.21%
1980	31.74%	11.22%	-2.99%	20.52%	34.72%	7.93%	5.73%
1981	-4.70%	14.30%	8.20%	-19.00%	-12.90%	7.55%	5.37%
1982	20.42%	11.01%	32.81%	9.41%	-12.40%	7.18%	5.10%
1983	22.34%	8.45%	3.20%	13.89%	19.14%	7.40%	5.34%
1984	6.15%	9.61%	13.73%	-3.47%	-7.59%	7.13%	5.12%
1985	31.24%	7.49%	25.71%	23.75%	5.52%	7.11%	5.13%
1986	18.49%	6.04%	24.28%	12.46%	-5.79%	6.89%	4.97%
1987	5.81%	5.72%	-4.96%	0.09%	10.77%	6.95%	5.07%
1988	16.54%	6.45%	8.22%	10.09%	8.31%	6.98%	5.12%
1989	31.48%	8.11%	17.69%	23.37%	13.78%	7.08%	5.24%
1990	-3.06%	7.55%	6.24%	-10.61%	-9.30%	6.82%	5.00%
1991	30.23%	5.61%	15.00%	24.62%	15.23%	6.96%	5.14%
1992	7.49%	3.41%	9.36%	4.09%	-1.87%	6.82%	5.03%
1993	9.97%	2.98%	14.21%	6.98%	-4.24%	6.65%	4.90%
1994	1.33%	3.99%	-8.04%	-2.66%	9.36%	6.69%	4.97%
1995	37.20%	5.52%	23.48%	31.68%	13.71%	6.80%	5.08%
1996	22.68%	5.02%	1.43%	17.66%	21.25%	7.01%	5.30%
1997	33.10%	5.05%	9.94%	28.05%	23.16%	7.24%	5.53%

1998	28.34%	4.73%	14.92%	23.61%	13.42%	7.32%	5.63%
1999	20.89%	4.51%	-8.25%	16.38%	29.14%	7.63%	5.96%
2000	-9.03%	5.76%	16.66%	-14.79%	-25.69%	7.17%	5.51%
2001	-11.85%	3.67%	5.57%	-15.52%	-17.42%	6.84%	5.17%
2002	-21.97%	1.66%	15.12%	-23.62%	-37.08%	6.25%	4.53%
2003	28.36%	1.03%	0.38%	27.33%	27.98%	6.54%	4.82%
2004	10.74%	1.23%	4.49%	9.52%	6.25%	6.53%	4.84%
2005	4.83%	3.01%	2.87%	1.82%	1.97%	6.48%	4.80%
2006	15.61%	4.68%	1.96%	10.94%	13.65%	6.57%	4.91%
2007	5.48%	4.64%	10.21%	0.84%	-4.73%	6.43%	4.79%
2008	-36.55%	1.59%	20.10%	-38.14%	-56.65%	5.65%	3.88%
2009	25.94%	0.14%	-11.12%	25.80%	37.05%	6.03%	4.29%
2010	14.82%	0.13%	8.46%	14.69%	6.36%	6.03%	4.31%
2011	2.10%	0.03%	16.04%	2.07%	-13.94%	5.80%	4.10%
2012	15.89%	0.05%	2.97%	15.84%	12.92%	5.88%	4.20%
2013	32.15%	0.07%	-9.10%	32.08%	41.25%	6.29%	4.62%
2014	13.52%	0.05%	10.75%	13.47%	2.78%	6.25%	4.60%
2015	1.36%	0.21%	1.28%	1.15%	0.08%	6.18%	4.54%

Appendix 2: Sovereign Ratings by Country- January 2016

These are Moody's sovereign ratings for both foreign currency (FC) and local currency (LC) borrowings, by country.

	FC	*LC*		*FC*	*LC*
Abu Dhabi	Aa2	Aa2	Kuwait	Aa2	Aa2
Albania	B1	B1	Kyrgyz Republic	B2	B2
Angola	Ba2	Ba2	Latvia	A3	A3
Argentina	Caa1	Caa1	Lebanon	B2	B2
Armenia	Ba3	Ba3	Lithuania	A3	A3
Australia	Aaa	Aaa	Luxembourg	Aaa	Aaa
Austria	Aaa	Aaa	Macao	Aa2	Aa2
Azerbaijan	Baa3	Baa3	Malaysia	A3	A3
Bahamas	Baa2	Baa2	Malta	A3	A3
Bahrain	Baa3	Baa3	Mauritius	Baa1	Baa1
Bangladesh	Ba3	Ba3	Mexico	A3	A3
Barbados	B3	B3	Moldova	B3	B3
Belarus	Caa1	Caa1	Mongolia	B2	B2
Belgium	Aa3	Aa3	Montenegro	Ba3	-
Belize	Caa2	Caa2	Morocco	Ba1	Ba1
Bermuda	A1	A1	Mozambique	B2	B2
Bolivia	Ba3	Ba3	Namibia	Baa3	Baa3
Bosnia and Herzegovina	B3	B3	Netherlands	Aaa	Aaa
Botswana	A2	A2	New Zealand	Aaa	Aaa
Brazil	Baa3	Baa3	Nicaragua	B2	B2
Bulgaria	Baa2	Baa2	Nigeria	Ba3	Ba3
Cambodia	B2	B2	Norway	Aaa	Aaa
Canada	Aaa	Aaa	Oman	A1	A1
Cayman Islands	Aa3	-	Pakistan	B3	B3
Chile	Aa3	Aa3	Panama	Baa2	-
China	Aa3	Aa3	Papua New Guinea	B1	B1
Colombia	Baa2	Baa2	Paraguay	Ba1	Ba1
Costa Rica	Ba1	Ba1	Peru	A3	A3
Côte d'Ivoire	Ba3	Ba3	Philippines	Baa2	Baa2
Croatia	Ba1	Ba1	Poland	A2	A2
Cuba	Caa2	-	Portugal	Ba1	Ba1
Cyprus	B1	B1	Qatar	Aa2	Aa2
Czech Republic	A1	A1	Republic of the Congo	Ba3	Ba3
Democratic Republic of the Congo	B3	B3	Romania	Baa3	Baa3

	FC	*LC*		*FC*	*LC*
Denmark	Aaa	Aaa	Russia	Ba1	Ba1
Dominican Republic	B1	B1	Saudi Arabia	Aa3	Aa3
Ecuador	B3	-	Senegal	B1	B1
Egypt	B3	B3	Serbia	B1	B1
El Salvador	Ba3	-	Sharjah	A3	A3
Estonia	A1	A1	Singapore	Aaa	Aaa
Ethiopia	B1	B1	Slovakia	A2	A2
Fiji	B1	B1	Slovenia	Baa3	Baa3
Finland	Aaa	Aaa	Solomon Islands	B3	B3
France	Aa2	Aa2	South Africa	Baa2	Baa2
Gabon	Ba3	Ba3	Spain	Baa2	Baa2
Georgia	Ba3	Ba3	Sri Lanka	B1	-
Germany	Aaa	Aaa	St. Maarten	Baa1	Baa1
Ghana	B3	B3	St. Vincent & the Grenadines	B3	B3
Greece	Caa3	Caa3	Suriname	Ba3	Ba3
Guatemala	Ba1	Ba1	Sweden	Aaa	Aaa
Honduras	B3	B3	Switzerland	Aaa	Aaa
Hong Kong	Aa1	Aa1	Taiwan	Aa3	Aa3
Hungary	Ba1	Ba1	Thailand	Baa1	Baa1
Iceland	Baa2	Baa2	Trinidad and Tobago	Baa2	Baa2
India	Baa3	Baa3	Tunisia	Ba3	Ba3
Indonesia	Baa3	Baa3	Turkey	Baa3	Baa3
Ireland	Baa1	Baa1	Uganda	B1	B1
Isle of Man	Aa1	Aa1	Ukraine	Caa3	Caa3
Israel	A1	A1	United Arab Emirates	Aa2	Aa2
Italy	Baa2	Baa2	United Kingdom	Aa1	Aa1
Jamaica	Caa2	Caa2	United States of America	Aaa	Aaa
Japan	A1	A1	Uruguay	Baa2	Baa2
Jordan	B1	B1	Venezuela	Caa3	Caa3
Kazakhstan	Baa2	Baa2	Vietnam	B1	B1
Kenya	B1	B1	Zambia	B2	B2
Korea	Aa2	Aa2			

Appendix 3: Country Risk Scores from the PRS Group – January 2016

Political Risk Services (PRS) is a risk estimation service that estimates country risk on multiple dimensions. The risk scores reported in this table are composite risk scores for each country, with lower numbers indicating higher risk.

Country	***PRS Score***	***Country***	***PRS Score***
Albania	68.8	Latvia	74.3
Algeria	63.0	Lebanon	60.8
Angola	59.0	Liberia	50.5
Argentina	65.3	Libya	52.8
Armenia	62.5	Lithuania	76.3
Australia	77.8	Luxembourg	87.0
Austria	78.8	Madagascar	61.3
Azerbaijan	68.5	Malawi	57.0
Bahamas	76.3	Malaysia	74.3
Bahrain	68.8	Mali	62.5
Bangladesh	66.0	Malta	77.5
Belarus	59.5	Mexico	68.3
Belgium	76.3	Moldova	62.3
Bolivia	68.8	Mongolia	62.5
Botswana	77.5	Morocco	69.5
Brazil	62.8	Mozambique	52.3
Brunei	72.8	Myanmar	63.3
Bulgaria	71.8	Namibia	71.3
Burkina Faso	63.5	Netherlands	82.8
Cameroon	63.8	New Zealand	82.3
Canada	81.3	Nicaragua	64.3
Chile	74.8	Niger	51.0
China, Peoples' Rep.	72.5	Nigeria	62.0
Colombia	65.3	Norway	87.5
Congo, Dem. Republic	57.3	Oman	74.5
Congo, Republic	64.8	Pakistan	61.3
Costa Rica	73.5	Panama	73.5
Cote d'Ivoire	64.0	Papua New Guinea	64.0
Croatia	71.5	Paraguay	67.3
Cuba	70.0	Peru	68.3
Cyprus	73.3	Philippines	73.0
Czech Republic	77.8	Poland	79.3
Denmark	82.3	Portugal	76.3

Dominican Republic	73.0	Qatar	78.3
Ecuador	63.0	Romania	71.8
Egypt	60.5	Russia	64.3
El Salvador	68.3	Saudi Arabia	72.5
Estonia	74.8	Senegal	63.3
Ethiopia	61.0	Serbia	63.8
Finland	81.8	Sierra Leone	56.5
France	73.8	Singapore	87.3
Gabon	69.5	Slovakia	74.0
Gambia	62.0	Slovenia	72.3
Germany	84.5	Somalia	42.5
Ghana	64.3	South Africa	66.3
Greece	68.5	Spain	74.0
Guatemala	70.0	Sri Lanka	67.5
Guinea	53.8	Sudan	48.3
Guinea-Bissau	62.3	Suriname	68.3
Guyana	63.5	Sweden	85.8
Haiti	57.0	Switzerland	87.5
Honduras	66.8	Syria	35.8
Hong Kong	81.0	Taiwan	83.3
Hungary	75.3	Tanzania	63.0
Iceland	83.5	Thailand	68.0
India	69.3	Togo	63.8
Indonesia	63.8	Trinidad & Tobago	75.5
Iran	67.8	Tunisia	65.8
Iraq	56.0	Turkey	61.5
Ireland	82.5	Uganda	60.3
Israel	77.0	Ukraine	52.0
Italy	75.5	United Arab Emirates	77.8
Jamaica	71.0	United Kingdom	80.3
Japan	82.3	United States	78.3
Jordan	68.8	Uruguay	70.5
Kazakhstan	63.8	Venezuela	49.3
Kenya	62.0	Vietnam	71.5
Korea, D.P.R.	56.0	Yemen, Republic	50.3
Korea, Republic	81.0	Zambia	65.0
Kuwait	73.8	Zimbabwe	54.5

Appendix 4: Equity Market volatility, relative to S&P 500: Total Equity Risk Premiums and Country Risk Premiums (Weekly returns from 1/14 – 1/16)

The standard deviation in stocks is computed using the primary index for each country, using two years of weekly returns.

Country	*Std deviation in Equities (weekly)*	*Relative Volatility (to US)*	*Total Equity Risk Premium*	*Country risk premium*
Argentina	38.11%	3.00	18.02%	12.02%
Bahrain	7.93%	0.62	3.75%	-2.25%
Bangladesh	13.48%	1.06	6.37%	0.37%
Bosnia	8.96%	0.71	4.24%	-1.76%
Botswana	4.89%	0.39	2.31%	-3.69%
Brazil	23.52%	1.85	11.12%	5.12%
Bulgaria	14.54%	1.15	6.87%	0.87%
Chile	12.29%	0.97	5.81%	-0.19%
China	29.13%	2.30	13.77%	7.77%
Colombia	17.48%	1.38	8.26%	2.26%
Costa Rica	8.31%	0.65	3.93%	-2.07%
Croatia	7.77%	0.61	3.67%	-2.33%
Cyprus	32.96%	2.60	15.58%	9.58%
Czech Republic	13.82%	1.09	6.53%	0.53%
Egypt	27.71%	2.18	13.10%	7.10%
Estonia	10.89%	0.86	5.15%	-0.85%
Ghana	8.33%	0.66	3.94%	-2.06%
Greece	43.21%	3.41	20.43%	14.43%
Hungary	17.05%	1.34	8.06%	2.06%
Iceland	10.01%	0.79	4.73%	-1.27%
India	14.93%	1.18	7.06%	1.06%
Indonesia	15.19%	1.20	7.18%	1.18%
Ireland	17.41%	1.37	8.23%	2.23%
Israel	10.30%	0.81	4.87%	-1.13%
Italy	20.08%	1.58	9.49%	3.49%
Jamaica	16.93%	1.33	8.00%	2.00%
Jordan	7.14%	0.56	3.38%	-2.62%
Kazakhastan	32.79%	2.58	15.50%	9.50%

Kenya	10.90%	0.86	5.15%	-0.85%
Korea	12.40%	0.98	5.86%	-0.14%
Kuwait	10.77%	0.85	5.09%	-0.91%
Laos	16.00%	1.26	7.57%	1.57%
Latvia	17.53%	1.38	8.29%	2.29%
Lebanon	6.33%	0.50	2.99%	-3.01%
Lithuania	7.63%	0.60	3.61%	-2.39%
Macedonia	11.59%	0.91	5.48%	-0.52%
Malaysia	10.65%	0.84	5.04%	-0.96%
Malta	7.75%	0.61	3.66%	-2.34%
Mauritius	5.40%	0.43	2.55%	-3.45%
Mexico	13.68%	1.08	6.47%	0.47%
Mongolia	17.21%	1.36	8.14%	2.14%
Montenegro	20.08%	1.58	9.49%	3.49%
Morocco	8.16%	0.64	3.86%	-2.14%
Namibia	21.83%	1.72	10.32%	4.32%
Nigeria	27.08%	2.13	12.80%	6.80%
Oman	17.56%	1.38	8.30%	2.30%
Pakistan	14.21%	1.12	6.72%	0.72%
Palestine	9.33%	0.74	4.41%	-1.59%
Panama	4.69%	0.37	2.22%	-3.78%
Peru	15.94%	1.26	7.54%	1.54%
Philippines	11.29%	0.89	5.34%	-0.66%
Poland	13.93%	1.10	6.59%	0.59%
Portugal	22.96%	1.81	10.86%	4.86%
Qatar	21.16%	1.67	10.00%	4.00%
Romania	12.79%	1.01	6.05%	0.05%
Russia	22.90%	1.80	10.83%	4.83%
Saudi Arabia	24.27%	1.91	11.48%	5.48%
Serbia	10.18%	0.80	4.81%	-1.19%
Singapore	11.27%	0.89	5.33%	-0.67%
Slovakia	17.69%	1.39	8.36%	2.36%
Slovenia	14.17%	1.12	6.70%	0.70%
South Africa	14.79%	1.17	6.99%	0.99%
Spain	22.89%	1.80	10.82%	4.82%
Sri Lanka	8.88%	0.70	4.20%	-1.80%

Taiwan	14.02%	1.10	6.63%	0.63%
Tanzania	19.44%	1.53	9.19%	3.19%
Thailand	12.08%	0.95	5.71%	-0.29%
Tunisia	8.44%	0.67	3.99%	-2.01%
Turkey	20.97%	1.65	9.91%	3.91%
UAE	31.74%	2.50	15.01%	9.01%
Ukraine	29.74%	2.34	14.06%	8.06%
US	**12.69%**	1.00	**6.00%**	**0.00%**
Venezuela	51.23%	4.04	24.22%	18.22%
Vietnam	17.55%	1.38	8.30%	2.30%

Appendix 5: Equity Market Volatility versus Bond Market/CDS volatility

Standard deviation in equity index (σ_{Equity}) and government bond price (σ_{Bond}) was computed, using 100 trading weeks, where available. To compute the σ_{CDS}, we first computed the standard deviation of the CDS in basis points over 100 weeks and then divided by the level of the CDS to get a coefficient of variation.

Country	*Std deviation in Equities (weekly)*	σ_{Bond}	$\sigma_{Equity}/\sigma_{Bond}$	*σ (CDS)*	*CDS*	*CVCDS*	$\sigma_{Equity}/\sigma_{CDS}$
Bahrain	7.93%	NA	NA	0.3200%	4.00%	8.00%	0.99
Brazil	23.52%	12.21%	1.93	0.4111%	5.09%	8.07%	2.91
Bulgaria	14.54%	13.05%	1.11	0.2917%	2.13%	13.69%	1.06
Chile	12.29%	8.04%	1.53	0.3765%	1.54%	24.50%	0.50
China	29.13%	NA	NA	0.3936%	1.76%	22.36%	1.30
Colombia	17.48%	7.09%	2.47	0.4247%	3.22%	13.19%	1.33
Costa Rica	8.31%	NA	NA	0.3136%	4.86%	6.45%	1.29
Croatia	7.77%	NA	NA	0.2240%	3.23%	6.93%	1.12
Cyprus	32.96%	NA	NA	0.5916%	2.66%	22.24%	1.48
Czech Republic	13.82%	4.93%	2.80	0.3475%	0.81%	42.90%	0.32
Egypt	27.71%	NA	NA	0.2988%	5.48%	5.45%	5.08
Estonia	10.89%	NA	NA	0.3969%	0.80%	49.71%	0.22
Hungary	17.05%	NA	NA	0.3111%	2.03%	15.33%	1.11
Iceland	10.01%	4.02%	2.49	0.3686%	1.26%	29.31%	0.34
India	14.93%	2.93%	5.10	0.3731%	2.25%	16.59%	0.90
Indonesia	15.19%	10.00%	1.52	0.3922%	2.96%	13.27%	1.14
Ireland	17.41%	3.08%	5.65	0.4114%	1.06%	38.81%	0.45
Israel	10.30%	4.86%	2.12	0.2495%	1.19%	20.97%	0.49
Italy	20.08%	7.23%	2.78	0.5215%	1.93%	27.09%	0.74
Kazakhastan	32.79%	NA	NA	0.3585%	3.55%	10.10%	3.25
Korea	12.40%	NA	NA	0.4744%	0.89%	53.60%	0.23
Latvia	17.53%	NA	NA	0.2699%	1.30%	20.76%	0.84
Lebanon	6.33%	3.15%	2.01	0.3565%	5.00%	7.13%	0.89
Lithuania	7.63%	NA	NA	0.2612%	1.26%	20.73%	0.37
Malaysia	10.65%	NA	NA	0.5214%	2.21%	23.59%	0.45
Mexico	13.68%	4.74%	2.89	0.4093%	2.48%	16.50%	0.83
Morocco	8.16%	NA	NA	0.3185%	2.69%	11.84%	0.69
Pakistan	14.21%	NA	NA	0.3219%	6.56%	4.90%	2.90
Panama	4.69%	NA	NA	0.3181%	2.32%	13.70%	0.34
Peru	15.94%	8.51%	1.87	0.3400%	2.35%	14.50%	1.10
Philippines	11.29%	30.36%	0.37	0.3890%	1.68%	23.22%	0.49
Poland	13.93%	12.13%	1.15	0.2970%	1.38%	21.57%	0.65
Portugal	22.96%	7.14%	3.22	0.5728%	3.18%	18.03%	1.27

Qatar	21.16%	NA	NA	0.4138%	1.63%	25.42%	0.83
Romania	12.79%	NA	NA	0.2938%	1.66%	17.72%	0.72
Russia	22.90%	40.10%	0.57	0.5519%	3.67%	15.05%	1.52
Saudi Arabia	24.27%	17.55%	1.38	0.6852%	1.93%	35.50%	0.68
Slovakia	17.69%	7.91%	2.24	0.1457%	0.88%	16.63%	1.06
Slovenia	14.17%	5.78%	2.45	0.2665%	1.62%	16.47%	0.86
South Africa	14.79%	20.21%	0.73	0.3821%	3.99%	9.58%	1.54
Spain	22.89%	6.37%	3.59	0.5239%	1.55%	33.85%	0.68
Thailand	12.08%	6.87%	1.76	0.3830%	2.05%	18.73%	0.65
Tunisia	8.44%	NA	NA	0.4039%	6.33%	6.38%	1.32
Turkey	20.97%	9.46%	2.22	0.3261%	3.39%	9.61%	2.18
Venezuela	51.23%	44.85%	1.14	1.3700%	NA	NA	NA
Vietnam	17.55%	NA	NA	0.2610%	3.52%	7.41%	2.37

Appendix 6: Year-end Implied Equity Risk Premiums: 1961-2015

These estimates of equity risk premium for the S&P 500 are forward looking and are computed based on the index level at the end of each year and the expected cash flows on the index for the future. The cash flows are computed as dividends plus stock buybacks in each year.

Year	*S&P 500*	*Earnings*[a]	*Dividends*[a]	*T.Bond Rate*	*Estimated Growth*	*Implied Premium*
1961	71.55	3.37	2.04	2.35%	2.41%	2.92%
1962	63.1	3.67	2.15	3.85%	4.05%	3.56%
1963	75.02	4.13	2.35	4.14%	4.96%	3.38%
1964	84.75	4.76	2.58	4.21%	5.13%	3.31%
1965	92.43	5.30	2.83	4.65%	5.46%	3.32%
1966	80.33	5.41	2.88	4.64%	4.19%	3.68%
1967	96.47	5.46	2.98	5.70%	5.25%	3.20%
1968	103.86	5.72	3.04	6.16%	5.32%	3.00%
1969	92.06	6.10	3.24	7.88%	7.55%	3.74%
1970	92.15	5.51	3.19	6.50%	4.78%	3.41%
1971	102.09	5.57	3.16	5.89%	4.57%	3.09%
1972	118.05	6.17	3.19	6.41%	5.21%	2.72%
1973	97.55	7.96	3.61	6.90%	8.30%	4.30%
1974	68.56	9.35	3.72	7.40%	6.42%	5.59%
1975	90.19	7.71	3.73	7.76%	5.99%	4.13%
1976	107.46	9.75	4.22	6.81%	8.19%	4.55%
1977	95.1	10.87	4.86	7.78%	9.52%	5.92%
1978	96.11	11.64	5.18	9.15%	8.48%	5.72%
1979	107.94	14.55	5.97	10.33%	11.70%	6.45%
1980	135.76	14.99	6.44	12.43%	11.01%	5.03%
1981	122.55	15.18	6.83	13.98%	11.42%	5.73%
1982	140.64	13.82	6.93	10.47%	7.96%	4.90%
1983	164.93	13.29	7.12	11.80%	9.09%	4.31%
1984	167.24	16.84	7.83	11.51%	11.02%	5.11%
1985	211.28	15.68	8.20	8.99%	6.75%	3.84%
1986	242.17	14.43	8.19	7.22%	6.96%	3.58%
1987	247.08	16.04	9.17	8.86%	8.58%	3.99%
1988	277.72	24.12	10.22	9.14%	7.67%	3.77%
1989	353.4	24.32	11.73	7.93%	7.46%	3.51%
1990	330.22	22.65	12.35	8.07%	7.19%	3.89%
1991	417.09	19.30	12.97	6.70%	7.81%	3.48%
1992	435.71	20.87	12.64	6.68%	9.83%	3.55%
1993	466.45	26.90	12.69	5.79%	8.00%	3.17%
1994	459.27	31.75	13.36	7.82%	7.17%	3.55%

1995	615.93	37.70	14.17	5.57%	6.50%	3.29%
1996	740.74	40.63	14.89	6.41%	7.92%	3.20%
1997	970.43	44.09	15.52	5.74%	8.00%	2.73%
1998	1229.23	44.27	16.20	4.65%	7.20%	2.26%
1999	1469.25	51.68	16.71	6.44%	12.50%	2.05%
2000	1320.28	56.13	16.27	5.11%	12.00%	2.87%
2001	1148.09	38.85	15.74	5.05%	10.30%	3.62%
2002	879.82	46.04	16.08	3.81%	8.00%	4.10%
2003	1111.91	54.69	17.88	4.25%	11.00%	3.69%
2004	1211.92	67.68	19.407	4.22%	8.50%	3.65%
2005	1248.29	76.45	22.38	4.39%	8.00%	4.08%
2006	1418.3	87.72	25.05	4.70%	12.50%	4.16%
2007	1468.36	82.54	27.73	4.02%	5.00%	4.37%
2008	903.25	65.39	28.05	2.21%	4.00%	6.43%
2009	1115.10	59.65	22.31	3.84%	7.20%	4.36%
2010	1257.64	83.66	23.12	3.29%	6.95%	5.20%
2011	1257.60	97.05	26.02	1.87%	7.18%	6.01%
2012	1426.19	102.47	30.44	1.76%	5.27%	5.78%
2013	1848.36	107.45	36.28	3.04%	4.28%	4.96%
2014	2058.90	114.74	38.57	2.17%	5.58%	5.78%
2015	2043.90	106.32	43.00	2.27%	5.55%	6.12%

[a] The earnings and dividend numbers for the S&P 500 represent the estimates that would have been available at the start of each of the years and thus may not match up to the actual numbers for the year. For instance, in January 2011, the estimated earnings for the S&P 500 index included actual earnings for three quarters of 2011 and the estimated earnings for the last quarter of 2011. The actual earnings for the last quarter would not have been available until March of 2011.

CHAPTER 13

DIVIDEND DISCOUNT MODELS

In the strictest sense, the only cash flow you receive from a firm when you buy publicly traded stock is the dividend. The simplest model for valuing equity is the dividend discount model -- the value of a stock is the present value of expected dividends on it. While many analysts have turned away from the dividend discount model and viewed it as outmoded, much of the intuition that drives discounted cash flow valuation is embedded in the model. In fact, there are specific companies where the dividend discount model remains a useful took for estimating value.

This chapter explores the general model as well as specific versions of it tailored for different assumptions about future growth. It also examines issues in using the dividend discount model and the results of studies that have looked at its efficacy.

The General Model

When an investor buys stock, she generally expects to get two types of cashflows - dividends during the period she holds the stock and an expected price at the end of the holding period. Since this expected price is itself determined by future dividends, the value of a stock is the present value of dividends through infinity.

$$\text{Value per share of stock} = \sum_{t=1}^{t=\infty} \frac{E(DPS_t)}{(1+k_e)^t}$$

where,

DPS_t = Expected dividends per share

k_e = Cost of equity

The rationale for the model lies in the present value rule - the value of any asset is the present value of expected future cash flows discounted at a rate appropriate to the riskiness of the cash flows.

There are two basic inputs to the model - expected dividends and the cost on equity. To obtain the expected dividends, we make assumptions about expected future growth rates in earnings and payout ratios. The required rate of return on a stock is determined by its riskiness, measured differently in different models - the market beta in the CAPM, and the factor betas in the arbitrage and multi-factor models. The model is flexible enough to allow for time-varying discount rates, where the time variation is caused by expected changes in interest rates or risk across time.

Versions of the model

Since projections of dollar dividends cannot be made through infinity, several versions of the dividend discount model have been developed based upon different assumptions about future growth. We will begin with the simplest – a model designed to value stock in a stable-growth firm that pays out what it can afford in dividends and then look at how the model can be adapted to value companies in high growth that may be paying little or no dividends.

I. The Gordon Growth Model

The Gordon growth model can be used to value a firm that is in 'steady state' with dividends growing at a rate that can be sustained forever.

The Model

The Gordon growth model relates the value of a stock to its expected dividends in the next time period, the cost of equity and the expected growth rate in dividends.

$$\text{Value of Stock} = \frac{\text{DPS}_1}{k_e - \text{g}}$$

where,

DPS_1 = Expected Dividends one year from now (next period)

k_e= Required rate of return for equity investors

g = Growth rate in dividends forever

What is a stable growth rate?

While the Gordon growth model is a simple and powerful approach to valuing equity, its use is limited to firms that are growing at a stable rate. There are two insights worth keeping in mind when estimating a 'stable' growth rate. First, since the growth rate in the firm's dividends is expected to last forever, the firm's other measures of performance (including earnings) can also be expected to grow at the same rate. To see why, consider the consequences in the long term of a firm whose earnings grow 6% a year forever, while its dividends grow at 8%. Over time, the dividends will exceed earnings. On the other hand, if a firm's earnings grow at a faster rate than dividends in the long term, the payout ratio, in the long term, will converge towards zero, which is also not a steady state. Thus, though the model's requirement is for the expected growth rate in dividends, analysts should be able to substitute in the expected growth rate in earnings and get precisely the same result, if the firm is truly in steady state.

The second issue relates to what growth rate is reasonable as a 'stable' growth rate. As noted in Chapter 12, this growth rate has to be less than or equal to the growth rate of the economy in which the firm operates. This does not, however, imply that analysts will always agree about what this rate should be even if they agree that a firm is a stable growth firm for three reasons.

- Given the uncertainty associated with estimates of expected inflation and real growth in the economy, there can be differences in the benchmark growth rate used by different analysts, i.e., analysts with higher expectations of inflation in the long term may project a nominal growth rate in the economy that is higher.
- The growth rate of a company may not be greater than that of the economy but it can be less. Firms can becomes smaller over time relative to the economy.
- There is another instance in which an analyst may be stray from a strict limit imposed on the 'stable growth rate'. If a firm is likely to maintain a few years of 'above-stable' growth rates, an approximate value for the firm can be obtained by adding a premium to the stable growth rate, to reflect the above-average growth in the initial years. Even in this case, the flexibility that the analyst has is limited. The sensitivity of the model to growth implies that the stable growth rate cannot be more than 1% or 2% above the growth rate in the economy. If the deviation becomes larger, the analyst will be better served using a two-stage or a three-stage model to capture the 'super-normal' or 'above-average' growth and restricting the Gordon growth model to when the firm becomes truly stable.

Does a stable growth rate have to be constant over time?

The assumption that the growth rate in dividends has to be constant over time is a difficult assumption to meet, especially given the volatility of earnings. If a firm has an average growth rate that is close to a stable growth rate, the model can be used with little real effect on value. Thus, a cyclical firm that can be expected to have year-to-year swings in growth rates, but has an average growth rate that is 5%, can be valued using the Gordon growth model, without a significant loss of generality. There are two reasons for this result. First, since dividends are smoothed even when earnings are volatile, they are less likely to be affected by year-to-year changes in earnings growth. Second, the mathematical effects of using an average growth rate rather than a constant growth rate are small.

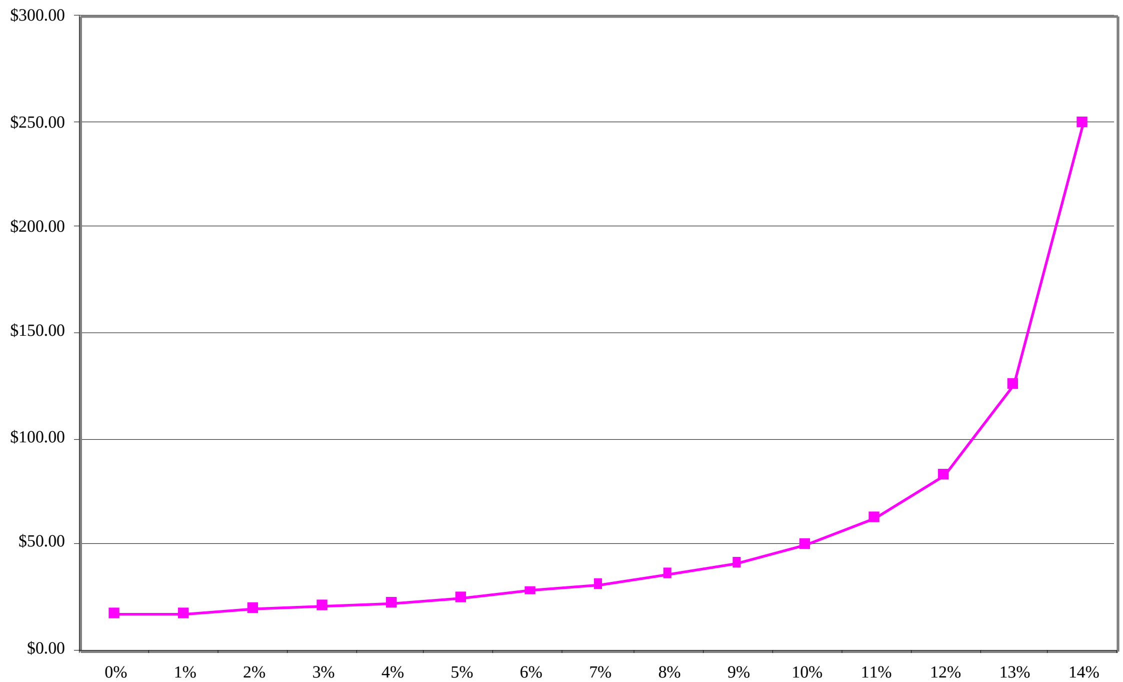
Limitations of the model

The Gordon growth model is a simple and convenient way of valuing stocks but it is extremely sensitive to the inputs for the growth rate. Used incorrectly, it can yield misleading or even absurd results, since, as the growth rate converges on the discount rate, the value goes to infinity. Consider a stock, with an expected dividend per share next period of $2.50, a cost of equity of 15%, and an expected growth rate of 5% forever. The value of this stock is:

$$\text{Value} = \frac{2.50}{0.15 - 0.05} = \$\,25.00$$

Note, however, the sensitivity of this value to estimates of the growth rate in Figure 13.1.

Figure 13.1: Value Per Share and Expected Growth Rate



As the growth rate approaches the cost of equity, the value per share approaches infinity. If the growth rate exceeds the cost of equity, the value per share becomes negative.

This issue is tied to the question of what comprises a stable growth rate. If an analyst follows the constraints discussed in the previous chapter in estimating stable growth rates, this will never happen. In this example, for instance, an analyst who uses a 14% growth rate and obtains a $250 value would have been violating a basic rule on what comprises stable growth.

Works best for:

In summary, the Gordon growth model is best suited for firms growing at a rate comparable to or lower than the nominal growth in the economy and which have well established dividend payout policies that they intend to continue into the future. The dividend payout of the firm has to be consistent with the assumption of stability, since stable firms generally pay substantial dividends[1]. In particular, this model will under estimate the value of the stock in firms that consistently pay out less than they can afford and accumulate cash in the process.

.*DDMst.xls*: This spreadsheet allows you to value a stable growth firm, with stable firm characteristics (beta and retun on equity) and dividends that roughly match cash flows.

Illustration 13.1: Value a regulated firm: Consolidated Edison in May 2001

Consolidated Edison is the electric utility that supplies power to homes and businesses in New York and its environs. It is a monopoly whose prices and profits are regulated by the State of New York.

Rationale for using the model

- The firm is in stable growth; based upon size and the area that it serves. Its rates are also regulated. It is unlikely that the regulators will allow profits to grow at extraordinary rates.
- The firm is in a stable business and regulation is likely to restrict expansion into new businesses.
- The firm is in stable leverage.
- The firm pays out dividends that are roughly equal to FCFE.
    - Average Annual FCFE between 1996 and 2000 = $551 million
    - Average Annual Dividends between 1996 and 2000 = $506 million
    - Dividends as % of FCFE = 91.54%

Background Information

Earnings per share in 2000 = $3.13

Dividend Payout Ratio in 1994 = 69.97%

Dividends per share in 2000 = $2.19

Return on equity = 11.63%

Estimates

We first estimate the cost of equity, using a bottom-up levered beta for electric utilities of 0.90, a riskfree rate of 5.40% and a market risk premium of 4%.

Con Ed Beta = 0.90

Cost of Equity = 5.4% + 0.90*4% = 9%

We estimate the expected growth rate from fundamentals.

Expected growth rate = (1- Payout ratio) Return on equity

= (1-0.6997)(0.1163) = 3.49%

[1] The average payout ratio for large stable firms in the United States is about 60%.

Valuation

We now use the Gordon growth model to value the equity per share at Con Ed:

$$\text{Value of Equity} = \frac{\text{Expected dividends next year}}{\text{Cost of equity - Expected growth rate}} = \frac{(\$2.19)(1.0349)}{0.09 - 0.0349} = \$41.15$$

Con Ed was trading for $36.59 on the day of this analysis (May 14, 2001). Based upon this valuation, the stock would have been under valued.

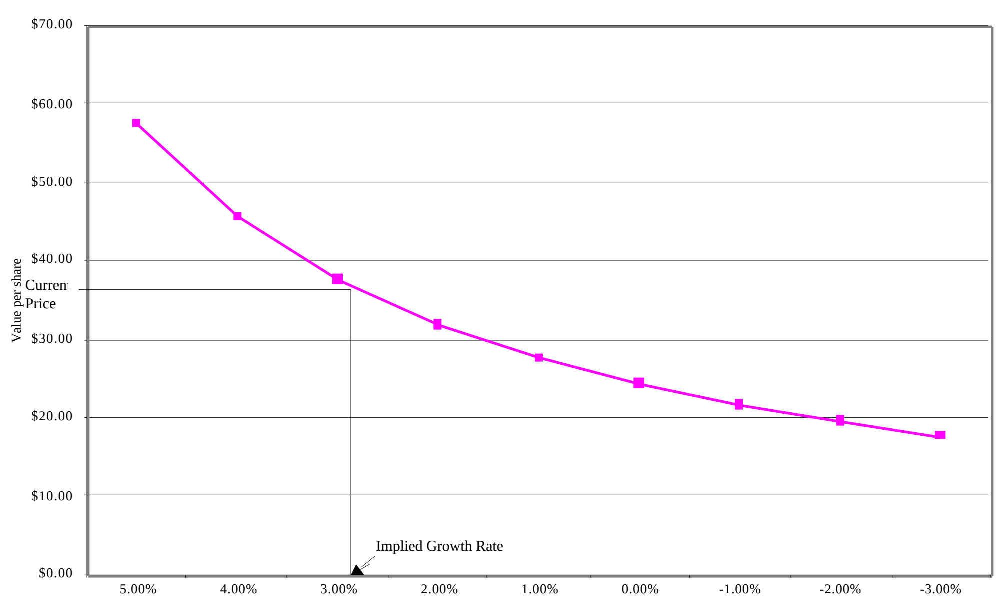
.DDMst.xlss: This spreadsheet allows you to value a stable growth firm, with stable firm characteristics (beta and return on equity) and dividends that roughly match cash flows.

Implied Growth Rate

Our value for Con Ed is different from the market price and this is likely to be the case with almost any company that you value. There are three possible explanations for this deviation. One is that you are right and the market is wrong. While this may be the correct explanation, you should probably make sure that the other two explanations do not hold – that the market is right and you are wrong or that the difference is too small to draw any conclusions. [

To examine the magnitude of the difference between the market price and your estimate of value, you can hold the other variables constant and change the growth rate in your valuation until the value converges on the price. Figure 13.2 estimates value as a function of the expected growth rate (assuming a beta of 0.90 and current dividends per share of $2.19).

Figure 13.2: Value per share versus Growth



Solving for the expected growth rate that provides the current price,

$$\$36.59 = \frac{\$2.19(1+g)}{0.09 - g}$$

The growth rate in earnings and dividends would have to be 2.84% a year to justify the stock price of $36.59. This growth rate is called an **implied growth rate**. Since we estimate growth from fundamentals, this allows us to estimate an implied return on equity.

$$\text{Implied return on equity} = \frac{\text{Implied growth rate}}{\text{Retention ratio}} = \frac{0.0284}{0.3003} = 9.47\%$$

Illustration 13.2: Value a real estate investment trust: Vornado REIT

Real estate investment trusts were created in the early 1970s by a law that allowed these entities to invest in real estate and pass the income, tax-free, to their investors. In return for the tax benefit, however, REITs are required to return at least 95% of their earnings as dividends. Thus, they provide an interesting case study in dividend discount model valuation. Vornado Realty Trust owns and has investments in real estate in the New York area including Alexander's, the Hotel Pennsylvania and other ventures.

Rationale for using the model

Since the firm is required to pay out 95% of its earnings as dividends, the growth in earnings per share will be modest,[2] making it a good candidate for the Gordon growth model.

Background Information

In 2000, Vornado paid dividends per share of $2.12 on earnings per share of $2.22. The estimated payout ratio is:

$$\text{Expected payout ratio} = \frac{2.12}{2.22} = 95.50\%$$

The firm had a return on equity of 12.29%.

Estimates

We use the average beta for real estate investment trusts of 0.69, a riskfree rate of 5.4% and a risk premium of 4% to estimate a cost of equity:

Cost of equity = 5.4% + 0.69 (4%) = 8.16%

The expected growth rate is estimated from the dividend payout ratio and the return on equity:

[2] Growth in net income may be much higher, since REITs can still issue new equity for investing in new ventures.

Expected growth rate = (1- 0.955) (0.1229) = 0.55%

Valuation

$$\text{Value per share} = \frac{2.12(1.0055)}{0.0816 - 0.0055} = \$28.03$$

It is particularly important with REITs that we steer away from net income growth, which may be much higher. On May 14, 2001, Vornado Realty was trading at $36.57, which would make it overvalued.

II. Two-stage Dividend Discount Model

The two-stage growth model allows for two stages of growth - an initial phase where the growth rate is not a stable growth rate and a subsequent steady state where the growth rate is stable and is expected to remain so for the long term. While, in most cases, the growth rate during the initial phase is higher than the stable growth rate, the model can be adapted to value companies that are expected to post low or even negative growth rates for a few years and then revert back to stable growth.

The Model

The model is based upon two stages of growth, an extraordinary growth phase that lasts n years and a stable growth phase that lasts forever afterwards.

Extraordinary growth rate: g% each year for n yearsStable growth: g_n forever

|____|_____________________>

Value of the Stock = PV of Dividends during extraordinary phase + PV of terminal price

$$P_0 = \sum_{t=1}^{t=n} \frac{DPS_t}{(1+k_{e,hg})^t} + \frac{P_n}{(1+k_{e,hg})^n} \text{ where } P_n = \frac{DPS_{n+1}}{(k_{e,st} - g_n)}$$

where,

DPS_t = Expected dividends per share in year t

k_e = Cost of Equity (hg: High Growth period; st: Stable growth period)

P_n = Price (terminal value) at the end of year n

g = Extraordinary growth rate for the first n years

g_n = Steady state growth rate forever after year n

In the case where the extraordinary growth rate (g) and payout ratio are unchanged for the first n years, this formula can be simplified.

$$P_0 = \frac{DPS_0 * (1+g) * \left(1 - \frac{(1+g)^n}{(1+k_{e,hg})^n}\right)}{k_{e,hg} - g} + \frac{DPS_{n+1}}{(k_{e,st} - g_n)(1+k_{e,hg})^n}$$

where the inputs are as defined above.

Calculating the terminal price

The same constraint that applies to the growth rate for the Gordon Growth Rate model, i.e., that the growth rate in the firm is comparable to the nominal growth rate in the economy, applies for the terminal growth rate (g_n) in this model as well.

In addition, the payout ratio has to be consistent with the estimated growth rate. If the growth rate is expected to drop significantly after the initial growth phase, the payout ratio should be higher in the stable phase than in the growth phase. A stable firm can pay out more of its earnings in dividends than a growing firm. One way of estimating this new payout ratio is to use the fundamental growth model described in Chapter 12.

Expected Growth = Retention ratio * Return on equity

Algebraic manipulation yields the following stable period payout ratio:

$$\text{Stable Payout ratio} = \frac{\text{Stable growth rate}}{\text{Stable period return on equity}}$$

Thus, a firm with a 5% growth rate and a return on equity of 15% will have a stable period payout ratio of 33.33%.

The other characteristics of the firm in the stable period should be consistent with the assumption of stability. For instance, it is reasonable to assume that a high growth firm has a beta of 2.0, but unreasonable to assume that this beta will remain unchanged when the firm becomes stable. In fact, the rule of thumb that we developed in the last chapter – that stable period betas should be between 0.8 and 1.2 – is worth repeating here. Similarly, the return on equity, which can be high during the initial growth phase, should come down to levels commensurate with a stable firm in the stable growth phase. What is a reasonable stable period return on equity? The industry average return on equity and the firm's own stable period cost of equity provide useful information to make this judgment.

Limitations of the model

There are three problems with the two-stage dividend discount model – the first two would apply to any two-stage model and the third is specific to the dividend discount model.

- The first practical problem is in defining the length of the extraordinary growth period. Since the growth rate is expected to decline to a stable level after this period, the value of an investment will increase as this period is made longer. While we did develop criteria that might be useful in making this judgment in Chapter 12, it is difficult in practice to convert these qualitative considerations into a specific time period.

- The second problem with this model lies in the assumption that the growth rate is high during the initial period and is transformed overnight to a lower stable rate at the end of the period. While these sudden transformations in growth can happen, it is much more realistic to assume that the shift from high growth to stable growth happens gradually over time.
- The focus on dividends in this model can lead to skewed estimates of value for firms that are not paying out what they can afford in dividends. In particular, we will under estimate the value of firms that accumulate cash and pay out too little in dividends.

Works best for:

Since the two-stage dividend discount model is based upon two clearly delineated growth stages, high growth and stable growth, it is best suited for firms which are in high growth and expect to maintain that growth rate for a specific time period, after which the sources of the high growth are expected to disappear. One scenario, for instance, where this may apply is when a company has patent rights to a very profitable product for the next few years and is expected to enjoy super-normal growth during this period. Once the patent expires, it is expected to settle back into stable growth. Another scenario where it may be reasonable to make this assumption about growth is when a firm is in an industry which is enjoying super-normal growth because there are significant barriers to entry (either legal or as a consequence of infra-structure requirements), which can be expected to keep new entrants out for several years.

The assumption that the growth rate drops precipitously from its level in the initial phase to a stable rate also implies that this model is more appropriate for firms with modest growth rates in the initial phase. For instance, it is more reasonable to assume that a firm growing at 12% in the high growth period will see its growth rate drops to 6% afterwards than it is for a firm growing at 40% in the high growth period.

Finally, the model works best for firms that maintain a policy of paying out most of residual cash flows – i.e, cash flows left over after debt payments and reinvestment needs have been met – as dividends.

Illustration 13.3: Valuing a firm with the two-stage dividend discount model: Procter & Gamble

Procter & Gamble (P&G) manufactures and markets consumer products all over the world. Some of its best known brand names include Pampers diapers, Tide detergent, Crest toothpaste and Vicks cough/cold medicines.

A Rationale for using the Model

- *Why two-stage?* While P&G is a firm with strong brand names and an impressive track record on growth, it faces two problems. The first is the saturation of the domestic U.S. market, which represents about half of P&G's revenues. The second is the increased competition from generics across all of its product lines. We will assume that the firm will continue to grow but restrict the growth period to 5 years.
- *Why dividends?* P&G has a reputation for paying high dividends and it has not accumulated large amounts of cash over the last decade.

Background Information

- Earnings per share in 2000 = \$3.00
- Dividends per share in 2000 = \$1.37
- Payout ratio in 2000 = $\frac{1.37}{3.00} = 45.67\%$
- Return on Equity in 2000 = 29.37%

Estimates

We will first estimate the cost of equity for P&G, based upon a bottom-up beta of 0.85 (estimated using the unlevered beta for consumer product firms and P&G's debt to equity ratio), a riskfree rate of 5.4% and a risk premium of 4%.

Cost of equity = 5.4% + 0.85 (4%) = 8.8%

To estimate the expected growth in earnings per share over the five-year high growth period, we use the retention ratio in the most recent financial year (2000) but lower the return on equity to 25% from the current value.

Expected growth rate = Retention ratio * Return on Equity

$$= (1 - 0.4567)(0.25) = 13.58\%$$

In stable growth, we will estimate that the beta for the stock will rise to 1, leading to a cost of equity of 9.40%.

Cost of equity in stable growth = 5.4% + 1 (4%) = 9.40%

The expected growth rate will be assumed to be equal to the growth rate of the economy (5%) and the return on equity will drop to 15%, which is lower than the current industry average (17.4%) but higher than the cost of equity estimated above. The retention ratio in stable growth during the stable growth period is calculated.

Retention ratio in stable growth = $\frac{g}{ROE} = \frac{5\%}{15\%} = 33.33\%$

The payout ratio in stable growth is therefore 66.67%.

Estimating the value:

The first component of value is the present value of the expected dividends during the high growth period. Based upon the current earnings ($3.00), the expected growth rate (13.58%) and the expected dividend payout ratio (45.67%), the expected dividends can be computed for each year in the high growth period.

Table 13.1: Expected Dividends per share: P&G

Year	*EPS*	*DPS*	*Present Value*
1	$3.41	$1.56	$1.43
2	$3.87	$1.77	$1.49
3	$4.40	$2.01	$1.56
4	$4.99	$2.28	$1.63
5	$5.67	$2.59	$1.70
Sum			$7.81

The present value is computed using the cost of equity of 8.8% for the high growth period.

Cumulative Present Value of Dividends during high growth (@8.8%) = $7.81

The present value of the dividends can also be computed in short hand using the following computation:

$$\text{PV of Dividends} = \frac{\$1.37(1.1358)\left(1 - \dfrac{(1.1358)^5}{(1.088)^5}\right)}{0.088 - 0.1358} = \$7.81$$

The price (terminal value) at the end of the high growth phase (end of year 5) can be estimated using the constant growth model.

$$\text{Terminal price} = \frac{\text{Expected Dividends per share}_{n+1}}{k_{e,st} - g_n}$$

Expected Earnings per share$_6$ = 3.00 *1.1358^5*1.05 = $5.96

Expected Dividends per share$_6$ = EPS$_6$*Stable period payout ratio

= $5.96 * 0.6667 = $3.97

$$\text{Terminal price} = \frac{\text{Dividends}_6}{k_{e,st} - g} = \frac{\$3.97}{0.094 - 0.05} = \$90.23$$

The present value of the terminal price –is:

$$\text{PV of Terminal Price} = \frac{\$90.23}{(1.088)^5} = \$59.18$$

The cumulated present value of dividends and the terminal price can then be calculated.

$$P_0 = \frac{\$1.37(1.1358)\left(1 - \frac{(1.1358)^5}{(1.088)^5}\right)}{0.088 - 0.1358} + \frac{\$90.23}{(1.088)^5} = \$7.81 + \$59.18 = \$66.99$$

P&G was trading at $63.90 at the time of this analysis on May 14, 2001.

.*DDM2st.xlss*: This spreadsheet allows you to value a firm with a temporary period of high earnings followed by stable growth.

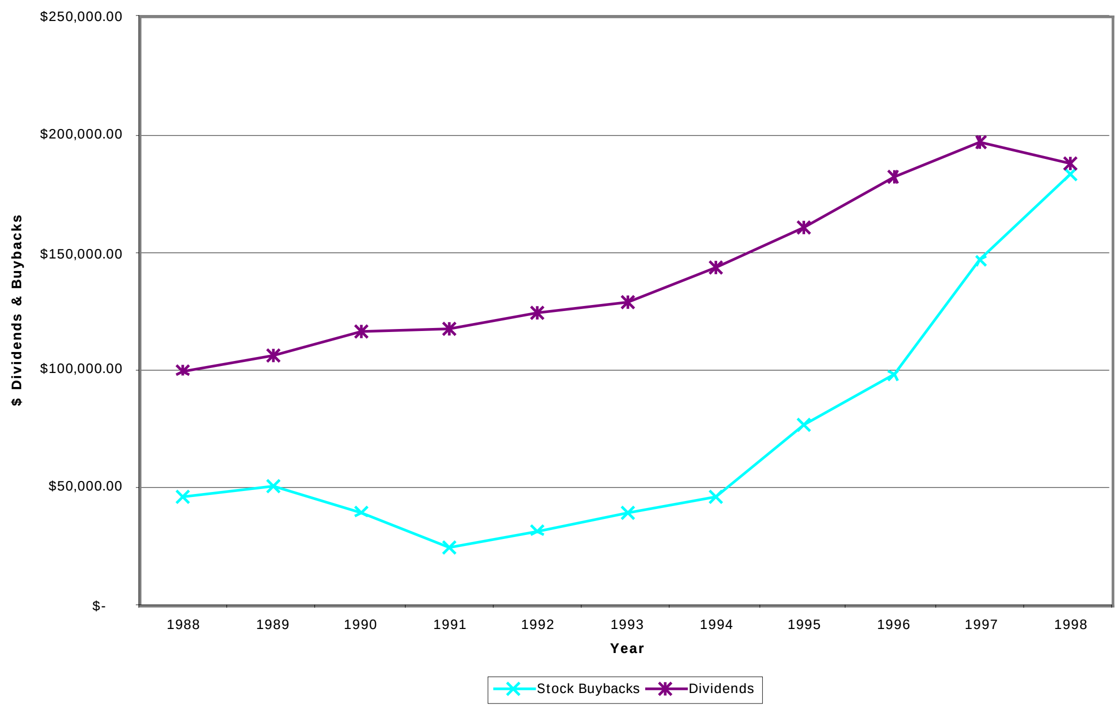
A Trouble Shooting Guide: What is wrong with this valuation? DDM 2 St

If this is your ‘problem’	*this may be the s*
· If you get a extremely low value from the 2-stage DDM, the likely culprits are	
- the stable period payout ratio is too low for a stable firm (< 40%)	If using fundame
	If entering direct
- the beta in the stable period is too high for a stable firm	Use a beta close
- the use of the two-stage model when the three-stage model is more appropriate	Use a three-stag
· If you get an extremely high value,	
- the growth rate in the stable growth period is too high for stable firm	Use a growth rat

Modifying the model to include stock buybacks

In recent years, firms in the United States have increasingly turned to stock buybacks as a way of returning cash to stockholders. Figure 13.3 presents the cumulative amounts paid out by firms in the form of dividends and stock buybacks from 1960 to 1998.

Figure 13.3: Stock Buybacks and Dividends: Aggregate for US Firms - 1989-98



The trend towards stock buybacks is very strong, especially in the 1990s.

What are the implications for the dividend discount model? Focusing strictly on dividends paid as the only cash returned to stockholders exposes us to the risk that we might be missing significant cash returned to stockholders in the form of stock buybacks. The simplest way to incorporate stock buybacks into a dividend discount model is to add them on to the dividends and compute a modified payout ratio:

$$\text{Modified dividend payout ratio} = \frac{\text{Dividends} + \text{Stock Buybacks}}{\text{Net Income}}$$

While this adjustment is straightforward, the resulting ratio for any one year can be skewed by the fact that stock buybacks, unlike dividends, are not smoothed out. In other words, a firm may buy back $ 3billion in stock in one year and not buy back stock for the next 3 years. Consequently, a much better estimate of the modified payout ratio can be obtained by looking at the average value over a four or five year period. In addition, firms may sometimes buy back stock as a way of increasing financial leverage. We could adjust for this by netting out new debt issued from the calculation above:

$$\text{Modified dividend payout} = \frac{\text{Dividends} + \text{Stock Buybacks} - \text{Long Term Debt issues}}{\text{Net Income}}$$

Adjusting the payout ratio to include stock buybacks will have ripple effects on the estimated growth and the terminal value. In particular, the modified growth rate in earnings per share can be written as:

Modified growth rate = (1 – Modified payout ratio) * Return on equity

Even the return on equity can be affected by stock buybacks. Since the book value of equity is reduced by the market value of equity bought back, a firm that buys backs stock can reduce its book equity (and increase its return on equity) dramatically. If we use this return on equity as a measure of the marginal return on equity (on new investments), we will overstate the value of a firm. Adding back stock buybacks in recent year to the book equity and re-estimating the return on equity can sometimes yield a more reasonable estimate of the return on equity on investments.

Illustration 13.4: Valuing a firm with modified dividend discount mode: Procter & Gamble

Consider our earlier valuation of Procter and Gamble where we used the current dividends as the basis for our projections. Note that over the last four years, P&G has had significant stock buybacks each period. Table 13.2 summarizes the dividends and buybacks over the period.

Table 13.2: Dividends and Stock Buybacks: P&G

	1997	*1998*	*1999*	*2000*	*Total*
Net Income	3415	3780	3763	3542	14500
Dividends	1329	1462	1626	1796	6213
Buybacks	2152	391	1881	-1021	3403
Dividends+Buybacks	3481	1853	3507	775	9616
Payout ratio	38.92%	38.68%	43.21%	50.71%	42.85%
Modified payout ratio	101.93%	49.02%	93.20%	21.88%	66.32%
Buybacks	1652	1929	2533	1766	
Net LT Debt issued	-500	1538	652	2787	
Buybacks net of debt	2152	391	1881	-1021	

Over the five-year period, P&G had significant buybacks but it also increased its leverage dramatically in the last three years. Summing up the total cash returned to stockholders over the last 4 years, we arrive at a modified payout ratio of 66.32%. If we substitute this payout ratio into the valuation in Illustration 13.3, the expected growth rate over the next 5 years drops to 8.42%:

Expected growth rate = (1- Modified payout ratio) ROE = (1-0.6632)(0.25) = 8.42%

We will still assume a five year high growth period and that the parameters in stable growth remain unchanged. The value per share can be estimated.

$$P_0 = \frac{\$3.00(0.6632)(1.0842)\left(1 - \frac{(1.0842)^5}{(1.0880)^5}\right)}{0.0880 - 0.0842} + \frac{\$71.50}{(1.0880)^5} = \$56.75$$

Note that the drop in growth rate in earnings during the high growth period reduces earnings in the terminal year, and the terminal value per share drops to $71.50.

This value is lower than that obtained in Illustration 13.3 and it reflects our expectation that P&G does not have as many new profitable new investments (earning a return on equity of 25%).

Valuing an entire market using the dividend discount model

All our examples of the dividend discount model so far have involved individual companies, but there is no reason why we cannot apply the same model to value a sector or even the entire market. The market price of the stock would be replaced by the cumulative market value of all of the stocks in the sector or market. The expected dividends would be the cumulated dividends of all these stocks and could be expanded to include stock buybacks by all firms. The expected growth rate would be the growth rate in cumulated earnings of the index. There would be no need for a beta or betas, since you are looking at the entire market (which should have a beta of 1) and you could add the risk premium (or premiums) to the riskfree rate to estimate a cost of equity. You could use a two-stage model, where this growth rate is greater than the growth rate of the economy, but you should be cautious about setting the growth rate too high or the growth period too long because it will be difficult for cumulated earnings growth of all firms in an economy to run ahead of the growth rate in the economy for extended periods.

Consider a simple example. Assume that you have an index trading at 700 and that the average dividend yield of stocks in the index is 5%. Earnings and dividends can be expected to grow at 4% a year forever and the riskless rate is 5.4%. If you use a market risk premium of 4%, the value of the index can be estimated.

Cost of equity = Riskless rate + Risk premium = 5.4% + 4% = 9.4%

Expected dividends next year = (Dividend yield * Value of the index)(1+ expected growth rate) = (0.05*700) (1.04) = 36.4

$$\text{Value of the index} = \frac{\text{Expected dividends next year}}{\text{Cost of equity - Expected growth rate}} = \frac{36.4}{0.094 - 0.04} = 674$$

At its existing level of 700, the market is slightly over priced.

Illustration 13.5: Valuing the S&P 500 using a dividend discount model: January 1, 2001

On January 1, 2001, the S&P 500 index was trading at 1320. The dividend yield on the index was only 1.43%, but including stock buybacks increases the modified dividend yield to 2.50%. Analysts were estimating that the earnings of the stocks in the index would increase 7.5% a year for the next 5 years. Beyond year 5, the expected growth rate is expected to be 5%, the nominal growth rate in the economy. The treasury bond rate was 5.1% and we will use a market risk premium of 4%, leading to a cost of equity of 9.1%:

Cost of equity = 5.1% + 4% = 9.1%

The expected dividends (and stock buybacks) on the index for the next 5 years can be estimated from the current dividends and expected growth of 7.50%.

Current dividends = 2.50% of 1320 = 33.00

	1	*2*	*3*	*4*	*5*
Expected Dividends =	$35.48	$38.14	$41.00	$44.07	$47.38
Present Value =	$32.52	$32.04	$31.57	$31.11	$30.65

The present value is computed by discounting back the dividends at 9.1%. To estimate the terminal value, we estimate dividends in year 6 on the index:

Expected dividends in year 6 = $47.38 (1.05) = $49.74

$$\text{Terminal value of the index} = \frac{\text{Expected Dividends}_6}{\text{r - g}} = \frac{\$49.74}{0.091 - 0.05} = \$1213$$

$$\text{Present value of Terminal value} = \frac{\$1213}{1.091^5} = \$785$$

The value of the index can now be computed:

Value of index = Present value of dividends during high growth + Present value of terminal value = $32.52+32.04+31.57+$31.11+ $30.65+ $785 = $943

Based upon this, we would have concluded that the index was over valued at 1320.

The Value of Growth

Investors pay a price premium when they acquire companies with high growth potential. This premium takes the form of higher price-earnings or price-book value ratios. While no one will contest the proposition that growth is valuable, it is possible to pay too much for growth. In fact, empirical studies that show low price-earnings ratio stocks earning return premiums over high price-earnings ratio stocks in the long term supports the notion that investors overpay for growth. This section uses the two-stage dividend discount model to examine the value of growth and it provides a benchmark that can be used to compare the actual prices paid for growth.

Estimating the value of growth

The value of the equity in any firm can be written in terms of three components:

$$P_0 = \left[\frac{DPS_0 * (1+g) * \left(1 - \frac{(1+g)^n}{(1+k_{e,hg})^n}\right)}{k_{e,hg} - g} + \frac{DPS_{n+1}}{(k_{e,st} - g_n)(1+k_{e,hg})^n} - \frac{DPS_1}{(k_{e,st} - g_n)} \right]$$

Extraordinary Growth

$$+ \left[\frac{DPS_1}{(k_{e,st} - g_n)} - \frac{DPS_0}{k_{e,st}} \right] + \frac{DPS_0}{k_{e,st}}$$

Stable Growth Assets in place

where

DPS_t = Expected dividends per share in year t

k_e = Required rate of return

P_n = Price at the end of year n

g = Growth rate during high growth stage

g_n = Growth rate forever after year n

Value of extraordinary growth = Value of the firm with extraordinary growth in first n years - Value of the firm as a stable growth firm[3]

Value of stable growth = Value of the firm as a stable growth firm - Value of firm with no growth

[3] The payout ratio used to calculate the value of the firm as a stable firm can be either the current payout ratio, if it is reasonable, or the new payout ratio calculated using the fundamental growth formula.

Assets in place = Value of firm with no growth

In making these estimates, though, we have to remain consistent. For instance, to value assets in place, you would have to assume that the entire earnings could be paid out in dividends, while the payout ratio used to value stable growth should be a stable period payout ratio.

Illustration 13.6: The Value of Growth: P&G in May 2001

In illustration 13.3, we valued P&G using a 2-stage dividend discount model at \$66.99. We first value the assets in place using current earnings (\$3.00) and assume that all earnings are paid out as dividends. We also use the stable growth cost of equity as the discount rates.

$$\text{Value of the assets in place} = \frac{\text{Current EPS}}{k_{e,st}} = \frac{\$3}{0.094} = \$31.91$$

To estimate the value of stable growth, we assume that the expected growth rate will be 5% and that the payout ratio is the stable period payout ratio of 66.67%:

$$\text{Value of stable growth} = \frac{(\text{Current EPS})(\text{Stable Payout Ratio})(1+g_n)}{k_{e,st}-g_n} - \$31.91$$

$$= \frac{(\$3.00)(0.6667)(1.05)}{0.094-0.05} - \$31.91 = \$15.81$$

Value of extraordinary growth = \$66.99 - \$31.91 - \$15.81 = \$19.26

The Determinants of the Value of Growth

1. *Growth rate during extraordinary period:* The higher the growth rate in the extraordinary period, the higher the estimated value of growth will be. If the growth rate in the extraordinary growth period had been raised to 20% for the Procter & Gamble valuation, the value of extraordinary growth would have increased from \$19.26 to \$39.45. Conversely, the value of high growth companies can drop precipitously if the expected growth rate is reduced, either because of disappointing earnings news from the firm or as a consequence of external events.
2. *Length of the extraordinary growth period:* The longer the extraordinary growth period, the greater the value of growth will be. At an intuitive level, this is fairly simple to illustrate. The value of \$19.26 obtained for extraordinary growth is predicated on the assumption that high growth will last for five years. If this is revised to last ten years, the value of extraordinary growth will increase to \$43.15.
3. *Profitability of projects*: The profitability of projects determines both the growth rate in the initial phase and the terminal value. As projects become more

profitable, they increase both growth rates and growth period, and the resulting value from extraordinary growth will be greater.

4. *Riskiness of the firm/equity* The riskiness of a firm determines the discount rate at which cashflows in the initial phase are discounted. Since the discount rate increases as risk increases, the present value of the extraordinary growth will decrease.

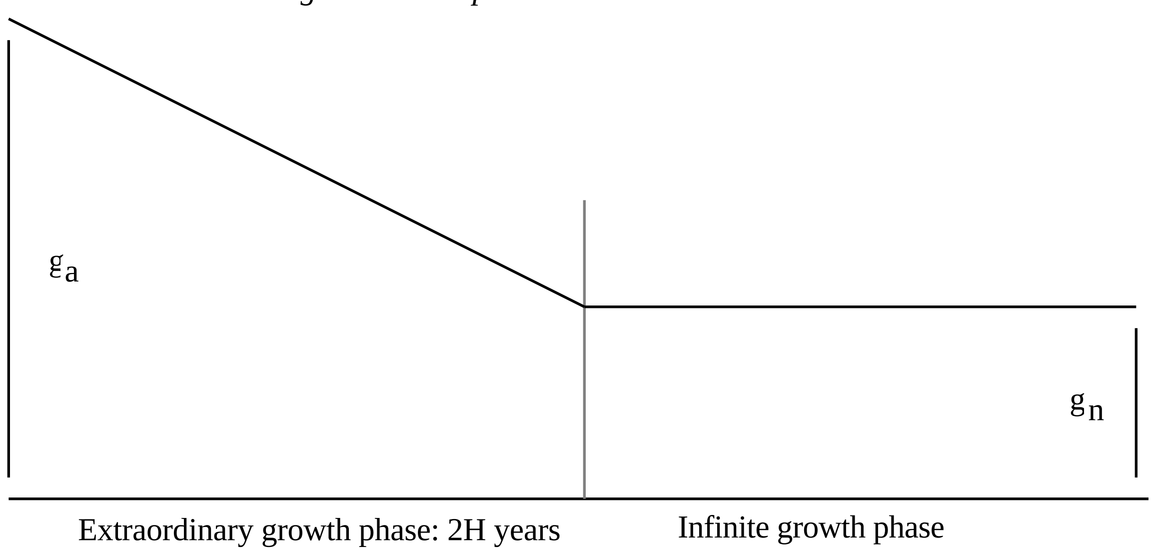
III. The H Model for valuing Growth

The H model is a two-stage model for growth, but unlike the classical two-stage model, the growth rate in the initial growth phase is not constant but declines linearly over time to reach the stable growth rate in steady stage. This model was presented in Fuller and Hsia (1984).

The Model

The model is based upon the assumption that the earnings growth rate starts at a high initial rate (g_a) and declines linearly over the extraordinary growth period (which is assumed to last 2H periods) to a stable growth rate (g_n). It also assumes that the dividend payout and cost of equity are constant over time and are not affected by the shifting growth rates. Figure 13.4 graphs the expected growth over time in the H Model.

Figure 13.4: Expected Growth in the H Model



The value of expected dividends in the H Model can be written as:

$$P_0 = \frac{DPS_0 * (1+g_n)}{(k_e - g_n)} + \frac{DPS_0 * H * (g_a - g_n)}{(k_e - g_n)}$$

Stable growth Extraordinary growth

where,

P_0 = Value of the firm now per share,

DPS_t = DPS in year t

k_e= Cost of equity

g_a = Growth rate initially

g_n = Growth rate at end of 2H years, applies forever afterwards

Limitations

This model avoids the problems associated with the growth rate dropping precipitously from the high growth to the stable growth phase, but it does so at a cost. First, the decline in the growth rate is expected to follow the strict structure laid out in the model -- it drops in linear increments each year based upon the initial growth rate, the stable growth rate and the length of the extraordinary growth period. While small deviations from this assumption do not affect the value significantly, large deviations can cause problems. Second, the assumption that the payout ratio is constant through both phases of growth exposes the analyst to an inconsistency -- as growth rates decline the payout ratio usually increases.

Works best for:

The allowance for a gradual decrease in growth rates over time may make this a useful model for firms which are growing rapidly right now, but where the growth is expected to decline gradually over time as the firms get larger and the differential advantage they have over their competitors declines. The assumption that the payout ratio is constant, however, makes this an inappropriate model to use for any firm that has low or no dividends currently. Thus, the model, by requiring a combination of high growth and high payout, may be quite limited[4] in its applicability.

Illustration 13.7: Valuing with the H model: Alcatel

Alcatel is a French telecommunications firm, paid dividends per share of 0.72 Ffr on earnings per share of 1.25 Ffr in 2000. The firm's earnings per share had grown at 12% over the prior 5 years but the growth rate is expected to decline linearly over the next 10 years to 5%, while the payout ratio remains unchanged. The beta for the stock is 0.8, the riskfree rate is 5.1% and the market risk premium is 4%.

[4] Proponents of the model would argue that using a steady state payout ratio for firms which pay little or no dividends is likely to cause only small errors in the valuation.

Cost of equity = 5.1% + 0.8*4% = 8.30%

The stock can be valued using the H model:

Value of stable growth = $\frac{(0.72)(1.05)}{0.083 - 0.05}$ = \$22.91

Value of extraordinary growth = $\frac{(0.72)(10/2)(0.12 - 0.05)}{0.083 - 0.05}$ = 7.64

Value of stock = 22.91 + 7.64 = 30.55

The stock was trading at 33.40 Ffr in May 2001.

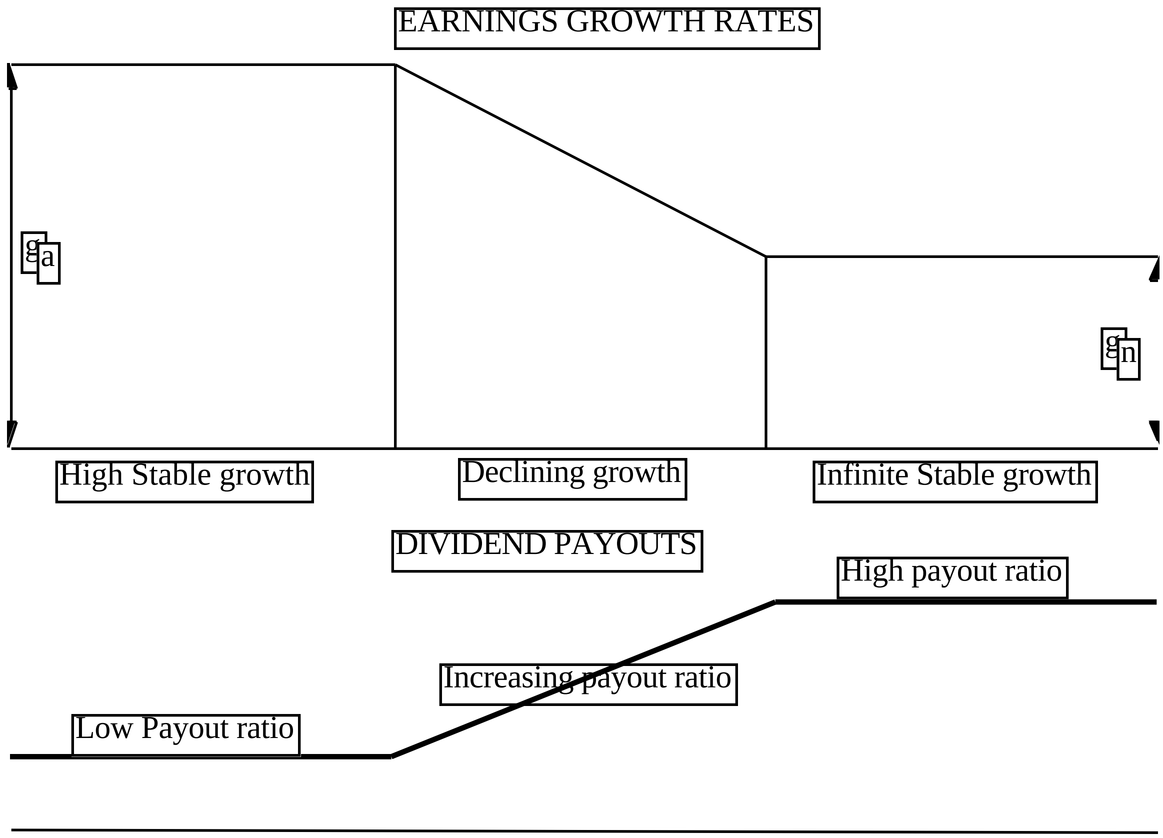
IV. Three-stage Dividend Discount Model

The three-stage dividend discount model combines the features of the two-stage model and the H-model. It allows for an initial period of high growth, a transitional period where growth declines and a final stable growth phase. It is the most general of the models because it does not impose any restrictions on the payout ratio.

The Model

This model assumes an initial period of stable high growth, a second period of declining growth and a third period of stable low growth that lasts forever. Figure 13.5 graphs the expected growth over the three time periods.

Figure 13.5: Expected Growth in the Three-Stage DDM



The value of the stock is then the present value of expected dividends during the high growth and the transitional periods and of the terminal price at the start of the final stable growth phase.

$$P_0 = \sum_{t=1}^{t=n1} \frac{EPS_0 * (1+g_a)^t * \Pi_a}{(1+k_{e,hg})^t} + \sum_{t=n1+1}^{t=n2} \frac{DPS_t}{(1+k_{e,t})^t} + \frac{EPS_{n2} * (1+g_n) * \Pi_n}{(k_{e,st} - g_n)(1+r)^n}$$

High growth phase   Transition   Stable growth phase

where,

EPS_t = Earnings per share in year t

DPS_t = Dividends per share in year t

g_a = Growth rate in high growth phase (lasts n1 periods)

g_n = Growth rate in stable phase

Π_a = Payout ratio in high growth phase

Π_n = Payout ratio in stable growth phase

k_e= Cost of equity in high growth (hg), transition (t) and stable growth (st)

Assumptions

This model removes many of the constraints imposed by other versions of the dividend discount model. In return, however, it requires a much larger number of inputs - year-specific payout ratios, growth rates and betas. For firms where there is substantial noise in the estimation process, the errors in these inputs can overwhelm any benefits that accrue from the additional flexibility in the model.

Works best for:

This model's flexibility makes it a useful model for any firm, which in addition to changing growth over time is expected to change on other dimensions as well - in particular, payout policies and risk. It is best suited for firms which are growing at an extraordinary rate now and are expected to maintain this rate for an initial period, after which the differential advantage of the firm is expected to deplete leading to gradual declines in the growth rate to a stable growth rate. Practically speaking, this may be the more appropriate model to use for a firm whose earnings are growing at very high rates[5], are expected to continue growing at those rates for an initial period, but are expected to start declining gradually towards a stable rate as the firm become larger and loses its competitive advantages.

Illustration 13.8: Valuing with the Three-stage DDM model: Coca Cola

Coca Cola, the owner of the most valuable brand name in the world according to Interbrand, was able to increase its market value ten-fold in the 1980s and 1990s. While growth has leveled off in the last few years, the firm is still expanding both into other products and other markets.

A Rationale for using the Three-Stage Dividend Discount Model

- *Why three-stage?* Coca Cola is still in high growth, but its size and dominant market share will cause growth to slide in the second phase of the high growth period. The high growth period is expected to last 5 years and the transition period is expected to last an additional 5 years.
- *Why dividends?* The firm has had a track record of paying out large dividends to its stockholders, and these dividends tend to mirror free cash flows to equity.
- The financial leverage is stable.

Background Information

- Current Earnings / Dividends
    - Earnings per share in 2000 = $1.56

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[5] The definition of a 'very high' growth rate is largely subjective. As a rule of thumb, growth rates over 25% would qualify as very high when the stable growth rate is 6-8%.

- Dividends per share in 2000 = $0.69
- Payout ratio in 2000 = 44.23%
- Return on Equity = 23.37%

Estimate

a. Cost of Equity

We will begin by estimating the cost of equity during the high growth phase, expected. We use a bottom-up levered beta of 0.80 and a riskfree rate of 5.4%. We use a risk premium of 5.6%, significantly higher than the mature market premium of 4%, which we have used in the valuation so far, to reflect Coca Cola's exposure in Latin America, Eastern Europe and Asia. The cost of equity can then be estimated for the high growth period.

Cost of $\text{equity}_{\text{high growth}}$ = 5.4% + 0.8 (5.6%) = 9.88%

In stable growth, we assume that the beta will remain 0.80, but reduce the risk premium to 5% to reflect the expected maturing of many emerging markets.

Cost of $\text{equity}_{\text{stable growth}}$ = 5.4% + 0.8 (5.0%) = 9.40%

During the transition period, the cost of equity will linearly decline from 9.88% in year 5 to 9.40% in year 10.

b. Expected Growth and Payout Ratios

The expected growth rate during the high growth phase is estimated using the current return on equity of 23.37% and payout ratio of 44.23%.

Expected growth rate = Retention ratio * Return on equity = (1-0.4423)(0.2337) = 13.03%

During the transition phase, the expected growth rate declines linearly from 13.03% to a stable growth rate of 5.5%. To estimate the payout ratio in stable growth, we assume a return on equity of 20% for the firm:

$$\text{Stable period payout ratio} = 1 - \frac{g}{ROE} = 1 - \frac{5.5\%}{20\%} = 72.5\%$$

During the transition phase, the payout ratio adjusts upwards from 44.23% to 72.5% in linear increments.

Estimating the Value

These inputs are used to estimate expected earnings per share, dividends per share and costs of equity for the high growth, transition and stable periods. The present values are also shown in the last column table 13.3.

Table 13.3: Expected EPS, DPS and Present Value: Coca Cola

Year	*Expected Growth*	*EPS*	*Payout ratio*	*DPS*	*Cost of Equity*	*Present Value*

High Growth Stage						
1	13.03%	$1.76	44.23%	$0.78	9.88%	$0.71
2	13.03%	$1.99	44.23%	$0.88	9.88%	$0.73
3	13.03%	$2.25	44.23%	$1.00	9.88%	$0.75
4	13.03%	$2.55	44.23%	$1.13	9.88%	$0.77
5	13.03%	$2.88	44.23%	$1.27	9.88%	$0.79
Transition Stage						
6	11.52%	$3.21	49.88%	$1.60	9.78%	$0.91
7	10.02%	$3.53	55.54%	$1.96	9.69%	$1.02
8	8.51%	$3.83	61.19%	$2.34	9.59%	$1.11
9	7.01%	$4.10	66.85%	$2.74	9.50%	$1.18
10	5.50%	$4.33	72.50%	$3.14	9.40%	$1.24

(Note: Since the costs of equity change each year, the present value has to be calculated using the cumulated cost of equity. Thus, in year 7, the present value of dividends is:

$$\text{PV of year 7 dividend} = \frac{\$1.96}{(1.0988)^5 (1.0978)\,(1.0969)} = \$1.02$$

The terminal price at the end of year 10 can be calculated based upon the earnings per share in year 11, the stable growth rate of 5%, a cost of equity of 9.40% and the payout ratio of 72.5% -

$$\text{Terminal price} = \frac{\$4.33(1.055)(0.725)}{0.094 - 0.055} = \$84.83$$

The components of value are as follows:

Present Value of dividends in high growth phase:$ 3.76
Present Value of dividends in transition phase:$ 5.46
Present Value of terminal price at end of transition:$ 33.50
Value of Coca Cola Stock :$ 42.72

Coca Cola was trading at $46.29 in May 21, 2001.

.DDM3st.xlss: This spreadsheet allows you to value a firm with a period of high growth followed by a transition period where growth declines to a stable growth rate.

What is wrong with this model? (3 stage DDM)	
If this is your problem	*this may*
· If you are getting too low a value from this model,	
- the stable period payout ratio is too low for a stable firm (< 40%)	If using fundame
	If entering direct
- the beta in the stable period is too high for a stable firm	Use a beta close
· If you get an extremely high value,	
- the growth rate in the stable growth period is too high for stable firm	Use a growth rat
- the period of growth (high + transition) is too high	Use shorter high

Issues in using the Dividend Discount Model

The dividend discount model's primary attraction is its simplicity and its intuitive logic. There are many analysts, however, who view its results with suspicion because of limitations that they perceive it to possess. The model, they claim, is not really useful in valuation, except for a limited number of stable, high-dividend paying stocks. This section examines some of the areas where the dividend discount model is perceived to fall short.

(a) Valuing non-dividend paying or low dividend paying stocks

The conventional wisdom is that the dividend discount model cannot be used to value a stock that pays low or no dividends. It is wrong. If the dividend payout ratio is adjusted to reflect changes in the expected growth rate, a reasonable value can be obtained even for non-dividend paying firms. Thus, a high-growth firm, paying no dividends currently, can still be valued based upon dividends that it is expected to pay out when the growth rate declines. If the payout ratio is not adjusted to reflect changes in the growth rate, however, the dividend discount model will underestimate the value of non-dividend paying or low-dividend paying stocks.

(b) Is the model too conservative in estimating value?

A standard critique of the dividend discount model is that it provides too conservative an estimate of value. This criticism is predicated on the notion that the value is determined by more than the present value of expected dividends. For instance, it is argued that the dividend discount model does not reflect the value of 'unutilized assets'. There is no reason, however, that these unutilized assets cannot be valued separately and added on to the value from the dividend discount model. Some of the assets that are supposedly ignored by the dividend discount model, such as the value of brand names, can be dealt with simply within the context of the model.

A more legitimate criticism of the model is that it does not incorporate other ways of returning cash to stockholders (such as stock buybacks). If you use the modified version of the dividend discount model, this criticism can also be countered.

(c) The contrarian nature of the model

The dividend discount model is also considered by many to be a contrarian model. As the market rises, fewer and fewer stocks, they argue, will be found to be undervalued using the dividend discount model. This is not necessarily true. If the market increase is due to an improvement in economic fundamentals, such as higher expected growth in the economy and/or lower interest rates, there is no reason, a priori, to believe that the values from the dividend discount model will not increase by an equivalent amount. If the market increase is not due to fundamentals, the dividend discount model values will not follow suit, but that is more a sign of strength than weakness. The model is signaling that the market is overvalued relative to dividends and cashflows and the cautious investor will pay heed.

Tests of the Dividend Discount Model

The ultimate test of a model lies in how well it works at identifying undervalued and overvalued stocks. The dividend discount model has been tested and the results indicate that it does, in the long term, provide for excess returns. It is unclear, however, whether this is because the model is good at finding undervalued stocks or because it proxies for well-know empirical irregularities in returns relating to price-earnings ratios and dividend yields.

A Simple Test of the Dividend Discount model

A simple study of the dividend discount model was conducted by Sorensen and Williamson, where they valued 150 stocks from the S&P 400 in December 1980, using the dividend discount model. They used the difference between the market price at that time and the model value to form five portfolios based upon the degree of under or over valuation. They made fairly broad assumptions in using the dividend discount model.

(a) The average of the earnings per share between 1976 and 1980 was used as the current earnings per share.

(b) The cost of equity was estimated using the CAPM.

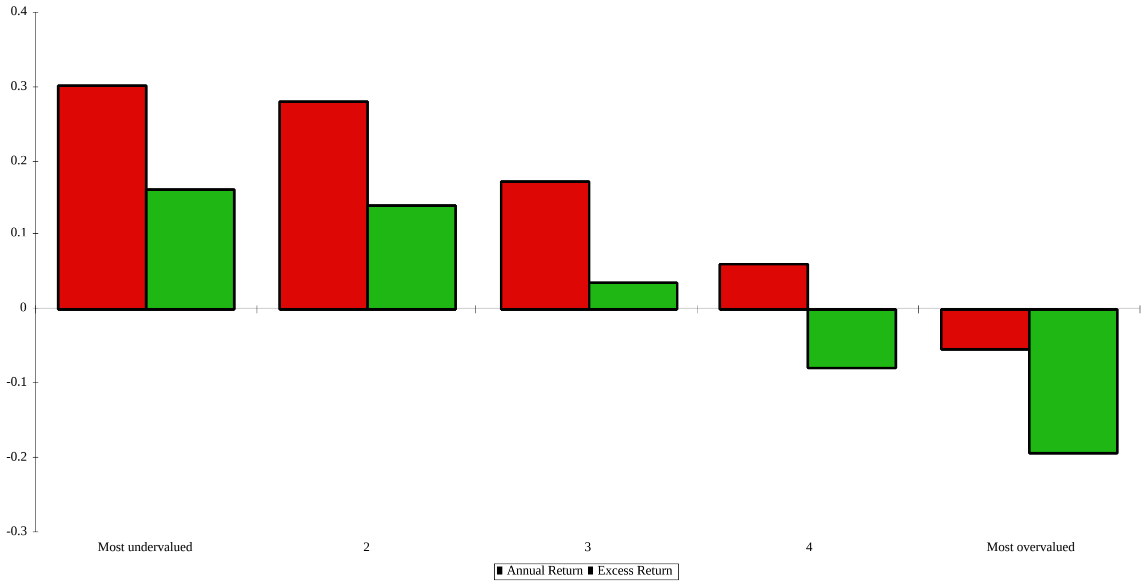
(c) The extraordinary growth period was assumed to be five years for all stocks and the I/B/E/S consensus forecast of earnings growth was used as the growth rate for this period.

(d) The stable growth rate, after the extraordinary growth period, was assumed to be 8% for all stocks.

(e) The payout ratio was assumed to be 45% for all stocks.

The returns on these five portfolios were estimated for the following two years (January 1981-January 1983) and excess returns were estimated relative to the S&P 500 Index using the betas estimated at the first stage and the CAPM. Figure 13.6 illustrates the excess returns earned by the portfolio that was undervalued by the dividend discount model relative to both the market and the overvalued portfolio.

Figure 13.6 Performance of the Dividend Discount Model: 1981-83



The undervalued portfolio had a positive excess return of 16% per annum between 1981 and 1983, while the overvalued portfolio had a negative excess return of 15% per annum during the same time period. Other studies which focus only on the dividend discount model come to similar conclusions. In the long term, undervalued (overvalued) stocks from the dividend discount model outperform (under perform) the market index on a risk adjusted basis.

Caveats on the use of the dividend discount model

The dividend discount model provides impressive results in the long term. There are, however, three considerations in generalizing the findings from these studies.

The dividend discount model does not beat the market every year

The dividend discount model outperforms the market over five-year time periods, but there have been individual years where the model has significantly under performed the market. Haugen reports on the results of a fund that used the dividend discount model to analyze 250 large capitalization firms and to classify them into five quintiles from the first quarter of 1979 to the last quarter of 1991. The betas of these quintiles were roughly equal. The valuation was done by six analysts who estimated an extraordinary growth rate for the initial high growth phase, the length of the high growth phase and a transitional phase for each of the firms. The returns on the five portfolios as well as the returns on all 250 stocks and the S&P 500 from 1979 to 1991 are reported in Table 13.4.

Table 13.4: Returns on Quintiles: Dividend Discount Model

Quintile							
	Under Valued	2	3	4	Over Valued	250 Stocks	S&P 500
1979	35.07%	25.92%	18.49%	17.55%	20.06%	23.21%	18.57%
1980	41.21%	29.19%	27.41%	38.43%	26.44%	31.86%	32.55%
1981	12.12%	10.89%	1.25%	-5.59%	-8.51%	28.41%	24.55%
1982	19.12%	12.81%	26.72%	28.41%	35.54%	24.53%	21.61%
1983	34.18%	21.27%	25.00%	24.55%	14.35%	24.10%	22.54%
1984	15.26%	5.50%	6.03%	-4.20%	-7.84%	3.24%	6.12%
1985	38.91%	32.22%	35.83%	29.29%	23.43%	33.80%	31.59%
1986	14.33%	11.87%	19.49%	12.00%	20.82%	15.78%	18.47%
1987	0.42%	4.34%	8.15%	4.64%	-2.41%	2.71%	5.23%
1988	39.61%	31.31%	17.78%	8.18%	6.76%	20.62%	16.48%
1989	26.36%	23.54%	30.76%	32.60%	35.07%	29.33%	31.49%
1990	-17.32%	-8.12%	-5.81%	2.09%	-2.65%	-6.18%	-3.17%
1991	47.68%	26.34%	33.38%	34.91%	31.64%	34.34%	30.57%
1979-91	*1253%*	*657%*	*772%*	*605%*	*434%*	*722%*	*654%*

The undervalued portfolio earned significantly higher returns than the overvalued portfolio and the S&P 500 for the 1979-91 period, but it under performed the market in five of the twelve years and the overvalued portfolio in four of the twelve years.

Is the model just a proxy for low PE ratios and dividend yields?

The dividend discount model weights expected earnings and dividends in near periods more than earnings and dividends in far periods., It is biased towards finding low price-earnings ratio stocks with high dividend yields to be undervalued and high price-earnings ratio stocks with low or no dividend yields to be overvalued. Studies of market efficiency indicate that low PE ratio stocks have outperformed (in terms of excess returns) high PE ratio stocks over extended time periods. Similar conclusions have been drawn about high-dividend yield stocks relative to low-dividend yield stocks. Thus, the valuation findings of the model are consistent with empirical irregularities observed in the market.

It is unclear how much the model adds in value to investment strategies that use PE ratios or dividend yields to screen stocks. Jacobs and Levy (1988b) indicate that the marginal gain is relatively small.

Attribute	*Average Excess Return per Quarter: 1982-87*

Dividend Discount Model	0.06% per quarter
Low P/E Ratio	0.92% per quarter
Book/Price Ratio	0.01% per quarter
Cashflow/Price	0.18% per quarter
Sales/Price	0.96% per quarter
Dividend Yield	-0.51% per quarter

This suggests that using low PE ratios to pick stocks adds 0.92% to your quarterly returns, whereas using the dividend discount model adds only a further 0.06% to quarterly returns. If, in fact, the gain from using the dividend discount model is that small, screening stocks on the basis of observables (such as PE ratio or cashflow measures) may provide a much larger benefit in terms of excess returns.

The tax disadvantages from high dividend stocks

Portfolios created with the dividend discount model are generally characterized by high dividend yield, which can create a tax disadvantage if dividends are taxed at a rate greater than capital gains or if there is a substantial tax timing[6] liability associated with dividends. Since the excess returns uncovered in the studies presented above are pre-tax to the investor, the introduction of personal taxes may significantly reduce or even eliminate these excess returns.

In summary, the dividend discount model's impressive results in studies looking at past data have to be considered with caution. For a tax-exempt investment, with a long time horizon, the dividend discount model is a good tool, though it may not be the only one, to pick stocks. For a taxable investor, the benefits are murkier, since the tax consequences of the strategy have to be considered. For investors with shorter time horizons, the dividend discount model may not deliver on its promised excess returns, because of the year-to-year volatility in its performance.

Conclusion

When you buy stock in a publicly traded firm, the only cash flow you receive directly from this investment are expected dividends. The dividend discount model builds on this simple propositions and argues that the value of a stock then has to be the present value of expected dividends over time. Dividend discount models can range from simple growing perpetuity models such as the Gordon Growth model, where a stock's value is a function of

[6] Investors do not have a choice of when they receive dividends, whereas they have a choice on the timing of capital gains.

its expected dividends next year, the cost of equity and the stable growth rate, to complex three stage models, where payout ratios and growth rates change over time.

While the dividend discount model is often criticized as being of limited value, it has proven to be surprisingly adaptable and useful in a wide range of circumstances. It may be a conservative model that finds fewer and fewer undervalued firms as market prices rise relative to fundamentals (earnings, dividends, etc.) but that can also be viewed as a strength. Tests of the model also seem to indicate its usefulness in gauging value, though much of its effectiveness may be derived from its finding low PE ratio, high dividend yield stocks to be undervalued.

Problems

1. Respond true or false to the following statements relating to the dividend discount model:

A. The dividend discount model cannot be used to value a high growth company that pays no dividends.

B. The dividend discount model will undervalue stocks, because it is too conservative.

C. The dividend discount model will find more undervalued stocks, when the overall stock market is depressed.

D. Stocks that are undervalued using the dividend discount model have generally made significant positive excess returns over long time periods (five years or more).

E. Stocks which pay high dividends and have low price-earnings ratios are more likely to come out as undervalued using the dividend discount model.

2. Ameritech Corporation paid dividends per share of $3.56 in 1992 and dividends are expected to grow 5.5% a year forever. The stock has a beta of 0.90 and the treasury bond rate is 6.25%.

a. What is the value per share, using the Gordon Growth Model?

b. The stock was trading for $80 per share. What would the growth rate in dividends have to be to justify this price?

3. Church & Dwight, a large producer of sodium bicarbonate, reported earnings per share of $1.50 in 1993 and paid dividends per share of $0.42. In 1993, the firm also reported the following:

Net Income = $30 million
Interest Expense = $0.8 million
Book Value of Debt = $7.6 million
Book Value of Equity = $160 million

The firm faced a corporate tax rate of 38.5%. (The market value debt to equity ratio is 5%.) The treasury bond rate is 7%.

The firm expected to maintain these financial fundamentals from 1994 to 1998, after which it was expected to become a stable firm with an earnings growth rate of 6%. The firm's financial characteristics were expected to approach industry averages after 1998. The industry averages were as follows:

Return on Capital = 12.5%
Debt/Equity Ratio = 25%
Interest Rate on Debt = 7%

Church and Dwight had a beta of 0.85 in 1993 and the unlevered beta was not expected to change over time.

a. What is the expected growth rate in earnings, based upon fundamentals, for the high-growth period (1994 to 1998)?

b. What is the expected payout ratio after 1998?

c. What is the expected beta after 1998?

d. What is the expected price at the end of 1998?

e. What is the value of the stock, using the two-stage dividend discount model?

f. How much of this value can be attributed to extraordinary growth? to stable growth?

4. Oneida Inc, the world's largest producer of stainless steel and silverplated flatware, reported earnings per share of $0.80 in 1993 and paid dividends per share of $0.48 in that year. The firm was expected to report earnings growth of 25% in 1994, after which the growth rate was expected to decline linearly over the following six years to 7% in 1999. The stock was expected to have a beta of 0.85. (The treasury bond rate was 6.25%)

a. Estimate the value of stable growth, using the H Model.

b. Estimate the value of extraordinary growth, using the H Model.

c. What are the assumptions about dividend payout in the H Model?

5. Medtronic Inc., the world's largest manufacturer of implantable biomedical devices, reported earnings per share in 1993 of $3.95 and paid dividends per share of $0.68. Its earnings were expected to grow 16% from 1994 to 1998, but the growth rate was expected to decline each year after that to a stable growth rate of 6% in 2003. The payout ratio was expected to remain unchanged from 1994 to 1998, after which it would increase each year to reach 60% in steady state. The stock was expected to have a beta of 1.25 from 1994 to 1998, after which the beta would decline each year to reach 1.00 by the time the firm becomes stable. (The treasury bond rate was 6.25%)

a. Assuming that the growth rate declines linearly (and the payout ratio increases linearly) from 1999 to 2003, estimate the dividends per share each year from 1994 to 2003.

b. Estimate the expected price at the end of 2003.

c. Estimate the value per share, using the three-stage dividend discount model.