Journal of Economic Perspectives—Volume 18, Number 3—Summer 2004—Pages 25–46

The Capital Asset Pricing Model: Theory and Evidence

Eugene F. Fama and Kenneth R. French

The capital asset pricing model (CAPM) of William Sharpe (1964) and John Lintner (1965) marks the birth of asset pricing theory (resulting in a Nobel Prize for Sharpe in 1990). Four decades later, the CAPM is still widely used in applications, such as estimating the cost of capital for firms and evaluating the performance of managed portfolios. It is the centerpiece of MBA investment courses. Indeed, it is often the only asset pricing model taught in these courses.[1]

The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk. Unfortunately, the empirical record of the model is poor—poor enough to invalidate the way it is used in applications. The CAPM's empirical problems may reflect theoretical failings, the result of many simplifying assumptions. But they may also be caused by difficulties in implementing valid tests of the model. For example, the CAPM says that the risk of a stock should be measured relative to a comprehensive "market portfolio" that in principle can include not just traded financial assets, but also consumer durables, real estate and human capital. Even if we take a narrow view of the model and limit its purview to traded financial assets, is it

---

[1] Although every asset pricing model is a capital asset pricing model, the finance profession reserves the acronym CAPM for the specific model of Sharpe (1964), Lintner (1965) and Black (1972) discussed here. Thus, throughout the paper we refer to the Sharpe-Lintner-Black model as the CAPM.

■ *Eugene F. Fama is Robert R. McCormick Distinguished Service Professor of Finance, Graduate School of Business, University of Chicago, Chicago, Illinois. Kenneth R. French is Carl E. and Catherine M. Heidt Professor of Finance, Tuck School of Business, Dartmouth College, Hanover, New Hampshire. Their e-mail addresses are ⟨eugene.fama@gsb.uchicago.edu⟩ and ⟨kfrench@dartmouth.edu⟩, respectively.*

legitimate to limit further the market portfolio to U.S. common stocks (a typical choice), or should the market be expanded to include bonds, and other financial assets, perhaps around the world? In the end, we argue that whether the model's problems reflect weaknesses in the theory or in its empirical implementation, the failure of the CAPM in empirical tests implies that most applications of the model are invalid.

We begin by outlining the logic of the CAPM, focusing on its predictions about risk and expected return. We then review the history of empirical work and what it says about shortcomings of the CAPM that pose challenges to be explained by alternative models.

The Logic of the CAPM

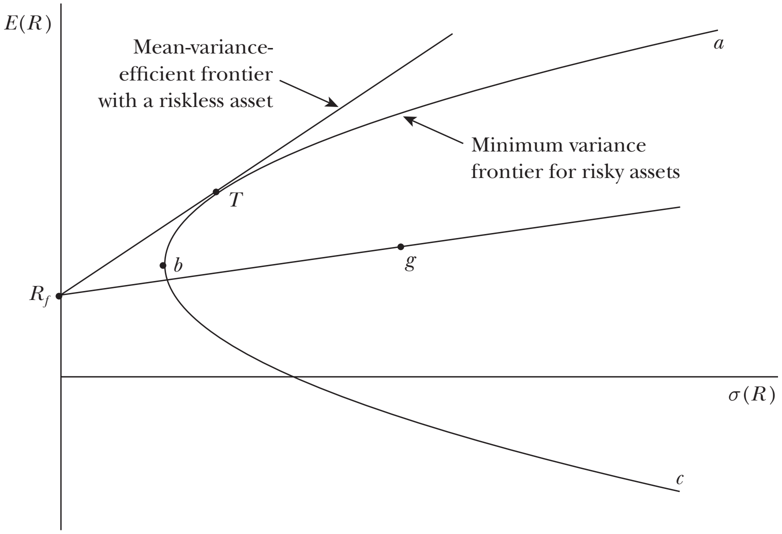
The CAPM builds on the model of portfolio choice developed by Harry Markowitz (1959). In Markowitz's model, an investor selects a portfolio at time $t - 1$ that produces a stochastic return at t. The model assumes investors are risk averse and, when choosing among portfolios, they care only about the mean and variance of their one-period investment return. As a result, investors choose "mean-variance-efficient" portfolios, in the sense that the portfolios 1) minimize the variance of portfolio return, given expected return, and 2) maximize expected return, given variance. Thus, the Markowitz approach is often called a "mean-variance model."

The portfolio model provides an algebraic condition on asset weights in mean-variance-efficient portfolios. The CAPM turns this algebraic statement into a testable prediction about the relation between risk and expected return by identifying a portfolio that must be efficient if asset prices are to clear the market of all assets.

Sharpe (1964) and Lintner (1965) add two key assumptions to the Markowitz model to identify a portfolio that must be mean-variance-efficient. The first assumption is *complete agreement*: given market clearing asset prices at $t - 1$, investors agree on the joint distribution of asset returns from $t - 1$ to t. And this distribution is the true one—that is, it is the distribution from which the returns we use to test the model are drawn. The second assumption is that there is *borrowing and lending at a risk-free rate*, which is the same for all investors and does not depend on the amount borrowed or lent.

Figure 1 describes portfolio opportunities and tells the CAPM story. The horizontal axis shows portfolio risk, measured by the standard deviation of portfolio return; the vertical axis shows expected return. The curve *abc*, which is called the minimum variance frontier, traces combinations of expected return and risk for portfolios of risky assets that minimize return variance at different levels of expected return. (These portfolios do not include risk-free borrowing and lending.) The tradeoff between risk and expected return for minimum variance portfolios is apparent. For example, an investor who wants a high expected return, perhaps at point *a*, must accept high volatility. At point *T*, the investor can have an interme-

Figure 1
Investment Opportunities



diate expected return with lower volatility. If there is no risk-free borrowing or lending, only portfolios above *b* along *abc* are mean-variance-efficient, since these portfolios also maximize expected return, given their return variances.

Adding risk-free borrowing and lending turns the efficient set into a straight line. Consider a portfolio that invests the proportion x of portfolio funds in a risk-free security and $1 - x$ in some portfolio *g*. If all funds are invested in the risk-free security—that is, they are loaned at the risk-free rate of interest—the result is the point R_f in Figure 1, a portfolio with zero variance and a risk-free rate of return. Combinations of risk-free lending and positive investment in *g* plot on the straight line between R_f and *g*. Points to the right of *g* on the line represent borrowing at the risk-free rate, with the proceeds from the borrowing used to increase investment in portfolio *g*. In short, portfolios that combine risk-free lending or borrowing with some risky portfolio *g* plot along a straight line from R_f through *g* in Figure 1.[2]

---

[2] Formally, the return, expected return and standard deviation of return on portfolios of the risk-free asset *f* and a risky portfolio *g* vary with x, the proportion of portfolio funds invested in *f*, as

$$R_p = xR_f + (1 - x)R_g,$$

$$E(R_p) = xR_f + (1 - x)E(R_g),$$

$$\sigma(R_p) = (1 - x)\sigma(R_g),\ x \leq 1.0,$$

which together imply that the portfolios plot along the line from R_f through *g* in Figure 1.

To obtain the mean-variance-efficient portfolios available with risk-free borrowing and lending, one swings a line from R_f in Figure 1 up and to the left as far as possible, to the tangency portfolio T. We can then see that all efficient portfolios are combinations of the risk-free asset (either risk-free borrowing or lending) and a single risky tangency portfolio, T. This key result is Tobin's (1958) "separation theorem."

The punch line of the CAPM is now straightforward. With complete agreement about distributions of returns, all investors see the same opportunity set (Figure 1), and they combine the same risky tangency portfolio T with risk-free lending or borrowing. Since all investors hold the same portfolio T of risky assets, it must be the value-weight market portfolio of risky assets. Specifically, each risky asset's weight in the tangency portfolio, which we now call M (for the "market"), must be the total market value of all outstanding units of the asset divided by the total market value of all risky assets. In addition, the risk-free rate must be set (along with the prices of risky assets) to clear the market for risk-free borrowing and lending.

In short, the CAPM assumptions imply that the market portfolio M must be on the minimum variance frontier if the asset market is to clear. This means that the algebraic relation that holds for any minimum variance portfolio must hold for the market portfolio. Specifically, if there are N risky assets,

$$\text{(Minimum Variance Condition for } M) \quad E(R_i) = E(R_{ZM}) + [E(R_M) - E(R_{ZM})]\beta_{iM}, \quad i = 1, \ldots, N.$$

In this equation, $E(R_i)$ is the expected return on asset i, and β_{iM}, the market beta of asset i, is the covariance of its return with the market return divided by the variance of the market return,

$$\text{(Market Beta)} \quad \beta_{iM} = \frac{\text{cov}(R_i, R_M)}{\sigma^2(R_M)}.$$

The first term on the right-hand side of the minimum variance condition, $E(R_{ZM})$, is the expected return on assets that have market betas equal to zero, which means their returns are uncorrelated with the market return. The second term is a risk premium—the market beta of asset i, β_{iM}, times the premium per unit of beta, which is the expected market return, $E(R_M)$, minus $E(R_{ZM})$.

Since the market beta of asset i is also the slope in the regression of its return on the market return, a common (and correct) interpretation of beta is that it measures the sensitivity of the asset's return to variation in the market return. But there is another interpretation of beta more in line with the spirit of the portfolio model that underlies the CAPM. The risk of the market portfolio, as measured by the variance of its return (the denominator of β_{iM}), is a weighted average of the covariance risks of the assets in M (the numerators of β_{iM} for different assets).

Thus, β_{iM} is the covariance risk of asset i in M measured relative to the average covariance risk of assets, which is just the variance of the market return.[3] In economic terms, β_{iM} is proportional to the risk each dollar invested in asset i contributes to the market portfolio.

The last step in the development of the Sharpe-Lintner model is to use the assumption of risk-free borrowing and lending to nail down $E(R_{ZM})$, the expected return on zero-beta assets. A risky asset's return is uncorrelated with the market return—its beta is zero—when the average of the asset's covariances with the returns on other assets just offsets the variance of the asset's return. Such a risky asset is riskless in the market portfolio in the sense that it contributes nothing to the variance of the market return.

When there is risk-free borrowing and lending, the expected return on assets that are uncorrelated with the market return, $E(R_{ZM})$, must equal the risk-free rate, R_f. The relation between expected return and beta then becomes the familiar Sharpe-Lintner CAPM equation,

$$\text{(Sharpe-Lintner CAPM)} \quad E(R_i) = R_f + [E(R_M) - R_f)]\beta_{iM},\ i = 1, \ldots, N.$$

In words, the expected return on any asset i is the risk-free interest rate, R_f, plus a risk premium, which is the asset's market beta, β_{iM}, times the premium per unit of beta risk, $E(R_M) - R_f$.

Unrestricted risk-free borrowing and lending is an unrealistic assumption. Fischer Black (1972) develops a version of the CAPM without risk-free borrowing or lending. He shows that the CAPM's key result—that the market portfolio is mean-variance-efficient—can be obtained by instead allowing unrestricted short sales of risky assets. In brief, back in Figure 1, if there is no risk-free asset, investors select portfolios from along the mean-variance-efficient frontier from a to b. Market clearing prices imply that when one weights the efficient portfolios chosen by investors by their (positive) shares of aggregate invested wealth, the resulting portfolio is the market portfolio. The market portfolio is thus a portfolio of the efficient portfolios chosen by investors. With unrestricted short selling of risky assets, portfolios made up of efficient portfolios are themselves efficient. Thus, the market portfolio is efficient, which means that the minimum variance condition for M given above holds, and it is the expected return-risk relation of the Black CAPM.

The relations between expected return and market beta of the Black and Sharpe-Lintner versions of the CAPM differ only in terms of what each says about $E(R_{ZM})$, the expected return on assets uncorrelated with the market. The Black version says only that $E(R_{ZM})$ must be less than the expected market return, so the

---

[3] Formally, if x_{iM} is the weight of asset i in the market portfolio, then the variance of the portfolio's return is

$$\sigma^2(R_M) = Cov(R_M, R_M) = Cov\left(\sum_{i=1}^{N} x_{iM}R_i,\ R_M\right) = \sum_{i=1}^{N} x_{iM}Cov(R_i, R_M).$$

premium for beta is positive. In contrast, in the Sharpe-Lintner version of the model, $E(R_{ZM})$ must be the risk-free interest rate, R_f, and the premium per unit of beta risk is $E(R_M) - R_f$.

The assumption that short selling is unrestricted is as unrealistic as unrestricted risk-free borrowing and lending. If there is no risk-free asset and short sales of risky assets are not allowed, mean-variance investors still choose efficient portfolios—points above *b* on the *abc* curve in Figure 1. But when there is no short selling of risky assets and no risk-free asset, the algebra of portfolio efficiency says that portfolios made up of efficient portfolios are not typically efficient. This means that the market portfolio, which is a portfolio of the efficient portfolios chosen by investors, is not typically efficient. And the CAPM relation between expected return and market beta is lost. This does not rule out predictions about expected return and betas with respect to other efficient portfolios—if theory can specify portfolios that must be efficient if the market is to clear. But so far this has proven impossible.

In short, the familiar CAPM equation relating expected asset returns to their market betas is just an application to the market portfolio of the relation between expected return and portfolio beta that holds in any mean-variance-efficient portfolio. The efficiency of the market portfolio is based on many unrealistic assumptions, including complete agreement and either unrestricted risk-free borrowing and lending or unrestricted short selling of risky assets. But all interesting models involve unrealistic simplifications, which is why they must be tested against data.

Early Empirical Tests

Tests of the CAPM are based on three implications of the relation between expected return and market beta implied by the model. First, expected returns on all assets are linearly related to their betas, and no other variable has marginal explanatory power. Second, the beta premium is positive, meaning that the expected return on the market portfolio exceeds the expected return on assets whose returns are uncorrelated with the market return. Third, in the Sharpe-Lintner version of the model, assets uncorrelated with the market have expected returns equal to the risk-free interest rate, and the beta premium is the expected market return minus the risk-free rate. Most tests of these predictions use either cross-section or time-series regressions. Both approaches date to early tests of the model.

Tests on Risk Premiums

The early cross-section regression tests focus on the Sharpe-Lintner model's predictions about the intercept and slope in the relation between expected return and market beta. The approach is to regress a cross-section of average asset returns on estimates of asset betas. The model predicts that the intercept in these regressions is the risk-free interest rate, R_f, and the coefficient on beta is the expected return on the market in excess of the risk-free rate, $E(R_M) - R_f$.

Two problems in these tests quickly became apparent. First, estimates of beta for individual assets are imprecise, creating a measurement error problem when they are used to explain average returns. Second, the regression residuals have common sources of variation, such as industry effects in average returns. Positive correlation in the residuals produces downward bias in the usual ordinary least squares estimates of the standard errors of the cross-section regression slopes.

To improve the precision of estimated betas, researchers such as Blume (1970), Friend and Blume (1970) and Black, Jensen and Scholes (1972) work with portfolios, rather than individual securities. Since expected returns and market betas combine in the same way in portfolios, if the CAPM explains security returns it also explains portfolio returns.[4] Estimates of beta for diversified portfolios are more precise than estimates for individual securities. Thus, using portfolios in cross-section regressions of average returns on betas reduces the critical errors in variables problem. Grouping, however, shrinks the range of betas and reduces statistical power. To mitigate this problem, researchers sort securities on beta when forming portfolios; the first portfolio contains securities with the lowest betas, and so on, up to the last portfolio with the highest beta assets. This sorting procedure is now standard in empirical tests.

Fama and MacBeth (1973) propose a method for addressing the inference problem caused by correlation of the residuals in cross-section regressions. Instead of estimating a single cross-section regression of average monthly returns on betas, they estimate month-by-month cross-section regressions of monthly returns on betas. The times-series means of the monthly slopes and intercepts, along with the standard errors of the means, are then used to test whether the average premium for beta is positive and whether the average return on assets uncorrelated with the market is equal to the average risk-free interest rate. In this approach, the standard errors of the average intercept and slope are determined by the month-to-month variation in the regression coefficients, which fully captures the effects of residual correlation on variation in the regression coefficients, but sidesteps the problem of actually estimating the correlations. The residual correlations are, in effect, captured via repeated sampling of the regression coefficients. This approach also becomes standard in the literature.

Jensen (1968) was the first to note that the Sharpe-Lintner version of the

---

[4] Formally, if x_{ip}, $i = 1, \ldots, N$, are the weights for assets in some portfolio p, the expected return and market beta for the portfolio are related to the expected returns and betas of assets as

$$E(R_p) = \sum_{i=1}^{N} x_{ip}E(R_i), \text{ and } \beta_{pM} = \sum_{i=1}^{N} x_{ip}\beta_{pM}.$$

Thus, the CAPM relation between expected return and beta,

$$E(R_i) = E(R_f) + [E(R_M) - E(R_f)]\beta_{iM},$$

holds when asset i is a portfolio, as well as when i is an individual security.

relation between expected return and market beta also implies a time-series regression test. The Sharpe-Lintner CAPM says that the expected value of an asset's excess return (the asset's return minus the risk-free interest rate, $R_{it} - R_{ft}$) is completely explained by its expected CAPM risk premium (its beta times the expected value of $R_{Mt} - R_{ft}$). This implies that "Jensen's alpha," the intercept term in the time-series regression,

$$\text{(Time-Series Regression)} \quad R_{it} - R_{ft} = \alpha_i + \beta_{iM}(R_{Mt} - R_{ft}) + \varepsilon_{it},$$

is zero for each asset.

The early tests firmly reject the Sharpe-Lintner version of the CAPM. There is a positive relation between beta and average return, but it is too "flat." Recall that, in cross-section regressions, the Sharpe-Lintner model predicts that the intercept is the risk-free rate and the coefficient on beta is the expected market return in excess of the risk-free rate, $E(R_M) - R_f$. The regressions consistently find that the intercept is greater than the average risk-free rate (typically proxied as the return on a one-month Treasury bill), and the coefficient on beta is less than the average excess market return (proxied as the average return on a portfolio of U.S. common stocks minus the Treasury bill rate). This is true in the early tests, such as Douglas (1968), Black, Jensen and Scholes (1972), Miller and Scholes (1972), Blume and Friend (1973) and Fama and MacBeth (1973), as well as in more recent cross-section regression tests, like Fama and French (1992).

The evidence that the relation between beta and average return is too flat is confirmed in time-series tests, such as Friend and Blume (1970), Black, Jensen and Scholes (1972) and Stambaugh (1982). The intercepts in time-series regressions of excess asset returns on the excess market return are positive for assets with low betas and negative for assets with high betas.

Figure 2 provides an updated example of the evidence. In December of each year, we estimate a preranking beta for every NYSE (1928–2003), AMEX (1963–2003) and NASDAQ (1972–2003) stock in the CRSP (Center for Research in Security Prices of the University of Chicago) database, using two to five years (as available) of prior monthly returns.[5] We then form ten value-weight portfolios based on these preranking betas and compute their returns for the next twelve months. We repeat this process for each year from 1928 to 2003. The result is 912 monthly returns on ten beta-sorted portfolios. Figure 2 plots each portfolio's average return against its postranking beta, estimated by regressing its monthly returns for 1928–2003 on the return on the CRSP value-weight portfolio of U.S. common stocks.

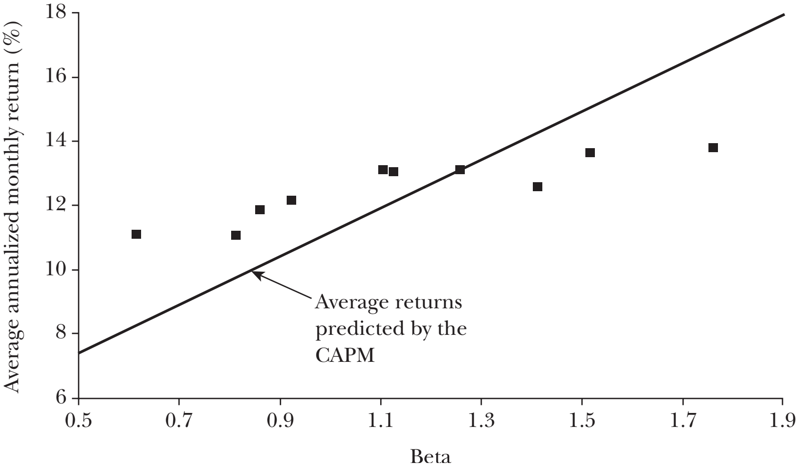
The Sharpe-Lintner CAPM predicts that the portfolios plot along a straight

---

[5] To be included in the sample for year t, a security must have market equity data (price times shares outstanding) for December of $t - 1$, and CRSP must classify it as ordinary common equity. Thus, we exclude securities such as American Depository Receipts (ADRs) and Real Estate Investment Trusts (REITs).

Figure 2

Average Annualized Monthly Return versus Beta for Value Weight Portfolios Formed on Prior Beta, 1928–2003



line, with an intercept equal to the risk-free rate, R_f, and a slope equal to the expected excess return on the market, $E(R_M) - R_f$. We use the average one-month Treasury bill rate and the average excess CRSP market return for 1928–2003 to estimate the predicted line in Figure 2. Confirming earlier evidence, the relation between beta and average return for the ten portfolios is much flatter than the Sharpe-Lintner CAPM predicts. The returns on the low beta portfolios are too high, and the returns on the high beta portfolios are too low. For example, the predicted return on the portfolio with the lowest beta is 8.3 percent per year; the actual return is 11.1 percent. The predicted return on the portfolio with the highest beta is 16.8 percent per year; the actual is 13.7 percent.

Although the observed premium per unit of beta is lower than the Sharpe-Lintner model predicts, the relation between average return and beta in Figure 2 is roughly linear. This is consistent with the Black version of the CAPM, which predicts only that the beta premium is positive. Even this less restrictive model, however, eventually succumbs to the data.

Testing Whether Market Betas Explain Expected Returns

The Sharpe-Lintner and Black versions of the CAPM share the prediction that the market portfolio is mean-variance-efficient. This implies that differences in expected return across securities and portfolios are entirely explained by differences in market beta; other variables should add nothing to the explanation of expected return. This prediction plays a prominent role in tests of the CAPM. In the early work, the weapon of choice is cross-section regressions.

In the framework of Fama and MacBeth (1973), one simply adds predetermined explanatory variables to the month-by-month cross-section regressions of returns on beta. If all differences in expected return are explained by beta, the average slopes on the additional variables should not be reliably different from zero. Clearly, the trick in the cross-section regression approach is to choose specific additional variables likely to expose any problems of the CAPM prediction that, because the market portfolio is efficient, market betas suffice to explain expected asset returns.

For example, in Fama and MacBeth (1973) the additional variables are squared market betas (to test the prediction that the relation between expected return and beta is linear) and residual variances from regressions of returns on the market return (to test the prediction that market beta is the only measure of risk needed to explain expected returns). These variables do not add to the explanation of average returns provided by beta. Thus, the results of Fama and MacBeth (1973) are consistent with the hypothesis that their market proxy—an equal-weight portfolio of NYSE stocks—is on the minimum variance frontier.

The hypothesis that market betas completely explain expected returns can also be tested using time-series regressions. In the time-series regression described above (the excess return on asset i regressed on the excess market return), the intercept is the difference between the asset's average excess return and the excess return predicted by the Sharpe-Lintner model, that is, beta times the average excess market return. If the model holds, there is no way to group assets into portfolios whose intercepts are reliably different from zero. For example, the intercepts for a portfolio of stocks with high ratios of earnings to price and a portfolio of stocks with low earning-price ratios should both be zero. Thus, to test the hypothesis that market betas suffice to explain expected returns, one estimates the time-series regression for a set of assets (or portfolios) and then jointly tests the vector of regression intercepts against zero. The trick in this approach is to choose the left-hand-side assets (or portfolios) in a way likely to expose any shortcoming of the CAPM prediction that market betas suffice to explain expected asset returns.

In early applications, researchers use a variety of tests to determine whether the intercepts in a set of time-series regressions are all zero. The tests have the same asymptotic properties, but there is controversy about which has the best small sample properties. Gibbons, Ross and Shanken (1989) settle the debate by providing an F-test on the intercepts that has exact small-sample properties. They also show that the test has a simple economic interpretation. In effect, the test constructs a candidate for the tangency portfolio T in Figure 1 by optimally combining the market proxy and the left-hand-side assets of the time-series regressions. The estimator then tests whether the efficient set provided by the combination of this tangency portfolio and the risk-free asset is reliably superior to the one obtained by combining the risk-free asset with the market proxy alone. In other words, the Gibbons, Ross and Shanken statistic tests whether the market proxy is the tangency portfolio in the set of portfolios that can be constructed by combining the market portfolio with the specific assets used as dependent variables in the time-series regressions.

Enlightened by this insight of Gibbons, Ross and Shanken (1989), one can see a similar interpretation of the cross-section regression test of whether market betas suffice to explain expected returns. In this case, the test is whether the additional explanatory variables in a cross-section regression identify patterns in the returns on the left-hand-side assets that are not explained by the assets' market betas. This amounts to testing whether the market proxy is on the minimum variance frontier that can be constructed using the market proxy and the left-hand-side assets included in the tests.

An important lesson from this discussion is that time-series and cross-section regressions do not, strictly speaking, test the CAPM. What is literally tested is whether a specific proxy for the market portfolio (typically a portfolio of U.S. common stocks) is efficient in the set of portfolios that can be constructed from it and the left-hand-side assets used in the test. One might conclude from this that the CAPM has never been tested, and prospects for testing it are not good because 1) the set of left-hand-side assets does not include all marketable assets, and 2) data for the true market portfolio of all assets are likely beyond reach (Roll, 1977; more on this later). But this criticism can be leveled at tests of any economic model when the tests are less than exhaustive or when they use proxies for the variables called for by the model.

The bottom line from the early cross-section regression tests of the CAPM, such as Fama and MacBeth (1973), and the early time-series regression tests, like Gibbons (1982) and Stambaugh (1982), is that standard market proxies seem to be on the minimum variance frontier. That is, the central predictions of the Black version of the CAPM, that market betas suffice to explain expected returns and that the risk premium for beta is positive, seem to hold. But the more specific prediction of the Sharpe-Lintner CAPM that the premium per unit of beta is the expected market return minus the risk-free interest rate is consistently rejected.

The success of the Black version of the CAPM in early tests produced a consensus that the model is a good description of expected returns. These early results, coupled with the model's simplicity and intuitive appeal, pushed the CAPM to the forefront of finance.

Recent Tests

Starting in the late 1970s, empirical work appears that challenges even the Black version of the CAPM. Specifically, evidence mounts that much of the variation in expected return is unrelated to market beta.

The first blow is Basu's (1977) evidence that when common stocks are sorted on earnings-price ratios, future returns on high E/P stocks are higher than predicted by the CAPM. Banz (1981) documents a size effect: when stocks are sorted on market capitalization (price times shares outstanding), average returns on small stocks are higher than predicted by the CAPM. Bhandari (1988) finds that high debt-equity ratios (book value of debt over the market value of equity, a measure of leverage) are associated with returns that are too high relative to their market betas.

Finally, Statman (1980) and Rosenberg, Reid and Lanstein (1985) document that stocks with high book-to-market equity ratios (B/M, the ratio of the book value of a common stock to its market value) have high average returns that are not captured by their betas.

There is a theme in the contradictions of the CAPM summarized above. Ratios involving stock prices have information about expected returns missed by market betas. On reflection, this is not surprising. A stock's price depends not only on the expected cash flows it will provide, but also on the expected returns that discount expected cash flows back to the present. Thus, in principle, the cross-section of prices has information about the cross-section of expected returns. (A high expected return implies a high discount rate and a low price.) The cross-section of stock prices is, however, arbitrarily affected by differences in scale (or units). But with a judicious choice of scaling variable X, the ratio X/P can reveal differences in the cross-section of expected stock returns. Such ratios are thus prime candidates to expose shortcomings of asset pricing models—in the case of the CAPM, shortcomings of the prediction that market betas suffice to explain expected returns (Ball, 1978). The contradictions of the CAPM summarized above suggest that earnings-price, debt-equity and book-to-market ratios indeed play this role.

Fama and French (1992) update and synthesize the evidence on the empirical failures of the CAPM. Using the cross-section regression approach, they confirm that size, earnings-price, debt-equity and book-to-market ratios add to the explanation of expected stock returns provided by market beta. Fama and French (1996) reach the same conclusion using the time-series regression approach applied to portfolios of stocks sorted on price ratios. They also find that different price ratios have much the same information about expected returns. This is not surprising given that price is the common driving force in the price ratios, and the numerators are just scaling variables used to extract the information in price about expected returns.

Fama and French (1992) also confirm the evidence (Reinganum, 1981; Stambaugh, 1982; Lakonishok and Shapiro, 1986) that the relation between average return and beta for common stocks is even flatter after the sample periods used in the early empirical work on the CAPM. The estimate of the beta premium is, however, clouded by statistical uncertainty (a large standard error). Kothari, Shanken and Sloan (1995) try to resuscitate the Sharpe-Lintner CAPM by arguing that the weak relation between average return and beta is just a chance result. But the strong evidence that other variables capture variation in expected return missed by beta makes this argument irrelevant. If betas do not suffice to explain expected returns, the market portfolio is not efficient, and the CAPM is dead in its tracks. Evidence on the size of the market premium can neither save the model nor further doom it.

The synthesis of the evidence on the empirical problems of the CAPM provided by Fama and French (1992) serves as a catalyst, marking the point when it is generally acknowledged that the CAPM has potentially fatal problems. Research then turns to explanations.

One possibility is that the CAPM's problems are spurious, the result of data dredging—publication-hungry researchers scouring the data and unearthing contradictions that occur in specific samples as a result of chance. A standard response to this concern is to test for similar findings in other samples. Chan, Hamao and Lakonishok (1991) find a strong relation between book-to-market equity (B/M) and average return for Japanese stocks. Capaul, Rowley and Sharpe (1993) observe a similar B/M effect in four European stock markets and in Japan. Fama and French (1998) find that the price ratios that produce problems for the CAPM in U.S. data show up in the same way in the stock returns of twelve non-U.S. major markets, and they are present in emerging market returns. This evidence suggests that the contradictions of the CAPM associated with price ratios are not sample specific.

Explanations: Irrational Pricing or Risk

Among those who conclude that the empirical failures of the CAPM are fatal, two stories emerge. On one side are the behavioralists. Their view is based on evidence that stocks with high ratios of book value to market price are typically firms that have fallen on bad times, while low B/M is associated with growth firms (Lakonishok, Shleifer and Vishny, 1994; Fama and French, 1995). The behavioralists argue that sorting firms on book-to-market ratios exposes investor overreaction to good and bad times. Investors overextrapolate past performance, resulting in stock prices that are too high for growth (low B/M) firms and too low for distressed (high B/M, so-called value) firms. When the overreaction is eventually corrected, the result is high returns for value stocks and low returns for growth stocks. Proponents of this view include DeBondt and Thaler (1987), Lakonishok, Shleifer and Vishny (1994) and Haugen (1995).

The second story for explaining the empirical contradictions of the CAPM is that they point to the need for a more complicated asset pricing model. The CAPM is based on many unrealistic assumptions. For example, the assumption that investors care only about the mean and variance of one-period portfolio returns is extreme. It is reasonable that investors also care about how their portfolio return covaries with labor income and future investment opportunities, so a portfolio's return variance misses important dimensions of risk. If so, market beta is not a complete description of an asset's risk, and we should not be surprised to find that differences in expected return are not completely explained by differences in beta. In this view, the search should turn to asset pricing models that do a better job explaining average returns.

Merton's (1973) intertemporal capital asset pricing model (ICAPM) is a natural extension of the CAPM. The ICAPM begins with a different assumption about investor objectives. In the CAPM, investors care only about the wealth their portfolio produces at the end of the current period. In the ICAPM, investors are concerned not only with their end-of-period payoff, but also with the opportunities they will have to consume or invest the payoff. Thus, when choosing a portfolio at time $t - 1$, ICAPM investors consider how their wealth at t might vary with future *state variables*, including labor income, the prices of consumption goods and the nature of portfolio opportunities at t, and expectations about the labor income, consumption and investment opportunities to be available after t.

Like CAPM investors, ICAPM investors prefer high expected return and low return variance. But ICAPM investors are also concerned with the covariances of portfolio returns with state variables. As a result, optimal portfolios are "multifactor efficient," which means they have the largest possible expected returns, given their return variances and the covariances of their returns with the relevant state variables.

Fama (1996) shows that the ICAPM generalizes the logic of the CAPM. That is, if there is risk-free borrowing and lending or if short sales of risky assets are allowed, market clearing prices imply that the market portfolio is multifactor efficient. Moreover, multifactor efficiency implies a relation between expected return and beta risks, but it requires additional betas, along with a market beta, to explain expected returns.

An ideal implementation of the ICAPM would specify the state variables that affect expected returns. Fama and French (1993) take a more indirect approach, perhaps more in the spirit of Ross's (1976) arbitrage pricing theory. They argue that though size and book-to-market equity are not themselves state variables, the higher average returns on small stocks and high book-to-market stocks reflect unidentified state variables that produce undiversifiable risks (covariances) in returns that are not captured by the market return and are priced separately from market betas. In support of this claim, they show that the returns on the stocks of small firms covary more with one another than with returns on the stocks of large firms, and returns on high book-to-market (value) stocks covary more with one another than with returns on low book-to-market (growth) stocks. Fama and French (1995) show that there are similar size and book-to-market patterns in the covariation of fundamentals like earnings and sales.

Based on this evidence, Fama and French (1993, 1996) propose a three-factor model for expected returns,

$$\text{(Three-Factor Model)} \quad E(R_{it}) - R_{ft} = \beta_{iM}[E(R_{Mt}) - R_{ft}] + \beta_{is}E(SMB_t) + \beta_{ih}E(HML_t).$$

In this equation, SMB_t (small minus big) is the difference between the returns on diversified portfolios of small and big stocks, HML_t (high minus low) is the difference between the returns on diversified portfolios of high and low B/M stocks, and the betas are slopes in the multiple regression of $R_{it} - R_{ft}$ on $R_{Mt} - R_{ft}$, SMB_t and HML_t.

For perspective, the average value of the market premium $R_{Mt} - R_{ft}$ for 1927–2003 is 8.3 percent per year, which is 3.5 standard errors from zero. The average values of SMB_t, and HML_t are 3.6 percent and 5.0 percent per year, and they are 2.1 and 3.1 standard errors from zero. All three premiums are volatile, with annual standard deviations of 21.0 percent $(R_{Mt} - R_{ft})$, 14.6 percent (SMB_t) and 14.2 percent (HML_t) per year. Although the average values of the premiums are large, high volatility implies substantial uncertainty about the true expected premiums.

One implication of the expected return equation of the three-factor model is that the intercept α_{i} in the time-series regression,

$$R_{it} - R_{ft} = \alpha_i + \beta_{iM}(R_{Mt} - R_{ft}) + \beta_{is}SMB_t + \beta_{ih}HML_t + \varepsilon_{it},$$

is zero for all assets *i*. Using this criterion, Fama and French (1993, 1996) find that the model captures much of the variation in average return for portfolios formed on size, book-to-market equity and other price ratios that cause problems for the CAPM. Fama and French (1998) show that an international version of the model performs better than an international CAPM in describing average returns on portfolios formed on scaled price variables for stocks in 13 major markets.

The three-factor model is now widely used in empirical research that requires a model of expected returns. Estimates of α_{i} from the time-series regression above are used to calibrate how rapidly stock prices respond to new information (for example, Loughran and Ritter, 1995; Mitchell and Stafford, 2000). They are also used to measure the special information of portfolio managers, for example, in Carhart's (1997) study of mutual fund performance. Among practitioners like Ibbotson Associates, the model is offered as an alternative to the CAPM for estimating the cost of equity capital.

From a theoretical perspective, the main shortcoming of the three-factor model is its empirical motivation. The small-minus-big (SMB) and high-minus-low (HML) explanatory returns are not motivated by predictions about state variables of concern to investors. Instead they are brute force constructs meant to capture the patterns uncovered by previous work on how average stock returns vary with size and the book-to-market equity ratio.

But this concern is not fatal. The ICAPM does not require that the additional portfolios used along with the market portfolio to explain expected returns "mimic" the relevant state variables. In both the ICAPM and the arbitrage pricing theory, it suffices that the additional portfolios are well diversified (in the terminology of Fama, 1996, they are multifactor minimum variance) and that they are sufficiently different from the market portfolio to capture covariation in returns and variation in expected returns missed by the market portfolio. Thus, adding diversified portfolios that capture covariation in returns and variation in average returns left unexplained by the market is in the spirit of both the ICAPM and the Ross's arbitrage pricing theory.

The behavioralists are not impressed by the evidence for a risk-based explanation of the failures of the CAPM. They typically concede that the three-factor model captures covariation in returns missed by the market return and that it picks up much of the size and value effects in average returns left unexplained by the CAPM. But their view is that the average return premium associated with the model's book-to-market factor—which does the heavy lifting in the improvements to the CAPM—is itself the result of investor overreaction that happens to be correlated across firms in a way that just looks like a risk story. In short, in the behavioral view, the market tries to set CAPM prices, and violations of the CAPM are due to mispricing.

The conflict between the behavioral irrational pricing story and the rational risk story for the empirical failures of the CAPM leaves us at a timeworn impasse. Fama (1970) emphasizes that the hypothesis that prices properly reflect available information must be tested in the context of a model of expected returns, like the CAPM. Intuitively, to test whether prices are rational, one must take a stand on what the market is trying to do in setting prices—that is, what is risk and what is the relation between expected return and risk? When tests reject the CAPM, one cannot say whether the problem is its assumption that prices are rational (the behavioral view) or violations of other assumptions that are also necessary to produce the CAPM (our position).

Fortunately, for some applications, the way one uses the three-factor model does not depend on one's view about whether its average return premiums are the rational result of underlying state variable risks, the result of irrational investor behavior or sample specific results of chance. For example, when measuring the response of stock prices to new information or when evaluating the performance of managed portfolios, one wants to account for known patterns in returns and average returns for the period examined, whatever their source. Similarly, when estimating the cost of equity capital, one might be unconcerned with whether expected return premiums are rational or irrational since they are in either case part of the opportunity cost of equity capital (Stein, 1996). But the cost of capital is forward looking, so if the premiums are sample specific they are irrelevant.

The three-factor model is hardly a panacea. Its most serious problem is the momentum effect of Jegadeesh and Titman (1993). Stocks that do well relative to the market over the last three to twelve months tend to continue to do well for the next few months, and stocks that do poorly continue to do poorly. This momentum effect is distinct from the value effect captured by book-to-market equity and other price ratios. Moreover, the momentum effect is left unexplained by the three-factor model, as well as by the CAPM. Following Carhart (1997), one response is to add a momentum factor (the difference between the returns on diversified portfolios of short-term winners and losers) to the three-factor model. This step is again legitimate in applications where the goal is to abstract from known patterns in average returns to uncover information-specific or manager-specific effects. But since the momentum effect is short-lived, it is largely irrelevant for estimates of the cost of equity capital.

Another strand of research points to problems in both the three-factor model and the CAPM. Frankel and Lee (1998), Dechow, Hutton and Sloan (1999), Piotroski (2000) and others show that in portfolios formed on price ratios like book-to-market equity, stocks with higher expected cash flows have higher average returns that are not captured by the three-factor model or the CAPM. The authors interpret their results as evidence that stock prices are irrational, in the sense that they do not reflect available information about expected profitability.

In truth, however, one can't tell whether the problem is bad pricing or a bad asset pricing model. A stock's price can always be expressed as the present value of expected future cash flows discounted at the expected return on the stock (Campbell and Shiller, 1989; Vuolteenaho, 2002). It follows that if two stocks have the same price, the one with higher expected cash flows must have a higher expected return. This holds true whether pricing is rational or irrational. Thus, when one observes a positive relation between expected cash flows and expected returns that is left unexplained by the CAPM or the three-factor model, one can't tell whether it is the result of irrational pricing or a misspecified asset pricing model.

The Market Proxy Problem

Roll (1977) argues that the CAPM has never been tested and probably never will be. The problem is that the market portfolio at the heart of the model is theoretically and empirically elusive. It is not theoretically clear which assets (for example, human capital) can legitimately be excluded from the market portfolio, and data availability substantially limits the assets that are included. As a result, tests of the CAPM are forced to use proxies for the market portfolio, in effect testing whether the proxies are on the minimum variance frontier. Roll argues that because the tests use proxies, not the true market portfolio, we learn nothing about the CAPM.

We are more pragmatic. The relation between expected return and market beta of the CAPM is just the minimum variance condition that holds in any efficient portfolio, applied to the market portfolio. Thus, if we can find a market proxy that is on the minimum variance frontier, it can be used to describe differences in expected returns, and we would be happy to use it for this purpose. The strong rejections of the CAPM described above, however, say that researchers have not uncovered a reasonable market proxy that is close to the minimum variance frontier. If researchers are constrained to reasonable proxies, we doubt they ever will.

Our pessimism is fueled by several empirical results. Stambaugh (1982) tests the CAPM using a range of market portfolios that include, in addition to U.S. common stocks, corporate and government bonds, preferred stocks, real estate and other consumer durables. He finds that tests of the CAPM are not sensitive to expanding the market proxy beyond common stocks, basically because the volatility of expanded market returns is dominated by the volatility of stock returns.

One need not be convinced by Stambaugh's (1982) results since his market proxies are limited to U.S. assets. If international capital markets are open and asset prices conform to an international version of the CAPM, the market portfolio should include international assets. Fama and French (1998) find, however, that betas for a global stock market portfolio cannot explain the high average returns observed around the world on stocks with high book-to-market or high earnings-price ratios.

A major problem for the CAPM is that portfolios formed by sorting stocks on price ratios produce a wide range of average returns, but the average returns are not positively related to market betas (Lakonishok, Shleifer and Vishny, 1994; Fama and French, 1996, 1998). The problem is illustrated in Figure 3, which shows average returns and betas (calculated with respect to the CRSP value-weight portfolio of NYSE, AMEX and NASDAQ stocks) for July 1963 to December 2003 for ten portfolios of U.S. stocks formed annually on sorted values of the book-to-market equity ratio (B/M).[6]

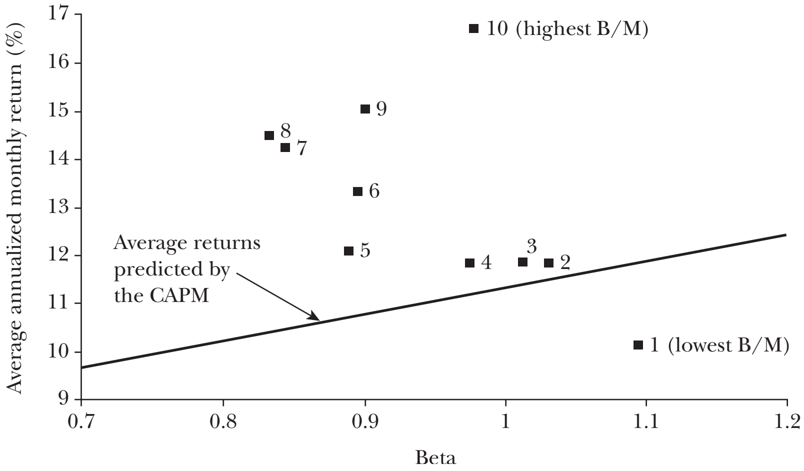
Average returns on the B/M portfolios increase almost monotonically, from 10.1 percent per year for the lowest B/M group (portfolio 1) to an impressive 16.7 percent for the highest (portfolio 10). But the positive relation between beta and average return predicted by the CAPM is notably absent. For example, the portfolio with the lowest book-to-market ratio has the highest beta but the lowest average return. The estimated beta for the portfolio with the highest book-to-market ratio and the highest average return is only 0.98. With an average annualized value of the riskfree interest rate, R_f, of 5.8 percent and an average annualized market premium, $R_M - R_f$, of 11.3 percent, the Sharpe-Lintner CAPM predicts an average return of 11.8 percent for the lowest B/M portfolio and 11.2 percent for the highest, far from the observed values, 10.1 and 16.7 percent. For the Sharpe-Lintner model to "work" on these portfolios, their market betas must change dramatically, from 1.09 to 0.78 for the lowest B/M portfolio and from 0.98 to 1.98 for the highest. We judge it unlikely that alternative proxies for the market portfolio will produce betas and a market premium that can explain the average returns on these portfolios.

It is always possible that researchers will redeem the CAPM by finding a reasonable proxy for the market portfolio that is on the minimum variance frontier. We emphasize, however, that this possibility cannot be used to justify the way the CAPM is currently applied. The problem is that applications typically use the same

---

[6] Stock return data are from CRSP, and book equity data are from Compustat and the Moody's Industrials, Transportation, Utilities and Financials manuals. Stocks are allocated to ten portfolios at the end of June of each year t (1963 to 2003) using the ratio of book equity for the fiscal year ending in calendar year $t - 1$, divided by market equity at the end of December of $t - 1$. Book equity is the book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Depending on availability, we use the redemption, liquidation or par value (in that order) to estimate the book value of preferred stock. Stockholders' equity is the value reported by Moody's or Compustat, if it is available. If not, we measure stockholders' equity as the book value of common equity plus the par value of preferred stock or the book value of assets minus total liabilities (in that order). The portfolios for year t include NYSE (1963–2003), AMEX (1963–2003) and NASDAQ (1972–2003) stocks with positive book equity in $t - 1$ and market equity (from CRSP) for December of $t - 1$ and June of t. The portfolios exclude securities CRSP does not classify as ordinary common equity. The breakpoints for year t use only securities that are on the NYSE in June of year t.

Figure 3
Average Annualized Monthly Return versus Beta for Value Weight Portfolios Formed on B/M, 1963–2003



market proxies, like the value-weight portfolio of U.S. stocks, that lead to rejections of the model in empirical tests. The contradictions of the CAPM observed when such proxies are used in tests of the model show up as bad estimates of expected returns in applications; for example, estimates of the cost of equity capital that are too low (relative to historical average returns) for small stocks and for stocks with high book-to-market equity ratios. In short, if a market proxy does not work in tests of the CAPM, it does not work in applications.

Conclusions

The version of the CAPM developed by Sharpe (1964) and Lintner (1965) has never been an empirical success. In the early empirical work, the Black (1972) version of the model, which can accommodate a flatter tradeoff of average return for market beta, has some success. But in the late 1970s, research begins to uncover variables like size, various price ratios and momentum that add to the explanation of average returns provided by beta. The problems are serious enough to invalidate most applications of the CAPM.

For example, finance textbooks often recommend using the Sharpe-Lintner CAPM risk-return relation to estimate the cost of equity capital. The prescription is to estimate a stock's market beta and combine it with the risk-free interest rate and the average market risk premium to produce an estimate of the cost of equity. The typical market portfolio in these exercises includes just U.S. common stocks. But empirical work, old and new, tells us that the relation between beta and average return is flatter than predicted by the Sharpe-Lintner version of the CAPM. As a result, CAPM estimates of the cost of equity for high beta stocks are too high (relative to historical average returns) and estimates for low beta stocks are too low (Friend and Blume, 1970). Similarly, if the high average returns on value stocks (with high book-to-market ratios) imply high expected returns, CAPM cost of equity estimates for such stocks are too low.[7]

The CAPM is also often used to measure the performance of mutual funds and other managed portfolios. The approach, dating to Jensen (1968), is to estimate the CAPM time-series regression for a portfolio and use the intercept (Jensen's alpha) to measure abnormal performance. The problem is that, because of the empirical failings of the CAPM, even passively managed stock portfolios produce abnormal returns if their investment strategies involve tilts toward CAPM problems (Elton, Gruber, Das and Hlavka, 1993). For example, funds that concentrate on low beta stocks, small stocks or value stocks will tend to produce positive abnormal returns relative to the predictions of the Sharpe-Lintner CAPM, even when the fund managers have no special talent for picking winners.

The CAPM, like Markowitz's (1952, 1959) portfolio model on which it is built, is nevertheless a theoretical tour de force. We continue to teach the CAPM as an introduction to the fundamental concepts of portfolio theory and asset pricing, to be built on by more complicated models like Merton's (1973) ICAPM. But we also warn students that despite its seductive simplicity, the CAPM's empirical problems probably invalidate its use in applications.

■ *We gratefully acknowledge the comments of John Cochrane, George Constantinides, Richard Leftwich, Andrei Shleifer, René Stulz and Timothy Taylor.*

---

[7] The problems are compounded by the large standard errors of estimates of the market premium and of betas for individual stocks, which probably suffice to make CAPM estimates of the cost of equity rather meaningless, even if the CAPM holds (Fama and French, 1997; Pastor and Stambaugh, 1999). For example, using the U.S. Treasury bill rate as the risk-free interest rate and the CRSP value-weight portfolio of publicly traded U.S. common stocks, the average value of the equity premium $R_{Mt} - R_{ft}$ for 1927–2003 is 8.3 percent per year, with a standard error of 2.4 percent. The two standard error range thus runs from 3.5 percent to 13.1 percent, which is sufficient to make most projects appear either profitable or unprofitable. This problem is, however, hardly special to the CAPM. For example, expected returns in all versions of Merton's (1973) ICAPM include a market beta and the expected market premium. Also, as noted earlier the expected values of the size and book-to-market premiums in the Fama-French three-factor model are also estimated with substantial error.

References

Ball, Ray. 1978. "Anomalies in Relationships Between Securities' Yields and Yield-Surrogates." *Journal of Financial Economics.* 6:2, pp. 103–26.

Banz, Rolf W. 1981. "The Relationship Between Return and Market Value of Common Stocks." *Journal of Financial Economics.* 9:1, pp. 3–18.

Basu, Sanjay. 1977. "Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis." *Journal of Finance.* 12:3, pp. 129–56.

Bhandari, Laxmi Chand. 1988. "Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence." *Journal of Finance.* 43:2, pp. 507–28.

Black, Fischer. 1972. "Capital Market Equilibrium with Restricted Borrowing." *Journal of Business.* 45:3, pp. 444–54.

Black, Fischer, Michael C. Jensen and Myron Scholes. 1972. "The Capital Asset Pricing Model: Some Empirical Tests," in *Studies in the Theory of Capital Markets.* Michael C. Jensen, ed. New York: Praeger, pp. 79–121.

Blume, Marshall. 1970. "Portfolio Theory: A Step Towards its Practical Application." *Journal of Business.* 43:2, pp. 152–74.

Blume, Marshall and Irwin Friend. 1973. "A New Look at the Capital Asset Pricing Model." *Journal of Finance.* 28:1, pp. 19–33.

Campbell, John Y. and Robert J. Shiller. 1989. "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors." *Review of Financial Studies.* 1:3, pp. 195–228.

Capaul, Carlo, Ian Rowley and William F. Sharpe. 1993. "International Value and Growth Stock Returns." *Financial Analysts Journal.* January/February, 49, pp. 27–36.

Carhart, Mark M. 1997. "On Persistence in Mutual Fund Performance." *Journal of Finance.* 52:1, pp. 57–82.

Chan, Louis K.C., Yasushi Hamao and Josef Lakonishok. 1991. "Fundamentals and Stock Returns in Japan." *Journal of Finance.* 46:5, pp. 1739–789.

DeBondt, Werner F. M. and Richard H. Thaler. 1987. "Further Evidence on Investor Overreaction and Stock Market Seasonality." *Journal of Finance.* 42:3, pp. 557–81.

Dechow, Patricia M., Amy P. Hutton and Richard G. Sloan. 1999. "An Empirical Assessment of the Residual Income Valuation Model." *Journal of Accounting and Economics.* 26:1, pp. 1–34.

Douglas, George W. 1968. *Risk in the Equity Markets: An Empirical Appraisal of Market Efficiency.* Ann Arbor, Michigan: University Microfilms, Inc.

Elton, Edwin J., Martin J. Gruber, Sanjiv Das and Matt Hlavka. 1993. "Efficiency with Costly Information: A Reinterpretation of Evidence from Managed Portfolios." *Review of Financial Studies.* 6:1, pp. 1–22.

Fama, Eugene F. 1970. "Efficient Capital Markets: A Review of Theory and Empirical Work." *Journal of Finance.* 25:2, pp. 383–417.

Fama, Eugene F. 1996. "Multifactor Portfolio Efficiency and Multifactor Asset Pricing." *Journal of Financial and Quantitative Analysis.* 31:4, pp. 441–65.

Fama, Eugene F. and Kenneth R. French. 1992. "The Cross-Section of Expected Stock Returns." *Journal of Finance.* 47:2, pp. 427–65.

Fama, Eugene F. and Kenneth R. French. 1993. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics.* 33:1, pp. 3–56.

Fama, Eugene F. and Kenneth R. French. 1995. "Size and Book-to-Market Factors in Earnings and Returns." *Journal of Finance.* 50:1, pp. 131–55.

Fama, Eugene F. and Kenneth R. French. 1996. "Multifactor Explanations of Asset Pricing Anomalies." *Journal of Finance.* 51:1, pp. 55–84.

Fama, Eugene F. and Kenneth R. French. 1997. "Industry Costs of Equity." *Journal of Financial Economics.* 43:2 pp. 153–93.

Fama, Eugene F. and Kenneth R. French. 1998. "Value Versus Growth: The International Evidence." *Journal of Finance.* 53:6, pp. 1975–999.

Fama, Eugene F. and James D. MacBeth. 1973. "Risk, Return, and Equilibrium: Empirical Tests." *Journal of Political Economy.* 81:3, pp. 607–36.

Frankel, Richard and Charles M.C. Lee. 1998. "Accounting Valuation, Market Expectation, and Cross-Sectional Stock Returns." *Journal of Accounting and Economics.* 25:3 pp. 283–319.

Friend, Irwin and Marshall Blume. 1970. "Measurement of Portfolio Performance under Uncertainty." *American Economic Review.* 60:4, pp. 607–36.

Gibbons, Michael R. 1982. "Multivariate Tests of Financial Models: A New Approach." *Journal of Financial Economics.* 10:1, pp. 3–27.

Gibbons, Michael R., Stephen A. Ross and Jay Shanken. 1989. "A Test of the Efficiency of a Given Portfolio." *Econometrica.* 57:5, pp. 1121–152.

Haugen, Robert. 1995. *The New Finance: The*

Case against Efficient Markets. Englewood Cliffs, N.J.: Prentice Hall.

Jegadeesh, Narasimhan and Sheridan Titman. 1993. "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency." *Journal of Finance.* 48:1, pp. 65–91.

Jensen, Michael C. 1968. "The Performance of Mutual Funds in the Period 1945–1964." *Journal of Finance.* 23:2, pp. 389–416.

Kothari, S. P., Jay Shanken and Richard G. Sloan. 1995. "Another Look at the Cross-Section of Expected Stock Returns." *Journal of Finance.* 50:1, pp. 185–224.

Lakonishok, Josef and Alan C. Shapiro. 1986. Systemaitc Risk, Total Risk, and Size as Determinants of Stock Market Returns." *Journal of Banking and Finance.* 10:1, pp. 115–32.

Lakonishok, Josef, Andrei Shleifer and Robert W. Vishny. 1994. "Contrarian Investment, Extrapolation, and Risk." *Journal of Finance.* 49:5, pp. 1541–578.

Lintner, John. 1965. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *Review of Economics and Statistics.* 47:1, pp. 13–37.

Loughran, Tim and Jay. R. Ritter. 1995. "The New Issues Puzzle." *Journal of Finance.* 50:1, pp. 23–51.

Markowitz, Harry. 1952. "Portfolio Selection." *Journal of Finance.* 7:1, pp. 77–99.

Markowitz, Harry. 1959. *Portfolio Selection: Efficient Diversification of Investments.* Cowles Foundation Monograph No. 16. New York: John Wiley & Sons, Inc.

Merton, Robert C. 1973. "An Intertemporal Capital Asset Pricing Model." *Econometrica.* 41:5, pp. 867–87.

Miller, Merton and Myron Scholes. 1972. "Rates of Return in Relation to Risk: A Reexamination of Some Recent Findings," in *Studies in the Theory of Capital Markets.* Michael C. Jensen, ed. New York: Praeger, pp. 47–78.

Mitchell, Mark L. and Erik Stafford. 2000. "Managerial Decisions and Long-Term Stock Price Performance." *Journal of Business.* 73:3, pp. 287–329.

Pastor, Lubos and Robert F. Stambaugh. 1999. "Costs of Equity Capital and Model Mispricing." *Journal of Finance.* 54:1, pp. 67–121.

Piotroski, Joseph D. 2000. "Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers." *Journal of Accounting Research.* 38:Supplement, pp. 1–51.

Reinganum, Marc R. 1981. "A New Empirical Perspective on the CAPM." *Journal of Financial and Quantitative Analysis.* 16:4, pp. 439–62.

Roll, Richard. 1977. "A Critique of the Asset Pricing Theory's Tests' Part I: On Past and Potential Testability of the Theory." *Journal of Financial Economics.* 4:2, pp. 129–76.

Rosenberg, Barr, Kenneth Reid and Ronald Lanstein. 1985. "Persuasive Evidence of Market Inefficiency." *Journal of Portfolio Management.* Spring, 11, pp. 9–17.

Ross, Stephen A. 1976. "The Arbitrage Theory of Capital Asset Pricing." *Journal of Economic Theory.* 13:3, pp. 341–60.

Sharpe, William F. 1964. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance.* 19:3, pp. 425–42.

Stambaugh, Robert F. 1982. "On The Exclusion of Assets from Tests of the Two-Parameter Model: A Sensitivity Analysis." *Journal of Financial Economics.* 10:3, pp. 237–68.

Stattman, Dennis. 1980. "Book Values and Stock Returns." *The Chicago MBA: A Journal of Selected Papers.* 4, pp. 25–45.

Stein, Jeremy. 1996. "Rational Capital Budgeting in an Irrational World." *Journal of Business.* 69:4, pp. 429–55.

Tobin, James. 1958. "Liquidity Preference as Behavior Toward Risk." *Review of Economic Studies.* 25:2, pp. 65–86.

Vuolteenaho, Tuomo. 2002. "What Drives Firm Level Stock Returns?" *Journal of Finance.* 57:1, pp. 233–64.

The Equity Premium

Eugene F. Fama; Kenneth R. French

The Journal of Finance, Vol. 57, No. 2. (Apr., 2002), pp. 637-659.

Stable URL:
http://links.jstor.org/sici?sici=0022-1082%28200204%2957%3A2%3C637%3ATEP%3E2.0.CO%3B2-%23

The Journal of Finance is currently published by American Finance Association.

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at http://www.jstor.org/about/terms.html. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at http://www.jstor.org/journals/afina.html.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

The JSTOR Archive is a trusted digital repository providing for long-term preservation and access to leading academic journals and scholarly literature from around the world. The Archive is supported by libraries, scholarly societies, publishers, and foundations. It is an initiative of JSTOR, a not-for-profit organization with a mission to help the scholarly community take advantage of advances in technology. For more information regarding JSTOR, please contact support@jstor.org.

http://www.jstor.org
Mon Jul 9 09:02:13 2007

THE JOURNAL OF FINANCE • VOL. LVII, NO. 2 • APRIL 2002

The Equity Premium

EUGENE F. FAMA and KENNETH R. FRENCH*

ABSTRACT

We estimate the equity premium using dividend and earnings growth rates to measure the expected rate of capital gain. Our estimates for 1951 to 2000, 2.55 percent and 4.32 percent, are much lower than the equity premium produced by the average stock return, 7.43 percent. Our evidence suggests that the high average return for 1951 to 2000 is due to a decline in discount rates that produces a large unexpected capital gain. Our main conclusion is that the average stock return of the last half-century is a lot higher than expected.

THE EQUITY PREMIUM—the difference between the expected return on the market portfolio of common stocks and the risk-free interest rate—is important in portfolio allocation decisions, estimates of the cost of capital, the debate about the advantages of investing Social Security funds in stocks, and many other applications. The average return on a broad portfolio of stocks is typically used to estimate the expected market return. The average real return for 1872 to 2000 on the S&P index (a common proxy for the market portfolio, also used here) is 8.81 percent per year. The average real return on six-month commercial paper (a proxy for the risk-free interest rate) is 3.24 percent. This large spread (5.57 percent) between the average stock return and the interest rate is the source of the so-called equity premium puzzle: Stock returns seem too high given the observed volatility of consumption (Mehra and Prescott (1985)).

We use fundamentals (dividends and earnings) to estimate the expected stock return. Along with other evidence, the expected return estimates from fundamentals help us judge whether the realized average return is high or low relative to the expected value.

The logic of our approach is straightforward. The average stock return is the average dividend yield plus the average rate of capital gain:

$$A(R_t) = A(D_t/P_{t-1}) + A(GP_t), \tag{1}$$

---

* Fama is from the University of Chicago and French is from Dartmouth College. The comments of John Campbell, John Cochrane, Kent Daniel, John Heaton, Jay Ritter, Andrei Shleifer, Rex Sinquefield, Tuomo Vuolteenaho, Paul Zarowin, and seminar participants at Boston College, Dartmouth College, the NBER, Purdue University, the University of Chicago, and Washington University have been helpful. Richard Green (the editor) and the two referees get special thanks.

where D_t is the dividend for year t, P_{t-1} is the price at the end of year $t - 1$, $GP_t = (P_t - P_{t-1})/P_{t-1}$ is the rate of capital gain, and $A(\ )$ indicates an average value. (Throughout the paper, we refer to D_t/P_{t-1} as the dividend yield and D_t/P_t is the dividend–price ratio. Similarly, Y_t/P_{t-1}, the ratio of earnings for year t to price at the end of year $t - 1$, is the earnings yield and Y_t/P_t is the earnings–price ratio.)

Suppose the dividend–price ratio, D_t/P_t, is stationary (mean reverting). Stationarity implies that if the sample period is long, the compound rate of dividend growth approaches the compound rate of capital gain. Thus, an alternative estimate of the expected stock return is

$$A(RD_t) = A(D_t/P_{t-1}) + A(GD_t), \tag{2}$$

where $GD_t = (D_t - D_{t-1})/D_{t-1}$ is the growth rate of dividends. We call (2) the dividend growth model.

The logic that leads to (2) applies to any variable that is cointegrated with the stock price. For example, the dividend–price ratio may be nonstationary because firms move away from dividends toward share repurchases as a way of returning earnings to stockholders. But if the earnings–price ratio, Y_t/P_t, is stationary, the average growth rate of earnings, $A(GY_t) = A((Y_t - Y_{t-1})/Y_{t-1})$, is an alternative estimate of the expected rate of capital gain. And $A(GY_t)$ can be combined with the average dividend yield to produce another estimate of the expected stock return:

$$A(RY_t) = A(D_t/P_{t-1}) + A(GY_t). \tag{3}$$

We call (3) the earnings growth model.[1]

We should be clear about the expected return concept targeted by (1), (2), and (3). D_t/P_t and Y_t/P_t vary through time because of variation in the conditional (point-in-time) expected stock return and the conditional expected growth rates of dividends and earnings (see, e.g., Campbell and Shiller (1989)). But if the stock return and the growth rates are stationary (they have constant unconditional means), D_t/P_t and Y_t/P_t are stationary. Then, like the average return (1), the dividend and earnings growth models (2) and (3) provide estimates of the unconditional expected stock return. In short, the focus of the paper is estimates of the unconditional expected stock return.

The estimate of the expected real equity premium for 1872 to 2000 from the dividend growth model (2) is 3.54 percent per year. The estimate from the average stock return, 5.57 percent, is almost 60 percent higher. The difference between the two is largely due to the last 50 years. The equity premium for 1872 to 1950 from the dividend growth model, 4.17 percent per year, is close to the estimate from the average return, 4.40 percent. In con-

---

[1] Motivated by the model in Lettau and Ludvigson (2001), one can argue that if the ratio of consumption to stock market wealth is stationary, the average growth rate of consumption is another estimate of the expected rate of capital gain. We leave this path to future work.

trast, the equity premium for 1951 to 2000 produced by the average return, 7.43 percent per year, is almost three times the estimate, 2.55 percent, from (2). The estimate of the expected real equity premium for 1951 to 2000 from the earnings growth model (3), 4.32 percent per year, is larger than the estimate from the dividend growth model (2). But the earnings growth estimate is still less than 60 percent of the estimate from the average return.

Three types of evidence suggest that the lower equity premium estimates for 1951 to 2000 from fundamentals are closer to the expected premium. (a) The estimates from fundamentals are more precise. For example, the standard error of the estimate from the dividend growth model is less than half the standard error of the estimate from the average return. (b) The Sharpe ratio for the equity premium from the average stock return for 1951 to 2000 is just about double that for 1872 to 1950. In contrast, the equity premium from the dividend growth model has a similar Sharpe ratio for 1872 to 1950 and 1951 to 2000. (c) Most important, valuation theory specifies relations among the book-to-market ratio, the return on investment, and the cost of equity capital (the expected stock return). The estimates of the expected stock return for 1951 to 2000 from the dividend and earnings growth models line up with other fundamentals in the way valuation theory predicts. But the book-to-market ratio and the return on investment suggest that the expected return estimate from the average stock return is too high.

Our motivation for the dividend growth model (2) is simpler and more general, but (2) can be viewed as the expected stock return estimate of the Gordon (1962) model. Our work is thus in the spirit of a growing literature that uses valuation models to estimate expected returns (e.g., Blanchard (1993), Claus and Thomas (2001), and Gebhardt, Lee, and Swaminathan (2001)). Claus and Thomas and Gebhardt, Lee, and Swaminathan use forecasts by security analysts to estimate expected cash flows. Their analyst forecasts cover short periods (1985 to 1998 and 1979 to 1995). We use realized dividends and earnings from 1872 to 2000. This 129-year period provides a long perspective, which is important for judging the competing expected return estimates from fundamentals and realized stock returns. Moreover, though the issue is controversial (Keane and Runkle (1998)), Claus and Thomas find that analyst forecasts are biased; they tend to be substantially above observed growth rates. The average growth rates of dividends and earnings we use are unbiased estimates of expected growth rates.

Like us, Blanchard (1993) uses dividend growth rates to estimate the expected rate of capital gain, which he combines with an expected dividend yield to estimate the expected stock return. But his focus is different and his approach is more complicated than ours. He is interested in the path of the conditional expected stock return. His conditional expected return is the sum of the fitted values from time-series regressions of the realized dividend yield and a weighted average of 20 years of future dividend growth rates on four predetermined variables (the dividend yield, the real rate of capital gain, and the levels of interest rates and inflation). He focuses on describing the path of the conditional expected return in terms of his four explanatory variables.

In contrast, our prime interest is the unconditional expected return, which we estimate more simply as the sum of the average dividend yield and the average growth rate of dividends or earnings. This approach is valid if the dividend–price and earnings–price ratios are stationary. And we argue below that it continues to produce estimates of the average expected stock return when the price ratios are subject to reasonable forms of nonstationarity. Given its simplicity and generality, our approach is an attractive addition to the research toolbox for estimating the expected stock return.

Moreover, our focus is comparing alternative estimates of the unconditional expected stock return over the long 1872 to 2000 period, and explaining why the expected return estimates for 1951 to 2000 from fundamentals are much lower than the average return. Our evidence suggests that much of the high return for 1951 to 2000 is unexpected capital gain, the result of a decline in discount rates.

Specifically, the dividend–price and earnings–price ratios fall from 1950 to 2000; the cumulative percent capital gain for the period is more than three times the percent growth in dividends or earnings. All valuation models agree that the two price ratios are driven by expectations about future returns (discount rates) and expectations about dividend and earnings growth. Confirming Campbell (1991), Cochrane (1994), and Campbell and Shiller (1998), we find that dividend and earnings growth rates for 1950 to 2000 are largely unpredictable. Like Campbell and Shiller (1998), we thus infer that the decline in the price ratios is mostly due to a decline in expected returns. Some of this decline is probably expected, the result of reversion of a high 1950 conditional expected return to the unconditional mean. But most of the decline in the price ratios seems to be due to the unexpected decline of expected returns to ending values far below the mean.

The paper proceeds as follows. The main task, addressed in Sections I and II, is to compare and evaluate the estimates of the unconditional annual expected stock return provided by the average stock return and the dividend and earnings growth models. Section III then considers the issues that arise if the goal is to estimate the long-term expected growth of wealth, rather than the unconditional expected annual (simple) return. Section IV concludes.

I. The Unconditional Annual Expected Stock Return

Table I shows estimates of the annual expected real equity premium for 1872 to 2000. The market portfolio is the S&P 500 and its antecedents. The deflator is the Producer Price Index until 1925 (from Shiller (1989)) and the Consumer Price Index thereafter (from Ibbotson Associates). The risk-free interest rate is the annual real return on six-month commercial paper, rolled over at midyear. The risk-free rate and S&P earnings data are from Shiller, updated by Vuolteenaho (2000) and us. Beginning in 1925, we construct S&P book equity data from the book equity data in Davis, Fama, and French (2000), expanded to include all NYSE firms. The data on dividends, prices, and returns for 1872 to 1925 are from Shiller. Shiller's annual data on the

Table I

Real Equity Premium and Related Statistics for the S&P Portfolio

The inflation rate for year t is $Inf_t = L_t/L_{t-1} - 1$, where L_t is the price level at the end of year t. The real return for year t on six-month (three-month for the year 2000) commercial paper (rolled over at midyear) is F_t. The nominal values of book equity and price for the S&P index at the end of year t are b_t and p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. Real rates of growth of dividends, earnings, and the stock price are $GD_t = (d_t/d_{t-1})*(L_{t-1}/L_t) - 1$, $GY_t = (y_t/y_{t-1})*(L_{t-1}/L_t) - 1$, and $GP_t = (p_t/p_{t-1})*(L_{t-1}/L_t) - 1$. The real dividend yield is $D_t/P_{t-1} = (d_t/p_{t-1})*(L_{t-1}/L_t)$. The real income return on investment is $Y_t/B_{t-1} = (1 + y_t/b_{t-1})*(L_{t-1}/L_t) - 1$. The dividend growth estimate of the real S&P return for t is $RD_t = D_t/P_{t-1} + GD_t$, the earnings growth estimate is $RY_t = D_t/P_{t-1} + GY_t$, and R_t is the realized real S&P return. The dividend and earnings growth estimates of the real equity premium for year t are $RXD_t = RD_t - F_t$ and $RXY_t = RY_t - F_t$, and $RX_t = R_t - F_t$ is the real equity premium from the realized real return. The Sharpe ratio for $RD_t - F_t$ (the mean of $RD_t - F_t$ divided by the standard deviation of R_t) is SD, SY is the Sharpe ratio for $RY_t - F_t$ (the mean of $RY_t - F_t$ divided by the standard deviation of R_t), and SR is the Sharpe ratio for $R_t - F_t$ (the mean of $R_t - F_t$ divided by the standard deviation of R_t). Except for the Sharpe ratios, all variables are expressed as percents, that is, they are multiplied by 100.

	Inf_t	F_t	D_t/P_{t-1}	GD_t	GY_t	GP_t	RD_t	RY_t	R_t	RXD_t	RXY_t	RX_t	SD	SY	SR
Means of annual values of variables															
1872–2000	2.16	3.24	4.70	2.08	NA	4.11	6.78	NA	8.81	3.54	NA	5.57	0.20	NA	0.31
1872–1950	0.99	3.90	5.34	2.74	NA	2.96	8.07	NA	8.30	4.17	NA	4.40	0.22	NA	0.23
1951–2000	4.00	2.19	3.70	1.05	2.82	5.92	4.74	6.51	9.62	2.55	4.32	7.43	0.15	0.25	0.44
Standard deviations of annual values of variables															
1872–2000	7.51	8.48	1.39	12.37	NA	17.83	12.56	NA	18.03	13.00	NA	18.51			
1872–1950	9.11	10.63	1.12	15.28	NA	18.48	15.41	NA	18.72	16.02	NA	19.57			
1951–2000	3.11	2.46	1.17	5.09	13.79	16.77	5.21	13.51	17.03	5.62	14.02	16.73			
Means of annual continuously compounded returns and growth rates															
1872–2000	1.86	2.87		1.34	NA	2.48			7.00						
1872–1950	0.59	3.33		1.60	NA	1.22			6.41						
1951–2000	3.88	2.14		0.92	1.89	4.46			7.94						

	b_t/p_t	RD_t	RY_t	R_t	Y_t/B_{t-1}
Means of annual values of variables					
1951–2000	0.66	4.74	6.51	9.62	7.60

level of the S&P (used to compute returns and other variables involving price) are averages of daily January values. The S&P dividend, price, and return data for 1926 to 2000 are from Ibbotson Associates, and the returns for 1926 to 2000 are true annual returns.

Without showing the details, we can report that the CRSP value-weight portfolio of NYSE, AMEX, and Nasdaq stocks produces average returns and dividend growth estimates of the expected return close to the S&P estimates for periods after 1925 when both indices are available. What one takes to be the risk-free rate has a bigger effect. For example, substituting the one-month Treasury bill rate for the six-month commercial paper rate causes estimates of the annual equity premium for 1951 to 2000 to rise by about one percent. But for our main task—comparing equity premium estimates from (1), (2), and (3)—differences in the risk-free rate are an additive constant that does not affect inferences.

One can estimate expected returns in real or nominal terms. Since portfolio theory says the goal of investment is consumption, real returns seem more relevant, and only results for real returns are shown. Because of suspicions about the quality of the price deflator during the early years of 1872 to 2000, we have replicated the results for nominal returns. They support all the inferences from real returns.

The dividend and earnings growth models (2) and (3) assume that the market dividend–price and earnings–price ratios are stationary. The first three annual autocorrelations of D_t/P_t for 1872 to 2000 are 0.73, 0.51, and 0.47. For the 1951 to 2000 period that occupies much of our attention, the autocorrelations are 0.83, 0.72, and 0.69. The autocorrelations are large, but their decay is roughly like that of a stationary first-order autoregression (AR1). This is in line with formal evidence (Fama and French (1988), Cochrane (1994), and Lamont (1998)) that the market dividend–price ratio is highly autocorrelated but slowly mean-reverting. S&P earnings data for the early years of 1872 to 2000 are of dubious quality (Shiller (1989)), so we estimate expected returns with the earnings growth model (3) only for 1951 to 2000. The first three autocorrelations of Y_t/P_t for 1951 to 2000, 0.80, 0.70, and 0.61, are again roughly like those of a stationary AR1.

We emphasize, however, that our tests are robust to reasonable nonstationarity of D_t/P_t and Y_t/P_t. It is not reasonable that the expected stock return and the expected growth rates of dividends and earnings that drive D_t/P_t and Y_t/P_t are nonstationary processes that can wander off to infinity. But nonstationarity of D_t/P_t and Y_t/P_t due to structural shifts in productivity or preferences that permanently change the expected return or the expected growth rates is reasonable. Such regime shifts are not a problem for the expected return estimates from (2) and (3), as long as D_t/P_t and Y_t/P_t mean-revert within regimes. If the regime shift is limited to expected dividend and earnings growth rates, the permanent change in expected growth rates is offset by a permanent change in the expected dividend yield, and (2) and (3) continue to estimate the (stationary) expected stock return. (An Appendix, available on request, provides an example.) If there is a permanent shift in the expected stock return, it is nonstationary, but like the average return in (1), the dividend and earnings growth models in (2) and (3) estimate the average expected return during the sample period.

Indeed, an advantage of the expected return estimates from fundamentals is that they are likely to be less sensitive than the average return to long-lived shocks to dividend and earnings growth rates or the expected stock return. For example, a permanent shift in the expected return affects the average dividend yield, which is common to the three expected return estimates, but it produces a shock to the capital gain term in the average return in (1) that is not shared by the estimates in (2) and (3). In short, the estimates of the expected stock return from fundamentals are likely to be more precise than the average stock return.

A. The Equity Premium

For much of the period from 1872 to 2000—up to about 1950—the dividend growth model and the average stock return produce similar estimates of the expected return. Thereafter, the two estimates diverge. To illustrate, Table I shows results for 1872 to 1950 (79 years) and 1951 to 2000 (50 years). The year 1950 is a big year, with a high real stock return (23.40 percent), and high dividend and earnings growth estimates of the return (29.96 percent and 24.00 percent). But because the three estimates of the 1950 return are similarly high, the ordering of expected return estimates, and the inferences we draw from them, are unaffected by whether 1950 is allocated to the earlier or the later period. Indeed, pushing the 1950 break-year backward or forward several years does not affect our inferences.

For the earlier 1872 to 1950 period, there is not much reason to favor the dividend growth estimate of the expected stock return over the average return. Precision is not an issue; the standard errors of the two estimates are similar (1.74 percent and 2.12 percent), the result of similar standard deviations of the annual dividend growth rate and the rate of capital gain, 15.28 percent and 18.48 percent. Moreover, the dividend growth model and the average return provide similar estimates of the expected annual real return for 1872 to 1950, 8.07 percent and 8.30 percent. Given similar estimates of the expected return, the two approaches produce similar real equity premiums for 1872 to 1950, 4.17 percent (dividend growth model) and 4.40 percent (stock returns).

The competition between the dividend growth model and the average stock return is more interesting for 1951 to 2000. The dividend growth estimate of the 1951 to 2000 expected return, 4.74 percent, is less than half the average return, 9.62 percent. The dividend growth estimate of the equity premium, 2.55 percent, is 34 percent of the estimate from returns, 7.43 percent. The 1951 to 2000 estimates of the expected stock return and the equity premium from the earnings growth model, 6.51 percent and 4.32 percent, are higher than for the dividend growth model. But they are well below the estimates from the average return, 9.62 percent and 7.43 percent.

B. Evaluating the Expected Return Estimates for 1951 to 2000

We judge that the estimates of the expected stock return for 1951 to 2000 from fundamentals are closer to the true expected value, for three reasons.

(a) The expected return estimates from the dividend and earnings growth models are more precise than the average return. The standard error of the dividend growth estimate of the expected return for 1951 to 2000 is 0.74 percent, versus 2.43 percent for the average stock return. Since earnings growth is more volatile than dividend growth, the standard error of the expected return from the earnings growth model, 1.93 percent, is higher than the estimate from the dividend growth model, but it is smaller than the 2.43 percent standard error of the average stock return. Claus and Thomas (2001) also argue that expected return estimates from fundamentals are more precise than average returns, but they provide no direct evidence.

(b) Table I shows Sharpe ratios for the three equity premium estimates. Only the average premium in the numerator of the Sharpe ratio differs for the three estimates. The denominator for all three is the standard deviation of the annual stock return. The Sharpe ratio for the dividend growth estimate of the equity premium for 1872 to 1950, 0.22, is close to that produced by the average stock return, 0.23. More interesting, the Sharpe ratio for the equity premium for 1951 to 2000 from the dividend growth model, 0.15, is lower than but similar to that for 1872 to 1950. The Sharpe ratio for the 1951 to 2000 equity premium from the earnings growth model, 0.25, is somewhat higher than the dividend growth estimate, 0.15, but it is similar to the estimates for 1872 to 1950 from the dividend growth model, 0.22, and the average return, 0.23.

In asset pricing theory, the Sharpe ratio is related to aggregate risk aversion. The Sharpe ratios for the 1872 to 1950 and 1951 to 2000 equity premiums from the dividend growth model and the earnings growth model suggest that aggregate risk aversion is roughly similar in the two periods. In contrast, though return volatility falls a bit, the equity premium estimate from the average stock return increases from 4.40 percent for 1872 to 1950 to 7.43 percent for 1951 to 2000, and its Sharpe ratio about doubles, from 0.23 to 0.44. It seems implausible that risk aversion increases so much from the earlier to the later period.

(c) Most important, the behavior of other fundamentals favors the dividend and earnings growth models. The average ratio of the book value of equity to the market value of equity for 1951 to 2000 is 0.66, the book-to-market ratio B_t/P_t is never greater than 1.12, and it is greater than 1.0 for only 6 years of the 50-year period. Since, on average, the market value of equity is substantially higher than its book value, it seems safe to conclude that, on average, the expected return on investment exceeds the cost of capital.

Suppose investment at time $t-1$ generates a stream of equity earnings for t, $t+1, \ldots, t+N$ with a constant expected value. The average income return on book equity, $A(Y_t/B_{t-1})$, is then an estimate of the expected return on equity's share of assets. It is an unbiased estimate when N is infinite and it is upward biased when N is finite. In either case, if the expected return on investment exceeds the cost of capital, we should find that (except for sampling error) the average income return on book equity is greater than estimates of the cost of equity capital (the expected stock return):

$$A(Y_t/B_{t-1}) > E(R). \tag{4}$$

Table I shows that (4) is confirmed when we use the dividend and earnings growth models to estimate the expected real stock return for 1951 to 2000. The estimates of $E(R)$, 4.74 percent (dividend growth model) and 6.51 percent (earnings growth model), are below 7.60 percent, the average real income return on book equity, $A(Y_t/B_{t-1})$. In contrast, the average real stock return for 1951 to 2000, 9.62 percent, exceeds the average income return by more than 2 percent. An expected stock return that exceeds the expected income return on book equity implies that the typical corporate investment has a negative net present value. This is difficult to reconcile with an average book-to-market ratio substantially less than one.

To what extent are our results new? Using analyst forecasts of expected cash flows and a more complicated valuation model, Claus and Thomas (2001) produce estimates of the expected stock return for 1985 to 1998 far below the average return. Like us, they argue that the estimates from fundamentals are closer to the true expected return. We buttress this conclusion with new results on three fronts. (a) The long-term perspective provided by the evidence that, for much of the 1872 to 2000 period, average returns and fundamentals produce similar estimates of the expected return. (b) Direct evidence that the expected return estimates for 1951 to 2000 from fundamentals are more precise. (c) Sharpe ratios and evidence on how the alternative expected return estimates line up with the income return on investment. These new results provide support for the expected return estimates from fundamentals, and for the more specific inference that the average stock return for 1951 to 2000 is above the expected return.

II. Unexpected Capital Gains

Valuation theory suggests three potential explanations for why the 1951 to 2000 average stock return is larger than the expected return. (a) Dividend and earnings growth for 1951 to 2000 is unexpectedly high. (b) The expected (post-2000) growth rates of dividends and earnings are unexpectedly high. (c) The expected stock return (the equity discount rate) is unexpectedly low at the end of the sample period.

A. Is Dividend Growth for 1951 to 2000 Unexpectedly High?

If the prosperity of the United States over the last 50 years was not fully anticipated, dividend and earnings growth for 1951 to 2000 exceed 1950 expectations. Such unexpected in-sample growth produces unexpected capital gains. But it does not explain why the average return for 1951 to 2000 (the average dividend yield plus the average rate of capital gain) is so much higher than the expected return estimates from fundamentals (the average dividend yield plus the average growth rate of dividends or earnings). To see the point, note that unexpected in-sample dividend and earnings growth do not affect either the 1950 or the 2000 dividend–price and earnings–price ratios. (The 2000 ratios depend on post-2000 expected returns and growth rates.) Suppose D_t/P_t and E_t/P_t were the same in 1950 and 2000. Then the total percent growth in dividends and earnings during the period would be the same as the percent growth in the stock price. And (1), (2), and (3) would provide similar estimates of the expected stock return.

It is worth dwelling on this point. There is probably survivor bias in the U.S. average stock return for 1872 to 1950, as well as for 1951 to 2000. During the 1872 to 2000 period, it was not a foregone conclusion that the U.S. equity market would survive several financial panics, the Great Depression, two world wars, and the cold war. The average return for a market that survives many potentially cataclysmic challenges is likely to be higher than the expected return (Brown, Goetzmann, and Ross (1995)). But if the positive bias shows up only as higher than expected dividend and earnings growth during the sample period, there is similar survivor bias in the expected return estimates from fundamentals—a problem we do not solve. Our more limited goal is to explain why the average stock return for 1951 to 2000 is so high relative to the expected return estimates from the dividend and earnings growth models.

Since unexpected growth for 1951 to 2000 has a similar effect on the three expected return estimates, the task of explaining why the estimates are so different falls to the end-of-sample values of future expected returns and expected dividend and earnings growth. We approach the problem by first looking for evidence that expected dividend or earnings growth is high at the end of the sample period. We find none. We then argue that the large spread of capital gains over dividend and earnings growth for 1951 to 2000, or equivalently, the low end-of-sample dividend–price and earnings–price ratios, are due to an unexpected decline in expected stock returns to unusually low end-of-sample values.

B. Are Post-2000 Expected Dividend and Earnings Growth Rates Unusually High?

The behavior of dividends and earnings provides little evidence that rationally assessed (i.e., true) long-term expected growth is high at the end of the sample period. If anything, the growth rate of real dividends declines during the 1951 to 2000 period (Table II). The average growth rate for the first two decades, 1.60 percent, is higher than the average growth rates for the last three, 0.68 percent. The regressions in Table III are more formal evidence on the best forecast of post-2000 real dividend growth rates. Re-

Table II

Means of Simple Real Equity Premium and Related Statistics for the S&P Portfolio for 10-year Periods

The inflation rate for year t is $Inf_t = L_t/L_{t-1} - 1$, where L_t is the price level at the end of year t. The real return for year t on six-month (three-month for the year 2000) commercial paper (rolled over at midyear) is F_t. The nominal price of the S&P index at the end of year t is p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. Real rates of growth of dividends, earnings, and the stock price are $GD_t = (d_t/d_{t-1})*(L_{t-1}/L_t) - 1$, $GY_t = (y_t/y_{t-1})*(L_{t-1}/L_t) - 1$, and $GP_t = (p_t/p_{t-1})*(L_{t-1}/L_t) - 1$. The real dividend yield is $D_t/P_{t-1} = (d_t/p_{t-1})*(L_{t-1}/L_t)$. The dividend growth estimate of the real S&P return for t is $RD_t = D_t/P_{t-1} + GD_t$, the earnings growth estimate is $RY_t = D_t/P_{t-1} + GY_t$, and R_t is the realized real S&P return. The dividend and earnings growth estimates of the real equity premium for year t are $RXD_t = RD_t - F_t$ and $RXY_t = RY_t - F_t$, and $RX_t = R_t - F_t$ is the real equity premium from the realized real return. All variables are expressed as percents, that is, they are multiplied by 100.

	Inf_t	F_t	D_t/P_{t-1}	GD_t	GY_t	GP_t	RD_t	RY_t	R_t	RXD_t	RXY_t	RX_t
1872–1880	−2.77	9.86	6.29	4.62	NA	7.13	10.91	NA	13.42	1.06	NA	3.56
1881–1890	−1.72	7.23	5.04	0.69	NA	0.04	5.73	NA	5.08	−1.51	NA	−2.15
1891–1900	0.18	5.08	4.40	4.49	NA	4.75	8.89	NA	9.15	3.81	NA	4.08
1901–1910	1.95	3.18	4.45	3.25	NA	2.33	7.70	NA	6.78	4.52	NA	3.60
1911–1920	6.82	0.82	5.70	−3.43	NA	−6.52	2.27	NA	−0.83	1.45	NA	−1.64
1921–1930	−1.70	7.41	5.72	9.07	NA	11.83	14.78	NA	17.54	7.37	NA	10.13
1931–1940	−1.23	2.80	5.31	0.36	NA	2.21	5.67	NA	7.52	2.87	NA	4.72
1941–1950	6.04	−4.57	5.90	3.02	NA	2.33	8.91	NA	8.22	13.48	NA	12.79
1951–1960	1.79	1.05	4.68	1.22	0.61	10.64	5.90	5.30	15.32	4.85	4.24	14.27
1961–1970	2.94	2.27	3.21	1.98	2.07	2.69	5.19	5.27	5.90	2.92	3.01	3.63
1971–1980	8.11	−0.30	4.04	−0.86	3.47	−1.92	3.18	7.50	2.12	3.48	7.80	2.42
1981–1990	4.51	5.32	4.19	2.32	0.37	5.40	6.51	4.56	9.59	1.19	−0.75	4.28
1991–2000	2.68	2.61	2.36	0.58	7.58	12.80	2.94	9.94	15.16	0.32	7.32	12.54

Table III

Regressions to Forecast Real Dividend and Earnings Growth Rates, GD_t and GY_t

The price level at the end of year t is L_t. The nominal values of book equity and price for the S&P index at the end of year t are b_t and p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. The real dividend and earnings growth rates for year t are $GD_t = (d_t/d_{t-1})*(L_{t-1}/L_t) - 1$ and $GY_t = (y_t/y_{t-1})*(L_{t-1}/L_t) - 1$, and R_t is the realized real return on the S&P portfolio for year t. The regression intercept is *Int*, and t-Stat is the regression coefficient (*Coef*) divided by its standard error. The regression R^2 is adjusted for degrees of freedom. Except for the dividend payout ratio, d_t/y_t, all variables are expressed as percents, that is, they are multiplied by 100.

Panel A: One Year: The Regressions Forecast Real Dividend Growth, GD_t, with Variables Known at $t - 1$

	Int	d_{t-1}/y_{t-1}	d_{t-1}/p_{t-1}	GD_{t-1}	GD_{t-2}	GD_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	R^2
1875–1950, $N = 76$ years										
Coef	29.56	−23.12	−2.63	−0.12	−0.07	−0.03	0.22	0.13	0.09	0.38
t-Stat	3.22	−3.17	−1.77	−1.08	−0.64	−0.29	2.24	1.37	1.01	
1951–2000, $N = 50$ years										
Coef	−2.16	2.97	0.11	−0.07	−0.20	−0.06	0.11	0.07	0.01	0.01
t-Stat	−0.40	0.33	0.16	−0.45	−1.57	−0.45	2.17	1.33	0.22	

Panel B: Two Years: The Regressions Forecast Real Dividend Growth, GD_t, with Variables Known at $t - 2$

	Int	d_{t-2}/y_{t-2}	d_{t-2}/p_{t-2}	GD_{t-2}	GD_{t-3}	R_{t-2}	R_{t-3}	R^2
1875–1950, N = 76 years								
Coef	6.61	−11.60	0.31	−0.26	0.05	0.24	0.11	0.07
t-Stat	0.64	−1.28	0.18	−2.02	0.39	2.03	1.00	
1951–2000, N = 50 years								
Coef	−4.11	7.62	0.32	−0.14	−0.03	0.05	−0.01	−0.05
t-Stat	−0.73	0.81	0.46	−1.13	−0.28	0.99	−0.16	

Panel C: One Year: The Regressions Forecast Real Earnings Growth, GY_t, with Variables Known at $t - 1$

	Int	Y_{t-1}/B_{t-2}	d_{t-1}/y_{t-1}	y_{t-1}/p_{t-1}	GY_{t-1}	GY_{t-2}	GY_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	R^2
1951–2000, N = 50 years											
Coef	5.48	0.11	13.06	−1.36	0.21	−0.13	−0.31	0.28	−0.25	0.03	0.40
t-Stat	0.33	0.11	0.52	−1.91	1.17	−0.89	−2.64	2.39	−2.18	0.26	

Panel D: Two Years: The Regressions Forecast Real Earnings Growth, GY_t, with Variables Known at $t - 2$

	Int	Y_{t-2}/B_{t-3}	d_{t-2}/y_{t-2}	y_{t-2}/p_{t-2}	GY_{t-2}	GY_{t-3}	R_{t-2}	R_{t-3}	R^2
1951–2000, N = 50 years									
Coef	−7.60	0.46	2.05	−0.74	−0.16	−0.39	−0.31	−0.12	0.23
t-Stat	−0.43	1.66	0.76	−1.02	−0.92	−2.54	−2.59	−0.97	

gressions are shown for forecasts one year ahead (the explanatory variables for year t dividend growth are known at the end of year $t - 1$) and two years ahead (the explanatory variables are known at the end of year $t - 2$).

The regression for 1875 to 1950 suggests strong forecast power one year ahead. The slopes on the lagged payout ratio, the dividend–price ratio, and the stock return are close to or more than two standard errors from zero, and the regression captures 38 percent of the variance of dividend growth. Even in the 1875 to 1950 period, however, power to forecast dividend growth does not extend much beyond a year. When dividend growth for year t is explained with variables known at the end of year $t - 2$, the regression R^2 falls from 0.38 to 0.07. Without showing the details, we can report that extending the forecast horizon from two to three years causes all hint of forecast power to disappear. Thus, for 1875 to 1950, the best forecast of dividend growth more than a year or two ahead is the historical average growth rate.

We are interested in post-2000 expected dividend growth, and even the short-term forecast power of the dividend regressions for 1872 to 1950 evaporates in the 1951 to 2000 period. The lagged stock return has some information ($t = 2.17$) about dividend growth one year ahead. But the 1951 to 2000 regression picks up only one percent of the variance of dividend growth. And forecast power does not improve for longer forecast horizons. Our evidence that dividend growth is essentially unpredictable during the last 50 years confirms the results in Campbell (1991), Cochrane (1991, 1994), and Campbell and Shiller (1998). If dividend growth is unpredictable, the historical average growth rate is the best forecast of future growth.

Long-term expected earnings growth also is not unusually high in 2000. There is no clear trend in real earnings growth during the 1951 to 2000 period. The most recent decade, 1991 to 2000, produces the highest average growth rate, 7.58 percent per year (Table II). But earnings growth is volatile. The standard errors of 10-year average growth rates vary around 5 percent. It is thus not surprising that 1981 to 1990, the decade immediately preceding 1991 to 2000, produces the lowest average real earnings growth rate, 0.37 percent per year.

The regressions in Table III are formal evidence on the predictability of earnings growth during the 1951 to 2000 period. There is some predictability of near-term growth, but it is largely due to transitory variation in earnings that is irrelevant for forecasting long-term earnings. In the 1951 to 2000 regression to forecast earnings growth one year ahead, the slope on the first lag of the stock return is positive (0.28, $t = 2.39$), but the slope on the second lag is negative (-0.25, $t = -2.18$) and about the same magnitude. Thus, the prediction of next year's earnings growth from this year's return is reversed the following year. In the one-year forecast regression for 1951 to 2000, the only variable other than lagged returns with power to forecast earnings growth ($t = -2.64$) is the third lag of earnings growth. But the slope is negative, so it predicts that the strong earnings growth of recent years is soon to be reversed.

In the 1951 to 2000 regression to forecast earnings one year ahead, there is a hint ($t = -1.91$) that the low earnings–price ratio at the end of the period implies higher than average expected growth one year ahead. But the effect peters out quickly; the slope on the lagged earnings–price ratio in the regression to forecast earnings growth two years ahead is -1.02 standard errors from zero. The only variables with forecast power two years ahead are the second lag of the stock return and the third lag of earnings growth. But the slopes on these variables are negative, so again the 2000 prediction is that the strong earnings growth of recent years is soon to be reversed. And again, regressions (not shown) confirm that forecast power for 1951 to 2000 does not extend beyond two years. Thus, beyond two years, the best forecast of earnings growth is the historical average growth rate.

In sum, the behavior of dividends for 1951 to 2000 suggests that future growth is largely unpredictable, so the historical mean growth rate is a near optimal forecast of future growth. Earnings growth for 1951 to 2000 is somewhat predictable one and two years ahead, but the end-of-sample message is that the recent high growth rates are likely to revert quickly to the historical mean. It is also worth noting that the market survivor bias argument of Brown, Goetzmann, and Ross (1995) suggests that past average growth rates are, if anything, upward biased estimates of future growth. In short, we find no evidence to support a forecast of strong future dividend or earnings growth at the end of our sample period.

C. Do Expected Stock Returns Fall during the 1951 to 2000 Period?

The S&P dividend–price ratio, D_t/P_t, falls from 7.18 percent at the end of 1950 to a historically low 1.22 percent at the end of 2000 (Figure 1). The growth in the stock price, P_{2000}/P_{1950}, is thus 5.89 times the growth in dividends, D_{2000}/D_{1950}. The S&P earnings–price ratio, Y_t/P_t, falls from 13.39 percent at the end of 1950 to 3.46 percent at the end of 2000, so the percent capital gain of the last 50 years is 3.87 times the percent growth in earnings. (Interestingly, almost all of the excess capital gain occurs in the last 20 years; Figure 1 shows that the 1979 earnings–price ratio, 13.40 percent, is nearly identical to the 13.39 percent value of 1950.)

All valuation models say that D_t/P_t and E_t/P_t are driven by expected future returns (discount rates) and expectations about future dividend and earnings growth. Our evidence suggests that rational forecasts of long-term dividend and earnings growth rates are not unusually high in 2000. We conclude that the large spread of capital gains for 1951 to 2000 over dividend and earnings growth is largely due to a decline in the expected stock return.

Some of the decline in D_t/P_t and E_t/P_t during 1951 to 2000 is probably anticipated in 1950. The dividend–price ratio for 1950, 7.18 percent, is high (Figure 1). The average for 1872 to 2000 is 4.64 percent. If D_t/P_t is mean-reverting, the expectation in 1950 of the yield in 2000 is close to the unconditional mean, say 4.64 percent. The actual dividend–price ratio for 2000 is

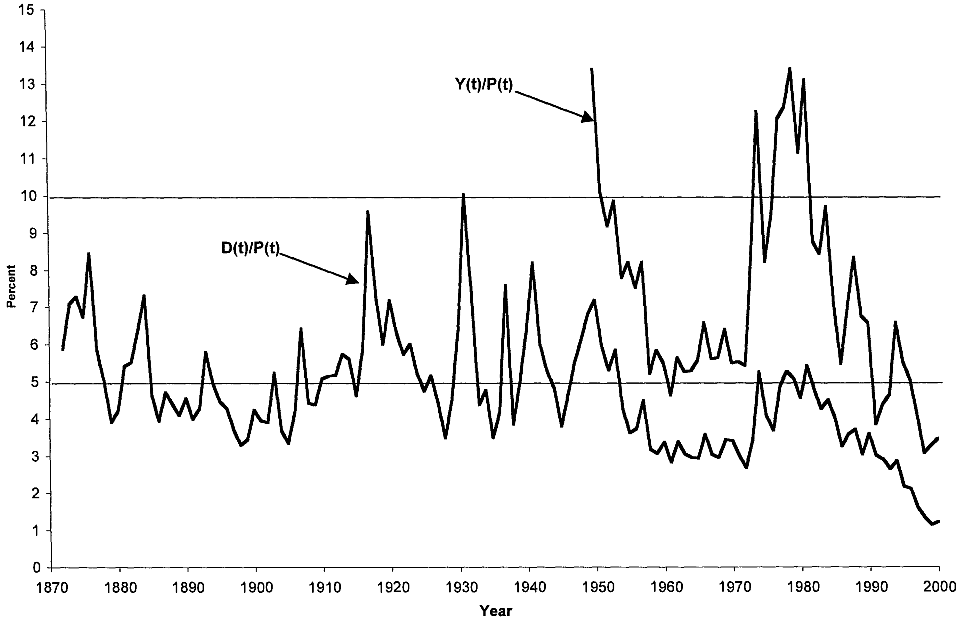


Figure 1. Dividend–price and earnings–price ratios.

1.22 percent. The 2000 stock price is thus 4.64/1.22 = 3.80 times what it would be if the dividend yield for 2000 hit the historical mean. Roughly speaking, this unexpected capital gain adds about 2.67 percent to the compound annual return for 1951 to 2000.

Similarly, part of the large difference between the 1951 to 2000 capital gain and the growth in earnings is probably anticipated in 1950. The 13.39 percent value of Y_t/P_t in 1950 is high relative to the mean for 1951 to 2000, 7.14 percent. If the earnings–price ratio is stationary, the expectation in 1950 of Y_t/P_t for 2000 is close to the unconditional mean, say 7.14 percent. The actual Y_t/P_t for 2000 is 3.46 percent. Thus, the 2000 stock price is 7.14/3.46 = 2.06 times what it would be if the ratio for 2000 hit the 7.14 percent average value for 1951 to 2000. Roughly speaking, this estimate of the unexpected capital gain adds about 1.45 percent to the compound annual return for the 50-year period.

In short, the percent capital gain for 1951 to 2000 is several times the growth of dividends or earnings. The result is historically low dividend–price and earnings–price ratios at the end of the period. Since the ratios are high in 1950, some of their subsequent decline is probably expected, but much of it is unexpected. Given the evidence that rational forecasts of long-term growth rates of dividends and earnings are not high in 2000, we conclude that the unexpected capital gains for 1951 to 2000 are largely due to a decline in the discount rate. In other words, the low end-of-sample price ratios imply low (rationally assessed, or true) expected future returns.

Like us, Campbell (1991), Cochrane (1994), and Campbell and Shiller (1998) find that, for recent periods, dividend and earnings growth are largely unpredictable, so variation in dividend–price and earnings–price ratios is largely due to the expected stock return. The samples in Campbell (1991) and Cochrane (1994) end in 1988 (before the strong subsequent returns that produce sharp declines in the price ratios), and they focus on explaining, in general terms, how variation in D_t/P_t splits between variation in the expected stock return and expected dividend growth. Campbell and Shiller (1998) focus on the low expected future returns implied by the low price ratios of recent years.

In contrast, we are more interested in what the decline in the price ratios says about past returns, specifically, that the average return for 1951 to 2000 is above the expected return. And this inference does not rest solely on the information in price ratios. We buttress it with two types of novel evidence. (a) The perspective from our long sample period that, although the average stock return for 1951 to 2000 is much higher than expected return estimates from fundamentals, the two approaches produce similar estimates for 1872 to 1950. (b) Evidence from Sharpe ratios, the book-to-market ratio, and the income return on investment, which also suggests that the average return for 1951 to 2000 is above the expected value.

III. Estimating the Expected Stock Return: Issues

There are two open questions about our estimates of the expected stock return. (a) In recent years the propensity of firms to pay dividends declines and stock repurchases surge. How do these changes in dividend policy affect our estimates of the expected return? (b) Under rather general conditions, the dividend and earnings growth models (2) and (3) provide estimates of the expected stock return. Are the estimates biased and does the bias depend on the return horizon? This section addresses these issues.

A. Repurchases and the Declining Incidence of Dividend Payers

Share repurchases surge after 1983 (Bagwell and Shoven (1989) and Dunsby (1995)), and, after 1978, the fraction of firms that do not pay dividends steadily increases (Fama and French (2001)). More generally, dividends are a policy variable, and changes in policy can raise problems for estimates of the expected stock return from the dividend growth model. There is no problem in the long-term, as long as dividend policies stabilize and the dividend–price ratio resumes its mean-reversion, though perhaps to a new mean. (An Appendix, available on request, provides an example involving repurchases.) But there can be problems during transition periods. For example, if the fraction of firms that do not pay dividends steadily increases, the market dividend–price ratio is probably nonstationary; it is likely to decline over time, and the dividend growth model is likely to underestimate the expected stock return.

Fortunately, the earnings growth model is not subject to the problems posed by drift in dividend policy. The earnings growth model provides an estimate of the expected stock return when the earnings–price ratio is stationary. And as discussed earlier, the model provides an estimate of the average expected return during the sample period when there are permanent shifts in the expected value of Y_t/P_t, as long as the ratio mean-reverts within regimes.

The earnings growth model is not, however, clearly superior to the dividend growth model. The standard deviation of annual earnings growth rates for 1951 to 2000 (13.79 percent, versus 5.09 percent for dividends) is similar to that of capital gains (16.77 percent), so much of the precision advantage of using fundamentals to estimate the expected stock return is lost. We see next that the dividend growth model has an advantage over the earnings growth model and the average stock return if the goal is to estimate the long-term expected growth of wealth.

B. The Investment Horizon

The return concept in discrete time asset pricing models is a one-period simple return, and our empirical work focuses on the one-year return. But many, if not most, investors are concerned with long-term returns, that is, terminal wealth over a long holding period. Do the advantages and disadvantages of different expected return estimates depend on the return horizon? This section addresses this question.

B.1. The Expected Annual Simple Return

There is downward bias in the estimates of the expected annual simple return from the dividend and earnings growth models—the result of a variance effect. The expected value of the dividend growth estimate of the expected return, for example, is the expected value of the dividend yield plus the expected value of the annual simple dividend growth rate. The expected annual simple return is the expected value of the dividend yield plus the expected annual simple rate of capital gain. If the dividend–price ratio is stationary, the compound rate of capital gain converges to the compound dividend growth rate as the sample period increases. But because the dividend growth rate is less volatile than the rate of capital gain, the expected simple dividend growth rate is less than the expected simple rate of capital gain.

The standard deviation of the annual simple rate of capital gain for 1951 to 2000 is 3.29 times the standard deviation of the annual dividend growth rate (Table I). The resulting downward bias of the average dividend growth rate as an estimate of the expected annual simple rate of capital gain is roughly 1.28 percent per year (half the difference between the variances of the two growth rates). Corrected for this bias, the dividend growth estimate of the equity premium in the simple returns of 1951 to 2000 rises from 2.55 to 3.83 percent (Table IV), which is still far below the estimate from the average return, 7.43 percent. Since the earnings growth rate and the annual rate of capital gain have similar standard deviations for 1951 to 2000,

Table IV

Estimates of the Real Equity Premium in Simple Annual and Long-term Returns: 1951 to 2000

The inflation rate for year t is $Inf_t = L_t/L_{t-1}$, where L_t is the price level at the end of year t. The real return for year t on six-month (three-month for the year 2000) commercial paper (rolled over at midyear) is F_t. The nominal value of the S&P index at the end of year t is p_t. Nominal S&P dividends and earnings for year t are d_t and y_t. Real rates of growth of dividends, earnings, and the stock price are $GD_t = (d_t/d_{t-1})*(L_{t-1}/L_t) - 1$, $GY_t = (y_t/y_{t-1})*(L_{t-1}/L_t) - 1$, and $GP_t = (p_t/p_{t-1})*(L_{t-1}/L_t) - 1$. The real dividend yield is $D_t/P_{t-1} = (d_t/p_{t-1})*(L_{t-1}/L_t)$. The dividend growth estimate of the real S&P return for t is $RD_t = D_t/P_{t-1} + GD_t$, the earnings growth estimate is $RY_t = D_t/P_{t-1} + GY_t$, and R_t is the realized real S&P return. The dividend and earnings growth estimates of the real equity premium for year t are $RXD_t = RD_t - F_t$ and $RXY_t = RY_t - F_t$, and $RX_t = R_t - F_t$ is the real equity premium from the realized real return. The average values of the equity premium estimates are $A(RXD_t)$, $A(RXY_t)$, and $A(RX_t)$. The first column of the table shows unadjusted estimates of the annual simple equity premium. The second column shows bias-adjusted estimates of the annual premium. The bias adjustment is one-half the difference between the variance of the annual rate of capital gain and the variance of either the dividend growth rate or the earnings growth rate. The third column shows bias-adjusted estimates of the expected equity premium relevant if one is interested in the long-term growth rate of wealth. The bias adjustment is one-half the difference between the variance of the annual dividend growth rate and the variance of either the growth rate of earnings or the rate of capital gain. The equity premiums are expressed as percents.

		Bias-adjusted	
	Unadjusted	Annual	Long-term
$A(RXD_t)$	2.55	3.83	2.55
$A(RXY_t)$	4.32	4.78	3.50
$A(RX_t)$	7.43	7.43	6.16

13.79 percent and 16.77 percent (Table I), the bias of the earnings growth estimate of the expected return is smaller (0.46 percent). Corrected for bias, the estimate of the equity premium for 1951 to 2000 from the earnings growth model rises from 4.32 to 4.78 percent (Table IV), which again is far below the 7.43 percent estimate from the average return.

B.2. Long-term Expected Wealth

The (unadjusted) estimate of the expected annual simple return from the dividend growth model is probably the best choice if we are concerned with the long-term expected wealth generated by the market portfolio. The annual dividend growth rates of 1951 to 2000 are essentially unpredictable. If the dividend growth rate is serially uncorrelated, the expected value of the compounded dividend growth rate is the compounded expected simple growth rate:

$$E\left[\prod_{t=1}^{T}(1 + GD_t)\right] = [1 + E(GD)]^T. \tag{5}$$

And if the dividend–price ratio is stationary, for long horizons the expected compounded dividend growth rate is the expected compounded rate of capital gain:

$$E\left[\prod_{t=1}^{T}(1+GD_t)\right]=E\left[\prod_{t=1}^{T}(1+GP_t)\right]. \tag{6}$$

Thus, when the horizon T is long, compounding the true expected annual simple return from the dividend growth model produces an unbiased estimate of the expected long-term return:

$$[1+E(RD)]^T=E\left[\prod_{t=1}^{T}(1+R_t)\right]. \tag{7}$$

In contrast, if the dividend growth rate is unpredictable and the dividend–price ratio is stationary, part of the higher volatility of annual rates of capital gain is transitory, the result of a mean-reverting expected annual return (Cochrane (1994)). Thus, compounding even the true unconditional expected annual simple return, $E(R)$, yields an upward biased measure of the expected compounded return:

$$[1+E(R)]^T>E\left[\prod_{t=1}^{T}(1+R_t)\right]. \tag{8}$$

There is a similar problem in using the average (simple) earnings growth rate to estimate long-term expected wealth. The regressions in Table III suggest that the predictability of earnings growth for 1951 to 2000 is due to transitory variation in earnings. As a result, annual earnings growth is 2.71 times more volatile than dividend growth (Table I). The compound growth rate of earnings for 1951 to 2000, 1.89 percent, is 2.05 times the compound dividend growth rate, 0.92 percent. But because earnings are more volatile, the average simple growth rate of earnings, 2.82 percent, is 2.69 times the average simple growth rate of dividends, 1.05 percent. As a result, the average simple growth rate of earnings produces an upward biased estimate of the compound rate of growth of long-term expected wealth.

We can correct the bias by subtracting half the difference between the variance of earnings growth and the variance of dividend growth (0.82 percent) from the average earnings growth rate. The estimate of the expected rate of capital gain provided by this adjusted average growth rate of earnings is 2.00 percent per year. Using this adjusted average growth rate of earnings, the earnings growth estimate of the expected real stock return for 1951 to 2000 falls from 6.51 to 5.69 percent. The estimate of the equity premium falls from 4.32 to 3.50 percent (Table IV), which is closer to the 2.55 percent obtained when the average dividend growth rate is used to estimate the expected rate of capital gain. Similarly, adjusting for the effects of transitory return volatility causes the estimate of the equity premium from realized stock returns to fall from 7.43 to 6.16 percent, which is still far above the bias-adjusted estimate of the earnings growth model (3.50 percent) and the estimate from the dividend growth model (2.55 percent).

Finally, we only have estimates of the expected growth rates of dividends and earnings and the expected rate of capital gain. Compounding estimates rather than true expected values adds upward bias to measures of expected long-term wealth (Blume (1974)). The bias increases with the imprecision of the estimates. This is another reason to favor the more precise estimate of the expected stock return from the dividend growth model over the earnings growth estimate or the estimate from the average stock return.

IV. Conclusions

There is a burgeoning literature on the equity premium. Our main additions are on two fronts. (a) A long (1872 to 2000) perspective on the competing estimates of the unconditional expected stock return from fundamentals (the dividend and earnings growth models) and the average stock return. (b) Evidence (estimates of precision, Sharpe ratios, and the behavior of the book-to-market ratio and the income return on investment) that allows us to choose between the expected return estimates from the two approaches.

Specifically, the dividend growth model and the realized average return produce similar real equity premium estimates for 1872 to 1950, 4.17 percent and 4.40 percent. For the half-century from 1951 to 2000, however, the equity premium estimates from the dividend and earnings growth models, 2.55 percent and 4.32 percent, are far below the estimate from the average return, 7.43 percent.

We argue that the dividend and earnings growth estimates of the equity premium for 1951 to 2000 are closer to the true expected value. This conclusion is based on three results.

(a) The estimates from fundamentals, especially the estimate from the dividend growth model, are more precise; they have lower standard errors than the estimate from the average return.

(b) The appealing message from the dividend and earnings growth models is that aggregate risk aversion (as measured by the Sharpe ratio for the equity premium) is on average roughly similar for the 1872 to 1949 and 1950 to 1999 periods. In contrast, the Sharpe ratio for the equity premium from the average return just about doubles from the 1872 to 1950 period to the 1951 to 2000 period.

(c) Most important, the average stock return for 1951 to 2000 is much greater than the average income return on book equity. Taken at face value, this says that investment during the period is on average unprofitable (its expected return is less than the cost of capital). In contrast, the lower estimates of the expected stock return from the dividend and earnings growth models are less than the income return on investment, so the message is that investment is on average profitable. This is more consistent with book-to-market ratios that are rather consistently less than one during the period.

If the average stock return for 1951 to 2000 exceeds the expected return, stocks experience unexpected capital gains. What is the source of the gains? Growth rates of dividends and earnings are largely unpredictable, so there is no basis for extrapolating unusually high long-term future growth. This leaves a decline in the expected stock return as the prime source of the unexpected capital gain. In other words, the high return for 1951 to 2000 seems to be the result of low expected future returns.

Many papers suggest that the decline in the expected stock return is in part permanent, the result of (a) wider equity market participation by individuals and institutions, and (b) lower costs of obtaining diversified equity portfolios from mutual funds (Diamond (1999), Heaton and Lucas (1999), and Siegel (1999)). But there is also evidence that the expected stock return is slowly mean reverting (Fama and French (1989) and Cochrane (1994)). Moreover, there are two schools of thought on how to explain the variation in expected returns. Some attribute it to rational variation in response to macroeconomic factors (Fama and French (1989), Blanchard (1993), and Cochrane (1994)), while others judge that irrational swings in investor sentiment are the prime moving force (e.g., Shiller (1989)). Whatever the story for variation in the expected return, and whether it is temporary or partly permanent, the message from the low end-of-sample dividend–price and earnings–price ratios is that we face a period of low (true) expected returns.

Our main concern, however, is the unconditional expected stock return, not the end-of-sample conditional expected value. Here there are some nuances. If we are interested in the unconditional expected annual simple return, the estimates for 1951 to 2000 from fundamentals are downward biased. The bias is rather large when the average growth rate of dividends is used to estimate the expected rate of capital gain, but it is small for the average growth rate of earnings. On the other hand, if we are interested in the long-term expected growth of wealth, the dividend growth model is probably best, and the average stock return and the earnings growth estimate of the expected return are upward biased. But our bottom line inference does not depend on whether one is interested in the expected annual simple return or long-term expected wealth. In either case, the bias-adjusted expected return estimates for 1951 to 2000 from fundamentals are a lot (more than 2.6 percent per year) lower than bias-adjusted estimates from realized returns. (See Table IV.) Based on this and other evidence, our main message is that the unconditional expected equity premium of the last 50 years is probably far below the realized premium.

REFERENCES

Bagwell, Laurie S., and John B. Shoven, 1989, Cash distributions to shareholders, *Journal of Economic Perspectives* 3, 129–149.

Blanchard, Olivier J., 1993, Movements in the equity premium, *Brooking Papers on Economic Activity* 2, 75–138.

Blume, Marshall, 1974, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69, 634–638.

Brown, Stephen J., William N. Goetzmann, and Stephen Ross, 1995, Survival, *Journal of Finance* 50, 853–873.

Campbell, John Y., 1991, A variance decomposition for stock returns, *Economic Journal* 101, 157–179.

Campbell, John Y., and Robert J. Shiller, 1989, The dividend–price ratio and expectations of future dividends and discount factors, *Review of Financial Studies* 1, 195–228.

Campbell, John Y., and Robert J. Shiller, 1998, Valuation ratios and the long-run stock market outlook, *Journal of Portfolio Management* 24, 11–26.

Claus, James, and Jacob Thomas, 2001, Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets, *Journal of Finance* 56, 1629-1666.

Cochrane, John, 1991, Volatility tests and efficient markets: A review essay, *Journal of Monetary Economics* 27, 463–487.

Cochrane, John H., 1994, Permanent and transitory components of GNP and stock prices, *Quarterly Journal of Economics* 109, 241–265.

Davis, James L., Eugene F. Fama, and Kenneth R. French, 2000, Characteristics, covariances, and average returns, *Journal of Finance* 55, 389–406.

Diamond, Peter A., 1999, What stock market returns to expect for the future? Center of Retirement Research at Boston College, September, Number 2.

Dunsby, Adam, 1995, *Share Repurchases, Dividends, and Corporate Distribution Policy* (Ph.D. thesis, The Wharton School, University of Pennsylvania).

Fama, Eugene F., and Kenneth R. French, 1988, Dividend yields and expected stock returns, *Journal of Financial Economics* 22, 3–25.

Fama, Eugene F., and Kenneth R. French, 1989, Business conditions and expected returns on stocks and bonds, *Journal of Financial Economics* 25, 23–49.

Fama, Eugene F., and Kenneth R. French, 2001, Disappearing dividends: Changing firm characteristics or lower propensity to pay, *Journal of Financial Economics* 60, 3–43.

Gebhardt, William R., Charles M. C. Lee, and Bhaskaram Swaminathan, 2001, Toward an implied cost of capital, *Journal of Accounting Research* 39, June, 135–176.

Gordon, Myron, 1962, *The Investment Financing and Valuation of the Corporation* (Irwin, Homewood, IL).

Heaton, John, and Deborah Lucas, 1999, Stock prices and fundamentals, in Ben Bernanke and Julio Rotemberg, eds.: *Macroeconomics Annual 1999* (National Bureau of Economic Research, MIT Press, Cambridge, MA).

Keane, Michael P., and David E. Runkle, 1998, Are financial analysts' forecasts of corporate profits rational? *Journal of Political Economy* 106, 768–805.

Lamont, Owen, 1998, Earnings and expected returns, *Journal of Finance* 53, 1563–1587.

Lettau, Martin, and Sydney Ludvigson, 2001, Consumption, aggregate wealth, and expected stock returns, *Journal of Finance* 56, 815–849.

Mehra, Rajnish, and Edward Prescott, 1985, The equity premium: A puzzle, *Journal of Monetary Economics* 15, 145–161.

Shiller, Robert, 1989, *Market Volatility* (MIT Press, Cambridge, MA).

Siegel, Jeremy J., 1999, The shrinking equity premium, *Journal of Portfolio Management* 26, 10–17.

Vuolteenaho, Tuomo, 2000, Understanding the aggregate book-to-market ratio, Manuscript, University of Chicago.

LINKED CITATIONS

- Page 1 of 3 -

You have printed the following article:

The Equity Premium
Eugene F. Fama; Kenneth R. French
The Journal of Finance, Vol. 57, No. 2. (Apr., 2002), pp. 637-659.
Stable URL:
http://links.jstor.org/sici?sici=0022-1082%28200204%2957%3A2%3C637%3ATEP%3E2.0.CO%3B2-%23

[Footnotes]

[1] **Consumption, Aggregate Wealth, and Expected Stock Returns**
Martin Lettau; Sydney Ludvigson
The Journal of Finance, Vol. 56, No. 3. (Jun., 2001), pp. 815-849.
Stable URL:
http://links.jstor.org/sici?sici=0022-1082%28200106%2956%3A3%3C815%3ACAWAES%3E2.0.CO%3B2-N

References

Cash Distributions to Shareholders
Laurie Simon Bagwell; John B. Shoven
The Journal of Economic Perspectives, Vol. 3, No. 3. (Summer, 1989), pp. 129-140.
Stable URL:
http://links.jstor.org/sici?sici=0895-3309%28198922%293%3A3%3C129%3ACDTS%3E2.0.CO%3B2-9

Unbiased Estimators of Long-Run Expected Rates of Return
Marshall E. Blume
Journal of the American Statistical Association, Vol. 69, No. 347. (Sep., 1974), pp. 634-638.
Stable URL:
http://links.jstor.org/sici?sici=0162-1459%28197409%2969%3A347%3C634%3AUEOLER%3E2.0.CO%3B2-V

NOTE: *The reference numbering from the original has been maintained in this citation list.*

LINKED CITATIONS

- Page 2 of 3 -

Survival

Stephen J. Brown; William N. Goetzmann; Stephen A. Ross

The Journal of Finance, Vol. 50, No. 3, Papers and Proceedings Fifty-Fifth Annual Meeting, American Finance, Association, Washington, D.C., January 6-8, 1995. (Jul., 1995), pp. 853-873.

Stable URL:

http://links.jstor.org/sici?sici=0022-1082%28199507%2950%3A3%3C853%3AS%3E2.0.CO%3B2-0

A Variance Decomposition for Stock Returns

John Y. Campbell

The Economic Journal, Vol. 101, No. 405. (Mar., 1991), pp. 157-179.

Stable URL:

http://links.jstor.org/sici?sici=0013-0133%28199103%29101%3A405%3C157%3AAVDFSR%3E2.0.CO%3B2-X

The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors

John Y. Campbell; Robert J. Shiller

The Review of Financial Studies, Vol. 1, No. 3. (Autumn, 1988), pp. 195-228.

Stable URL:

http://links.jstor.org/sici?sici=0893-9454%28198823%291%3A3%3C195%3ATDRAEO%3E2.0.CO%3B2-O

Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets

James Claus; Jacob Thomas

The Journal of Finance, Vol. 56, No. 5. (Oct., 2001), pp. 1629-1666.

Stable URL:

http://links.jstor.org/sici?sici=0022-1082%28200110%2956%3A5%3C1629%3AEPALAT%3E2.0.CO%3B2-6

Permanent and Transitory Components of GNP and Stock Prices

John H. Cochrane

The Quarterly Journal of Economics, Vol. 109, No. 1. (Feb., 1994), pp. 241-265.

Stable URL:

http://links.jstor.org/sici?sici=0033-5533%28199402%29109%3A1%3C241%3APATCOG%3E2.0.CO%3B2-K

Characteristics, Covariances, and Average Returns: 1929 to 1997

James L. Davis; Eugene F. Fama; Kenneth R. French

The Journal of Finance, Vol. 55, No. 1. (Feb., 2000), pp. 389-406.

Stable URL:

http://links.jstor.org/sici?sici=0022-1082%28200002%2955%3A1%3C389%3ACCAAR1%3E2.0.CO%3B2-V

NOTE: *The reference numbering from the original has been maintained in this citation list.*

LINKED CITATIONS

- Page 3 of 3 -

Toward an Implied Cost of Capital
William R. Gebhardt; Charles M. C. Lee; Bhaskaran Swaminathan
Journal of Accounting Research, Vol. 39, No. 1. (Jun., 2001), pp. 135-176.
Stable URL:
http://links.jstor.org/sici?sici=0021-8456%28200106%2939%3A1%3C135%3ATAICOC%3E2.0.CO%3B2-4

Are Financial Analysts' Forecasts of Corporate Profits Rational?
Michael P. Keane; David E. Runkle
The Journal of Political Economy, Vol. 106, No. 4. (Aug., 1998), pp. 768-805.
Stable URL:
http://links.jstor.org/sici?sici=0022-3808%28199808%29106%3A4%3C768%3AAFAFOC%3E2.0.CO%3B2-%23

Earnings and Expected Returns
Owen Lamont
The Journal of Finance, Vol. 53, No. 5. (Oct., 1998), pp. 1563-1587.
Stable URL:
http://links.jstor.org/sici?sici=0022-1082%28199810%2953%3A5%3C1563%3AEAER%3E2.0.CO%3B2-G

Consumption, Aggregate Wealth, and Expected Stock Returns
Martin Lettau; Sydney Ludvigson
The Journal of Finance, Vol. 56, No. 3. (Jun., 2001), pp. 815-849.
Stable URL:
http://links.jstor.org/sici?sici=0022-1082%28200106%2956%3A3%3C815%3ACAWAES%3E2.0.CO%3B2-N

NOTE: *The reference numbering from the original has been maintained in this citation list.*

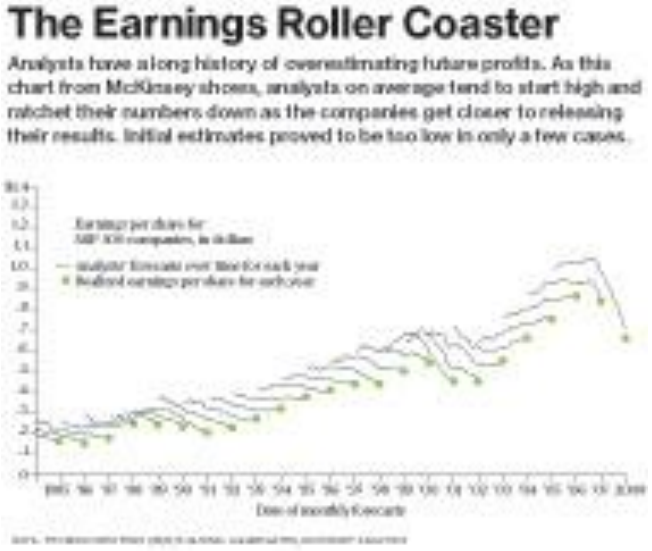
Markets & Finance June 10, 2010, 5:00PM EST

For Analysts, Things Are Always Looking Up

They're raising earnings estimates for U.S. companies at a record pace

By Roben Farzad

GETTY IMAGES



The Earnings Roller Coaster

Analysts have a long history of overestimating future profits. As this chart from McKinsey shows, analysts on average tend to start high and ratchet their numbers down as the companies get closer to releasing their results. Initial estimates proved to be too low in only a few cases.

For years, the rap on Wall Street securities analysts was that they were shills, reflexively producing upbeat research on companies they cover to help their employers win investment banking business. The dynamic was well understood: Let my bank take your company public, or advise it on this acquisition, and—wink, wink—I will recommend your stock through thick or thin. After the Internet bubble burst, that was supposed to change. In April 2003 the Securities & Exchange Commission reached a settlement with 10 Wall Street firms in which they agreed, among other things, to separate research from investment banking.

Seven years on, Wall Street analysts remain a decidedly optimistic lot. Some economists look at the global economy and see troubles—the European debt crisis, persistently high unemployment worldwide, and housing woes in the U.S. Stock analysts as a group seem unfazed. Projected 2010 profit growth for companies in the Standard & Poor's 500-stock index has climbed seven percentage points this quarter, to

34 percent, data compiled by Bloomberg show. According to Sanford C. Bernstein (AB), that's the fastest pace since 1980, when the Dow Jones industrial average was quoted in the hundreds and Nancy Reagan was getting ready to order new window treatments for the Oval Office.

Among the companies analysts expect to excel: Intel (INTL) is projected to post an increase in net income of 142 percent this year. Caterpillar, a multinational that gets much of its revenue abroad, is expected to boost its net income by 47 percent this year. Analysts have also hiked their S&P 500 profit estimate for 2011 to $95.53 a share, up from $92.45 at the beginning of January, according to Bloomberg data. That would be a record, surpassing the previous high reached in 2007.

With such prospects, it's not surprising that more than half of S&P 500-listed stocks boast overall buy ratings. It is telling that the proportion has essentially held constant at both the market's October 2007 high and March 2009 low, bookends of a period that saw stocks fall by more than half. If the analysts are correct, the market would appear to be attractively priced right now. Using the $95.53 per share figure, the price-to-earnings ratio of the S&P 500 is a modest 11 as of June 9. If, however, analysts end up being too high by, say, 20 percent, the P/E would jump to almost 14.

If history is any guide, chances are good that the analysts are wrong. According to a recent McKinsey report by Marc Goedhart, Rishi Raj, and Abhishek Saxena, "Analysts have been persistently over-optimistic for 25 years," a stretch that saw them peg earnings growth at 10 percent to 12 percent a year when the actual number was ultimately 6 percent. "On average," the researchers note, "analysts' forecasts have been almost 100 percent too high," even after regulations were enacted to weed out conflicts and improve the rigor of their calculations. As the chart below shows, in most years analysts have been forced to lower their estimates after it became apparent they had set them too high.

While a few analysts, like Meredith Whitney, have made their names on bearish calls, most are chronically bullish. Part of the problem is that despite all the reforms they remain too aligned with the companies they cover. "Analysts still need to get the bulk of their information from companies, which have an incentive to be over-optimistic," says Stephen Bainbridge, a professor at UCLA Law School who specializes in the securities industry. "Meanwhile, analysts don't want to threaten that ongoing access by being too negative." Bainbridge says that with the era of the overpaid, superstar analyst long over, today's job description calls for resisting the urge to be an iconoclast. "It's a matter of herd behavior," he says.

So what's a more plausible estimate of companies' earning power? Looking at factors including the strengthening dollar, which hurts exports, and higher corporate borrowing costs, David Rosenberg, chief economist at Toronto-based investment shop Gluskin Sheff + Associates, says "disappointment looms." Bernstein's Adam Parker says every 10 percent drop in the value of the euro knocks U.S. corporate earnings down by 2.5 percent to 3 percent. He sees the S&P 500 earning $86 a share next year.

As realities hit home, "It's only natural that analysts will have to revise down their views," says Todd Salamone, senior vice-president at Schaeffer's Investment Research. The market may be making its own downward adjustment, as the S&P 500 has already fallen 14 percent from its high in April. If precedent holds, analysts are bound to curb their enthusiasm belatedly, telling us next year what we really needed to know this year.

The bottom line: *Despite reforms intended to improve Wall Street research, stock analysts seem to be promoting an overly rosy view of profit prospects.*

Bloomberg Businessweek Senior Writer Farzad covers Wall Street and international finance.

123 FERC ¶ 61,048
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Joseph T. Kelliher, Chairman;
Suedeen G. Kelly, Marc Spitzer,
Philip D. Moeller, and Jon Wellinghoff.

Composition of Proxy Groups for Determining Gas and Oil Pipeline Return on Equity   Docket No. PL07-2-000

POLICY STATEMENT

(Issued April 17, 2008)

1. On July 19, 2007, the Commission issued a proposed policy statement concerning the composition of the proxy groups used to determine gas and oil pipelines' return on equity (ROE) under the Discounted Cash Flow (DCF) model.[1] Historically, in determining the proxy group, the Commission required that pipeline operations constitute a high proportion of the business of any firm included in the proxy group. However, in recent years, there have been fewer gas pipeline corporations that meet that standard, in part because of the greater trend toward Master Limited Partnerships (MLPs) in the gas pipeline industry. Additionally, there are no oil corporations available for use in the oil pipeline proxy group. These trends have made the MLP issue one of particular concern to the Commission and are the reason that the Commission issued the Proposed Policy Statement.[2]

---

[1] *Composition of Proxy Groups for Determining Gas and Oil Pipeline Return on Equity,* 120 FERC ¶ 61,068 (2007) (Proposed Policy Statement).

[2] After an initial round of comments and reply comments, the Commission concluded that it required additional comment on the issue of the growth rates of MLPs. After notice to this effect and the receipt of a round of initial and reply comments, staff held a technical conference involving an eight member panel on January 23, 2008 that was transcribed for the record. Comments and reply comments were filed thereafter.

2. After review of an extensive record developed in this proceeding, the Commission concludes: (1) MLPs should be included in the ROE proxy group for both oil and gas pipelines; (2) there should be no cap on the level of distributions included in the Commission's current DCF methodology; (3) the Institutional Brokers Estimated System (IBES) forecasts should remain the basis for the short-term growth forecast used in the DCF calculation; (4) there should be an adjustment to the long-term growth rate used to calculate the equity cost of capital for an MLP; and (5) there should be no modification to the current respective two-thirds and one-third weightings of the short- and long-term growth factors. Moreover, the Commission will not explore other methods for determining a pipeline's equity cost of capital at this time. The Commission also concludes that this Policy Statement should govern all gas and oil rate proceedings involving the establishment of ROE that are now pending before the Commission, whether at hearing or in a decisional phase at the Commission.

I. <u>Background</u>

A. <u>The DCF Model</u>

3. The Supreme Court has stated that "the return to the equity owner should be commensurate with the return on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital."[3] Since the 1980s, the Commission has used the DCF model to develop a range of returns earned on investments in companies with corresponding risks for purposes of determining the ROE to be awarded natural gas and oil pipelines.

4. The DCF model was originally developed as a method for investors to estimate the value of securities, including common stocks. It is based on the premise that "a stock's price is equal to the present value of the infinite stream of expected dividends discounted at a market rate commensurate with the stock's risk."[4] With simplifying assumptions, the DCF model results in the investor using the following formula to determine share price:

$$P = D/(r-g)$$

---

[3] *FPC v. Hope Natural Gas Co.*, 320 U.S. 591 (1944). *Bluefield Water Works & Improvement Co. v. Public Service Comm'n*, 262 U.S. 679 (1923).

[4] *CAPP v. FERC*, 254 F.3d 289, 293 (2001) (*CAPP*).

where P is the price of the stock at the relevant time, D is the current dividend, r is the discount rate or rate of return, and g is the expected constant growth in dividend income to be reflected in capital appreciation.[5]

5. Unlike investors, the Commission uses the DCF model to determine the ROE (the "r" component) to be included in the pipeline's rates, rather than to estimate a stock's value. Therefore, the Commission solves the DCF formula for the discount rate, which represents the rate of return that an investor requires in order to invest in a firm. Under the resulting DCF formula, ROE equals current dividend yield (dividends divided by share price) plus the projected future growth rate of dividends:

$$r = D/P + g$$

6. Over the years, the Commission has standardized the inputs to the DCF formula as applied to interstate gas and oil pipelines. The Commission averages short-term and long-term growth estimates in determining the constant growth of dividends (referred to as the two-step procedure). Security analysts' five-year forecasts for each company in the proxy group (discussed below), as published by IBES, are used for determining growth for the short term. The long-term growth is based on forecasts of long-term growth of the economy as a whole,[6] as reflected in the Gross Domestic Product (GDP which are drawn from three different sources.[7] The short-term forecast receives a two-thirds weighting and the long-term forecast receives a one-third weighting in calculating the growth rate in the DCF model.[8]

---

[5] *Id. National Fuel Gas Supply Corp*., 51 FERC ¶ 61,122, at 61,337 n.68 (1990). *Ozark Gas Transmission System,* 68 FERC ¶ 61,032, at 61,104 n.16. (1994).

[6] *Northwest Pipeline Company*, 79 FERC ¶ 61,309, at 62,383 (1997) (Opinion No. 396-B). *Williston Basin Interstate Pipeline Company*, 79 FERC ¶ 61,311, at 62,389 (1997) (*Williston I*), *aff'd*, *Williston Basin Interstate Pipeline Co. v. FERC*, 165 F.3d 54, 57 (D.C. Cir. 1999) (*Williston v. FERC*).

[7] The three sources used by the Commission are Global Insight: *Long-Term Macro Forecast – Baseline (U.S. Economy 30-Year Focus)*; Energy Information Agency, *Annual Energy Outlook*; and the Social Security Administration.

[8] *Transcontinental Gas Pipe Line Corp.*, 84 FERC ¶ 61,084, at 61,423-4 (Opinion No. 414-A), *reh'g denied*, 85 FERC ¶ 61,323, at 62,266-70 (1998) (Opinion No. 414-B), *aff'd sub nom. North Carolina Utilities Commission v. FERC*, 203 F.3d 53 (D.C. Cir. 2000) (unpublished opinion). *Northwest Pipeline Co.*, 88 FERC ¶ 61,057, *reh'g denied*, 88 FERC ¶ 61,298 (1999), *aff'd CAPP v. FERC,* 254 F.3d 289 (D.C. Cir. 2001).

7. Most gas pipelines are wholly-owned subsidiaries and their common stocks are not publicly traded. This is also true for some jurisdictional oil pipelines. Therefore, the Commission must use a proxy group of publicly traded firms with corresponding risks to set a range of reasonable returns for both natural gas and oil pipelines. For both oil and gas pipelines, after defining the zone of reasonableness through development of the appropriate proxy group for the pipeline, the Commission assigns the pipeline a rate within that range or zone, to reflect specific risks of that pipeline as compared to the proxy group companies.[9] The Commission has historically presumed that existing pipelines fall within a broad range of average risk. A pipeline or other litigating party has to show highly unusual circumstances that indicate anomalously high or low risk as compared to other pipelines to overcome the presumption.[10]

8. The Commission historically required that each company included in the proxy group satisfy the following three standards.[11] First, the company's stock must be publicly traded. Second, the company must be recognized as a natural gas or oil pipeline company and its stock must be recognized and tracked by an investment information service such as Value Line. Third, pipeline operations must constitute a high proportion of the company's business. Until 2003, the Commission's policy was that the third standard could only be satisfied if a company's pipeline business accounted for, on average, at least 50 percent of a company's assets or operating income over the most recent three-year period.[12]

9. However, in recent years fewer corporations have satisfied the Commission's standards for inclusion in the gas and oil pipeline proxy groups. Mergers and acquisitions have reduced the number of publicly traded corporations with natural gas pipeline operations. Most of the remaining corporations are engaged in such significant non-pipeline business that their pipeline business accounts are significantly less than 50 percent of their assets or operating income. At the same time, there has been a trend toward MLPs owning natural gas pipelines. This trend has been even more pronounced in the oil pipeline industry, with the result that there are now no purely oil pipeline corporations available for inclusion in the oil pipeline proxy group and virtually all traded

---

[9] *Williston v. FERC*, 165 F.3d at 57 (*citation omitted*).

[10] *Transcontinental Gas Pipe Line Corp.*, 90 FERC ¶ 61,279, at 61,936 (2000).

[11] *Id.* at 61,933.

[12] *Williston Basin Interstate Pipeline Company*, 104 FERC ¶ 61,036, at P 35 n.46 (2003) (*Williston II*).

oil pipeline equity interests are owned by MLPs. Thus, for both oil and gas pipeline rate cases, the composition of the proxy group has become a significant issue, and the central question is whether, and how, to include MLPs in the proxy group.

B. The MLP Business Model

10. MLPs consist of a general partner, who manages the partnership, and limited partners, who provide capital and receive cash distributions, but have no management role. The units of the limited partners are traded on public exchanges, just like corporate stock shares. In order to be treated as an MLP for Federal income tax purposes, an MLP must receive at least 90 percent of its income from certain qualifying sources, including natural resource activities. Natural resource activities include exploration, development, mining or production, processing, refining, transportation, storage and marketing of any mineral or natural resource, including gas and oil.[13]

11. MLPs generally distribute most available cash flow to the general and limited partners in the form of quarterly distributions. At their inception, MLPs establish agreements between the general and limited partners, which define cash flow available for distribution and how that cash flow is to be divided between the general and limited partners. Most MLP agreements define "available cash flow" as (1) net income (gross revenues minus operating expenses) plus (2) depreciation and amortization, minus (3) capital investments the partnership must make to maintain its current asset base and cash flow stream.[14] Depreciation and amortization may be considered a part of "available

---

[13] *See* Wachovia Securities, *Master Limited Partnerships: A Primer*, November 10, 2003, (*Wachovia Primer 1*) at 1, 3-4, reproduced in full in Docket No. OR96-2-012, Ex. SEP ARCO-22 and also in *Kern River Gas Transmission Company*, Docket No. RP04-274-000, Ex. No. BP-19 filed October 25, 2005; J.P. Morgan, *Industry Analysis, Energy MLPS,* dated March 28, 2002 (*J.P. Morgan 2002 Energy MLPs*) at 5-6, reproduced in full in Docket No. OR92-8-025, Ex. No. SWST-18, filed October 20, 2005; Wachovia Capital Markets, LLC, Equity Research Department, *Master Limited Partnerships: Primer 2nd Edition, A Framework for Investment* dated August 23, 2005 (*Wachovia 2nd Primer*) at 8-9, reproduced in full in Docket No. RP06-72-000 at Ex. S-36, filed May 31, 2006); Coalition of Publicly Traded Partnerships, *Publicly Traded Partnerships: What they are and how they work* (undated) (*Publicly Traded Partnerships*) at 1-3, reproduced in full in Docket No. RP06-72-000 at Ex. S-35, filed May 31, 2006, and Docket No. OR96-2-012, Ex. No. BP-19, filed October 25, 2005; CAPP Reply Comments, Attachment A at 2-3; APGA Additional Comments dated December 21, 2007.

[14] The definition of available cash may also net out short term working capital

(continued…)

cash flow," because depreciation is an accounting charge against current income, rather than an actual cash expense. Thus, depreciation does not reduce the MLP's current cash on hand. The MLP agreement may provide for the general partner to receive increasingly higher percentages of the overall distribution if it raises the quarterly distribution. This gives the general partner incentives to increase the partnership's business and cash flow.[15]

12. The general partner has discretion not to distribute the entire amount of available cash flow for the proper exercise of the business, to create reserves for capital expenditures, for the payment of debt, and for future distributions. However, pipeline MLPs have typically distributed 90 percent or more of available cash flow. As a result, the MLP's cash distributions normally include not only the operating profit component of "available cash flow," but also the depreciation component. This means that, in contrast to a corporation's dividends, an MLP's cash distributions generally exceed the MLP's reported earnings. The pipeline MLP's ability to distribute a high percentage of available cash flows reflects the stable cash flows underpinning its businesses.[16]

13. Because of their high cash distributions, MLPs have financed capital investments required to significantly expand operations or to make acquisitions through debt or by issuing additional units rather than through retained cash, although the general partner has the discretion to do so. These expansions financed through external debt are intended to provide a return equal to the cost of the capital plus some additional return for the existing unit holders, i.e., it is accretive. Thus, the return on any newly issued units is expected to be sufficiently high to avoid dilution of the current distributions to the existing unit holders.[17]

14. MLPs may also provide significant tax advantages to their unit holders. Some MLPs allocate depreciation, amortization, and tax credits to the limited partners and away from the general partner. In some cases, the limited partner may have no net taxable income reported on the income tax information document (the K-1) the limited partner

---

borrowings, the repayment of capital expenditures, and other internal items.

[15] *Wachovia Primer 1* at 6-7; *J.P. Morgan 2002 Energy MLPs* at 5, 14; *Wachovia 2nd Primer* at 9, 15-19.

[16] *J.P. Morgan 2002 Energy MLPs* at 11-13; *Wachovia 2nd Primer* at 24-25; Enbridge Initial Comments Attachment A, Wachovia Capital Markets, LLC, *MLPs: Safe to Come Back Into the Water* (*Wachovia MLPs*) dated August 20, 2007, at 2-4.

[17] *Id.*

receives from the partnership each year, a pattern that may continue for years. In that case, the limited partner will not pay any taxes on the cash received from the partnership in the year of the distribution. To the extent a limited partner is allocated items of depreciation, credit, or losses that exceed the limited partner's ownership percentage, income taxes will be due on the difference when the unit is sold. However, this may not occur for many years. Over time the real cost of the future taxes declines while the future return of any tax savings that is reinvested increases. This can significantly increase the return to the investor over the holding period of the limited partnership unit.[18]

15. Moreover, distributions in excess of earnings are not taxed as long as the limited partner has a tax basis. Rather, the limited partner's tax basis is reduced and again any taxes are deferred until the unit is sold. By this tax deferral, the cash flow distributed in excess of earnings can be made available for reinvestment much earlier than would be the case of a corporate share.[19] This reduces the limited partner's risk because the limited partner's cash basis in the unit is reduced, but the distribution would not normally reduce the market price of the unit nor, if the firm has access to external capital, would this necessarily reduce its long term growth potential.

C. The Recent Cases on the Shrinking Proxy Group

1. Natural Gas Pipeline Cases

16. The Commission first addressed the problem of the shrinking natural gas pipeline proxy group in *Williston II*, 104 FERC ¶ 61,036 at P 34-43. In that NGA section 4 rate case, the Commission relaxed the requirement that natural gas business account for at least 50 percent of the corporation's assets or operating income. Instead, the Commission approved the pipeline's proposal to use a proxy group based on the corporations listed in the Value Line Investment Survey's list of diversified natural gas firms that own Commission-regulated natural gas pipelines, without regard to what portion of the company's business comprises pipeline operations. The proxy group approved in that case included four corporations that satisfied the Commission's historic standards[20] and

---

[18] *See* PSCNY Initial Comments at 12-13 and Attachment 1 thereto at 2; *Wachovia Primer* at 4-5; *Publicly Traded Partnerships* at 2-3; *Wachovia 2nd Primer* at 1, 5, 20-22; *J.P. Morgan 2002 Energy MLPs* at 18-19.

[19] *Id.*

[20] The Commission noted that two of those four companies were in the process of merging so that in the future there would be only three pipeline corporations that satisfied our historic proxy group standards. *Williston II,* 104 FERC ¶ 61,036 at P 35.

five corporations with less pipeline business and more local distribution business than the Commission had previously allowed. The Commission set Williston's ROE at the median of this proxy group.

17. The Commission next addressed the proxy group issue in a 2004 order in *Petal Gas Storage, L.L.C.*, 97 FERC ¶ 61,097 (2001), *reh'g granted in part and denied in part*, 106 FERC ¶ 61,325 (2004) (*Petal*). In that case, a jurisdictional storage company with market-based rates had applied for a certificate under NGA section 7 to construct pipeline facilities to transport gas from its existing storage facility to a new interconnection with Southern Natural Gas Co. The Commission found that Petal was not a new entrant in the jurisdictional gas transportation business, but was simply expanding its existing business and had not shown that it faced any unusual risks. Ordinarily in such circumstances the Commission would use the pipeline's own currently approved ROE for its existing services in determining an initial incremental rate for the expansion. However, because Petal had market-based rates for its existing services, there was no such currently approved ROE to use. Therefore, the Commission calculated the initial rate for Petal's expansion using the same median ROE which it had approved in *Williston*, which was the most recent litigated gas pipeline section 4 rate case.

18. When the Commission next addressed the proxy group issue, in *High Island Offshore System, L.L.C.* (*HIOS*),[21] and *Kern River Gas Transmission Company* (Opinion No. 486),[22] the *Williston II* proxy group had shrunk to six corporations. Moreover, the Commission found that two of those corporations should be excluded from the proxy group on the ground that their financial difficulties had lowered their ROEs to such a low level as to render them unrepresentative.[23] This left only four corporations eligible for the proxy group under the standards adopted in *Williston II*, three of whom derived more revenue from the distribution business than the pipeline business. The two pipelines contended that, in these circumstances, the Commission should include natural gas pipeline MLPs in the gas pipeline proxy group. They asserted that MLPs have a much higher percentage of their business devoted to pipeline operations than most of the corporations eligible for the proxy group under *Williston II*, and therefore are more representative of the risks faced by pipelines.

---

[21] 110 FERC ¶ 61,043, *reh'g denied*, 112 FERC ¶ 61,050 (2005).

[22] 117 FERC ¶ 61,077 (2006), *reh'g pending.*

[23] *HIOS*, 110 FERC ¶ 61,043 at P 118. Opinion No. 486, 117 FERC ¶ 61,077 at P 140-141.

19. In *HIOS* and Opinion No. 486, the Commission rejected the proposals to include MLPs in the proxy group, and approved proxy groups using the four corporations still available under the *Williston II* approach of basing the proxy group on the Value Line Investment Survey's group of diversified natural gas corporations that own Commission-regulated pipelines. In *HIOS*, the Commission set the pipeline's ROE at the median of the four-corporation proxy group. In Opinion No. 486, the Commission took the same general approach as in *HIOS*, but set the pipeline's ROE 50 basis points above the median to account for the fact its pipeline operations have a higher risk than its distribution business.[24]

20. In rejecting the proposals to include MLPs in the proxy group in both cases, the Commission made clear that it was not making a generic finding that MLPs cannot be considered for inclusion in the proxy group if a proper evidentiary showing is made.[25] However, the Commission pointed out that data concerning dividends paid by the proxy group members is a key component in any DCF analysis, and expressed concern that an MLP's cash distributions to its unit holders may not be comparable to the corporate dividends the Commission uses in its DCF analysis. In Opinion No. 486, the Commission explained its concern as follows:

> Corporations pay dividends in order to distribute a share of their earnings to stockholders. As such, dividends do not include any return *of* invested capital to the stockholders. Rather, dividends represent solely a return *on* invested capital. Put another way, dividends represent profit that the stockholder is making on its investment. Moreover, corporations typically reinvest some earnings to provide for future growth of earnings and thus dividends. Since the return on equity which the Commission awards in a rate case is intended to permit the pipeline's investors to earn a profit on their investment and provides funds to finance future growth, the use of dividends in the DCF analysis is entirely consistent with the purpose for which the Commission uses that analysis. By contrast, as Kern River concedes, the cash distributions of the MLPs it seeks to add to the proxy group in this case include a return *of* invested capital through an allocation of the partnership's net income. While the level of an MLP's cash distributions may be a significant factor in the unit holder's decision to invest in the MLP, the Commission uses the DCF analysis solely to determine the pipeline's return on equity. The Commission provides for the return of invested capital through a separate depreciation allowance. For this reason, to the extent an MLP's distributions include a significant return of invested capital, a DCF analysis based

---

[24] *Id.* at P 171-176.

[25] *Id.* at P 147. *See also HIOS*, 110 FERC ¶ 61,043 at P 125.

> on those distributions, without any adjustment, will tend to overstate the estimated return on equity, because the 'dividend' would be inflated by cash flow representing return of equity, thereby overstating the earnings the dividend stream purports to reflect.[26]

21. The Commission stated that it could nevertheless consider including MLPs in the proxy group in a future case, if the pipeline presented evidence addressing these concerns. The discussion in the order suggested that such evidence might include some method of adjusting the MLPs' distributions to make them comparable to dividends, a showing that the higher "dividend" yield of the MLP was offset by a lower long-term growth projection, or some other explanation why distributions in excess of earnings do not distort the DCF results for the MLP in question.[27] However, the Commission concluded that Kern River had not presented sufficient evidence to address these issues, and that the record in that case did not support including MLPs in the proxy group.

22. In addition, Opinion No. 486 pointed out that the traditional DCF model only incorporates growth resulting from the reinvestment of earnings, not growth arising from external sources of capital.[28] Therefore, the Commission stated that if growth forecasted for an MLP comes from external capital, it is necessary either (1) to explain why the external sources of capital do not distort the DCF results for that MLP or (2) propose an adjustment to the DCF analysis to eliminate any distortion.

2. Oil Pipeline Cases

23. In some oil pipeline rate cases decided before *HIOS* and Opinion No. 486, the Commission included MLPs in the proxy group used to determine oil pipeline return on equity on the ground that there were no corporations available for use in the oil proxy group.[29] In those cases, no party raised any issue concerning the comparability of an MLP's cash distribution to a corporation's dividend. However, that issue did arise in the first oil pipeline case decided after *HIOS* and Opinion No. 486, which involved SFPP's Sepulveda Line.[30] The Commission approved inclusion of MLPs in the proxy group in

---

[26] Opinion No. 486, 117 FERC ¶ 61,077 at P 149-150.

[27] Proposed Policy Statement at P 10-11.

[28] *Id.* at P 152.

[29] *SFPP, L .P.*, 86 FERC ¶ 61,022, at 61,099 (1999).

[30] *SFPP, L.P.*, 117 FERC ¶ 61,285 (2006) (SFPP Sepulveda Order), *rehearing pending*.

that case on the grounds that the included MLPs in question had not made distributions in excess of earnings. The order found these facts sufficient to address the concerns expressed in *HIOS* and Opinion No. 486.

D. Court Remand of Petal and HIOS

24. Both Petal and HIOS appealed the Commission's orders in their cases to the United States Court of Appeals for the District of Columbia Circuit. The court considered the appeals together, and it vacated and remanded the proxy group rulings in both cases.[31] The court emphasized that the Commission's "proxy group arrangements must be risk-appropriate."[32] The court explained that this means that firms included in the proxy group should face similar risks to the pipeline whose ROE is being determined, and any differences in risk should be recognized in determining where to place the pipeline in the proxy group range of reasonable returns.

25. The court recognized that changes in the gas pipeline industry compel a change in the Commission's traditional approach to determining the proxy group, and the court stated that "controversy about how it should change has been bubbling up in a number of recent cases," citing both *Williston II* and Opinion No. 486. But the court found that the cases on appeal "seem[] to represent an arrival point of sorts for the Commission," pointing out that Opinion No. 486 had reversed an administrative law judge for deviating from the *HIOS* proxy group.[33]

26. The court held that the Commission had not shown that the proxy group arrangements it approved in *Petal* and *HIOS* were risk-appropriate. The court pointed out that the Commission had rejected the inclusion of MLPs in the proxy group on the ground that MLP distributions, unlike dividends, might provide returns *of* equity as well as returns *on* equity. While stating that this proposition is not "self-evident," the court accepted it for the sake of argument. Nonetheless, the court stated that nothing in the Commission's decision explained why the companies selected by the Commission for inclusion in the proxy group are risk-comparable to HIOS. The court stated that when the

---

[31] *Petal Gas Storage, L.L.C. v. FERC*, 496 F.3d 695 (D.C. Cir. 2007) (*Petal v. FERC*).

[32] *Petal v. FERC*, 496 F.3d at 697, quoting *Canadian Association of Petroleum Producers v. FERC*, 254 F.3d 289 (D.C. Cir. 2001).

[33] Opinion No. 486 reversed the ALJ's inclusion of the two financially troubled pipelines in the proxy group

goal is a proxy group of comparable companies, it is not clear that natural gas companies with highly different risk profiles should be regarded as comparable.

27. The court further stated that in placing Petal and HIOS in the middle of the proxy group in terms of return on equity, the Commission expressly relied on the assumption that pipelines generally fall into a broad range of average risk as compared to other pipelines. However, the court stated, this assumption is decisive only given a proxy group composed of other pipelines. Thus, the court reasoned that if gas distribution companies generally face lower risk than gas pipelines,[34] a risk-appropriate placement would be at the high end of the group. The court stated that the Commission erred by failing to explain how its proxy group arrangements were based on the principle of relative risk.

28. Therefore, the court vacated the Commission's orders with respect to the proxy group issue. The court stated that on remand, it did not require any particular proxy group arrangement, but stated that the overall arrangement must make sense in terms of the relative risk and in terms of the statutory command to set just and reasonable rates that are commensurate with returns on investments in other enterprises having corresponding risks.

II. The Proposed Policy Statement

29. A month before the court's decision in *Petal v. FERC*, the Commission reached a similar conclusion that its proxy group arrangements for gas and oil pipelines must be reexamined. Accordingly, on July 19, 2007, the Commission issued a Proposed Policy Statement, in which it proposed to modify its policy to allow MLPs to be included in the proxy group. The Proposed Policy Statement found that:

> Cost of service ratemaking requires that firms in the proxy group be of comparable risk to the firm whose equity cost of capital is being determined in a particular rate proceeding. If the proxy group is less than clearly representative, this may require the Commission to adjust for the difference in risk by adjusting the equity cost-of-capital, a difficult undertaking requiring detailed support from the contending parties and detailed case-by-case analysis by the Commission. Expanding the proxy group to include MLPs whose business is more narrowly

---

[34] The court noted that this seems likely.

> focused on pipeline activities would help provide a more representative proxy group.[35]

30. However, the Commission proposed to cap the cash distribution used to determine an MLP's return under the DCF method at the MLP's reported earnings. The Commission found that this was necessary to exclude that portion of an MLP's distributions constituting return *of* equity. The Commission provides for the return *of* equity through a depreciation allowance. Therefore, the Commission stated that the cash flows used in the DCF analysis should be limited to those which reflect a return *on* equity. The concern was the pipeline could double recover its depreciation expense. The Commission also proposed to require a showing that the MLP has had stable earnings over a multi-year period, so as to justify a finding that it will be able to maintain the current level of cash distributions in future years. The Proposed Policy Statement found that these requirements should render the MLP's cash distribution comparable to a corporation's dividend for purposes of the DCF analysis.

31. Under the Proposed Policy Statement, the Commission would leave to individual cases the determination of which specific MLPs and corporations should be included in the proxy group. The Commission proposed to apply its final policy statement to all gas and oil cases that have not completed the hearing phase as of the date the Commission issues its final policy statement. The Commission stated that it would consider on a case-by-case basis whether to apply the final policy statement in cases that have completed the hearing phase.

III. The Record in the Policy Statement Proceeding

A. Pre-Technical Conference Comments

32. Twenty-two initial comments and thirteen reply comments were filed in response to the Proposed Policy Statement[36] and fall into two categories: (1) those of gas and oil pipelines and the related trade associations (Pipeline Interests),[37] and (2) those of gas and

---

[35] Proposed Policy Statement, 120 FERC ¶ 61,068 at P 17.

[36] Comments related to the technical conference are discussed *infra* and are characterized as conference comments or conference reply comments.

[37] The Pipeline Interests include: the Association of Oil Pipe Lines (AOPL); El Paso Corporation (El Paso); Enbridge Energy Partners, L.P. (Enbridge); the Interstate Natural Gas Association of America (INGAA); MidAmerican Energy Pipeline Group (MidAmerican); the National Association of Publicly Traded Partnerships (NAPTP);

(continued…)

oil producers and shippers, public and municipal utilities, state public service commissions, and related trade associations (Customer Interests).[38] Two comments were also submitted by individuals in their business or personal capacity.[39]

33. The comments focus on three issues: (1) whether MLPs should be included in the gas pipeline proxy group at all; (2) whether the proposed cap on the MLP cash distributions used in the DCF analysis is necessary or adequate; and (3) whether the short- and long-term growth component of the DCF model should be modified given the financial practices of MLPs. Secondary points include the potential distorting effects of: MLP tax treatment, the large payouts by MLPs, the general partner's incentive distribution rights (IDRs), and the relative returns to the limited and general partners.

34. All parties recognize that MLPs are the only available entities for inclusion in the oil pipeline proxy group. The Pipeline Interests also all assert that the Commission correctly proposed to include MLPs in the gas pipeline proxy group. In contrast, most of the Customer Interests assert that there are enough corporations available for inclusion in the gas pipeline proxy group and that there is no need to include MLPs.

35. Both the Pipeline and Customer Interests question the proposed earnings cap on MLP distributions, with the Pipeline Interests asserting the cap is unnecessary and the Customer Interests asserting the cap should be lower. The Pipeline Interests assert that an MLP's share price reflects investors' projection of all cash flows it will receive from the MLP, including distributions in excess of earnings. Therefore, any cap on the

---

Panhandle Energy Pipelines (Panhandle); Spectra Energy Transmission, LLC (Spectra); TransCanada Corporation (TransCanada); and Williston Basin Interstate Pipeline Company (Williston).

[38] The Customer Interests include: the American Gas Association (AGA); the America Public Gas Association (APGA); the Air Transport Association of America; the Canadian Association of Petroleum Producers (CAPP); Indicated Shippers (consisting of Area Energy, LLC, Anadarko E&P Company LP, Anadarko Petroleum Corporation, Chevron USA Inc., Coral Energy Resources LP, Occidental Energy Marketing Inc., and Shell Rocky Mountain Production, LLC); the Natural Gas Supply Association (NGSA); the Process Gas Consumers Group; the Public Service Commission of New York (PSCNY); Tesoro Refining and Marketing Company (Tesoro); the Northern Municipal Distributors Group (NMDG) and the Midwest Region Gas Task Force Association filing jointly; and the Society for the Preservation of Oil Shippers (Society).

[39] The individual comments include Crowley Energy Consulting, supporting the Customer Interests, and Barry Gleicher, supporting the Pipeline Interests.

distributions while still using a dividend yield reflecting the full share price would lead to distorted results.[40] The Customer Interests agree that the adjustment to MLP distributions is necessary to remove a double count attributed to depreciation, but they also uniformly assert that the proposed adjustment is inadequate to compensate for a wide range of financial factors that distinguish MLPs from Schedule C corporations.

36. On the growth rate issue, the Pipeline Interests in their initial comments generally agree that, if MLPs have greater distributions than a corporation, then the MLP may have less growth potential than a corporation. However, they argue that this fact does not require any additional adjustment, since any lower growth potential would be reflected in a reduced IBES growth forecast. The Pipeline Interests also state that distributions in excess of earnings do not prevent reinvestment or organic growth. They assert that pipeline MLPs have ready access to capital markets given their stable cash flows and the projected expansion of the pipeline system, which can be the basis for organic growth.[41]

37. In contrast, the Customer Interests assert that MLPs have significantly lower growth potential than corporations due to their distributions in excess of earnings, particularly over the long term.[42] They cite studies by established investment firms suggesting that the long term growth potential of MLPs is less than the long term growth factor now included in the DCF model. Moreover, they argue that given the high level of MLP distributions and declining opportunities for acquisitions with high returns, MLP growth must now come from investment of external funds in projects that will enhance organic growth of existing business lines.[43]

38. Some of the Customer Interests further argue that there are inadequate investment opportunities to support capital investment, and in the relatively near future the present level of MLP distributions will be maintained only by borrowing or issuing additional

---

[40] AOPL initial comments at 8, 10; INGAA initial comments at 13-14; Spectra initial comments at 4; NAPTP initial comments at 4.

[41] AOPL comments at 21-24 and attachments; Enbridge Energy reply comments at 5; INGAA comments at 22-24; TransCanada reply comments at 8-10.

[42] APGA reply comments at 11-15; CAPP initial comments at 1; CAPP reply comments at 6-7, and attachment at 3-4; NYPSC initial comments at 19-21, 23, including attachments of financial materials from major investment houses; NYPSC reply comments at 4-7; Tesoro reply comments at 25-27.

[43] *Id.*

limited partners' units.[44] Therefore, they argue, sustainability of MLP growth is a major issue that must be examined in rate proceedings as this implies a lower equity cost-of-capital component in the pipeline's rate structure.[45] The Customer Interests also assert that the Commission's traditional DCF model has never permitted the inclusion of externally generated funds in the growth component of the model. Thus, to the extent the IBES projections include such external funds, they assert that this compromises the forecasts.

39. Finally, NGSA urge the Commission to initiate a new proceeding to consider alternatives to the DCF methodology for determining gas pipeline ROEs. AGA requests a technical conference to discuss the issues further, which as noted, the Commission granted with regard to the growth factors.[46] Two commenters assert that any change in policy should apply prospectively and should not apply to proceedings for which the hearing record is completed, e.g., the *Kern River* proceeding.[47]

B. Technical Conference and Post-Technical Conference Comments

40. After review of the initial comments summarized above, the Commission issued a supplemental notice on November 15, 2007, requesting additional comments solely on the issue of MLP growth rates, and establishing a technical conference to discuss that issue. The technical conference was held on January 23, 2008. The Commission concluded that supplementing the record before the Commission could resolve the issue of how to project MLP growth rates assuming that the Commission ultimately decides to permit the use of MLPs in the proxy group. The Commission focused the technical conference on the appropriate method for determining MLP growth and, in particular, that which should be used if the Commission did not cap the distributions used to determine the dividend yield. Thus, whether to include MLPs in the proxy group or to limit the distributions to earnings were not issues before the technical conference. The technical conference was transcribed for use in the record herein.

41. Thirteen parties submitted comments in response to the November 15 notice, on three main topics: (1) the short-term growth component; (2) the long-term growth

---

[44] Crowley Energy Consultant initial comments; Society at 5-6.

[45] *Id.*

[46] AGA initial comments at 8.

[47] *Id.* at 8, 25; NGSA initial comments at 3, 11.

component; and (3) the weighting of these two components.[48] Of these, eight parties requested to participate on the panels and the Commission accepted all of the individuals proffered by these parties.[49] To summarize, two of the panelists represented parties that continued to assert that MLPs should not be included in the ROE proxy group.[50] More consistent with the premise of the conference, three panelists stated that there needed to be an adjustment to the long term GDP component the Commission currently uses in its DCF model.[51] Two stated that MLPs would grow at a slower rate than corporations in the long-term phase of growth. However, six other panelists asserted that an MLP as a whole could grow as fast as a corporation in the terminal phase, but most conceded that the use of an incentive distribution rights (IDRs)[52] would cause the limited partnership interests to grow at slower rate than the MLP as a whole.[53] In addition, three panelists questioned the reliability of the IBES forecasts for use in developing the short- term

---

[48] APGA, AOPL, CAPP, Enbridge, INGAA, MidAmerica, NAPTP, NGSA, PSNYC, State of Alaska, Tesoro, TransCanada, and Williston.

[49] Professor J. Peter Williamson on behalf of the Association of Oil Pipelines, Mr. J. Bertram Solomon on behalf of the American Public Gas Association, Mr. Michael J. Vilbert on behalf of the Interstate Natural Gas Association of America, Mr. Park Shaper and Mr. Yves Siegel on behalf of the National Association of Publicly Traded Partnerships, Mr. Patrick Barry on behalf of the Public Service Commission of New York, Mr. Thomas Horst on behalf of the State of Alaska, and Mr. Paul Moul on behalf of TransCanada Corporation.

[50] PSCNY and APGA. CAPP, NGSA, and Tesoro supported this position but did not participate on the panel.

[51] PSCNY, APGA, and State of Alaska as well as the NGSA.

[52] As discussed further below, an incentive distribution provision in an MLP partnership agreement provides for an increasing large percentage of distributions to the general partner as the cash distributions per limited partnership share increase over time. The maximum incentive distribution to the general partner varies with the partnership agreement, but may be as high as 47 percent. .

[53] Two spoke for NAPTP and one each for AOPL, INGAA, the State of Alaska, and TransCanada. Williston, Enbridge, and MidAmerican also asserted that there is no reason to conclude the growth would not at least equal GDP. They did not speak to the issue of the limited partner growth rate that might be lower as a result of the incentive distributions to the general partner.

projection[54] and one stated that the longer term growth component of the formula should be weighted at no greater than 10 percent.[55]

IV. Discussion

42. Based on its review of all the comments and the record of the technical conference, the Commission is adopting the following policy concerning the composition of the natural gas pipeline and oil pipeline proxy groups: (1) consistent with the Proposed Policy Statement, the Commission will permit MLPs to be included in the proxy group for both gas and oil pipelines; (2) the proposed earnings cap on the MLPs' distributions will not be adopted; and (3) the Commission will use the same DCF analysis for MLPs as for corporations, except that the long-term growth projection for MLPs shall be 50 percent of projected growth in GDP.

A. Whether to Include MLPs in the Gas and Oil Pipeline Proxy Groups

1. Comments

43. The first issue is whether to include MLPs in the proxy group used to determine a pipeline's return on equity. No commenter contests the Commission's statement that, in oil pipeline proceedings, MLPs are the only firms available for inclusion in the proxy group.[56] In addition, the Pipeline Interests all assert that the Commission correctly proposed to include MLPs in the gas pipeline proxy group. They agree with the Commission that this will result in a more representative proxy group that reflects long-term trends within the gas pipeline industry and assert that the resulting returns will encourage further investment in both the gas and oil pipeline industries. Including MLPs in the proxy group would reduce the need for difficult adjustments to projected equity returns to accommodate differences in risk among the different types of firms that might reasonably be included in the proxy group.

44. In contrast, most of the commenters representing the Customer Interests assert that there are enough corporations available for inclusion in the gas pipeline proxy group that there is no need to include MLPs. They further argue that the differences between the

---

[54] APGA, PSCNY, and State of Alaska.

[55] TransCanada, Additional Comments dated December 21 at 12.

[56] AOPL initial comments at 5. Tesoro initial comments at 2. *See also* Society initial comments addressing the possible inclusion oil pipeline MLPs in the proxy group.

MLP and corporate business model render any use of MLPs inconsistent with the DCF model. APGA expressly states that the Commission should abandon the Proposed Policy Statement.[57]

45. The NMDG asserts that the Commission has not established that there is any reason to issue the Policy Statement or to relieve a pipeline applicant of the burden of establishing why any MLPs should be included in the proxy group. In this vein, Indicated Shippers assert that the Commission should consider alternative procedures for defining the proxy group, and that the improvement in El Paso Natural Corporation's and the William Company's financial situation and the creation of the Spectra Group suggest that the corporate gas proxy group is becoming more representative.

46. Finally, NGSA urges the Commission to initiate a new proceeding to consider alternatives to the DCF methodology for determining gas pipeline ROEs. NGSA generally supports including MLPs in the proxy group, subject to adjustments, as a means of continuing to use the DCF method on a temporary basis. But it argues that a better long-term solution to determining gas pipeline ROEs would be to stop using the DCF method, and instead adopt a risk premium approach to determining ROE. It asserts that the risk premium approach is used in Canada and does not require adjustments to account for variations in corporate structure.[58] INGAA states in its reply comments that the DCF methodology is not necessarily the only financial model that may be used, and asks the Commission to clarify that parties may propose other approaches in individual rate cases.[59]

2. Discussion

47. As the Commission pointed out in the proposed policy statement, the Supreme Court has held that "the return to the equity owner should be commensurate with the return on investment in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital."[60] In order to attract capital, "a utility must offer a risk-adjusted expected rate of return sufficient to attract

---

[57] APGA initial comments at 14.

[58] NGSA initial comments at 13-15.

[59] INGAA reply comments at 18.

[60] *FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 603 (1044).

investors."[61] In other words, the utility must compete in the equity markets to obtain capital.

48. The Commission performs a DCF analysis of publicly-traded proxy firms to determine the return on equity that markets require a pipeline to give its investors in order for them to invest their capital in the pipeline. As the court explained in *Petal Gas Storage, L.L.C. v. FERC*, the purpose of the proxy group is to "provide market-determined stock and dividend figures from public companies comparable to a target company for which those figures are unavailable. Market-determined stock figures reflect a company's risk level and when combined with dividend values, permit calculation of the 'risk-adjusted expected rate of return sufficient to attract investors.'"[62] It is thus crucial that the firms in the proxy group be comparable to the regulated firm whose rate is being determined. In other words, as the court emphasized in *Petal*, the proxy group must be "risk-appropriate."[63]

49. The Commission continues to believe that including MLPs in the gas and oil proxy groups will, as required by *Petal*, make those proxy groups more representative of the business risks of the regulated firm whose rates are at issue. While there has been some modest expansion of the number of publicly-traded diversified natural gas companies that could be included in the proxy group, this does not change one basic fact. This is that more and more gas pipeline assets are being transferred to publicly-traded MLPs, whose business is narrowly focused on pipeline activities. As a result, these MLPs are likely to be more representative of predominantly pipeline firms than the diversified gas corporations still available for inclusion in a proxy group. As such, including MLPs in the gas pipeline proxy group should render the proxy group more "risk-appropriate," consistent with *Petal*. Moreover, MLPs are the only publicly traded ownership form for oil pipelines and are the most representative group for determining the equity cost of capital for oil pipelines.

50. As the court also emphasized in *Petal*, when a proxy group is less than clearly representative, there may be a need for the Commission to adjust for the difference in risk by adjusting the equity cost-of-capital, a difficult undertaking requiring detailed support from the contending parties and detailed case-by-case analysis by the Commission.

---

[61] *CAPP*, 254 F.3d at 293.

[62] *Petal*, 496 F.3d at 697, quoting *Canadian Association of Petroleum Producers v. FERC*, 254 F.3d 289 (D.C. Cir. 2001).

[63] *Id.* 6.

Expanding a proxy group to include MLPs whose business is more narrowly focused on pipeline activities should help minimize the need to make adjustments, because the proxy group should be more representative of the regulated firms whose rates are at issue.

51. While this Policy Statement modifies Commission policy to permit MLPs to be included in the proxy group, the Commission is making no findings at this time as to which particular corporations and/or MLPs should be included in the gas or oil proxy groups. The Commission leaves that determination to each individual rate case. In order to assist the Commission in determining the most representative possible proxy group in those cases, the parties and other participants should provide as much information as possible regarding the business activities of each firm they propose to include in the proxy group, including their recent annual SEC filings and investor service analyses of the firms. This information should help the Commission determine whether the interstate natural gas or oil pipeline business is a primary focus of the firm and whether investors view an investment in the firm as essentially an investment in that business. While the Commission is not precluding use of diversified corporations or MLPs in the proxy group, the probable difference in the risk of the natural gas pipeline business and the risk profile of a diversified gas corporation with substantial local distribution activities has been highlighted by the parties and specifically recognized by the court in *Petal*.[64]

52. As discussed further below, the Commission recognizes that there are significant differences in the cash flows to investors and growth rates of corporations and MLPs. However, as discussed below, the Commission believes that those issues may be accounted for in a correctly performed DCF analysis, and therefore these differences do not preclude inclusion of MLPs in the proxy group.

53. Finally, the Commission has concluded that it will not explore other methods of determining the equity cost of capital at this time. The DCF model is a well established method of determining the equity cost of capital,[65] and other methods such as the risk premium model have not been used by the Commission for almost two decades. In the Commission’s judgment, the uncertainty that would be created by reopening its procedures to include other approaches outweighs any limitations in its current pragmatic

---

[64] *Id.* at 6-7.

[65] *See Illinois Bell Telephone Co. v. FCC*, 988 F.2d 1254, 1259 n. 6 (D.C. Cir. 1993), stating, “The DCF method ‘has become the most popular technique of estimating the cost of equity, and it is generally accepted by most commissions. Virtually all cost of capital witnesses use this method, and most of them consider it their primary technique.’” *quoting J. Bonbright et al., Principles of Public Utility Regulation* 318 (2d ed. 1988).

approach to the financial characteristics of MLPs. Therefore the alternatives suggested by certain of the parties will not be pursued further here. Nothing submitted at the January 23rd technical conference warrants different conclusions.

B. The Proposed Adjustment to MLP Cash Distributions

1. Comments

54. Both the Pipeline and Customer Interests attack the proposed earnings cap on MLP distributions, with the Pipeline Interests asserting the cap is unnecessary and the Customer Interests asserting the cap should be lower. The Pipeline Interests assert that there is no need to adjust the distributions included in the DCF model. They argue that investors include all cash flows that are generated by an MLP in applying a DCF model and do not distinguish between a return of investment and a return on investment[66] since depreciation is an accounting concept that is used to calculate an MLP's earnings that is not relevant to determining the cash flows included in a DCF analysis.[67] The Pipeline Interests further assert that an unadjusted DCF calculation does not result in the double recovery of the depreciation component of an MLP's cost-of-service.[68]

55. Moreover, the Pipeline Interests assert that, because all parts of the DCF model are linked, if the distribution component is reduced, this will necessarily affect the growth component of the model. They assert that any adjustment limiting the distributions used to earnings will result in below market returns to investors and thus any such adjustment is arbitrary.[69] As an alternative, they suggest that if an MLP's distributions are unrepresentative, it is wiser to exclude that MLP from the sample as an outlier.[70] They further assert there have been corporations in the proxy group that have distributed

---

[66] AOPL initial comments at 16, 18; Spectra Energy initial comments at 14; NAPTP initial comments at 3.

[67] INGAA initial comments at 5-6, 15-18; NAPTP initial comments at 4-5; MidAmerican initial comments at 5; Panhandle initial comments at 3 and attachment; Williston initial comments at 11.

[68] INGAA initial comments at 15-17 and 20-21.

[69] AOPL initial comments at 8, 10; INGAA initial comments at 13-14; Spectra initial comments at 4; PAPTP initial comments at 4.

[70] INGAA initial comments at 13; Spectra Energy initial comments at 5, 19-20.

dividends in excess of earnings for years and the Commission has never required an adjustment.[71] They claim that in any event there are practical problems with an earnings cap because earnings are reported quarterly (unlike distributions which are reported monthly) and such reports are unedited and may require seasonal adjustments.[72]

56. The Customer Interests support the Commission's initial conclusion that an adjustment to MLP distributions is necessary to remove a double count attributed to depreciation, but they also uniformly assert that the proposed adjustment is inadequate to compensate for a wide range of financial factors that distinguish MLPs from Schedule C corporations. Thus, they assert that further adjustments to the distributions should be made to reflect the tax advantages that flow to MLPs,[73] the alleged distortions that result from incentive distributions to the general partner,[74] and the fact that distributions may also include cash derived from the sale of assets, bond issues, and the issuance of further limited partnership units.[75] Several also assert that for an MLP's distribution to be comparable to that of a corporation, the percentage of the MLP's distribution included in the DCF model should be no higher than the percentage of earnings corporations typically include in their dividend payments, or about 60 percent.[76] Finally, to the extent that INGAA and others assert that depreciation is not a direct source of cash flow for distribution, the Customer Interests cite to investor literature and MLP filings with the SEC disclosure that state exactly the opposite.[77]

---

[71] INGAA initial comments at 18; MidAmerica initial comments at 6.

[72] AOPL initial comments at 24-25; Spectra Energy initial comments at 17-18.

[73] Crowley Energy at 2; Indicated Shippers initial comments at 24; PSCNY initial comments at 12-13; Society initial comments, *passim*.

[74] APGA at 7-8; Crowley Energy at 2; Indicated Shippers comments at 24; NGSA at 6; Society initial comments *passim*.

[75] Crowley Energy initial comments; Society, *passim*; Tesoro reply comments at 26.

[76] CAPP initial comments at 3, 6; Indicated Shippers initial comments at 23; PSCNY initial comments at 6; Tesoro initial comments at 15.

[77] APGA initial comments at 11; CAPP reply comments at 3-4; NGSA reply comments at 9-10; Tesoro reply comments at 19-21.

2. Discussion

57. The Commission concludes that a proposed earnings cap on the MLP distributions that would be included in the DCF model should not be adopted. On further review, the Commission concludes that its concern with the distinction between return *on* capital and return *of* capital improperly conflates cost-of-service rate-making techniques with the market-driven DCF method used for determining the pipeline's cost of obtaining capital in the equity markets. This is inconsistent with the DCF model's internal structure.

58. The fundamental premise of the DCF model is that a firm's stock price should equal the present value of its future cash flows, discounted at a market rate commensurate with the stock's risk. No commenter seriously contends that an investor would distinguish between cash flows attributable to return *on* capital, and those attributable to return *of* capital, in performing a DCF analysis. In short, under the DCF model, all cash flows, whatever their source, contribute to the value of stock. The Commission agrees that, since the DCF model uses the total unadjusted cash flows to determine a stock's value, it is theoretically inconsistent to use lower adjusted cash flows when using the DCF model to determine the return required by investors purchasing the stock.

59. More specifically, the investor first determines what risk should be attributed to a prospective investment and the related return that would be required in order to make the investment. For example, the investor may conclude that the minimum return from the investment must be 10 percent on equity. The investor then looks at the total cash flows from all sources over time, including the current distribution (or dividend) and its projected growth. The DCF model yields a price for the share that reflects the present value of those cash flows at the discount rate.

60. In contrast, the Commission solves the DCF formula for the return required by the investor, not the price of the stock. This results in the Commission calculating the proxy firm's ROE as the sum of (1) the proxy firm's dividend yield and (2) the projected growth rate. The Commission determines dividend yield by dividing the proxy firm's cash distribution (or dividend) by its current stock price. As the court in *Petal* pointed out, both the stock price and distribution (or dividend) figures of the proxy firms are market-determined. Moreover, an investor's projection of the MLP's growth prospects would be affected by the actual level of its distributions, with distributions in excess of earnings generally perceived as reducing the growth projection because less cash flow is available for reinvestment in the firm.[78] The pipeline industry generally acknowledged

---

[78] Because a corporation typically retains a portion of its earnings, general financial theory suggests that it is able to use internally generated funds to obtain a higher growth rate. An MLP's higher level of distributions theoretically produces a lower projected growth rate. In fact, the most recent IBES projections for the four corporations

(continued…)

this fact in earlier rate proceedings as well as in this proceeding, or at least until its later phases.[79] As illustrated in Appendix B to this Policy Statement, a DCF analysis using market-determined inputs for each of the variables in the DCF formula appropriately determines, consistent with *Petal*, the percentage return on equity a pipeline must offer in the equity market in order to attract investors, whether the proxy firms are corporations or MLPs.

61. If the Commission were to cap the distribution used to determine an MLP's dividend yield at below the market-determined level, but use the actual market price of the MLP's publicly traded units and a growth projection reflecting the actual level of distributions, the DCF analysis would fail to achieve its intended purpose of determining the return the equity market requires in order to justify an investment in the pipeline. That is because there would be a mismatch among the inputs the Commission used for the variables in the DCF formula. The DCF analysis presumes that the market value of an MLP's units is a function of the entire present and future cash flow provided by an investment in those units. Given this interlocking nature of the variables in the DCF formula, INGAA and the other pipeline commenters are correct that limiting the distribution input to earnings, while using market values for the other inputs to the DCF formula, would result in the calculation of a return below that implied in the share price.[80]

---

included in the gas pipeline proxy group in Appendix A average 10.5 percent, while the IBES growth projections for the six MLPs average only 6.67 percent.

[79] *See* AOPL Initial Comments, Williamson Aff. at 6-7; AOPL Reply Comments at 6-7; Panhandle Initial Comments, Attachment dated August 30, 2007, *Analysis of the Use of MLPs in the Group of Proxy Companies Used For Determining Gas and Oil Pipeline Return on Equity* at 10-11; *Transwestern Pipeline Company, LLC*, Docket No. RP06-614-000, Ex. TW-56 filed September 29, 2006, at 23-24; *High Island Offshore System, L.L.C.*, Docket No. RP96-540-000, Ex. HIO-73 filed August 26, 2006 at 28-29; *Texaco Refining and Marketing Inc, et al. v. SFPP, L.P.*, Docket No. OR96-2-012, Ex. SEP SFPP-56 dated February 14, 2005 at 9-10; *Mojave Pipeline Company*, Docket No. RP07-310-000, Ex. MPC-70 dated February 2, 2007 at 28-32 (including tables and charts on the relative growth rates of corporations and MLPs); *Kern River Gas Transmission Company*, Docket No. RP04-274-000, Ex. KR-107 at 17.

[80] The earnings cap on the distribution would artificially reduce an MLP's dividend yield below that assumed by the investor in valuing the stock. Adding the artificially reduced dividend yield to a growth projection that reflects the MLP's reduced growth prospects due to its high actual distributions would inevitably result in an ROE lower than that actually required by the market.

62. In addition, use of a proxy MLP’s full distribution in determining ROE will not cause a double recovery of the depreciation component included in the pipeline’s cost-of-service rates. In a rate case, the Commission determines the dollar amount of the ROE component of the cost-of-service of the pipeline filing the rate case by multiplying (1) the percentage return on equity required by the market by (2) the actual rate base of the pipeline in question. Having found that use of a proxy MLP’s full distribution is necessary for the DCF analysis to accurately determine the percentage return on equity required by the equity markets, it necessarily follows that the same percentage should be used in determining the dollar amount of the ROE component of the pipeline’s cost of service. Awarding the pipeline an ROE allowance based on that percentage of its own rate base will give the pipeline an opportunity to provide its investors with the return on their investment required by the market. Such an ROE allowance does not implicate the separate depreciation allowance the Commission also includes in a pipeline’s cost of service to provide for return of investment.

63. The Commission therefore concludes that it is not analytically sound to cap the distributions to be included in the DCF model by the MLP’s earnings. As discussed below, the record is more convincing that if any adjustment is required, this issue centers on the projected growth of the MLPs. Given this, it is not necessary to discuss the appropriate level for any earnings cap.

64. Having concluded that an earnings cap adjustment would be inappropriate, the Commission also concludes that it is not necessary to address the long term sustainability of MLPs as a whole, or those of the particular MLP whose rates are under review. As has been discussed, the DCF model has two components. One is the cash distribution in the current period and the second is the discounted value of the anticipated growth in that distribution. The increase in distribution is driven by the anticipated growth in earnings that generates the cash to be used for the distribution. If projected earnings suggest that the distribution cannot be sustained, this will be reflected in the projected cash flow for the firm and ultimately the MLP unit price.[81] In this regard, some MLPs will inevitably do better and others not as well, and from the Commission’s point of view, this will be reflected in the required rate of return developed by the DCF model.

65. For this reason, as the Pipeline Interests suggest, if an MLP’s financial condition or growth rate is outside the norm for the industry, or is unrepresentative, the best way to deal with this issue is to exclude that particular MLP from the proxy group sample, just

---

[81] The investor requires a minimum return that reflects the perceived risk of the investment. Thus, if the cash flows decline, so will the price of the stock assuming the percentage return required remains the same.

as the Commission has done with unrepresentative diversified gas corporations. Finally, the Commission has previously held that the issue of whether MLPs are an appropriate investment vehicle for the pipeline industry as a whole is a matter that is best left for Congress, the body that authorized MLPs in the first instance. Thus the Commission will not address that issue, or the appropriateness of the tax deferral aspects of MLPs further in this proceeding.[82] Nothing presented at the technical conference warrants different conclusions.

66. The Commission now turns to the issue of how to project the growth rates of MLPs. For the reasons discussed below, the Commission finds that the differences between MLPs and corporations, and particularly the MLPs' lower growth prospects due to their distributions in excess of earnings, are appropriately accounted for in the growth projection component of the DCF model.

C. The Short Term Growth Component

67. This section of the Policy Statement discusses whether changes should be made to the short-term growth component of the DCF model. For the short-term growth estimate the Commission currently uses security analysts' five-year forecasts for each company in the proxy group, as published by IBES. IBES is a service that monitors the earnings estimates on over 18,000 companies of interest to institutional investors. More than 850 firms contribute data to IBES to be used in its projections and the information is provided on a subscription basis.

1. Comments

68. The Pipeline Interests support the continued use of five-year IBES forecasts for short-term growth projections in the DCF model with regard to MLPs. In general, they argue that, while no growth forecast is perfect, IBES provides the best available information regarding what investors expect in companies. They state that IBES estimates are unbiased and publicly available. They add that since IBES estimates are company-specific, they already adjust for any differences among the entities analyzed, including whether the company is organized as an MLP or corporation.

---

[82] *See SFPP, L.P.*, 121 FERC ¶ 61,240, at P 20-61 (2007) for an extensive discussion of these income tax allowance and tax deferral policy issues relating to MLPs. Moreover, any tax advantages are normally reflected in the MLP unit price. See also INGAA Reply Comments at 12-13; MidAmerica, Reply Comments at 4-5; AOPL Reply Comments at 11-12; Tr.121-22; AOPL Post-Technical Conference Comments at 14.

69. For example, NAPTP supports the IBES estimates because the various items that may affect the growth rate expected by the market, such as the effect of IDRs to the general partner, are already factored into IBES projections.[83] Williston Basin argues that since IBES data is drawn from many financial analysts, and since the information is widely accepted in the financial industry, use of IBES helps reduce subjectivity when estimating appropriate short-term growth forecasts.[84] TransCanada acknowledges that IBES may underestimate short-term growth for MLPs, but argues that modifying IBES would only further understate short-term growth rates and compound any problems brought on by trying to estimate growth for MLPs.[85] The AOPL similarly argues that studies have shown that IBES estimates understate short-term growth rates for MLPs and therefore the growth projections are conservative.[86]

70. However, certain parties recommend that the Commission discontinue using IBES estimates for MLPs to project short-term growth rates in its DCF model. These parties argue there is considerable uncertainty of whether the individual forecasts IBES is reporting reflect earnings growth or distribution growth. The State of Alaska asserts that IBES growth estimates of distributions per share are incomplete and unreliable for use in the DCF calculation. It argues that there are not a sufficient number of stock analysts providing IBES with distribution per share growth estimates to get a reliable estimate for the purposes of calculating the cost of equity for pipeline companies. Speaking for the State of Alaska, Dr. Thomas Horst notes that of the 37 gas and oil companies he examined data for, there was not a single case where IBES received two or more estimates of distributions per share growth rates.[87]

71. APGA states that through communications with personnel at Thompson Financial, the owner of IBES and the publisher of its forecasts, it verified that the five-year analysts' growth rate projections reported by IBES for MLPs are projections of earnings per unit, and not distributions per unit.[88] PSCNY also considers IBES projections unreliable, since

---

[83] NAPTP, Initial Technical Conference Comments at 3.

[84] Williston, Additional Comments dated December 21 at 2.

[85] TransCanada, Additional Comments dated December 21 at 12-13.

[86] AOPL, Initial Technical Conference Comments at 5, Williamson Post-Technical Conference Aff. at 3, 8.

[87] State of Alaska, Reply Comments dated February 20 at 5.

[88] APGA, Reply Technical Conference Comments at 5-6.

they do not account for such parameters as IDRs. It questions whether analysts can truly estimate MLP growth beyond two years. It also questions whether lower earnings retention necessarily would translate into lower short-term IBES growth rates relative to corporations.[89] CAPP expresses concerns that the analysts that produce IBES growth estimates continue to be concentrated within the same financial institutions that also underwrite the securities of the subject companies, invest in those securities, and furnish other financial services to the subject enterprises[90] and also notes the uncertainty of whether the forecasts are for earnings or distributions.[91]

72. However AOPL maintains that historical records confirm that what analysts actually report to IBES is distribution growth. It adds that Yves Siegel, Wachovia's representative, confirmed that Wachovia provides projected MLP distribution growth to IBES, and not earnings growth.[92] NAPTP asserts that, for projecting the short-term growth rates of MLPs, the Commission should use analysts forecasts of growth in the MLP's distributable cash flow for all of its equity holders and that, while not perfect, this is the best information that is available.[93]

2. <u>Discussion</u>

73. The Commission's longstanding policy is to use security analysts' five-year growth forecasts as reported by IBES to determine the short-term growth rates for each proxy company. In *Opinion No 414-A*,[94] the Commission explained that the growth rate to be used in the DCF model is the growth rate expected by the market. Thus, the Commission seeks to base its growth projections on "the best evidence of the growth rates actually expected by the investment community."[95] Moreover, the Commission stated, the growth rate expected by the investment community is not, quoting a Transco witness, "necessarily a correct growth forecast; the market may be wrong. But the cost of

---

[89] NYPSC Initial Technical Conference Comments at 5-6.

[90] CAPP Supplemental Comments dated December 21 at 3-4.

[91] CAPP Initial Technical Conference Comments at 7.

[92] AOPL Initial Technical Conference Comments at 4-5.

[93] NAPTP Post-Technical Conference Comments at 1-3.

[94] 85 FERC ¶ 61,323 at 62,268-9.

[95] *Id.* at 62,269.

common equity to a regulated enterprise depends upon what the market expects not upon precisely what is going to happen."[96]

74. The Commission held that the IBES five-year growth forecasts for each company in the proxy group are the best available evidence of the short-term growth rates expected by the investment community. It cited evidence that (1) those forecasts are provided to IBES by professional security analysts, (2) IBES reports the forecast for each firm as a service to investors, and (3) the IBES reports are well known in the investment community and used by investors. The Commission has also rejected the suggestion that the IBES analysts are biased and stated that "in fact the analysts have a significant incentive to make their analyses as accurate as possible to meet the needs of their clients since those investors will not utilize brokerage firms whose analysts repeatedly overstate the growth potential of companies."[97]

75. Based on the comments, the Commission concludes that the IBES five-year growth forecasts should also be used for any MLP included in the proxy group. While the Commission recognizes that there may be some statistical limitations to the IBES projections, the record here demonstrates that it remains the best and most reliable source of growth information available. IBES publishes security analysts' five-year growth forecasts for MLPs in the same manner as for corporations. No party questions the Commission's findings in past cases that investors rely on the IBES projections in making investment decisions, because they are widely available and generally reflect the input of a number of financial analysts. Also, since IBES projections are company-specific, they should already adjust for any differences among the entities analyzed, including any reduced growth prospects investors expect due to the fact an MLP makes distributions in excess of earnings. In fact, the most recent IBES projections for the seven MLPs included in the gas pipeline proxy group in Appendix A, Table 1, average 6.86 percent, while the IBES growth projections for the four corporations average of 10.75 percent. Thus, those MLP growth projections are about 400 basis points below those for the corporations.

76. As discussed above, several parties assert that the security analysts' five-year growth forecasts appear generally to be forecasts of growth in earnings, rather than distributions. They point out that the relevant cash flows for the DCF model are the MLP's distributions to the limited partners, and therefore the growth projections used in the DCF analysis should be growth in distributions, not earnings. Despite these concerns, the Commission again concludes that the IBES short-term growth projections provide the

---

[96] *Id.*

[97] *Transcontinental Gas Pipe Line Corp.*, 90 FERC ¶ 61,279, at 61,932 (2000).

best estimate of short-term growth rates for MLP distributions. Professor J. Peter Williamson, on behalf of AOPL, reviewed historical IBES five-year growth forecasts for five oil pipeline MLPs since the mid-1990s. IBES had published five to nine growth forecasts for each the MLPs, with a total of 39 forecasts. Williamson compared each of these 39 forecasts to the MLP's actual growth in earnings and distributions during the subsequent five-year period. He found that 29 of the 39 IBES five-year forecasts, or 74 percent, were closer to the actual average distribution growths over that time span than the actual earnings growths. In his study, Williamson also found that historical records fail to support any claims that the IBES forecasts are biased or tend to overstate future growth.[98] In fact, 22 of the 39 forecasts were lower than the actual distribution growth, and 17 were higher. Thus, far from showing a pattern of overestimating actual growth in distributions, the IBES growth projections underestimated growth in distributions 56 percent of the time, a conservative result. Accordingly, regardless of whether financial analysts stated they are reporting projected earnings growth or projected distribution growth for MLPs, the Commission finds the five-year growth rates that IBES reports are acceptable since they closely approximate distribution growth for MLPs, which is the short-term input for the DCF model.

77. As noted, the State of Alaska expresses concerns that there are an insufficient number of stock analysts providing IBES with estimates which are expressly identified at forecasts of MLP distribution per share growth to obtain reliable short-term growth projections for MLPs. At the technical conference, Mr. Horst presented a chart showing the number of IBES report counts for 37 oil and gas pipeline companies – both corporations and MLPs. The chart breaks the analyst report counts down into earnings reports and distribution reports. It shows that analysts made an average of 3.1 earnings reports for each MLP and an average of 0.8 distribution reports for each MLP.[99] However, as discussed above, Williamson's analysis of a historical period suggests that actual MLP growth in the short term tracks IBES earnings projections better than distribution projections. Moreover, Mr. Horst's averages include many smaller, less frequently traded MLPs and thus understate the number of analysts that are likely to follow the larger, more established pipeline MLPs likely to be included in a proxy group. The Commission therefore concludes that the number of reports made by analysts for oil and gas companies MLPs is acceptable for use in the DCF model.

---

[98] AOPL, Post-Technical Conference Comments, Williamson Aff. at 2-6.

[99] State of Alaska, Comments dated December 21, Second Horst Aff. at 4-5; Reply Comments dated February 20 at 5, Third Horst Aff. at 16-17, 21.

78. Some of the Customer Interests are agreeable to the continued use of IBES forecasts, but only under certain conditions. Specifically, PSCNY contends that, should the Commission continue to use IBES forecasts in its DCF model, any MLP the Commission allows in a proxy group must be market-tested and representative of a natural gas pipeline company. PSCNY contends that IBES would be acceptable if the MLP is tracked by Value Line, has been in operation for at least five years as an MLP, and derives 50-percent of its operating income from, or has 50 percent of its assets devoted to, interstate natural gas transportation operations. PSCNY also contends that the Commission should exclude MLPs from proxy groups when their growth projections are illogical or anomalous.[100]

79. The Commission agrees in principle with PSCNY's position that IBES forecasts should only be used for an MLP that is tracked by Value Line, has been in operation for at least five years as an MLP, and derives at least 50 percent of its operating income from, or 50 percent of its assets devoted to, interstate operations. Thus, when developing its proxy group, a pipeline should select MLPs that are well established and have assets that are predominantly gas and oil pipelines. Such pipelines are those most likely to have risk comparable to the pipeline seeking to justify its rates. However, there may be particular MLPs that do not satisfy these criteria, but are still appropriate for inclusion in the proxy group. The pipeline must justify including such an MLP in its proxy group. Thus, while the Commission encourages pipelines to follow the guidelines suggested by PSCNY, it will not make them a condition of including a particular MLP in the proxy group. As suggested by the parties, the Commission will continue to exclude an MLP from the proxy groups if its growth projection is illogical or anomalous.

80. Two parties state that, should the Commission continue to use IBES projections to estimate short-term growth rates in its DCF model for MLPs, it must modify the estimated rates. Tesoro states that, if the Commission makes no adjustments to dividend distributions of MLPs, it should significantly reduce its IBES short-term growth estimates to recognize the fact that an MLP cannot indefinitely sustain its operations when distributions consistently exceed earnings. It argues that, if the Commission caps MLP distributions at earnings, it would still have to reduce IBES rates in order to recognize the fact that proxy group members would not be reinvesting retained earnings in ongoing operations, thereby achieving lower growth rates. Tesoro only recommends no adjustments to short-term growth estimates if the Commission caps distributions at a level below earnings, offering 65-percent of earnings as an example.[101]

---

[100] PSCNY Supplemental Comments dated Dec. 21 at 3-5.

[101] Tesoro, Comments on Growth dated December 21 at 3-4, 5-7.

81. The State of Alaska recommends that if a pipeline company's distributions per share exceed its earnings per share (as is frequently the case with pipeline MLPs), then the expected growth rate of the pipeline's distributions per share should be adjusted to equal (1) the expected growth of its earnings per share, multiplied by (2) the ratio of the pipeline's earnings per share to its distributions per share. According to Alaska, if a pipeline company distributes more cash than its current earnings, then the projected growth in earnings per share should also be adjusted by the ratio of the pipeline's earnings per share to its distributions per share.[102]

82. The Commission rejects these proposals by Tesoro and the State of Alaska. As already discussed, to the extent investors expect an MLP's distributions in excess of earnings to reduce its growth prospects, that fact should be reflected in the IBES five-year growth projections themselves, without the need for any further adjustment. MLPs must publicly report their earnings and distribution levels. Therefore, the security analysts are aware of the degree to which each MLP is making distributions in excess of earnings. The security analysts presumably take that information, together with all other available information concerning the MLP, into account when making their projections. Moreover, these proposals would have a similar effect as capping the distributions used to calculate dividend yield at or below the level of the MLP's earnings. For the reasons previously discussed, the Commission finds that any cap on an MLP's distributions used in the DCF model at a level below the actual distribution is inconsistent with the basic operation of the DCF model. Thus, using a straight IBES five-year projection without modification presents the best method of estimating an MLP's short-term growth rate.

83. APGA further suggests revising IBES growth rates by averaging them with the comparable growth forecasts reported by Zacks Investment. It states that this averaging could help remove anomalous or outlying growth rates. It offers as an example, on December 10, 2007, IBES projected a five-year growth rate of 7.60 percent for Kinder Morgan Energy Partners (KMEP), whereas Zacks Investment projected a 33.70 percent growth rate for that company. APGA argues that the Commission should also use Value Line reports to test the reasonableness of projected growth rates for MLPs.[103]

84. The Commission will not require that IBES growth rates be averaged with the corresponding company's growth rates as reported for Zacks Investment at this time, or

---

[102] State of Alaska, Comments dated Dec. 21 at 3-4; Second Horst Aff. at 2-3, 5-11.

[103] APGA, Additional Comments dated Dec. 21 at 3, 9-10.

that Value Line reports be used to test the reasonableness of projected growth rates for MLPs. Finally, PSCNY requests that the Commission clarify that Thomson Financial Data posted on Yahoo.com may be used in the DCF formula, since Thomson Financial owns IBES.[104] The Commission clarifies that the growth projections to be used in the DCF model are those reported by IBES. If they are the same growth projections posted by Thomson Financial Data on Yahoo.com, then they are acceptable for the DCF model.

D. The Long Term Growth Component

1. Comments

85. As this point the critical issue is whether the long term growth component of the Commission's DCF methodology should be modified in determining the equity cost of capital for an MLP. As has been discussed, for more than a decade the Commission has required that projected long-term growth in GDP be used as the corporate long term (terminal) growth component of the DCF calculation. The discussion at the technical conference disclosed four general positions. The AOPL,[105] NAPTP,[106] INGAA,[107] and TransCanada[108] asserted that the use of long term GDP is equally applicable to MLPs as to corporations.[109] However, the APGA,[110] PSCNY,[111] and the State of Alaska[112] all

---

[104] PSCNY, Supplemental Comments dated Dec. 21 at 5.

[105] AOPL, Post-Technical Conference Comments at 7-9, 13.

[106] NAPTP Additional Comments dated Dec. 21 at 1, 10-11; Post-Technical Conference Comments at 4-8.

[107] INGAA, Additional Initial Comments dated Dec. 21 at 2-3; Post-Technical Conference Reply Comments at 3-6.

[108] TransCanada Post-Technical Comments at 2-5.

[109] MidAmerican and Williston supported this position.

[110] APGA Additional Comments dated Dec. 21 at 4, 7-8; Initial Post-Technical Comments at 2, J. Bertram Solomon Aff. at 4-8.

[111] PSCNY, Supplemental Comments dated Dec. 21 at 5, 8-9 and appended Prepared Statement of Patrick J. Barry for the January 23, 2008 Technical Conference; Initial Post-Technical Conference Comments at 14-16.

[112] State of Alaska, Comments dated Dec. 21 at 3-4 and Second Horst Aff. at 3, 5-

(continued…)

made suggestions for a reduction to the GDP growth projection to reflect the different retention and investment practices of MLPs.[113] In a different vein, INGAA suggested the use of the average of the projected long term inflation rate and projected long term GDP as a proxy for the lower growth rate of the limited partnership interests, but only if the Commission concluded that some reduction in the MLP long term growth rate was warranted.[114] NAPTP further argued that there must be an upward adjustment of the limited partnership growth rate to reflect the equity cost of capital of the limited and general partners, and thus that of the entire firm.[115]

86. The Pipeline Interests also generally assert that an MLP's terminal growth can be at least equal to that of a corporation, and perhaps exceed it. They assert that MLPs are able to raise external capital in a tax efficient manner. Because an MLP does not retain cash it does not immediately need and can distribute without the tax penalty, it is under less pressure to invest idle capital. Rather, an MLP can wait until sounder investment opportunities are available and pursue them more discreetly, which results in a more consistent return from the projects selected.[116] Moreover, while the computation is very complicated, the tax-deferral aspects of MLP limited partnership interest normally result in a higher per unit price when issued and thus a lower cost of equity capital to the issuing MLP. For these reasons the Pipeline Interests conclude that MLPs should readily find profitable investment opportunities despite their lower retention ratios.[117]

87. The Pipeline Interests further assert that the record demonstrates that MLPs have a long term history of growing distributions and an overall growth rate that has at times been higher than that of corporations.[118] They cite to the example of KMEP in particular

---

7. Reply Comments dated February 20, 2008 at 6.

[113] NGPA and Tesoro also supported a lower long term growth rate for MLPs.

[114] INGAA Additional Initial Comments dated Dec. 21 at 3-4 and Vilbert Report attached thereto, *passim*;

[115] NAPTP Reply Comments dated Sept. 19 at 2-4; Additional Comments dated Dec. 21 at 9-12.

[116] NAPTP Post-Technical Conference Comments at 9; TransCanada Post Technical Conference Comments at 8-9.

[117] NAPTP, *id.* 2, 5-6. TransCanada, *id.*

[118] NAPTP Additional Comments dated Dec. 21 at 4-8,

and that KMEP has been able to grow its distributions in good or poor financial environments.[119] They therefore conclude that there is no reason to conclude that MLPs cannot continue to grow at least as fast as corporations or that the relatively high distribution growth rate for the industry as a whole will not be sustained.[120] However, INGAA concedes that even if an MLP as a whole can grow as fast as a corporation, the limited partnership interests would grow less rapidly than the MLP as a whole because of the IDRs[121] most MLPs have granted their general partners.[122] The Pipeline Interests also argue that investors will not invest in enterprises that have a projected growth rate that is less than GDP and that such firms are likely to fail.[123]

---

[119] NAPTP Additional Comments dated December 21 at 8.

[120] NAPTP and Post-Technical Conference Comments at 11-12 AOPL Post-Technical Conference at 9-10 and Williamson Post Technical Conf. Aff. Ex. at 1 and 2.

[121] IDRs operate as follows. Most MLP agreements provide that the limited partners own 98 percent of the equity when the firm is first created and the general partner 2 percent. Thus, given a distributable cash of $1,000, the limited partners would obtain $980 (98 percent) and the general partner $20.00 (2 percent). The partnership agreement also provides that as the total cash available for distribution increases, a greater share goes to the general partner, including that which would be available in liquidation. For example, the partnership agreement may provide that once distributable cash is $3,000, the general partner will receive 2 percent based on its partnership interest and 48 percent based on the IDRs.

At that point the limited partners' share of the distribution is $1,500 (50 percent) and the general partner's share is also $1,500 (50 percent). Thus, while the limited partners' distribution has grown in the relevant time frame (by 50 percent), it has not grown as fast as it would have absent the general partner's IDR. Absent the IDR the general partner's share would only be $60. Since a proportionately smaller share of future value flows to the limited partners in the initial years, the projected long term growth rate for a limited partnership interest will be lower. Therefore the limited partnership interests have lower return than that of the general partner.

[122] INGAA Additional Initial Comments dated December 21 at 5; TransCanada.

[123] AOPL, Post-Technical Comments at 7-8. TransCanada, Additional Comments dated Dec. 21 at 2, 4-5.

2. Discussion

a. Should the MLP long-term growth projection be lower than projected growth in GDP?

88. As discussed in the previous section, in determining the appropriate growth projections to use in its DCF analysis, the Commission seeks to approximate the growth projections investors would rely upon in making their investment decisions. This principle applies equally to the long-term growth projection, as to the short-term growth projection. When the Commission first established its policy of basing the long-term growth projections on projected growth in GDP in Opinion No. 396-B and *Williston I,* the Commission stated in both cases, "The purpose of using the DCF analysis in this proceeding is to approximate the rate of return an investor would reasonably expect from a pipeline company." [124] The Commission found, "the record shows that Merrill Lynch and Prudential Bache do not attempt to make long-term growth projections for specific industries or companies in doing DCF analyses. Instead they use the long-term growth of the United States economy as a whole as the long-term growth forecast for all firms, including regulated businesses."[125] The Commission thus relied heavily on evidence concerning investment house long-term growth projections in deciding to base its long-term growth projections for corporations that were properly included in the proxy group on the long-term growth of GDP. In affirming this aspect of *Williston I*, the D.C. Circuit similarly relied on the fact that the record "demonstrated that major investment houses used an economy-wide approach to projecting long-term growth . . . and that existing industry-specific approaches reflected investor expectations and many unfounded economic assumptions."[126]

89. Consistent with this precedent, the key question in deciding what long-term growth projection the Commission should use in its DCF analysis of MLPs is whether investors expect MLP long-term growth rates to be less than projections of growth in

---

[124] Opinion No. 396-B, 79 FERC ¶ 61,309 at 62,383. *Williston I*, 79 FERC at 62,389.

[125] Opinion No. 396-B, 79 FERC ¶ 61,309 at 62,382. *Williston I,* 79 FERC ¶ 61,311 at 62,389. As the Commission pointed out in a subsequent case, the exhibits in both the Opinion No. 396-B proceeding and *Williston I*, describing Prudential Bache's methodology stated that it used a lower long-term growth projection for electric utilities, because of their high payout ratios. *System Energy Resources, Inc.*, 92 FERC ¶ 61,119, at 61,445 n.23 (2000).

[126] *Williston Basin Interstate Pipeline Co. v. FERC*, 165 F.3d 54 (D.C. Cir. 1999).

GDP. The record established here shows that at least two major investment houses project terminal growth rates for MLPs that are notably lower than the current 4.43 percent projected growth in GDP. Citicorp Smith Barney (Citicorp)[127] projects a 1 percent terminal growth rate for pipeline MLPs. Wachovia projects terminal growth rates for individual MLPs that vary from zero to 3.5 percent.[128] The Wachovia projection for each MLP which the Commission is likely to include in a proxy group[129] is for a 2.5 percent terminal growth rate.[130] The Pipeline Interests did not submit any evidence of a major investment house projecting long-term growth rates for MLPs equal to or above the growth in GDP. Thus, applying the same approach as that in Opinion No. 396-B and *Williston I*, the record supports a finding that investors project MLP growth rates significantly below the growth in GDP.

90. To counter this conclusion, the Pipeline Interests argue that these lower figures reflect the investment houses' desire to use "conservative" estimates in order to prevent unrealistic investor expectations. However, as discussed above, the Commission has found in earlier cases that investment houses try to give the most accurate information to their investors. In any event, it is appropriate for the Commission to use growth

---

[127] Society, Reply Comments at 11, citing: *Citicorp Master Limited Partnership Monitor and Reference Book*, Citigroup Investment Research (March 2007) at 28, Figure 24.

[128] Comments of Enbridge Energy Partners, L.P., Attachment A, Wachovia Equity Research Paper dated August 20, 2007 at 9-12; Wachovia Equity Research dated January 30, 2008, *MLP Outlook 2008: Cautious Optimism* at 39-44.

[129] These are the MLPs listed in Tables 1 and 2.

[130] NAPTA, in its Post-Technical Conference Comments, provided a publication by Morgan Stanley Research which, among other things, reported on our January 23, 2008 technical conference. That publication, at page 3, states, "At Morgan Stanley, we assume an MLP will increase its cash flow – 1.5%-3.0% per year beyond 2012. Importantly we make the same assumption in forecasting long-term growth for our C-Corp companies." *Pipeline MLPs: What's in the Pipeline*, Morgan Stanley Research at 3. These projections are also less than the current projection of 4.43 percent long-term growth in the economy as a whole. However, we give greater weight to the Citigroup and Wachovia publications, because those publications include specific long-term growth projections for individual MLPs, whereas the Morgan Stanley publication simply sets forth a general range it uses without specifying how that range is distributed among individual firms. Also, the Citigroup and Wachovia analyses were not issued in response to the technical conference.

estimates that reflect the investment houses' view of what investors should realistically expect from an investment in an MLP. Moreover, the fact that some MLPs have grown rapidly in the past does not mean necessarily that they will maintain the same growth rate in the future. In fact, KMEP's projected growth rate is expected to drop in future years.[131] This record also demonstrates that a rate of long term growth is dependent on the base years selected. Thus, the Customer Interests focus on more recent years to show that the growth rate has slowed for many MLPs.[132]

91. The Pipeline Interests also argue that investors will not invest in entities with a projected long term growth rate that is less than the long-term growth in GDP.[133] However, the fact is that, despite major investment houses advising their clients that MLPs will have long-term growth rates below GDP, investors have continued to invest in MLPs, and in increasing amounts through 2007. Historically this was true even though the Commission's analyses continue to indicate that the IBES five-year growth projections for MLPs are lower than those for corporations.[134]

92. At bottom, the key financial assumption advanced by the Pipeline Interests is that MLPs and corporations have equal access to capital. However, the Customer Interests advance credible reasons why MLPs may not have as ready access to capital markets in the future given the MLPs' unique financial structure. This would reduce the total capital pool available to the MLPs, thus reducing their growth prospects. These include a greater exposure to interest rate risk,[135] the increased cost of capital that a high level of IDRs imposes on an MLP,[136] and lower future returns from either acquisitions or organic

---

[131] APGA, Post-Technical Conference Reply Comments, Solomon Aff. at 4.

[132] APGA, Post-Technical Conference Reply Comments at 4-5 and attached Solomon Aff. at 4-9.

[133] TransCanada, Additional Comments at 5; AOPL Post-Technical Conference Comments at 8.

[134] See Appendix A, which displays in part the comparative corporate and MLP short term growth projections. *Cf.* PSCNY Post Technical Conference Comments at 7-8.

[135] Indicated Shippers Initial Comments at 21, citing Citicorp Smith Barney; AGPA Reply Comments at 5; Wachovia August 20, 2007 Report, *supra*, at 1-2;

[136] PSCNY Supplemental Comments at 3, n. 8 and Initial Post-Technical Conference Comments at 12.

investments as the MLP industry matures.[137] This latter point is of greater importance to MLPs because they are limited by law to a narrower range of investment opportunities than a schedule C corporation. These arguments suggest why the long term forecasts by investment houses investors rely on could conclude that the long term growth rate for MLPs would be less than the long term GDP the Commission uses for corporations. Each addresses the consistency of investment opportunities and as such consistency of access to capital markets that MLPs are dependent on to maintain long term growth.

93. In particular, the Commission concludes that corporations (1) have greater opportunities for diversification because their investment opportunities are not limited to those that meet the tax qualifying standards for an MLP and (2) are able to assume greater risk at the margin because of less pressure to maintain a high payout ratio. It is a corporation's higher retention ratio that allows this greater flexibility. This is consistent with the fact that Prudential Bache projected the long-term growth rates of electric utilities to be less than that of the economy as whole because of their greater dividend payouts and lower retention ratios.[138] Therefore, investors would quite reasonably conclude that MLP long term growth rates would be lower than that of tax paying corporations, because MLPs have fewer opportunities to participate in the broad economy that underpins the Commission's current use of long-term growth in GDP.

94. Thus, while it is true that the Commission uses GDP as a proxy for long term growth, the point here is not whether some firms, including MLPs may have a growth rate that is more or less than the proxy over time. The issue is whether MLPs have the same relative potential as the corporate based economy that has been the basis for the Commission's assumption that a mature firm will grow at the same rate as the economy as whole. For the reasons stated, the Commission concludes that the collective long term growth rate for MLPs will be less than that of schedule C corporations regardless of the past performance of MLPs the Pipeline Interests have inserted in the record.

b. What specific projection should be used for MLPs?

95. We now turn to the issue of exactly what long-term growth projection below GDP should be used in MLP pipeline rate cases. As the Commission recognized when it established its policy of giving the long-term growth projection only one-third weight, while giving the short-term growth projection two-thirds weight, "long-term growth

---

[137] PSCNY Initial Post-Technical Conference Comments at 9-10 and cited Value Line attachments; Reply Comments at 5-6 citing Merrill Lynch, n. 16.

[138] *System Energy Resources, Inc.*, 92 FERC ¶ 61,119, at 61,445 n.23 (2000).

projections are inherently more difficult to make, and thus less reliable, than short-term projections."[139] Thus, as the Commission has stated with respect to the other aspects of its long-term growth projection policy, the Commission is "required to choose from among imperfect alternatives"[140] in deciding what specific long-term growth projection should be used for MLPs.

96. The technical conference panelists advanced four methods of determining long-term growth projections for MLPs which are less than the growth in GDP. After reviewing all four, the Commission adopts the APGA proposal to use a long-term growth projection for MLPs equal to 50 percent of long term GDP.[141] At present, that proposal results in a long-term growth projection of 2.22 percent. This is within the range of long-term growth projections used by investment houses for MLPs discussed in the preceding section. For example, Wachovia projects terminal growth rates for individual MLPs that vary from zero to 3.5 percent,[142] and its projection for each MLP which the Commission is likely to include in a proxy group is for a 2.5 percent terminal growth rate.[143] Therefore, in light of the inherent difficulty of projecting long-term growth, the 50 percent of GDP proposal would appear to result in a long-term growth projection that

---

[139] *Transcontinental Gas Pipe Line Corp*., 84 FERC ¶ 61,084, at 61,423 (1998).

[140] *Northwest Pipeline Corp.*, 88 FERC ¶ 61,298, at 61,911 (1999).

[141] APGA Additional Comments dated Dec. 21 at 2-3, 8; Outline for the Presentation of Bertrand Solomon on the Behalf of APGA dated January 23, 2008 at 3; Initial Post-Technical Conference Comments. J. Bertrand Solomon Aff. at 3-4, 6-7 and supporting exhibits.

[142] Comments of Enbridge Energy Partners, L.P., Attachment A, Wachovia Equity Research Paper dated August 20, 2007 at 9-12; Wachovia Equity Research dated January 30, 2008, *MLP Outlook 2008: Cautious Optimism* at 39-44.

[143] The Commission will not use the specific long-term MLP growth projections of the investment houses to determine the cost of equity for specific firms for the same reasons we have not done so with respect to the projections of long-term growth in GDP the Commission uses for corporations. As the Commission explained in *Michigan Gas Storage Co.,* 87 FERC ¶ 61,038, at 61,162-5 (1999) and *Williston Basin Interstate Pipeline Co.*, 87 FERC ¶ 61,264, at 62,005-6 (1999), there is no evidence as to how the investment house figures were derived which limits their utility in determining the cost of equity for an individual firm. However, as here, the Commission has relied on the perceptions of the investment community in developing a generic long term growth rate. See also Opinion No. 396-B, 79 FERC ¶ 61,309 at 62,384.

falls within any reasonable margin of error for such projections, while giving recognition to the fact that investors expect MLPs' long-term growth to be less than that of GDP.[144]

97. The Commission also concludes that the other three proposed methods of projecting MLP long-term growth rates all have flaws justifying their rejection. The State of Alaska and the NYPSC propose methods which would result in varying long-term growth projections for each MLP, based upon financial information for each of the MLPs to be included in a proxy group. These proposals are contrary to the Commission's policy of using a single long-term growth projection for all corporations, based on the fact that it is not possible to make reliable company-by-company long-term growth projections.[145] The State of Alaska and NYPSC have provided no basis to conclude that they have provided a more reliable way to make long-term growth projections for individual MLPs. Their difficulty in doing so reinforces the Commission's traditional practice in this regard.

98. The State of Alaska suggests adjusting the GDP long term growth projection used for each MLP based on its current positive or negative retention ratio.[146] Thus, if an MLP's retention ratio was positive, then 100 percent of long term growth in GDP would be used. If the retention ratio was less than one, then the long term growth in GDP would be reduced accordingly. This theory essentially caps the long term growth rate at the earnings of the entities involved. As such, it suffers from the same weakness as the original proposal to cap the distribution component included in the model at earnings. Consistent with the premise of the DCF model that a stock is worth the present value of all future cash flows to be received from the investment, investors base their DCF analyses on the MLP's entire cash distributions, including projected cash flows generated by external investments, which to date is the bulk of the investment for the MLP model. In addition, because MLPs rely substantially on external capital to finance growth, the fact one MLP currently pays out more of its earnings than another MLP does not necessarily mean that the first MLP's long-term growth prospects are less than the second MLP's. Moreover, Alaska's proposed method assumes each MLP's current retention

---

[144] As the D.C. Circuit stated with respect to our choice of the relative weighting of the short- and long-term growth projections, the choice of the long-term growth component is also an exercise "hard to limit by strict rules." *CAPP v. FERC*, 254 F.3d at 290.

[145] Opinion No. 396-B, 79 FERC ¶ 61,309 at 62,382.

[146] State of Alaska, Comments dated December 21 at 3-4 and Second Horst Aff. at 3, 5-7. Reply Comments dated February 20, 2008 at 6.

ratio will continue indefinitely into the future, without any support for the accuracy of such an assumption.

99. The NYPSC recommends use of a modified form of the sustainable growth model the Commission uses to determine electric return on equity.[147] Under that method, the Commission determines growth based on a formula under which growth = br + sv, where b is the expected retention ratio, r is the expected earned rate of return on common equity, s is the percent of common equity expected to be issued annually as new common stock, and v is the equity accretion rate. The br component of this formula projects a utility's growth from the investment of retained earnings, and the sv component estimates growth from external capital raised by the sale of additional units. The NYPSC would assume zero growth from investment of retained earnings (the br component) and then base the long-term growth projection for each MLP on projected growth from external capital resulting from the sv component of the br + sv formula.

100. A fundamental problem with this approach is that the Commission has consistently held that the br + sv formula only produces a projection of short-term growth, similar to the IBES projections.[148] This follows from the fact that the inputs used in the formula are all drawn from Value Line data and projections reaching no more than five years into the future. In addition, there would be great uncertainties in projecting any of the inputs to the formula, such as the retention ratio, the amount and timing of equity sales, and the projected price of the sale for any longer period. Moreover, setting the br component at zero assumes that an MLP can only grow through the use of external capital. This does not reflect accurately the retention and investment flexibility vested in an MLP's general partners or the fact that some MLPs may reinvest a fairly high proportion of the free cash available. Therefore this methodology does not appropriately adjust the long term GDP component that the Commission now uses for corporations.

101. Finally, INGAA provided a complex model designed to calculate the equity cost of capital for an MLP as a whole.[149] This model was developed by Mr. Vilbert and

---

[147] PSCNY, Supplemental Comments dated Dec. 21 at 5, 8-9 and appended Prepared Statement of Patrick J. Barry for the January 23, 2008 Technical Conference; Initial Post-Technical Conference Comments at 14-16.

[148] *See Southern California Edison Co.*, 92 FERC ¶ 61,070, at 61,262-3 (2000).

[149] INGAA, Additional Initial Comments dated Dec. 21 at 4-5 and *Report on the Terminal Growth Rate for MLPs for Use in the DCF Model* by Michael J. Vilbert dated December 21, 2007 (Vilbert Report), particularly at 10.

attempts to calculate the equity cost of capital for both the limited and the general partners. At their inception, MLPs establish agreements between the general and limited partners, which define how the partnership's cash flow is to be divided between the general and limited partners. Such agreements give the general partners IDRs, which provide for them to receive increasingly higher percentages of the overall distribution, if the general partners are able to increase that distribution above defined levels. The INGAA model recognizes that, as a result of these incentive distribution rights, a DCF analysis of the MLP as a whole should (1) include higher projected growth rates for the general partner interest than for the limited partner interest and (2) a correspondingly higher value for general partner interests than the MLP units which would, in turn, reduce the general partner's current "dividend" yield. However, since there are relatively few publicly traded general partner interests, in most cases the estimated equity cost of capital for the general partner can only be derived through various assumptions that markup the limited partner's cost of capital.

102. INGAA drew two significant conclusions from Mr. Vilbert's analysis. First, application of the Commission's existing DCF methodology solely to the limited partner interest in the MLP would generate returns relatively close to those that would be required to reflect the growth rate, and cost of equity capital, for the MLP as whole. Second, if the Commission remains concerned that a DCF analysis using data solely for the limited partner interest,[150] together with a long-term growth rate equal to the growth in GDP, may overstate the appropriate return based on the limited partners' projected growth, the long-term growth projection could be adjusted by averaging projected long term GDP and the projected long term inflation rate.[151] The latter would have to be updated regularly to test its accuracy.

103. Mr. Horst, the witness for the State of Alaska, responded that the INGAA model was mathematically correct, but that the model's assumptions about the rate of growth and incentive distributions were open to question and the results would overstate the equity for the MLP as a whole.[152] INGAA filed a reply to Mr. Horst's arguments by Mr. Vilbert that first calculates the actual DCF values for eight publicly traded general

---

[150] In such a DCF analysis the dividend yield would be calculated by dividing the distribution to the limited partner by the limited partner share price.

[151] INGAA Additional Initial Comments dated Dec. 21 at 4-6; Vilbert Report at 18-19.

[152] State of Alaska, Reply Comments dated February 20, 2008 at 6 and Third Horst Aff. at 6-15.

partner interests.[153] Mr. Vilbert then compares the resulting value of the general partner interests for the same eight firms generated by the model. The results calibrate more closely to the eight market samples than the analysis produced by Mr. Horst but, like Mr. Horst's analysis, tend to overstate the value of the general partner interest.

104. The Commission will not use the INGAA model for several reasons. First, the internal operations of the model are relatively opaque, and the model appears to have a relatively wide range of error. Second, as the court stated in *Petal Gas Storage, L.L.C. v. FERC*,[154] the purpose of the proxy group is to "provide market-determined stock and dividend figures from public companies comparable to a target company for which those figures are unavailable." While INGAA used eight publicly traded general partner interests to test the validity of the model, most of those interests are not related to MLPs that have been proffered in rate proceedings before the Commission. In the absence of such market-determined figures for the general partner interest of the MLPs to be included in the proxy group, use of the INGAA model would necessarily entail deriving an estimated equity cost of capital for the general partner through various assumptions that markup the limited partner's cost of capital. In these circumstances, use of the INGAA model would be inconsistent with the purpose of the proxy group of providing a fully market-based estimated cost of capital.

105. INGAA alternatively suggested that the returns from the current methodology be reduced somewhat to reflect the admittedly lower growth rate of a MLP's limited partnership interests. However, its proposal to do that by averaging GDP growth projections with the Federal Reserve's target inflation rate appears to have no analytical basis. Therefore, INGAA's recommendations will not be accepted here.[155]

106. Based upon the above discussion, the Commission concludes that the long term growth component for an MLPs equity cost of capital should be 50 percent of long term GDP, rather than the full long term GDP currently used for corporations.

---

[153] INGAA, Post-Technical Supplemental Comments dated March 12, 2008 at 2-4 and Vilbert Aff. attached thereto, *passim*. The Commission will accept INGAA's March 12 filing because INGAA had no earlier opportunity to reply to the material contained in the State of Alaska's February 20, 2008 filing.

[154] 496 F. 3d 695 at 699.

[155] See AOPL Post-Technical Comments at 3-4, which suggest that the complexity of Mr. Vilbert's model and the use of its assumption indicate that it is more appropriate to rely on the limited partners' distributions in a DCF analysis.

c. Proposed upward adjustments to the long term component

107. NAPTP asserted that the Commission should increase rather than decrease the long term growth component used to determine an MLP's equity cost of capital to reflect the general partner component of an MLP's equity.[156] It asserts that equity cost of capital must be determined for the MLP as a whole, not just for the limited partners. NAPTP asserts that the return, and hence the projected growth rate, must generate sufficient cash flows to support the IDRs provided the general partner under most MLP agreements. To this end, it marked up the growth rate of the limited partners to reflect the portion of the equity effectively controlled by the general partner through its IDRs. Thus, growth rate for the limited partners was 10 percent and general partner received a total of 50 percent of the distributions, the growth rate for the general partner could be as high as 20 percent. The Shipper Interest partners argued that this only rewarded the general partner for its excessive distributions and would inordinately increase the MLPs equity cost of capital.

108. Both INGAA's witness Vilbert and the State of Alaska's witness Horst rejected the NAPTP approach on mathematical grounds. Both argue that the gross-up fails to properly value the general partner's interest at multiples that reflect the general partner interest's relative risk to that of the limited partners.[157] Furthermore, Vilbert argues that the general partner's risk, while always greater than that of the limited partner, declines as the MLP matures and the general partner's share of distributions increases.[158] As this occurs, the growth rate of the general partner's interest slows and approaches that of the limited partner. Failure to adjust for both facts means that the general partner's interest is undervalued using the NAPTP method, thus overstating the yield, and thus the return, that would be incorporated in the DCF model. As such, the NAPTP approach is inappropriate.

109. The Commission agrees that the NAPTP method is mathematically and conceptually flawed. Moreover, it has the same basic limitation as the INGAA model in that there is simply not enough publicly generated, transparent information at this time to support developing an equity cost of capital for the MLP as a whole. INGAA likewise

---

[156] NAPTP Additional Comments dated Dec. 21 at 3-4.

[157] State of Alaska, Reply Comments dated February 20, 2008 at 6 and Third Horst Aff. at 2, 4-5.

[158] INGAA, Post-Technical Supplemental Comments dated March 12, 2008 at 2-4 and Vilbert Aff. at 6-12.

attempted to develop an approach that would reflect the growth rate, and the return, of the MLP as a whole. The Commission has previously concluded that this approach has too many practical limits. Therefore the Commission will not pursue this issue further here.

E. The Weighting of the Growth Components

110. The third issue is whether to change the weighting of the short-term and long-term components now used in the Commission's DCF model. As has been discussed, the Commission's existing policy is to provide two-thirds of the weight to the short-term component and one-third to the long- term component. TransCanada suggested changing the weighting, so that the 90 percent of the weight should be to the short-term component.[159] MidAmerica recommended the use of a single stage model and abandoning the long-term component completely.[160] However, these suggestions received no support from the other parties and would serve to increase the overall returns by sharply diminishing or eliminating the long-term component of the DCF.

111. As discussed in the previous section, the Commission's longstanding policy is that the growth component of the DCF analysis of gas and oil proxy companies must include a projection of long-term growth, and the court affirmed that policy in *Williston I*. As the Commission has explained in numerous orders, the DCF methodology requires that a long-term evaluation be taken into account. In the preceding section, the Commission has fully discussed why the long-term growth projection for MLPs should be 50 percent of projected long-term growth of GDP.

112. The Commission established its policy of giving the long-term growth projection one-third weight, while the short-term growth projection is given two-thirds weight, in *Opinion Nos. 414-A*. The Commission explained its weighting policy as follows:

> While determining the cost of equity nevertheless requires that a long-term evaluation be taken into account, long-term projections are inherently more difficult to make, and thus less reliable, than short-term projections. Over a longer period, there is a greater likelihood for unanticipated developments to occur affecting the projection. Given the greater reliability of the short-term projection, we believe it appropriate to give it greater weight. However,

---

[159] TransCanada, Reply Comments at 13-14; Additional Comments dated December 21 at 9-12.

[160] MidAmerican Response to Request for Additional Comments dated December 21 at 9-11.

> continuing to give some effect to the long-term growth projection will aid in normalizing any distortions that might be reflected in short-term data limited to a narrow segment of the economy.[161]

The court affirmed this policy in *CAPP v. FERC*,[162] stating that "in an exercise so hard to limit by strict rules, it would likely be difficult to show that the Commission abused its discretion in the weighting choice."

113. The need to normalize any distortions that may be reflected in short-term data limited to a narrow segment of the economy applies equally to the IBES five-year growth projections for MLPs as for corporations. At the same time, the two-thirds weighting for the short-term growth projections recognizes their greater reliability. Moreover, TransCanada does not establish why the MLP short-term growth projections should be accorded a greater weight than that of corporations. In fact, as was discussed in the previous section, the record reasonably shows that investment houses include a long-term growth component in their DCF analyses of MLPs, and use a long-term growth projection that is lower than the projected long-term growth in GDP. Therefore the Commission will not modify the two-thirds to one-third ratio it now uses in its DCF model and will apply that ratio to all pending cases.

V. <u>Pending Proceedings</u>

114. The procedural issue here is whether this Policy Statement should be applied to all proceedings that are now before the Commission for which the ROE issue has not been resolved with finality. NGSA asserts that any new policy should apply only prospectively and not to cases now pending before the Commission. Indicated Shippers take the same position, asserting that application of the Policy Statement to pending proceedings would be administratively inefficient and would materially delay instituting new rates in the *Kern River* proceeding, which is now before the Commission on rehearing. Indicated Shippers further argue that in *Kern River* the Commission addressed and rejected the use of MLPs without some adjustment to reflect the fact that MLP distributions involve both a return of and return on equity. They also argue that there would be no inequity because Kern River could always file a new section 4 rate case if the existing proceeding proved unsatisfactory. Finally, Indicated Shippers assert that a policy change should not be applied retroactively because it does not have the force of

---

[161] Opinion No. 414-A, 84 FERC at 61,423.

[162] 254 F.3d at 289.

law[163] and because policy statements are considered "statements issued by the agency to advise the public prospectively of the manner in which the agency proposes to exercise a discretionary power."[164]

115. MidAmerica answered that the Policy Statement must be applied to all pending cases and *Kern River* in particular for two reasons. It states that in *Petal* the court both seriously questioned the Commission's analysis regarding MLPs and held that it was improper to include an entity of higher risk (a pipeline) and one of lower risk, such as a diversified natural gas company, in the same sample without adjusting the returns. MidAmerica argues that application of the *Williston* doctrine[165] requires that it be given an opportunity to address the return on equity issue further. This is particularly the case since the court suggested applying the upper end of the range of reasonableness as a way of compensating for the difference in risk. MidAmerica asserts that application of either this suggestion or use of the unadjusted MLP sample Kern River advanced at hearing would result in the same return on equity.

116. The Commission concludes that the instant Policy Statement must be applied to all proceedings now pending at hearing before an ALJ or before the Commission for which the ROE issue has not been resolved with finality. In *Petal v. FERC,* the court vacated and remanded the Commission's orders on the ROE issue in both *Petal* and *HIOS*. In both those cases, the Commission applied its current policy of using a proxy group based on the corporations listed in the Value Line Investment Survey's list of diversified natural gas firms that own Commission-regulated natural gas pipelines, without regard to what portion of the company's business comprises pipeline operations. The court found that the Commission had not shown that the proxy group arrangements used in those cases were risk-appropriate. In this Policy Statement we have reexamined our proxy group policy in light of the *Petal v. FERC* remand as well as current trends in the gas and oil pipeline industries, and determined we must modify our policy as discussed above. Therefore, because the Commission's current proxy group policies as applied in prior

---

[163] *Citing Consolidated Edison of New York, et al., v. FERC*, 315 F.3d 316, 323-24 (D.C. Cir. 2003) (*Consolidated Edison*).

[164] *Citing American Bus Assn. v. ICC*, 627 F.2d 525, 529 (D.C. Cir. 1980).

[165] *See Williston Basis Interstate Pipeline Co. v. FERC*, 165 F.3d 54 (D.C. Cir. 1999) (*Williston*). MidAmerica cites to the related administrative proceeding, *Williston Basin Interstate Pipeline Co.*, 104 FERC ¶ 61,036 (2003), but the principles are the same. The cited Commission case was in response to the remand in cited court decision.

cases have not withstood court review, the Commission cannot and will not apply them in currently pending cases in which there has been no final determination of ROE issues.

<u>The Commission orders</u>:

(A) The Commission adopts the Policy Statement and supporting analysis contained in the body of this order.

(B) This Policy Statement is effective the date issued and shall apply to all oil and gas pipelines then pending before the Commission in which there has been no final determination of ROE issues.

By the Commission.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.

APPENDIX A

TABLE 1

DCF Analysis for Selected Corporations and MLPs Owning Jurisdictional Natural Gas Pipelines

Six-Month Period Ended 03/31/2008

	(1)	(2)	(3)	(4)	(5)	(6)
	6-mos Avg	Growth Rate ("g")			Adjusted	Estimated
Company	Dividend Yield	IBES (03/08)	GDP (1/22/08)	Composite	Dividend Yield	Cost of Equity
Spectra Energy Corp.	3.65%	6%	4.43%	5.48%	3.75%	9.23%
El Paso Corp.	0.96%	11%	4.43%	8.81%	1.00%	9.81%
Oneok Partners, LP	6.66%	5%	2.22%	4.07%	6.80%	10.87%
Boardwalk Pipeline Partners, LP	6.29%	6%	2.22%	4.74%	6.44%	11.18%
Oneok, Inc.	3.10%	10%	4.43%	8.14%	3.23%	11.37%
TC Pipelines, LP	7.46%	5%	2.22%	4.07%	7.61%	11.68%
TEPPCO Partners, LP	7.31%	6%	2.22%	4.74%	7.48%	12.22%
Spectra Energy Partners	5.00%	10%	2.22%	7.41%	5.18%	12.59%
Enterprise Products Partners, LP	6.45%	8%	2.22%	6.07%	6.64%	12.71%
Kinder Morgan Energy Partners, LP	6.69%	8%	2.22%	6.07%	6.89%	12.96%
Williams Companies	1.17%	16%	4.43%	12.14%	1.24%	13.38%

Column (1) is taken from individual company analysis.

Column (2) is taken from I/B/E/S Monthly Summary Data, US Edition.

Column (3) is calculated from three sources: EIA, Global Insight, and SSA.

Column (4) = Column(2)*2/3 + Column(3)*1/3

Column (5) = Column(1)*(1 + 0.5*Column(4))

Column (6) = Column(4) + Column(5)

NOTE: This Appendix is for illustrative purposes only and does not prejudge what would be an appropriate proxy group for use in individual proceedings.

TABLE 2

DCF Analysis for Selected MLPs Owning Jurisdictional Oil Pipelines

Six-Month Period Ended 03/31/2008

	(1)	(2)	(3)	(4)	(5)	(6)
	6-mos Avg	Growth Rate ("g")			Adjusted	Estimated
Company	Dividend Yield	IBES (03/08)	50% GDP (1/22/08)	Composite	Dividend Yield	Cost of Equity
Buckeye Partners, LP	6.72%	5%	2.22%	4.07%	6.86%	10.93%
Magellan Midstream Partners, LP	6.16%	6%	2.22%	4.74%	6.30%	11.04%
NuStar Energy, LP	7.07%	6%	2.22%	4.74%	7.24%	11.98%
TEPPCO Partners, LP	7.31%	6%	2.22%	4.74%	7.48%	12.22%
Plains All American Pipelines, LP	6.74%	7%	2.22%	5.41%	6.93%	12.33%
Enbridge Energy Partners, LP	7.58%	6%	2.22%	4.74%	7.76%	12.50%
Enterprise Products Partners, LP	6.45%	8%	2.22%	6.07%	6.64%	12.71%
Kinder Morgan Energy Partners, LP	6.69%	8%	2.22%	6.07%	6.89%	12.96%

Column (1) is taken from individual company analysis.

Column (2) is taken from I/B/E/S Monthly Summary Data, US Edition.

Column (3) is calculated from three sources: EIA, Global Insight, and SSA.

Column (4) = Column(2)*2/3 + Column(3)*1/3

Column (5) = Column(1)*(1 + 0.5*Column(4))

Column (6) = Column(4) + Column(5)

NOTE: This Appendix is for illustrative purposes only and does not prejudge what would be an appropriate proxy group for use in individual proceedings.

Appendix B

In this Appendix, we illustrate with a simplified numerical example why a DCF analysis using a proxy MLP's full distribution, including any return of equity, does not lead to the award of an excess ROE in a pipeline rate case or the double recovery of depreciation.

In this example, we compare the results of a DCF analysis for two firms included in a proxy group, one a corporation and the other an MLP. We initially assume that the theoretical basis of the DCF methodology is sound. In other words, the DCF formula will lead to valid results for investors in pricing shares and returns. We further assume that each proxy firm engages only in jurisdictional interstate natural gas pipeline business. Therefore, each proxy firm charges cost-of-service rates determined by the Commission in the proxy firm's last rate case. We also assume that the Commission awarded the same 10 percent ROE to each proxy firm in its last rate case.

Based on these assumptions and the additional facts set forth below illustrating the typical differences between corporations and MLPs, we first set forth the DCF analysis an investor would perform to determine the value of the corporation's stock and the MLP's limited partner units. We then assume, consistent with the underlying premise of the DCF model, that the results of the investor's DCF analysis represent the actual share prices of the two proxy firms. Using those share prices, we then apply the DCF formula used in rate cases to determine the ROEs of the two proxy firms. As illustrated below, that DCF analysis arrives at the same 10 percent ROE for the proxy MLP, as for the proxy corporation, despite the fact the MLP's distribution includes a return of equity. Thus, the inclusion of return of equity in the MLP's distribution does not improperly distort the rate case DCF analysis.

Assumed Facts

The proxy corporation's rate base is $100. In its last rate case, the Commission awarded the proxy corporation an ROE of 10 percent, and found that its depreciable life is 25 years. So the proxy corporation's cost of service includes $10 for ROE, and $4 for depreciation. We assume that in its most recent year of operations, the corporation actually collected those amounts from its customers, and paid a dividend of $6.50, i.e., a dividend equal to 65 percent of its annual earnings. The corporation thus retains $7.50 in cash flow, which it reinvests the following year. This reflects the fact that corporations typically pay out less than earnings in their dividends. We also assume that that the corporation's composite growth rate is 8 percent.

The facts with respect to the MLP are the same, with two exceptions. First, the MLP paid its unit holders a distribution of $13, i.e., a distribution equal to 130 percent of earnings. The remaining $1 is distributed to the general partner of the MLP. Second, the

MLP's composite growth rate is only 5 percent.

DCF Analysis of Proxy Corporation

As discussed at P 2 of the notice, an investor uses the following DCF formula to determine share price (with simplifying assumptions):

D/ (ROE - g) = P

where P is the price of the stock at the relevant time, D is the current dividend, ROE is the discount rate or rate of return, and g is the expected constant growth in dividend income to be reflected in capital appreciation. Using that formula, investors would determine the rational stock price for the proxy corporation as follows:

$6.50 dividend/ (ROE of .10 – growth of .08) = Stock Price of $325

That is, investors would sell shares at a price above $325, and buy shares until the price reached $325. In a rate case for another pipeline, the Commission will determine the ROE of the proxy firm by solving the above formula for ROE, instead of share price. This rearranges the formula so that:

D/P + g = ROE

Using that formula and assuming the proxy corporation's actual stock price is $325, the Commission would determine the proxy corporation's ROE as follows:

$6.50 dividend/$325 stock price + growth of .08 = ROE of .10

Therefore, if the corporation was included in the proxy group for purposes of determining another firm's ROE in a new rate case, we would find, under the assumed facts, that the proxy corporation has the same 10 percent ROE as we awarded in its last rate case.

DCF Analysis of Proxy MLP

We now go through the same exercise for the proxy MLP to determine whether its distribution in excess of earnings distorts its DCF analysis so as to improperly inflate its ROE. Using the D/ (ROE - g) = P formula described above, investors would determine the proxy MLP's share price as follows:

$13 distribution/ (ROE of .10 – growth of .05) = Share price of $260

Assuming that the actual price of units in the proxy MLP is $260, we now determine the ROE of the proxy MLP, using the DCF formula used in rate cases (D/P + g = ROE).

Under that formula, we would calculate the proxy MLP's ROE as follows:

$13 distribution/$260 unit price + growth of .05 = ROE of .10

Therefore, if the MLP was included in the proxy group for purposes of determining another firm's ROE in a new rate case, we would, under the assumed facts, reach the same result as we reached for above proxy corporation: that the proxy MLP has the same 10 percent ROE as we awarded in its last rate case.

By contrast, if the Commission capped the proxy MLP's distribution at its $10 in earnings but continued to use the $260 share price, the ROE calculated for the proxy MLP would be only about 8.8 percent, and thus less than the 10 percent ROE the Commission awarded the proxy MLP in its last rate case and less than the results for the proxy corporation:

$10 distribution/$260 unit price + growth of .05 = ROE of .088

Conclusion

As shown by the above illustrative calculations, an MLP may be included in the proxy group and its full distribution used in the DCF analysis without distorting the results. This is because the level of an MLP's distributions affects both its share price and its projected growth rate. The MLP's inclusion of a return of equity in its distribution causes its share price to be higher than it otherwise would be and its growth rate to be lower. These facts offset the effect of the higher distribution on the DCF calculation of the MLP's ROE. Indeed, capping the MLP's distribution at earnings would lead to a distorted result. This is because there would be mismatch between the market-determined share price, which reflects the actual, higher uncapped distribution, and the lower earnings-capped distribution.

Huge dispersion of the Risk-Free Rate and Market Risk Premium used by analysts in USA and Europe in 2015

Pablo Fernandez. Professor of Finance. IESE Business School, fernandezpa@iese.edu
Alberto Ortiz. Research Assistant. IESE Business School. AOrtiz@iese.edu
Isabel F. Acín. Independent researcher. University of Navarra. ifernandez.28@alumni.unav.es

ABSTRACT

We look at the Risk-Free Rate (R_F) and the Market Risk Premium (MRP) used by analysts in 2015 to value companies of six countries.

The dispersion of both, the R_F and the MRP used, is huge, and the most unexpected result is that the dispersion is higher for the R_F than for the MRP.

We also find that some analysts have more freedom than others do.

The data permits other comparisons. For example: Does it make sense that the average MRP used for Germany is higher than the average MRP used for France, Italy, Spain or the UK?

Most of the analysts use a Risk-Free Rate (R_F) higher than the yield of the 10-year Government bonds. A reason for it and for the huge dispersion may be the activity of the European Central Bank (ECB). The risk-free rate (R_F) is the required return to Government bonds when nobody (not even the ECB) manipulates the market. A question arises: May we consider the Quantitative Easing (QE) implemented by the ECB in 2014 and 2015 "market abuse", "market manipulation", a way of "altering competitive markets"…?

JEL Classification: G12, G31, M21

Keywords: analyst, market risk premium; required equity premium; risk-free rate

November 2, 2015

xPpLhmlsjmOo

1. RF and MRP used in 156 valuation reports

We revised more than 1,000 analyst reports about companies with headquarters in six countries: France, Germany, Italy, Spain, UK and USA. We looked for reports that indicated the Risk-Free Rate (**RF**) and the Market Risk Premium (**MRP**) used by the analyst in the valuation. We found only 156. Exhibit 1 contains the date, the company of the financial analyst, the company valued, and the RF and MRP used. The analysts belong to 35 different companies and the reports refer to 99 different companies.

Figures 1 and 2 contain the Risk-Free Rate (**RF**) and the Market Risk Premium (**MRP**) used in 2015 in by the financial analysts in the 156 reports. The dispersion is huge.

Table 1 contains the statistics of the **RF**, **MRP** and (**RF** + **MRP**) that appear in Figure 1. The most unexpected result is that the (Standard deviation / average) is higher for **RF** than for **MRP** in the six countries: the dispersion is higher for the **RF** used than for the **MRP** used.

The reader can do also other comparisons and assessments. For example: Does it make sense that the average MRP used for Germany is higher than the average MRP used for France, Italy, Spain or the UK? Does it make sense that the MRP and the RF used have positive correlation only in France?

Figure 1. RF, MRP and (RF + MRP) used in 2015 by 156 analysts in their valuations of companies of 6 countries

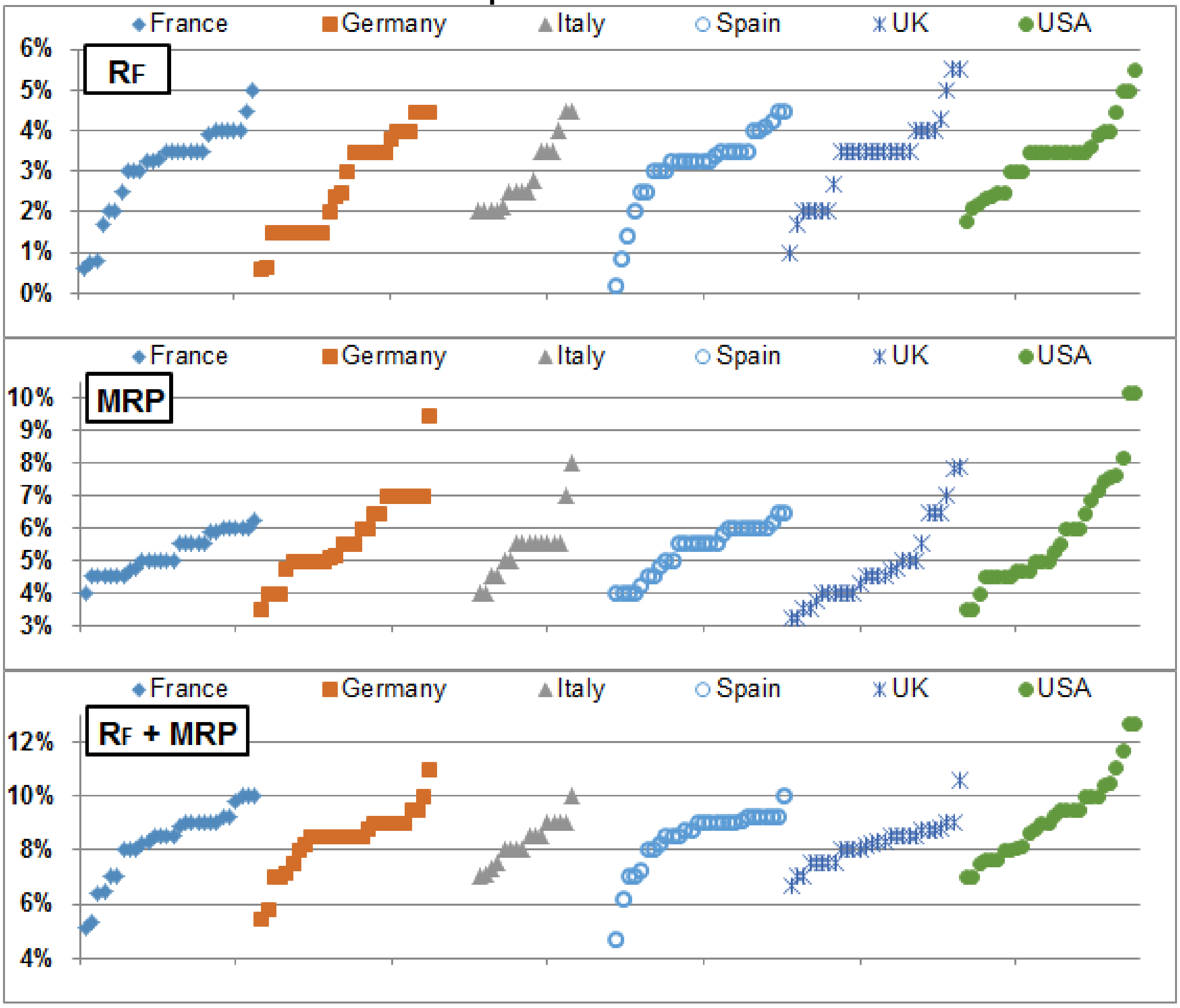


Figure 2. RF and MRP used in 2015 by 156 analysts in their valuations of companies of six countries

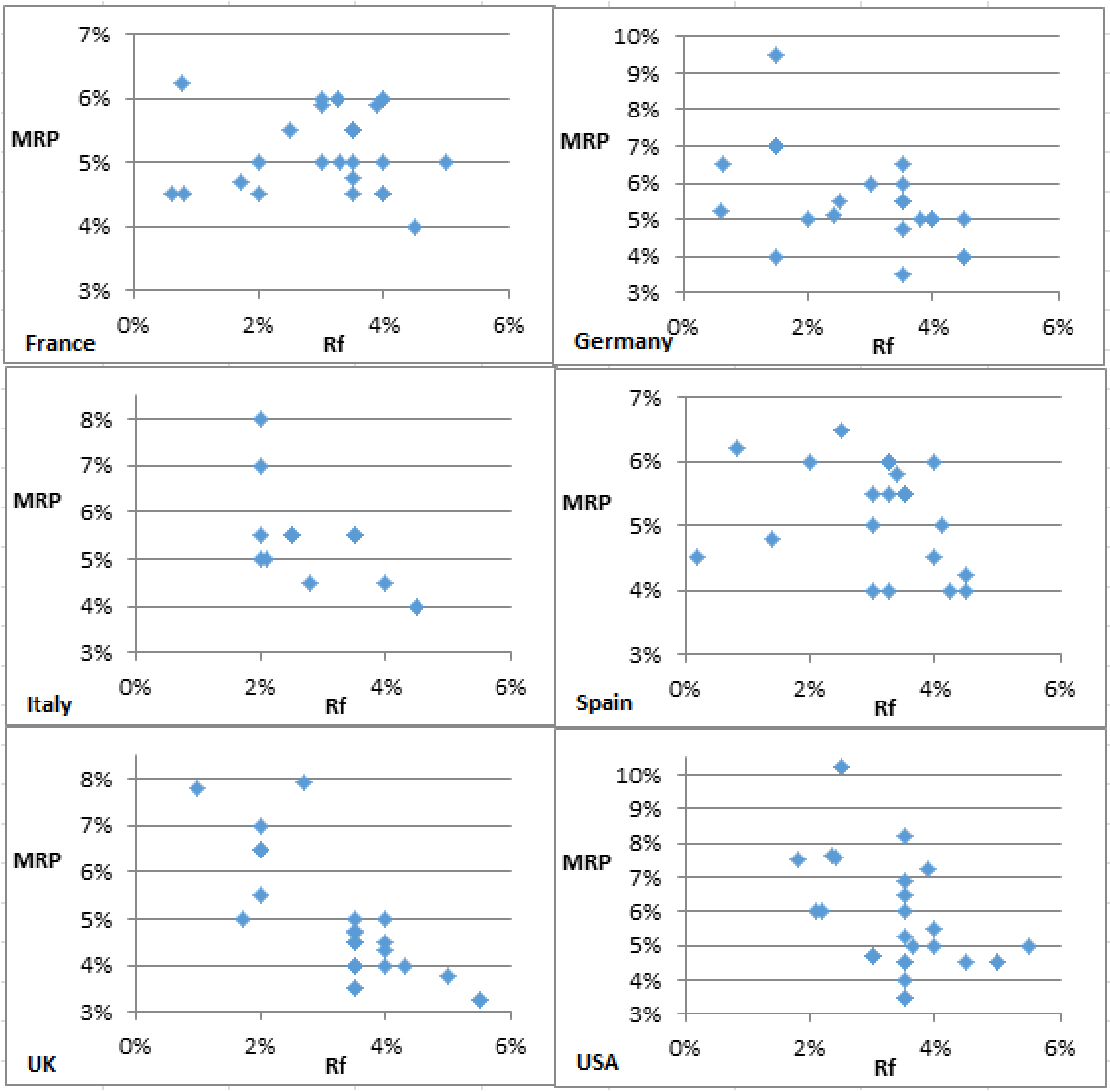


Table 1. RF and MRP used in 2015 by 156 analysts in their valuations

	RF				MRP				RF + MRP			
	average	max	min	StDev	average	max	min	StDev	average	max	min	StDev
France	3.1%	5.0%	0.6%	1.1%	5.2%	6.3%	4.0%	0.6%	8.3%	10.0%	5.1%	1.3%
Germany	2.7%	4.5%	0.6%	1.2%	5.7%	9.5%	3.5%	1.3%	8.4%	11.0%	5.5%	1.2%
Italy	2.8%	4.5%	2.0%	0.8%	5.4%	8.0%	4.0%	1.0%	8.3%	10.0%	7.0%	0.8%
Spain	3.1%	4.5%	0.2%	1.0%	5.3%	6.5%	4.0%	0.8%	8.5%	10.0%	4.7%	1.1%
UK	3.3%	5.5%	1.0%	1.1%	4.8%	7.9%	3.3%	1.3%	8.2%	10.6%	6.7%	0.8%
USA	3.4%	5.5%	1.8%	0.9%	5.8%	10.2%	3.5%	1.8%	9.2%	12.7%	7.0%	1.5%

	StDev / average		Correlation		
	RF	MRP	RF, RF + MRP	RF, MRP	MRP, RF + MRP
France	0.67	0.25	*87.5%*	*4.9%*	52.7%
Germany	0.62	0.28	41.4%	-59.3%	48.7%
Italy	0.73	0.28	31.3%	-56.2%	54.0%
Spain	0.55	0.27	*72.4%*	-24.2%	49.4%
UK	0.38	0.33	5.8%	-80.3%	54.8%
USA	0.46	0.25	0.7%	-49,7%	86.4%

The statistics of table 1 can be compared with the statistics of a survey that was conducted on April 2015 (see **Table 2).** It can be seen that:

- The (average RF) used by analysts is substantially higher than the (average RF) of the survey.
- The (average MRP) is not substantially different,
- The average (RF + MRP) used by analysts is substantially higher than the average (RF + MRP) of the survey.

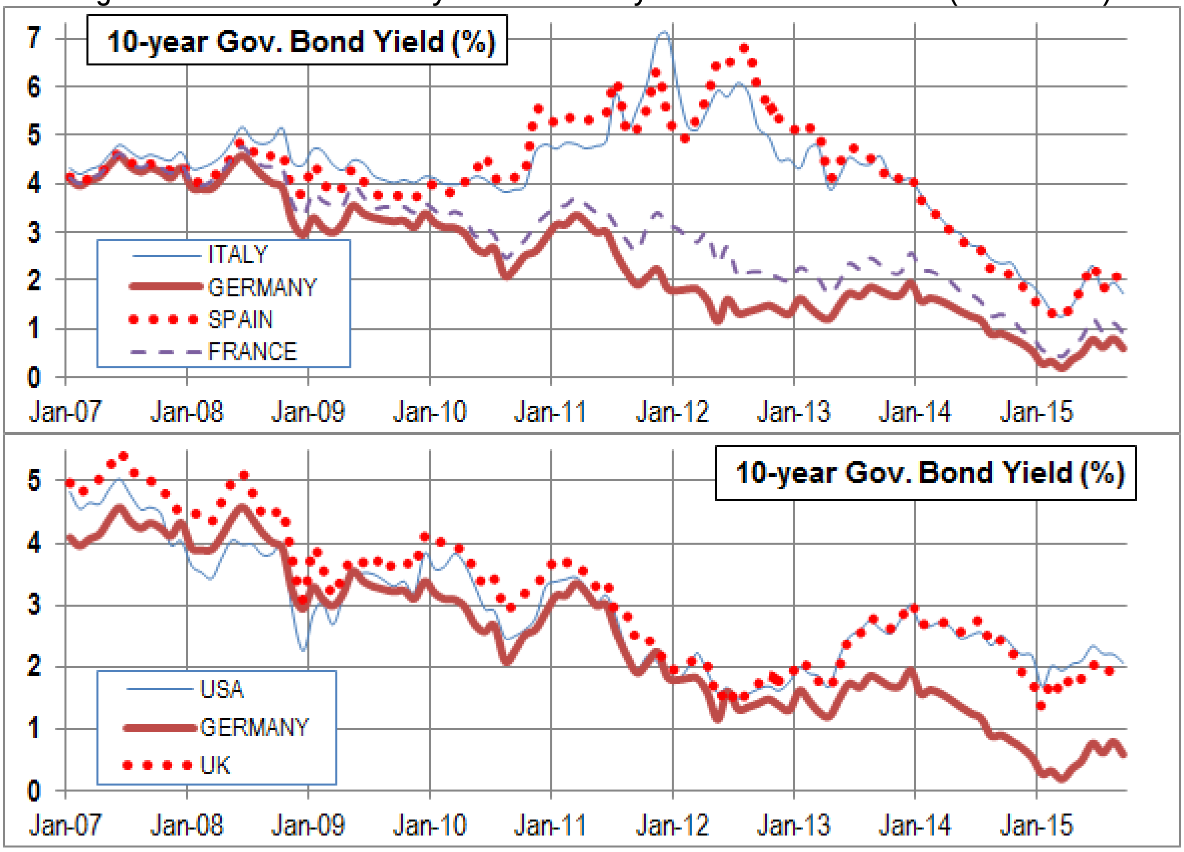
Table 2. RF and MRP used in 2015 according to a survey[1]

	RF				MRP				RF + MRP			
	average	max	min	StDev	average	max	min	StDev	average	max	min	StDev
France	1.5%	5.1%	0.0%	1.0%	5.6%	10.0%	2.0%	1.4%	7.2%	14.0%	4.0%	1.6%
Germany	1.3%	5.1%	-0.2%	0.8%	5.3%	11.3%	2.0%	1.5%	6.6%	14.2%	2.8%	1.7%
Italy	1.5%	5.0%	0.0%	1.1%	5.4%	10.0%	2.0%	1.5%	7.0%	14.0%	3.0%	2.1%
Spain	2.2%	7.0%	0.0%	1.2%	5.9%	12.0%	3.0%	1.6%	8.1%	15.7%	4.1%	2.0%
UK	2.1%	6.0%	0.4%	0.8%	5.2%	10.5%	1.3%	1.7%	7.2%	13.0%	3.0%	1.9%
USA	2.4%	8.0%	0.0%	1.1%	5.5%	15.0%	2.0%	1.4%	7.9%	22.0%	2.5%	1.7%

2. Evolution of the 10-year Government bonds yield for the six countries

The anomalous low yields on the Government bonds in 2014 and 2015 (see **Figure 3**) may have some influence on the results presented on the previous section. Figure 3 suggests three pairs of countries with RF moving quite close: Italy-Spain, Germany-France and US-UK.

Figure 3. Evolution of the 10-year Gov. Bond yield of the six countries (2007 – 2015)



---

[1] "RF and Market Risk Premium Used for 41 Countries in 2015: A Survey", http://ssrn.com/abstract=2598104

A comment about the **Quantitative Easing (QE)** implemented by the ECB in 2014, 2015... It is just a strange synonym for “print a lot of money (euros) and buy many, many bonds of the countries in the EU”. By doing so, bond prices increase (and bond yields decrease) dramatically. Some people refer to this “QE” as “market abuse of the ECB”, “market manipulation”, “altering competitive markets”, “expropriation of savings”… We agree with all this definitions: they are clearer than “QE”.

3. Degrees of freedom of different analysts

A closer look at Exhibit 1 permits to find four different patterns of analyst houses. We can see that there companies with their analysts using (for companies of the same country):

a) The same RF and same MRP
b) The same RF and different MRP
c) Different RF and same MRP
d) Different RF and different MRP. Among these we find the analysts of Spanish companies that belong to Deutsche Bank (see table 3). Other companies where the analysts have a lot of freedom are Jefferies, Morgan Stanley, Natixis, Societe Generale (although not in the USA) and UBS.

Table 3. RF and MRP used in 2015 in reports done by analysts of Spanish companies that belong to Deutsche Bank.

	Company	**RF**	**MRP**	**RF + MRP**
24/02/2015	Amadeus	4.1%	5.0%	9.1%
25/02/2015	Gamesa	1.8%	4.0%	5.8%
26/02/2015	Grifols	3.5%	5.5%	9.0%
24/03/2015	Inditex	2.0%	6.0%	8.0%
26/05/2015	Red Eléctrica	1.8%	4.0%	5.8%
17/06/2015	Aena	3.4%	5.8%	9.2%
30/07/2015	Acerinox	2.5%	6.5%	9.0%

4. MRP in 2015 according to Damodaran

Damodaran does a strange calculation of the MRP in 2015 of 116 countries. **Table 4** contains the 57 countries with MRP smaller than 9%.

Table 4. MRP in 2015 according to Damodaran

Source: *Damodaran* http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

5.75%; Australia; Austria; Brunei; Canada; Denmark; Finland; **Germany**; Luxembourg; Netherlands; New Zealand; Norway; Singapore; Sweden; Switzerland; **United States**
6.35%; **France**; Hong Kong; **United Kingdom**
6.50%; Kuwait; Qatar; United Arab Emirates
6.65%; Belgium; Chile; China. Peoples' Rep.; Korea. Republic; Saudi Arabia; Taiwan
6.80%; Czech Republic; Estonia; Israel; Japan; Oman
7.03%; Botswana; Poland; Slovakia
7.55%; Malaysia; Malta; Mexico; Peru
8.15%; Ireland; Latvia; Lithuania; Thailand; Trinidad & Tob.
8.60%; Bahamas; Bahrain; Brazil; Bulgaria; Colombia; **Italy**; Kazakhstan; Panama; Philippines; Russia; South Africa; **Spain;** Uruguay

Exhibit 3 reproduces how Damodaran gets the MRP of table 4. We agree with Damodaran in many valuation issues, but we cannot agree with table 4 or with Exhibit 3 for two reasons:

1. It does not make much sense to calculate the MRP, something related to the perceived risk of shares of a market, using only a characteristic of the Government bonds of that market.
2. The comparison of the MRP of different countries does not agree with common sense. Does it make sense, for example, to affirm that in December 2014 the risk of investing in Italian

companies was higher than the risk of investing in companies from Estonia, Oman, Botswana, Poland, Malaysia, Malta, Mexico, Peru…?

All analysts in our sample used a MRP smaller than the suggested by Damodaran for Spain (8.6%), Italy (8.6%) and France (6.35%). 12 analysts used a MRP smaller (and 16 a MRP higher) than the suggested by Damodaran for USA and Germany (5.75%). 6 analysts used a MRP smaller (and 22 a MRP higher) than the suggested by Damodaran for UK (6.35%).

5. MRP and RF. Where they come from?[2]

The valuation of companies using discounted cash flows is an extension of the valuation of Government bonds. The Value of a Government bond (VGB) is the present value of the cash flows promised in the bond (CFgb) using the so called "**risk-free rate**" (R_F):

$$\text{Value of a Government bond} = VGB = PV\ (CFgb;\ R_F) \qquad (1)$$

The risk-free rate (R_F) is the **required return** to Government bonds (when the ECB does not manipulate the market)

Valuation of the Debt. The **Debt cash flows** (CFd) are interest payments and repayments of debt (∇N).[3]

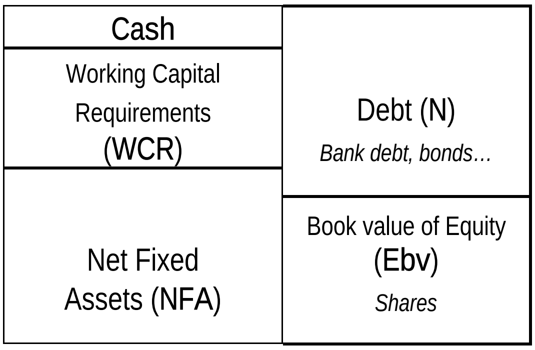
$$CFd = \text{Interest} + \nabla N \qquad (2)$$

As the (CFd) promised by a company are usually riskier[4] than the cash flows promised by the Government (CFgb), the **required return to Debt** (Kd) is usually higher than the risk-free rate (R_F)

$$\text{Required return to debt} = Kd = R_F + RPd\ (\text{debt risk premium}) \qquad (3)$$

The **debt risk premium** (RPd) depends on the perceived risk on the Debt (expectations of getting less money than the promised Debt cash flows) by every investor. Applying Equation (1) to the Debt of the company, we get:

$$\text{Value of debt} = D = PV\ (CFd;\ Kd) \qquad (4)$$



Debt Cash Flow (CFd): money (cash) that goes from the Cash of the company to the pockets of bondholders

Equity Cash Flow (ECF): money (cash) that goes from the Cash of the company to the pockets of shareholders

Valuation of the shares. A share of a company is a piece of paper that, contrary to debt, has not dates nor amounts that will receive its owner, the shareholder. We need, first, to estimate the expected cash flows for the owners of the shares in the following years, named **Equity Cash Flows** (ECF). A usual way of estimating the ECF is to start with the expected Balance Sheets and P&Ls. Equation (5) is the basic accounting identity: assets are equal to liabilities and equity:

$$Cash + WCR + NFA = N + Ebv \qquad (5)$$

Equation (6) is the annual change of Equation (5). The increase of the cash of the company before giving anything to the shareholders will be divided between the **ECF** and the increase of cash (ΔCash) decided by the managers:

$$ECF + \Delta Cash + \Delta WCR + \Delta NFA = \Delta N + \Delta Ebv \qquad (6)$$

If the (ΔEbv) is due only to the Profit after Tax (PAT) of the year, then[5]:

$$ECF = PAT - \Delta WCR - \Delta NFA + \Delta N - \Delta Cash \qquad (7)$$

---

[2] *Source: "Cash flow discounting: fundamental relationships and unnecessary complications"*, http://ssrn.com/abstract=2117765

[3] If the company does not repay debt (∇N) but increases its debt (ΔN), Equation (2) would be $CFd = \text{Interest} - \Delta N$

[4] The risk of the debt is the probability that the company will not pay some of the promised cash flows. Risk-free debt means that we believe that the issuer will pay all promised cash flows for sure.

[5] As NFA = GFA (gross fixed assets) – depreciation, equation (7) can be written:
$ECF = PAT + \text{depreciation} - \Delta NOF - \Delta GFA + \Delta N - \Delta Cash$

As the expected ECF are riskier than the cash flows promised by the Government bonds (CFgb) and also riskier than the cash flows promised by the Debt of the company (CFd), the **required return to equity (shares)** (Ke) is higher than risk-free rate (R_F) and also higher than the required return to Debt (Kd): Ke = R_F + RPs (shares risk premium) (8)

The so-called **shares risk premium** (RPs) depends on the estimated (expected) risk of the expected equity cash flows (ECF). Obviously, this parameter depends on the expectations of each investor. Applying Equation (1) to the equity (the shares of the company), we get:
Value of the shares (equity value) = E = PV (ECF; Ke) (9)

With equations (2) to (9) we can value any company. But, as equations (2) to (9) are relatively easy to understand, it is quite common to complicate the valuation with new 'concepts' and new equations. With these unnecessary complications, the valuation becomes more difficult to understand and acquires a more "scientific", "serious", "intriguing", "impenetrable"… appearance.

'Invention' of the beta and the market risk premium (MRP). It consists in calculating RPs (shares risk premium) as a product: RPs = β MRP (10)

The MRP (**market risk premium**) is the "shares risk premium" applied to the whole market (or to a portfolio with shares of most of the companies traded in the stock markets). The market risk Premium (MRP) is the answer to the following question: Knowing that your money invested in long-term Government bonds will provide you a return of R_F% almost for sure, which additional return you require to another investment (in a portfolio with shares of most of the companies with shares traded in the financial markets) for feeling compensated for the extra risk that you assume?

The "market risk premium" is also called "*equity premium*", "*equity risk premium*", "*market premium*" and "*risk premium*".

The β (**beta**) is a specific parameter for each company. $\beta = 0$ corresponds to Government bonds (no risk) and $\beta = 1$ to an investment with a perceived risk similar to that of the market.

With the 'invention' of the beta, Equation (8) becomes equation (11)

Ke = R_F + β MRP (11)

6. Two common errors about β and MRP

First error: To maintain that the β may be calculated with a regression of historical data

This lack of common sense consists first, in assuming that "the market" assigns a beta to every company and second, in maintaining that the levered beta may be calculated with a regression of historical data. According to the followers of this new "complication", the beta has nothing to do with the expectations of risk, the experience of the valuator… but rather every investor should use the same beta: the calculated beta. You can get that beta running a regression of the past returns of the company this the returns of some market index.

We show that it is an enormous error to use calculated betas (see *Are Calculated Betas Worth for Anything?* http://ssrn.com/abstract=504565). First, because it is almost impossible to calculate a meaningful beta because historical betas change dramatically from one day to the next. Second, because very often we cannot say with a relevant statistical confidence that the beta of one company is smaller or bigger than the beta of another. Third, because historical betas do not make much sense in many cases: high-risk companies very often have smaller historical betas than low-risk companies do. Fourth, because historical betas depend very much on which index we use to calculate them.

Some authors and companies publish calculated betas. For example, Damodaran publish industry betas in http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html

Second error: To maintain that "the market" has "a MRP" and that it is possible to estimate it

This new "complication" consists in assuming that "the market" has a MRP (market risk premium). Then, the MRP would be a parameter "of the market" and not a parameter that is different for different investors.

We reviewed[6] 150 textbooks on corporate finance and valuation written by authors such as Brealey, Myers, Copeland, Damodaran, Merton, Ross, Bruner, Bodie, Penman, Arzac… and finds that their recommendations regarding the equity premium range from 3% to 10%, and that 51 books use different equity premia in various pages. Some confusion arises from not distinguishing among the concepts that the phrase equity premium designates: the Historical, the Expected and the Required equity premium (incremental return of a diversified portfolio over the risk-free rate required by an investor). 129 out of the 150 textbooks identify Expected and Required equity premium and 82 books identify Expected and Historical equity premium.

We maintain that the CAPM is an absurd model[7].

7. Expected, Required and Historical Market Risk Premium: different concepts

Fernandez and F.Acín (2015)[8] claim and show that Expected Return and Required Return are two very different concepts.

We also claim[9] that the term "MRP" is used to designate three different concepts:

1. **Historical** equity premium (HEP): historical differential return of the stock market over treasuries.
2. **Expected** equity premium (EEP): expected differential return of the stock market over treasuries.
3. **Required** equity premium (REP): incremental return of a diversified portfolio (the market) over the risk-free rate required by an investor. It is used for calculating the required return to equity.

The three concepts (HEP, REP, EEP) designate different realities. The **HEP** is easy to calculate and is equal for all investors, provided they use the same period, the same market index, the same risk-free instrument and the same average (arithmetic or geometric). However, the **EEP** and the **REP** may be different for different investors and are not observable.

The **HEP** is the historical average differential return of the market portfolio over the risk-free debt. The most widely cited sources are Ibbotson Associates and Dimson *et al.* (2007).

Numerous papers and books assert or imply that there is a "market" EEP. However, it is obvious that investors and professors do not share "homogeneous expectations" and have different assessments of the **EEP**. As Brealey et al. (2005, page 154) affirm, *"Do not trust anyone who claims to know what returns investors expect".*

The **REP** is the answer to the following question: What incremental return do I require for investing in a diversified portfolio of shares over the risk-free rate? It is a crucial parameter because the REP is the key to determining the company's required return to equity and the WACC. Different companies may use, and in fact do use, different **REPs**.

For a particular investor, the **EEP** is not necessary equal to the REP (unless he considers that the market price is equal to the value of the shares). Obviously, an investor will hold a diversified portfolio of shares if his EEP is higher (or equal) than his REP and will not hold it otherwise.

We can find out the REP and the EEP of an investor by asking him, although for many investors the REP is not an explicit parameter but, rather, it is implicit in the price they are prepared to pay for the shares. However, it is not possible to determine the REP for the market as a whole, because it does not exist: even if we knew the REPs of all the investors in the market, it would be meaningless to talk of a REP for the market as a whole. There is a distribution of REPs and we can only say that some percentage of investors have REPs contained in a range. The average of that distribution cannot be interpreted as the REP of the market nor as the REP of a representative investor.

---

[6] "The Equity Premium in 150 Textbooks", http://ssrn.com/abstract=1473225
[7] "CAPM: an absurd model", http://ssrn.com/abstract=2505597
[8] "Expected and Required Returns: Very Different Concepts", http://ssrn.com/abstract=2591319
[9] "Equity premium: historical, expected, required and implied", http://ssrn.com/abstract=933070

8. Conclusion

We look at the RF and the MRP used by analysts in 2015 to value companies of six countries. The dispersion of both, the RF and the MRP used, is huge, and the most unexpected result is that the dispersion is higher for the RF than for the MRP.

Most of the analyst use a RF higher than the yield of the 10-year Government bonds. A reason for it and for the huge dispersion may be the activity of the European Central Bank (ECB). The risk-free rate (RF) is the required return to Government bonds when nobody (not even the ECB) manipulates the market. A question arises: May we consider the Quantitative Easing (QE) implemented by the ECB in 2014, 2015... "market abuse", "market manipulation", a way of "altering competitive markets"…?

We also find that some analysts have more freedom than others.

The data permits other comparisons. For example: Does it make sense that the average MRP used for Germany is higher than the average MRP used for France, Italy, Spain or the UK?

References

Claus, J.J. and J.K. Thomas (2001), "Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets," *Journal of Finance*. 55, (5), pp. 1629-66.

Damodaran, A. (2008), "Equity Risk Premiums (ERP): Determinants, Estimation and Implications", Working Paper.

Dimson, E., P. Marsh and M. Staunton (2007), "The Worldwide Equity Premium: A Smaller Puzzle," in *Handbook of investments: Equity risk premium*, R. Mehra, Elsevier.

Fernandez, P. (2007), "Equity Premium: Historical, Expected, Required and Implied", http://ssrn.com/abstract=933070

Fernandez, P. (2009a), "Market Risk Premium Used in 2008 by Professors: A Survey with 1,400 Answers", http://ssrn.com/abstract=1344209

Fernandez, P. (2009b), "The Equity Premium in 150 Textbooks", http://ssrn.com/abstract=1473225

Fernandez, P., J. Aguirremalloa and H. Liechtenstein (2009), "The Equity Premium Puzzle: High Required Premium, Undervaluation and Self Fulfilling Prophecy". IESE Business School WP. http://ssrn.com/abstract=1274816

Fernandez, P. and J. del Campo (2010a), "Market Risk Premium used in 2010 by Analysts and Companies: a survey with 2,400 answers", downloadable in http://ssrn.com/abstract=1609563

Fernandez, P. and J. del Campo (2010b), "Market Risk Premium Used in 2010 by Professors: A Survey with 1,500 Answers", downloadable in http://ssrn.com/abstract=1606563

Fernandez, P., J. Aguirreamalloa and L. Corres (2011a), "US Market Risk Premium Used in 2011 by Professors, Analysts and Companies: A Survey with 5.731 Answers", downloadable in http://ssrn.com/abstract=1805852

Fernandez, P., J. Aguirreamalloa and L. Corres (2011b), "The Equity Premium in Spain: Survey 2011 (in Spanish)", downloadable in http://ssrn.com/abstract=1822422

Fernandez, P., J. Aguirreamalloa and L. Corres (2011c), "Market Risk Premium Used in 56 Countries in 2011: A Survey with 6,014 Answers", downloadable in http://ssrn.com/abstract=1822182

Fernandez, P., J. Aguirreamalloa and P. Linares (2014), "Market Risk Premium and Risk Free Rate Used for 51 Countries in 2013: A Survey with 6,237 Answers", downloadable in http://ssrn.com/abstract=914160

Fernandez, P., J. Aguirreamalloa and L. Corres (2012), "Market Risk Premium Used in 82 Countries in 2012: A Survey with 7,192 Answers", downloadable in http://ssrn.com/abstract=2084213

Fernandez, P. and I. F. Acín (2015), "Expected and Required Returns: Very Different Concepts", downloadable in http://ssrn.com/abstract=2591319

Fernandez, P., P. Linares and I. F. Acín (2014), "Market Risk Premium Used in 88 Countries in 2014: A Survey with 8,228 Answers", downloadable in http://ssrn.com/abstract=2450452

Exhibit 1. Analyst reports analyzed in this document

US COMPANIES

Date	Analyst	Company	Rf	MRP	Rf+MRP
02/02/2015	HSBC	Chevron	3,5%	6,0%	9,5%
06/08/2015	JP Morgan	Tesla	1,8%	7,5%	9,3%
22/07/2015	Jefferies	Microsoft	3,5%	8,2%	11,7%
06/10/2015	Deutsche Bank	Pepsico	3,5%	4,0%	7,5%
23/09/2015	Morgan Stanley	JP Morgan Chase	5,0%	4,5%	9,5%
14/07/2015	RBC Capital	JP Morgan Chase	2,4%	7,6%	10,0%
16/04/2015	Societe Generale	JP Morgan Chase	3,0%	4,7%	7,7%
17/07/2015	RBC Capital	Citigroup	2,4%	7,7%	10,0%
17/07/2015	Morgan Stanley	Citigroup	5,0%	4,5%	9,5%
18/09/2015	Barclays	Altria (ex Philip Morris)	3,5%	4,5%	8,0%
12/05/2015	HSBC	Verizon	3,5%	3,5%	7,0%
22/07/2015	Cowen and Company	Verizon	2,5%	10,2%	12,7%
18/02/2015	Piper Jaffray	Amazon	2,1%	6,0%	8,1%
15/04/2015	Morgan Stanley	Wells Fargo	4,5%	4,5%	9,0%
09/03/2015	Societe Generale	Wells Fargo	3,0%	4,7%	7,7%
13/10/2015	Piper Jaffray	Johnson & Johnson	3,6%	5,0%	8,6%
30/07/2015	Brean Capital	Facebook	3,5%	6,5%	10,0%
17/09/2015	Wedbush Securities	Oracle	2,2%	6,0%	8,2%
17/09/2015	Jefferies	Oracle	3,5%	5,3%	8,8%
15/06/2015	UBS	Walt Disney	3,5%	6,9%	10,4%
12/05/2015	Deutsche Bank	Walt Disney	4,0%	5,0%	9,0%
24/07/2015	Cowen and Company	AT&T	2,5%	10,2%	12,7%
03/06/2015	Jefferies	AT&T	4,0%	5,5%	9,5%
23/04/2015	HSBC	AT&T	3,5%	3,5%	7,0%
19/06/2015	Societe Generale	Bank of America	3,0%	4,7%	7,7%
13/08/2015	Deutsche Bank	Cisco Systems	5,5%	5,0%	10,5%
12/10/2015	UBS	Anheuser-Busch	3,9%	7,2%	11,1%
08/10/2015	Barclays	Anheuser-Busch	3,5%	4,5%	8,0%

Average	3,4%	5,8%	9,2%
Max	5,5%	10,2%	12,7%
min	1,8%	3,5%	7,0%
St. Dev	0,9%	1,8%	1,5%

GERMAN COMPANIES

Date	Analyst	Company	Rf	MRP	Rf+MRP
30/09/2015	HSBC	BASF	0,6%	5,2%	5,8%
11/03/2015	Warburg Research Gmbh	BASF	1,5%	7,0%	8,5%
07/05/2015	Warburg Research Gmbh	BMW	1,5%	7,0%	8,5%
29/04/2015	Warburg Research Gmbh	DAIMLER	1,5%	7,0%	8,5%
14/04/2015	Natixis	Deutsche Bank	2,4%	5,1%	7,5%
03/08/2015	Esn/Equinet Bank	Deutsche Telekom	4,5%	4,0%	8,5%
13/05/2015	Warburg Research Gmbh	Deutsche Telekom	1,5%	7,0%	8,5%
03/12/2014	Kepler Cheuvreux	Siemens	3,8%	5,0%	8,8%
30/04/2015	Warburg Research Gmbh	Bayer	1,5%	7,0%	8,5%
18/02/2015	Commerzbank	Bayer	1,5%	4,0%	5,5%
02/10/2015	HSBC	Merck	3,5%	3,5%	7,0%
12/08/2015	Deutsche Bank	Merck	4,0%	5,0%	9,0%
19/05/2015	Warburg Research Gmbh	Merck	1,5%	7,0%	8,5%
02/10/2015	HSBC	Lufthansa	3,5%	5,5%	9,0%
28/09/2015	ESN/Equinet Bank	Lufthansa	4,5%	5,0%	9,5%
18/09/2015	Macquarie Research	E.ON	4,0%	5,0%	9,0%
10/09/2015	HSBC	E.ON	3,5%	5,5%	9,0%
12/03/2015	Warburg Research Gmbh	E.ON	1,5%	7,0%	8,5%
07/10/2015	ESN/Equinet Bank	Volkswagen	4,5%	4,0%	8,5%
02/10/2015	Baader Helvea Equity Res.	Volkswagen	2,0%	5,0%	7,0%
30/03/2015	Redburn / Automotive	Volkswagen	3,5%	6,0%	9,5%
12/08/2015	HSBC	Henkel	3,5%	4,8%	8,3%
09/03/2015	Jefferies	Henkel	2,5%	5,5%	8,0%
26/08/2015	JP Morgan	ThyssenKrupp	0,7%	6,5%	7,2%

31/03/2015	Societe Generale	ThyssenKrupp	1,5%	9,5%	11,0%
22/04/2015	HSBC	SAP	3,0%	6,0%	9,0%
21/04/2015	Jefferies	SAP	3,5%	6,5%	10,0%
20/03/2015	Deutsche Bank	SAP	4,0%	5,0%	9,0%

Average	2,7%	5,7%	8,4%
Max	4,5%	9,5%	11,0%
min	0,6%	3,5%	5,5%
St. Dev	1,2%	1,3%	1,2%

FRENCH COMPANIES

Date	**Analyst**	**Company**	**Rf**	**MRP**	**Rf+MRP**
10/04/2015	ESN	AXA	4,5%	4,0%	8,5%
09/09/2015	BPI	BNP Paribas	3,3%	6,0%	9,3%
27/04/2015	Kepler Cheuvreux	BNP Paribas	4,0%	4,5%	8,5%
15/09/2015	HSBC	Carrefour	3,5%	5,5%	9,0%
04/09/2015	Natixis	Credit Agricole	3,0%	6,0%	9,0%
23/09/2015	HSBC	EDF	3,5%	5,5%	9,0%
22/06/2015	Macquarie Research	EDF	3,3%	5,0%	8,3%
07/10/2015	RBC Capital Markets	LVMH	3,0%	5,0%	8,0%
15/09/2015	Societe Generale	LVMH	2,0%	5,0%	7,0%
07/08/2015	HSBC	LVMH	3,5%	5,5%	9,0%
14/09/2015	Raymond James	L´Oreal	3,5%	5,0%	8,5%
31/07/2015	HSBC	L´Oreal	3,5%	4,8%	8,3%
27/07/2015	Deutsche Bank	Saint Gobain	4,0%	6,0%	10,0%
07/10/2015	Liberum	Total	4,0%	5,0%	9,0%
16/09/2015	BPI	Societe Generale	3,3%	6,0%	9,3%
30/09/2015	UBS	Pernod Ricard	3,0%	5,9%	8,9%
28/08/2015	Raymond James	Pernod Ricard	3,5%	5,5%	9,0%
28/08/2015	Barclays	Pernod Ricard	3,5%	4,5%	8,0%
18/05/2015	UBS	Essilor	2,0%	4,5%	6,5%
06/04/2015	UBS	Legrand	0,6%	4,5%	5,1%
17/12/2015	Deutsche Bank	Lafarge	3,9%	5,9%	9,8%
14/07/2015	Liberum	Technip	5,0%	5,0%	10,0%
19/02/2015	Raymond James	Technip	4,0%	6,0%	10,0%
02/10/2015	UBS	Schneider Electric	0,8%	4,5%	5,3%
12/06/2015	Deutsche Bank	Air Liquide	4,0%	4,5%	8,5%
20/02/2015	Liberum	Air Liquide	2,5%	5,5%	8,0%
23/09/2015	Societe Generale	Unibail-Rodamco	1,7%	4,7%	6,4%
23/07/2015	Natixis	Unibail-Rodamco	0,8%	6,3%	7,0%

Average	3,1%	5,2%	8,3%
Max	5,0%	6,3%	10,0%
min	0,6%	4,0%	5,1%
St. Dev	1,1%	0,6%	1,3%

UK COMPANIES

Date	**Analyst**	**Company**	**Rf**	**MRP**	**Rf+MRP**
30/07/2015	HSBC	GlaxoSmithKline	3,5%	3,5%	7,0%
24/07/2015	Renaissance Capital	Anglo American Minas	4,0%	5,0%	9,0%
09/09/2015	HSBC	Astra Zeneca	3,5%	3,5%	7,0%
31/07/2015	Barclays	Diageo	3,5%	4,5%	8,0%
27/01/2015	Deutsche Bank	Intercont.Hotels Group	4,0%	4,0%	8,0%
12/01/2015	BNP Paribas	British Americ. Tobacco	2,7%	7,9%	10,6%
27/07/2015	HSBC	Reckitt Benckiser	3,5%	4,8%	8,3%
29/06/2015	Kepler Cheuvreux	Reckitt Benckiser	1,0%	7,8%	8,8%
14/01/2015	Raymond James	Reckitt Benckiser	3,5%	5,0%	8,5%
24/06/2015	Barclays	Next	3,5%	4,5%	8,0%
10/07/2015	Morgan Stanley	Rolls Royce	4,0%	4,5%	8,5%
08/07/2015	Kepler Cheuvreux	Rolls Royce	2,0%	5,5%	7,5%
18/08/2015	UBS	Aviva	1,7%	5,0%	6,7%
16/07/2015	Credit Suisse	Michael Page	2,0%	6,5%	8,5%
16/04/2015	Kepler Cheuvreux	Michael Page	2,0%	7,0%	9,0%
08/10/2015	Morgan Stanley	Sports Direct	5,5%	3,3%	8,8%

26/01/2015	Morgan Stanley	Dixons Carphone	5,0%	3,8%	8,8%
03/09/2015	HSBC	International Airlines Gr	3,5%	4,0%	7,5%
26/06/2015	HSBC	Aberdeen Assets Manag.	3,5%	4,0%	7,5%
10/09/2015	Peel Hunt	Admiral Group	4,3%	4,0%	8,3%
01/07/2015	SEB	4GS	3,5%	4,0%	7,5%
12/01/2015	Credit Suisse	4GS	2,0%	6,5%	8,5%
30/09/2015	HSBC	Sainsbury	3,5%	4,0%	7,5%
17/03/2015	Morgan Stanley	Sainsbury	5,5%	3,3%	8,8%
26/03/2015	Credit Suisse	Serco	2,0%	6,5%	8,5%
24/04/2015	HSBC	WPP	3,5%	4,7%	8,2%
22/06/2015	Barclays	Imperial Tobacco	3,5%	4,5%	8,0%
15/06/2015	Deutsche Bank	Imperial Tobacco	4,0%	4,3%	8,3%

Average	3,3%	4,8%	8,2%
Max	5,5%	7,9%	10,6%
min	1,0%	3,3%	6,7%
St. Dev	1,1%	1,3%	0,8%

ITALIAN COMPANIES

Date	Analyst	Company	Rf	MRP	Rf+MRP
20/01/2015	Barclays	Luxottica	4,0%	4,5%	8,5%
22/01/2015	Banca IMI	Natural Gas	2,5%	5,5%	8,0%
22/01/2015	Banca IMI	R&M	2,5%	5,5%	8,0%
22/01/2015	Banca IMI	Chem	2,5%	5,5%	8,0%
22/01/2015	Banca IMI	PowerGen	2,5%	5,5%	8,0%
27/01/2015	UBS	Finmeccanica	2,0%	7,0%	9,0%
30/01/2015	Deutsche Bank	Grupo Mediolanum	2,0%	8,0%	10,0%
05/02/2015	ICBPI	Mediaset	2,0%	5,0%	7,0%
17/02/2015	ICBPI	Pirelli	2,1%	5,0%	7,1%
12/03/2015	HSBC	Telecom Italia	3,5%	5,5%	9,0%
13/03/2015	Banca IMI	Luxottica	2,0%	5,5%	7,5%
16/03/2015	Morgan Stanley	Enel	4-5%	4,0%	8,5%
19/03/2015	ESN	Eni	4,5%	4,0%	8,5%
20/03/2015	HSBC	Enel	3,5%	5,5%	9,0%
23/03/2015	Barclays	Luxottica	2,8%	4,5%	7,3%
25/03/2015	HSBC	Mediaset	3,5%	5,5%	9,0%

Average	2,8%	5,4%	8,3%
Max	4,5%	8,0%	10,0%
Min	2,0%	4,0%	7,0%
St Dev	0,8%	1,0%	0,8%

SPANISH COMPANIES

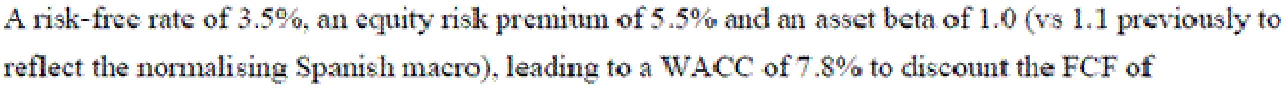
Date	Analyst	Company	Rf	MRP	Rf+MRP
20/04/2015	HSBC	Telefónica	3,5%	5,5%	9,0%
18/09/2015	HSBC	Inditex	3,5%	5,5%	9,0%
04/09/2015	Societe Generale	Inditex	1,4%	4,8%	6,2%
03/06/2015	UBS	Inditex	0,2%	4,5%	4,7%
26/05/2015	Morgan Stanley	Inditex	3,3%	5,5%	8,8%
24/03/2015	Deutsche Bank	Inditex	2,0%	6,0%	8,0%
08/09/2015	BPI	OHL	3,3%	6,0%	9,3%
17/09/2015	UBS	Banco Sabadell	3,5%	5,5%	9,0%
30/07/2015	Deutsche Bank	Acerinox	2,5%	6,5%	9,0%
19/01/2015	BPI	Acerinox	3,3%	6,0%	9,3%
03/07/2015	HSBC	Enagás	3,5%	5,5%	9,0%
29/06/2015	BPI	Enagás	3,3%	6,0%	9,3%
27/07/2015	HSBC	Iberdrola	3,0%	5,5%	8,5%
18/02/2015	Morgan Stanley	Iberdrola	3,0%	4,0%	7,0%
06/10/2015	HSBC	Gas Natural	3,5%	5,5%	9,0%
16/09/2015	Morgan Stanley	Gas Natural	4,5%	4,0%	8,5%
03/07/2015	Santander	Gamesa	4,5%	4,3%	8,8%
13/08/2015	Santander	Amadeus	4,3%	4,0%	8,3%
13/07/2015	JP Morgan	Amadeus	0,8%	6,2%	7,0%
24/02/2015	Deutsche Bank	Amadeus	4,1%	5,0%	9,1%

29/06/2015	BPI	Prosegur	3,3%	6,0%	9,3%
14/05/2015	Santander	Abertis	3,3%	4,0%	7,3%
10/09/2015	UBS	Aena	3,0%	5,0%	8,0%
11/08/2015	Societe Generale	Aena	4,0%	6,0%	10,0%
17/06/2015	Deutsche Bank	Aena	3,4%	5,8%	9,2%
14/08/2015	RBC Capital Markets	Endesa	2,5%	6,5%	9,0%
06/07/2015	ESN/Beka Finance	Mapfre	4,0%	4,5%	8,5%
08/09/2015	BPI	FCC	3,3%	6,0%	9,3%

Average	3,1%	5,3%	8,5%
Max	4,5%	6,5%	10,0%
min	0,2%	4,0%	4,7%
St. Dev	1,0%	0,8%	1,1%

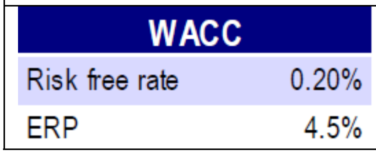
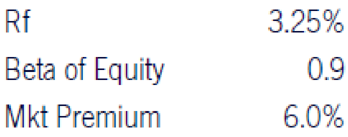
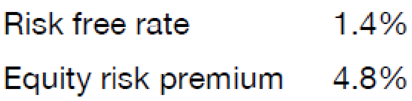
Exhibit *2.* Details of some valuation reports

20/04/2015 – HSBC – Telefónica

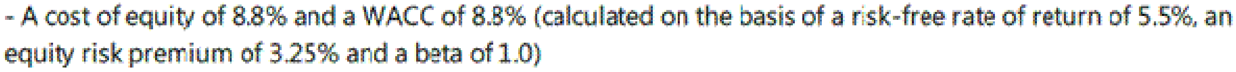

A risk-free rate of 3.5%, an equity risk premium of 5.5% and an asset beta of 1.0 (vs 1.1 previously to reflect the normalising Spanish macro), leading to a WACC of 7.8% to discount the FCF of

18/09/2015 – HSBC – Inditex

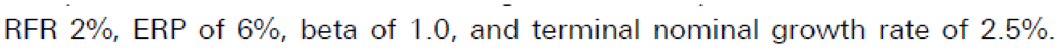

risk-free rate of 3.5%, an equity risk premium of 5.5%, a beta of 0.8

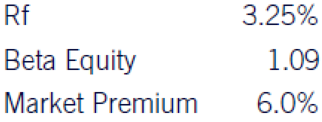
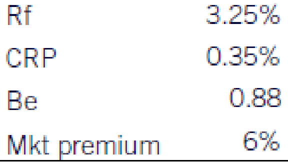
03/06/2015 – UBS – Inditex	08/09/2015 – BPI – OHL	04/9/2015 – Societe Generale - Inditex
 WACC Risk free rate 0.20% ERP 4.5%	 Rf 3.25% Beta of Equity 0.9 Mkt Premium 6.0%	 Risk free rate 1.4% Equity risk premium 4.8%

26/05/2015 – Morgan Stanley – Inditex

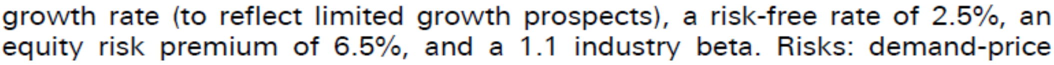

- A cost of equity of 8.8% and a WACC of 8.8% (calculated on the basis of a risk-free rate of return of 5.5%, an equity risk premium of 3.25% and a beta of 1.0)

24/03/2015 – Deutsche Bank – Inditex

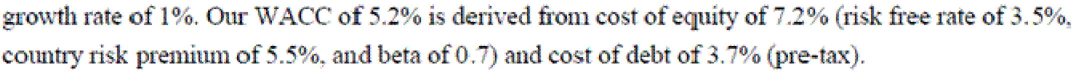

RFR 2%, ERP of 6%, beta of 1.0, and terminal nominal growth rate of 2.5%.

17/09/2015 – UBS – Banco Sabadell	19/01/2015 – BPI – Acerinox	29/06/2015 – BPI – Enagás
 Long Term Risk Free Rate 3.50% Equity Risk Premium 5.5%	 Rf 3.25% Beta Equity 1.09 Market Premium 6.0%	 Rf 3.25% CRP 0.35% Be 0.88 Mkt premium 6%

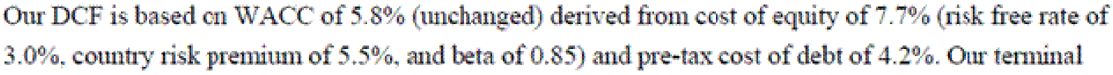
30/07/2015 – Deutsche Bank – Acerinox


growth rate (to reflect limited growth prospects), a risk-free rate of 2.5%, an equity risk premium of 6.5%, and a 1.1 industry beta. Risks: demand-price

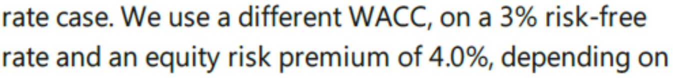
03/07/2015 – HSBC – Enagás


growth rate of 1%. Our WACC of 5.2% is derived from cost of equity of 7.2% (risk free rate of 3.5%, country risk premium of 5.5%, and beta of 0.7) and cost of debt of 3.7% (pre-tax).

27/07/2015 – HSBC – Iberdrola


Our DCF is based on WACC of 5.8% (unchanged) derived from cost of equity of 7.7% (risk free rate of 3.0%, country risk premium of 5.5%, and beta of 0.85) and pre-tax cost of debt of 4.2%. Our terminal

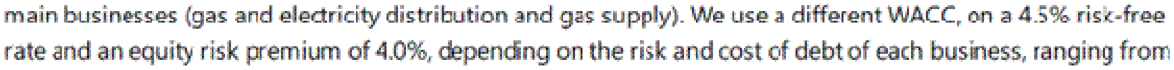
18/02/2015 – Morgan Stanley – Iberdrola

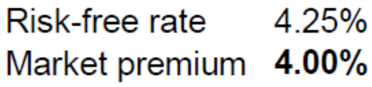
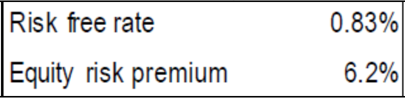
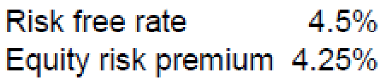

rate case. We use a different WACC, on a 3% risk-free
rate and an equity risk premium of 4.0%, depending on

06/10/2015 – HSBC – Gas Natural

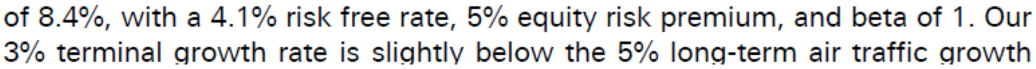

(risk free rate of 3.5%, country risk premium of 5.5%, and beta of 0.9)

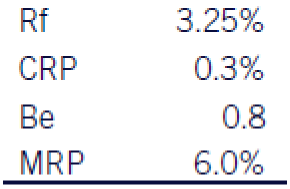
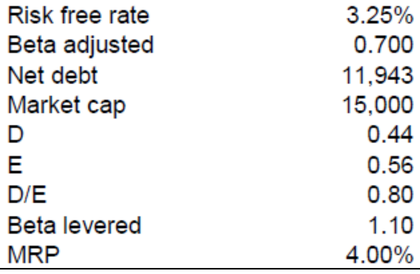
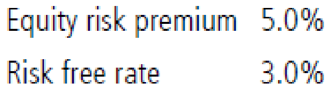
16/09/2015 – Morgan Stanley – Gas Natural


main businesses (gas and electricity distribution and gas supply). We use a different WACC, on a 4.5% risk-free
rate and an equity risk premium of 4.0%, depending on the risk and cost of debt of each business, ranging from

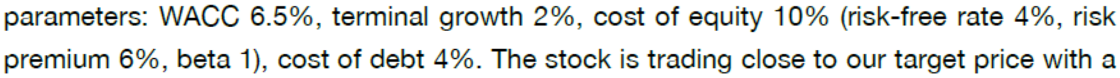
13/8/2015 – Santander – Amadeus	13/07/2015 – JP Morgan – Amadeus	03/07/2015 – Santander – Gamesa
 Risk-free rate 4.25% Market premium **4.00%**	 Risk free rate 0.83% Equity risk premium 6.2%	 Risk free rate 4.5% Equity risk premium 4.25%

24/02/2015 – Deutsche Bank – Amadeus

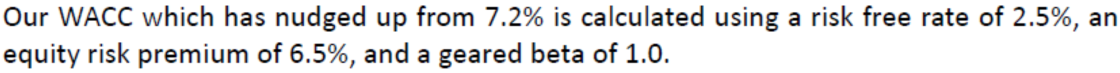

of 8.4%, with a 4.1% risk free rate, 5% equity risk premium, and beta of 1. Our
3% terminal growth rate is slightly below the 5% long-term air traffic growth

29/6/2015 – BPI – Prosegur	14/05/2015 – Santander – Abertis	10/09/2015 – UBS – Aena
 Rf 3.25% CRP 0.3% Be 0.8 MRP 6.0%	 Risk free rate 3.25% Beta adjusted 0.700 Net debt 11,943 Market cap 15,000 D 0.44 E 0.56 D/E 0.80 Beta levered 1.10 MRP 4.00%	 Equity risk premium 5.0% Risk free rate 3.0%

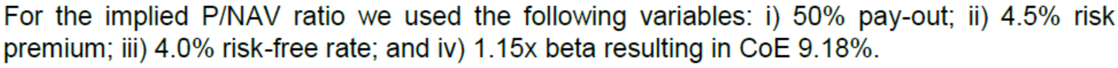
11/08/2015 – Societe Generale – Aena


parameters: WACC 6.5%, terminal growth 2%, cost of equity 10% (risk-free rate 4%, risk
premium 6%, beta 1), cost of debt 4%. The stock is trading close to our target price with a

14/08/2015 – RBC Capital Markets – Endesa


Our WACC which has nudged up from 7.2% is calculated using a risk free rate of 2.5%, an
equity risk premium of 6.5%, and a geared beta of 1.0.

06/07/2015 – ESN/Beka Finance – Mapfre


For the implied P/NAV ratio we used the following variables: i) 50% pay-out; ii) 4.5% risk
premium; iii) 4.0% risk-free rate; and iv) 1.15x beta resulting in CoE 9.18%.

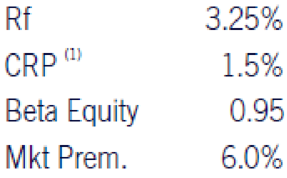
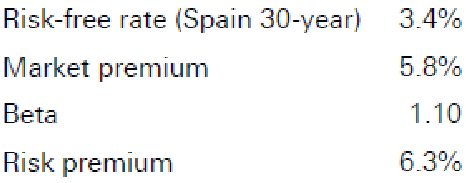
08/09/2015 – BPI – FCC	17/06/2015 – Deutsche Bank – Aena
 Rf 3.25% CRP [1] 1.5% Beta Equity 0.95 Mkt Prem. 6.0%	 Risk-free rate (Spain 30-year) 3.4% Market premium 5.8% Beta 1.10 Risk premium 6.3%

Exhibit 3. MRP according to Damodaran

Source: Damodaran http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

In Damodarans' page, we can read for Italy:

Country	Italy
Moody's sovereign rating	Baa2
S&P sovereign rating	BBB-
CDS spread	2,34%
Excess CDS spread (over US CDS)	2,03%
Country Risk Premium (Rating)	2,85%
Equity Risk Premium (Rating)	**8,60%**

This table summarizes the latest **bond ratings** and appropriate **default spreads** for different countries. While you can use these numbers as rough estimates of country risk premiums, you may want to modify the premia to reflect the additional risk of equity markets. To estimate the long term country equity risk premium, I start with a default spread, which I obtain in one of two ways:

(1) I use the local currency sovereign rating (from Moody's: www.moodys.com) and estimate the default spread for that rating (based upon traded country bonds) over a default free government bond rate. For countries without a Moody's rating but with an S&P rating, I use the Moody's equivalent of the S&P rating. To get the default spreads by sovereign rating, I use the CDS spreads and compute the average CDS spread by rating. Using that number as a basis, I extrapolate for those ratings for which I have no CDS spreads.

(2) I start with the CDS spread for the country, if one is available and subtract out the US CDS spread, since my mature market premium is derived from the US market. That difference becomes the country spread. For the few countries that have CDS spreads that are lower than the US, I will get a negative number.

You can add just this default spread to the mature market premium to arrive at the total equity risk premium. I add an additional step. In the short term especially, the equity country risk premium is likely to be greater than the country's default spread. You can estimate an adjusted country risk premium by multiplying the default spread by the relative equity market volatility for that market (Std dev in country equity market/Std dev in country bond). I have used the **emerging market average of 1.5** (equity markets are about 1.5 times more volatile than bond markets) to estimate country risk premium. I have added this to my estimated risk premium of 5.75% for mature markets (obtained by looking at the implied premium for the S&P 500) to get the total risk premium.

860=575+285 **285=190*1,5**

Surveys about Market Risk Premium

2008	http://ssrn.com/abstract=1344209
2010	http://ssrn.com/abstract=1606563; http://ssrn.com/abstract=1609563
2011	http://ssrn.com/abstract=1822182; http://ssrn.com/abstract=1805852
2012	http://ssrn.com/abstract=2084213
2013	http://ssrn.com/abstract=914160
2014	http://ssrn.com/abstract=1609563

Some comments and webs about MRP and Rf

MRP: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html
http://www.market-risk-premia.com/market-risk-premia.html http://www.marktrisikoprämie.de/marktrisikopraemien.html

US risk free rate: http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yieldYear&year=2015

risk free rate: http://www.basiszinskurve.de/basiszinssatz-gemaess-idw.html
http://www.econ.yale.edu/~shiller/ http://www.cfosurvey.org/pastresults.htm http://alephblog.com/

Market Risk Premium used in 71 countries in 2016: a survey with 6,932 answers

Pablo Fernandez*, Alberto Ortiz** and Isabel Fernandez Acín***
IESE Business School. University of Navarra

ABSTRACT

This paper contains the statistics of the Equity Premium or Market Risk Premium (MRP) used in 2016 for **71 countries**. We got answers for more countries, but we only report the results for 71 countries with more than 8 answers.

54% of the MRP used in 2016 decreased (vs. 2015) and 38% increased.

Most previous surveys have been interested in the Expected MRP, but this survey asks about the Required MRP. The paper also contains the references used to justify the MRP, and comments from 46 persons.

JEL Classification: G12, G31, M21

Keywords: equity premium; required equity premium; expected equity premium; historical equity premium

May 9, 2016

---

* Professor of Corporate Finance. e-mail: fernandezpa@iese.edu
** Research Assistant. e-mail: AOrtiz@iese.edu
*** Independent Researcher. e-mail: ifernandez.28@alumni.unav.es

xLhMTPPP

IESE Business School
Camino del Cerro del Aguila 3. 28023 Madrid, Spain

1. Market Risk Premium (MRP) used in 2016 in 71 countries

We sent a short email (see exhibit 1) on April 2016 to more than 23,000 email addresses of finance and economic professors, analysts and managers of companies obtained from previous correspondence, papers and webs of companies and universities. We asked about the Market Risk Premium (**MRP**) **used *"to calculate the required return to equity in different countries"***. We also asked about "*Books or articles that I use to support this number*".

By May 4, 2016, we had received 2,732 emails with 6,734 specific MRP used in 2016.[1] We considered 86 of them as outliers because they provided a very small MRP (for example, -4% for the USA) or a very high MRP (for example, 30% for the USA). Other 112 persons answered that they do not use MRP for different reasons (see table 1). We would like to sincerely thank everyone who took the time to answer us.

Table 1. MRP used in 2016: 6932 answers

	Professors	Analyst	Companies	Financial companies	Other	Total
Answers reported (MRP figures)	3.006	430	1.337	983	978	6.734
Outliers	2	4	23	20	37	86
Answers that do not provide a figure	7	24	34	43	4	112
Total	3.015	458	1.394	1.046	1.019	6.932

Some answers that do not provide a figure: *"We use a minimum IRR"; "We use multiples"; "MRP is a concept that we do not use"; "It is confidential"; "The CAPM is not very useful"; "I think about premia for particular stocks"; "I teach derivatives: I did not have to use a MRP"; "The MRP changes every day".*

Table 2 contains the statistics of the MRP used in 2016 **for 71 countries**. We got answers for more countries, but we only report the results for 71 countries with more than 8 answers. Fernandez et al (2011a)[2] is an analysis of the answers for the USA; it also shows the evolution of the Market Risk Premium used for the USA in 2011, 2010, 2009 and 2008 according to previous surveys (Fernandez et al, 2009, 2010a and 2010b). Fernandez et al (2011b)[3] is an analysis of the answers for Spain.

Figures 1 and 2 are graphic representations of the MRPs reported in table 2.

Surveys of previous years		
2015	Risk-Free Rate and MRP used for 41 countries in 2015	http://ssrn.com/abstract=2598104
2014	MRP used in 88 countries in 2014	http://ssrn.com/abstract=2450452
2013	MRP and Risk Free Rate used for 51 countries in 2013	http://ssrn.com/abstract=914160
2012	MRP used in 82 countries in 2012	http://ssrn.com/abstract=2084213
2011	MRP used in 56 countries in 2011	http://ssrn.com/abstract=1822182
2010	MRP used in 22 countries in 2010	http://ssrn.com/abstract=1609563

---

[1] 1,217 emails contained MRP for more than one country.

[2] Fernandez, P., J. Aguirreamalloa and L. Corres (2011a), "US Market Risk Premium Used in 2011 by Professors, Analysts and Companies: A Survey...", downloadable in **http://ssrn.com/abstract=1805852**

[3] Fernandez, P., J. Aguirreamalloa and L. Corres (2011b), "The Equity Premium in Spain: Survey 2011 (in Spanish)", downloadable in **http://ssrn.com/abstract=1822422**

Table 2. Market Risk Premium (%) used for 71 countries in 2016

		Average	**Median**	**St Dev**	**Max**	**min**	**Q1**	**Q3**	**N**
1	USA	5,3%	5,0%	1,3%	20,0%	1,5%	4,5%	6,0%	2536
2	Spain	6,2%	6,0%	1,4%	12,0%	1,5%	5,0%	6,8%	817
3	Germany	5,3%	5,0%	1,7%	12,4%	1,2%	4,0%	6,0%	360
4	UK	5,3%	5,0%	1,4%	12,8%	1,5%	4,5%	6,0%	221
5	Italy	5,6%	5,5%	1,5%	10,1%	2,0%	4,8%	6,0%	152
6	Canada	5,4%	5,2%	1,3%	10,5%	3,0%	4,6%	6,0%	127
7	Brazil	8,2%	7,0%	4,9%	30,0%	1,8%	5,5%	8,7%	107
8	France	5,8%	5,5%	1,6%	11,4%	2,0%	5,0%	6,7%	105
9	Mexico	7,4%	7,0%	2,3%	15,0%	3,0%	6,0%	9,0%	103
10	South Africa	6,3%	6,0%	1,5%	11,8%	3,0%	5,5%	7,0%	99
11	China	8,3%	7,0%	4,4%	30,0%	3,8%	6,0%	10,0%	96
12	Netherlands	5,1%	5,0%	1,2%	11,6%	2,5%	4,5%	5,9%	93
13	Switzerland	5,1%	5,0%	1,1%	9,6%	3,0%	4,5%	5,6%	88
14	Australia	6,0%	6,0%	1,6%	15,0%	3,0%	5,0%	6,2%	87
15	India	8,1%	8,0%	2,4%	16,0%	2,3%	6,6%	9,0%	82
16	Russia	7,9%	7,0%	3,5%	25,0%	2,7%	6,0%	9,0%	81
17	Chile	6,1%	6,0%	1,6%	15,0%	3,0%	5,5%	7,0%	72
18	Sweden	5,2%	5,0%	1,0%	9,0%	3,0%	4,5%	5,9%	72
19	Austria	5,4%	5,3%	1,4%	14,3%	2,5%	5,0%	6,0%	71
20	Belgium	5,6%	5,5%	1,1%	8,1%	3,6%	5,0%	6,4%	71
21	Norway	5,5%	5,0%	1,8%	14,0%	3,0%	4,5%	6,0%	70
22	Denmark	5,3%	5,0%	1,7%	14,0%	2,0%	4,4%	6,0%	63
23	Japan	5,4%	5,0%	2,3%	16,7%	2,0%	4,0%	6,8%	58
24	Argentina	11,8%	11,0%	4,4%	28,7%	5,0%	9,0%	14,0%	57
25	Colombia	8,1%	7,8%	3,9%	20,5%	2,0%	6,5%	9,0%	56
26	Portugal	7,9%	8,0%	2,1%	14,0%	4,0%	6,6%	9,0%	55
27	Finland	5,5%	5,0%	1,6%	12,0%	3,0%	4,7%	6,0%	51
28	Poland	6,2%	5,8%	1,5%	10,0%	4,4%	5,0%	7,6%	50
29	Peru	7,8%	7,5%	2,6%	15,0%	3,5%	6,3%	8,3%	44
30	New Zealand	5,8%	6,0%	1,4%	8,0%	2,0%	5,0%	7,0%	42
31	Greece	13,0%	12,4%	5,2%	23,0%	6,5%	8,5%	17,9%	41
32	Luxembourg	4,7%	5,0%	1,1%	7,0%	2,0%	4,0%	5,4%	38
33	Israel	5,9%	6,0%	2,2%	15,0%	2,5%	5,0%	7,0%	37
34	Turkey	8,1%	8,0%	3,4%	18,0%	2,5%	5,5%	10,5%	37
35	Czech Republic	6,3%	6,5%	1,0%	8,0%	4,3%	5,5%	7,3%	32
36	Egypt	13,8%	13,0%	6,2%	30,3%	3,5%	9,0%	16,4%	32
37	Indonesia	8,0%	8,0%	2,1%	14,5%	4,5%	6,1%	9,3%	29
38	Ireland	6,6%	5,8%	2,2%	12,3%	4,0%	5,0%	8,2%	28
39	Pakistan	9,8%	6,5%	5,4%	18,0%	2,5%	6,0%	16,0%	26
40	Taiwan	7,9%	7,2%	2,1%	15,0%	4,3%	7,0%	8,4%	26
41	Korea	6,7%	7,0%	1,8%	11,1%	2,0%	6,0%	7,3%	25
42	Singapore	5,9%	6,0%	1,3%	9,6%	3,9%	5,5%	6,3%	25
43	Liechtenstein	4,8%	5,0%	1,0%	7,3%	3,0%	4,4%	5,0%	24
44	Hong Kong	7,6%	6,9%	2,6%	12,0%	3,5%	5,5%	10,0%	21

Table 2 (cont). Market Risk Premium (%) used for 71 countries in 2016

		Average	**Median**	**St Dev**	**Max**	**min**	**Q1**	**Q3**	**N**
45	Malaysia	6,5%	6,8%	1,6%	8,8%	3,4%	6,0%	8,0%	21
46	Hungary	8,1%	8,0%	2,5%	13,8%	5,0%	6,0%	10,0%	19
47	Thailand	8,4%	8,0%	1,9%	15,1%	6,5%	7,1%	9,0%	19
48	Kazakhstan	6,9%	7,0%	1,4%	9,2%	4,7%	6,0%	8,0%	18
49	Croatia	7,5%	6,5%	2,1%	10,1%	4,4%	5,5%	9,6%	17
50	Bulgaria	8,2%	8,3%	1,8%	12,0%	5,0%	7,0%	9,2%	16
51	Romania	7,4%	7,0%	1,7%	10,0%	5,0%	6,1%	8,4%	16
52	Saudi Arabia	6,6%	6,5%	1,3%	10,6%	5,5%	5,5%	7,1%	15
53	Ecuador	11,8%	12,6%	5,2%	20,0%	5,0%	6,6%	16,3%	14
54	Vietnam	9,9%	9,9%	3,0%	15,0%	3,9%	8,0%	12,0%	14
55	Nigeria	11,1%	10,0%	3,9%	20,0%	6,9%	8,5%	12,0%	13
56	United Arab Emir.	7,9%	7,5%	1,2%	9,7%	5,7%	7,0%	9,0%	12
57	Bolivia	10,7%	11,8%	2,5%	15,1%	7,5%	8,3%	12,0%	11
58	Philippines	8,1%	8,0%	1,3%	10,0%	6,4%	7,1%	9,2%	11
59	Kuwait	6,7%	6,8%	1,6%	10,6%	5,0%	5,5%	7,0%	10
60	Senegal	9,9%	10,0%	2,7%	13,2%	5,0%	8,5%	12,3%	10
61	Bahrain	7,7%	8,3%	2,2%	11,1%	5,5%	5,5%	9,6%	9
62	Slovenia	7,1%	6,0%	2,4%	10,0%	3,6%	5,5%	9,6%	9
63	Ukraine	14,6%	13,8%	5,0%	21,7%	8,0%	12,0%	18,0%	9
64	Costa Rica	9,2%	10,0%	2,4%	12,0%	3,8%	8,8%	10,1%	8
65	Malta	6,8%	8,1%	2,5%	9,3%	3,1%	5,3%	8,1%	8
66	Oman	6,9%	7,1%	2,0%	11,1%	5,0%	5,0%	7,3%	8
67	Panama	9,4%	9,2%	1,8%	11,3%	6,0%	9,1%	10,5%	8
68	Qatar	7,5%	7,0%	1,1%	10,1%	7,0%	7,0%	7,1%	8
69	Serbia	11,3%	12,4%	3,0%	13,2%	5,5%	11,1%	13,2%	8
70	Uruguay	8,2%	9,2%	2,1%	10,4%	5,0%	6,8%	9,6%	8
71	Venezuela	15,3%	17,8%	6,5%	21,7%	6,0%	11,0%	19,8%	8

Figure 1. Market Risk Premium used in 2016 for some countries (plot of answers)

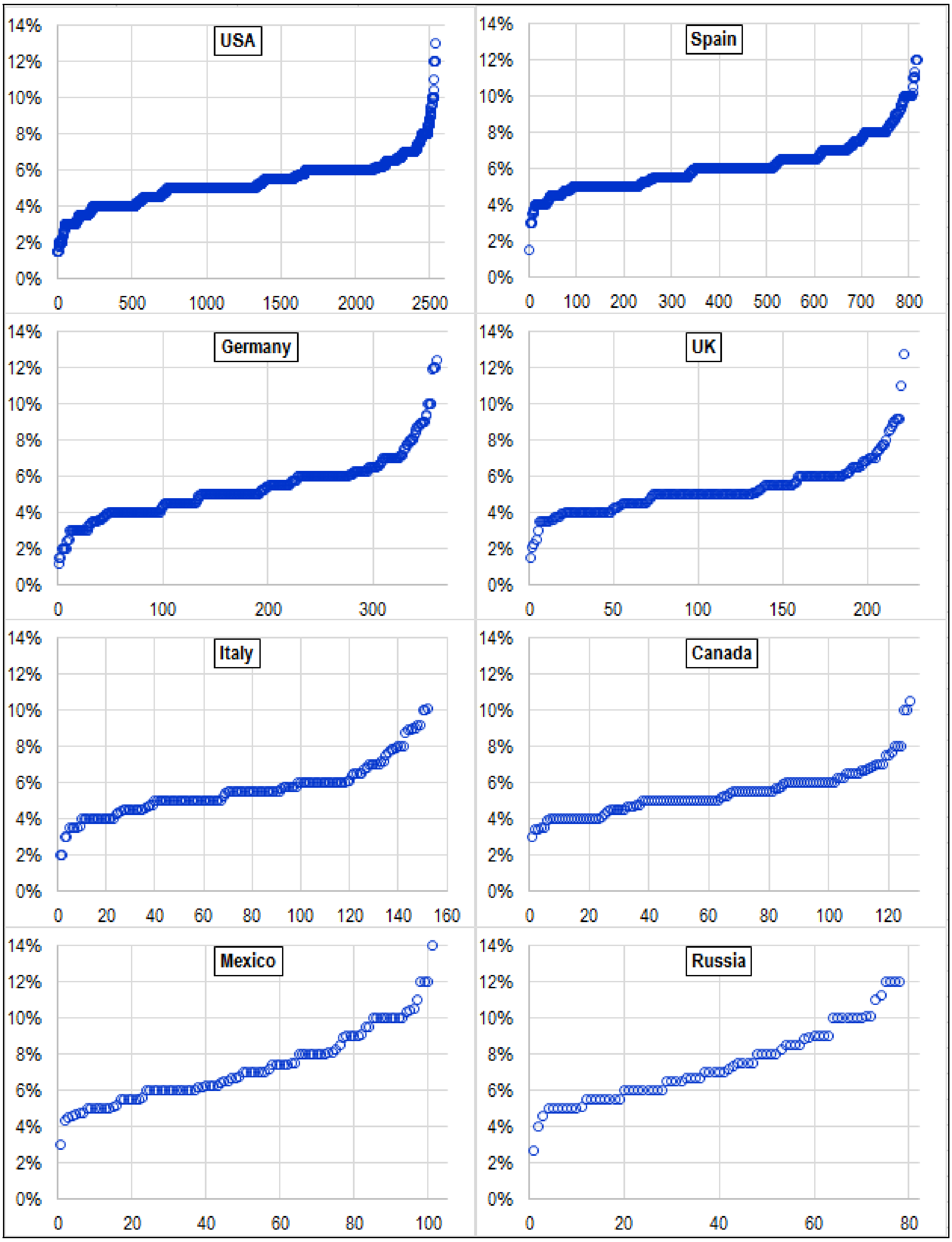
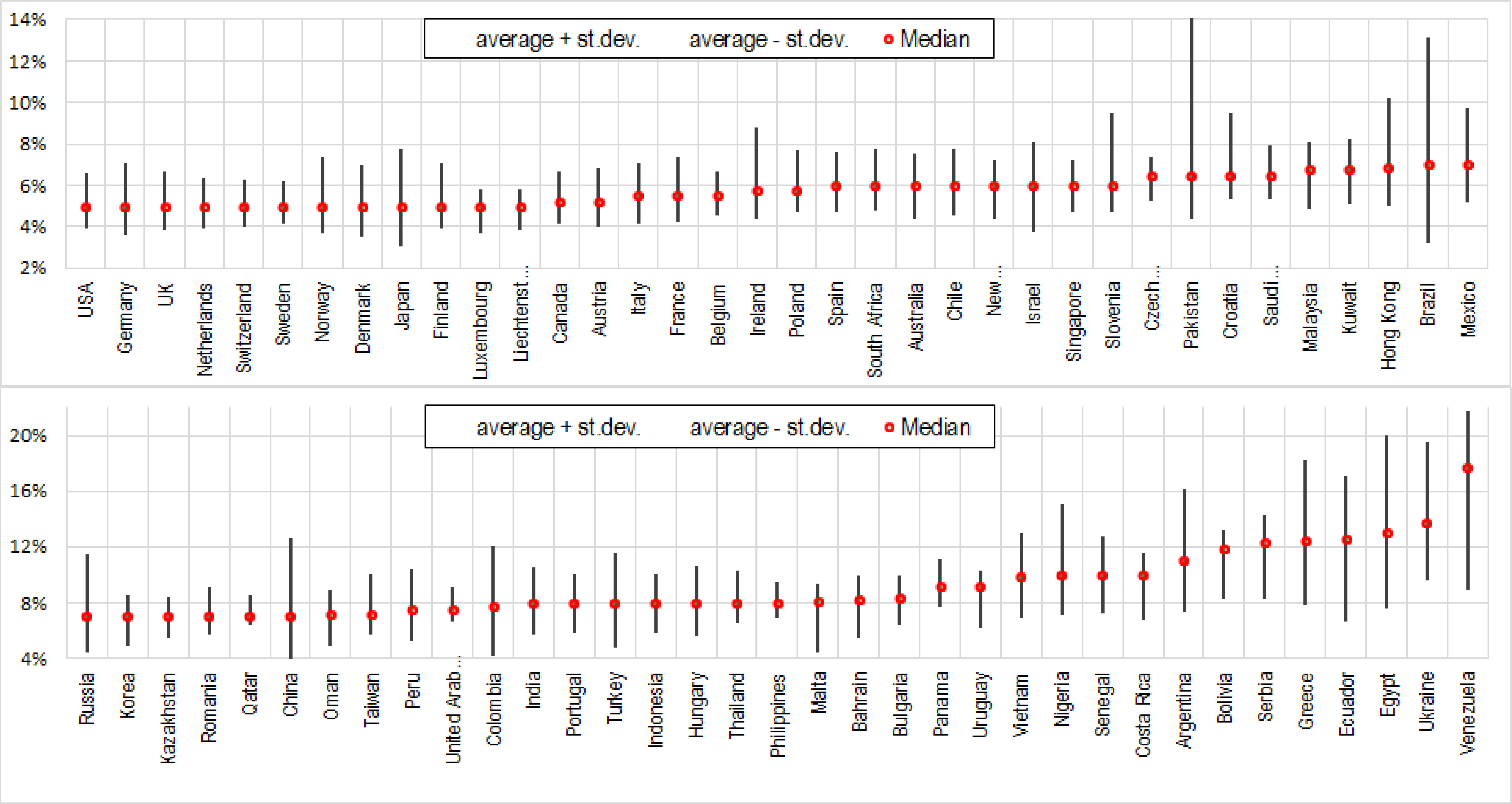


Figure 2. Market Risk Premium used in 2016. Median and dispersion of the answers by country



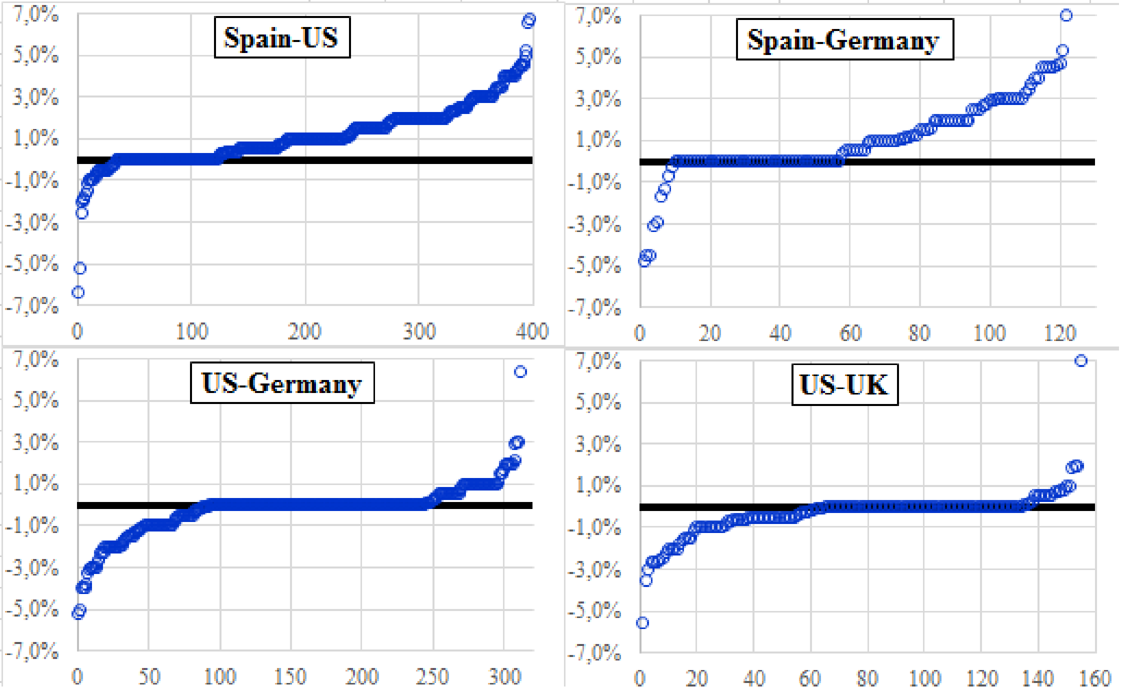
2. Differences among respondents

Table 3 and figure 3 show the differences in Market Risk Premium used by the same person for 2 countries. 312 respondents provided us with answers for USA and Germany. 155 provided us with answers for USA and UK.

Table 3. Difference in the Market Risk Premium used in 2016 by the same person for two countries

		Number of answers			
MRP	Average	Total	<0	0	>0
US - Germany	-0,2%	312	92	151	69
US - UK	-0,3%	155	63	70	22
Germany - UK	0,1%	80	17	43	20
Spain - Germany	1,0%	122	9	48	65
Spain - US	1,1%	397	33	90	274

Figure 3. Difference in the MRP used by the same person in 2016 for several countries



3. References used to justify the MRP figure

Some respondents indicated which books, papers… they use as a reference to justify the MRP that they use. The most cited references were: Damodaran, Internal estimate, Duff&Phelps, Ibbotson/Morningstar, Fernandez, DMS, Graham-Harvey, Bloomberg, Analysts, Experience, Own judgement, Grabowski , Pratt's & Grabowski, Brealy & Myers, Siegel.

4. Comparison with previous surveys

Table 4 compares some results of this survey with the results of 2011, 2012, 2013, 2014 and 2015.

Table 4. Comparison of some results of the surveys of 2011, 2012, 2013, 2014, 2015 and 2016 (%)

	Average						St. Dev.					
	2016	2015	2014	2013	2012	2011	2016	2015	2014	2013	2012	2011
Switzerland	5,1	5,4	5,2	5,6	5,4	5,7	1,1	1,2	1,1	1,5	1,2	1,3
Netherlands	5,1	5,9	5,2	6,0	5,4	5,5	1,2	0,6	1,2	1,3	1,3	1,9
Sweden	5,2	5,4	5,3	6,0	5,9	5,9	1,0	1,3	1,0	1,7	1,2	1,4
Denmark	5,3	5,5	5,1	6,4	5,5	5,4	1,7	1,2	1,8	0,8	1,9	3,3
Germany	5,3	5,3	5,4	5,5	5,5	5,4	1,7	1,5	1,7	1,7	1,9	1,4
UK	5,3	5,2	5,1	5,5	5,5	5,3	1,4	1,7	1,4	1,4	1,9	2,2
USA	5,3	5,5	5,4	5,7	5,5	5,5	1,3	1,4	1,4	1,6	1,6	1,7
Austria	5,4	5,7	5,5	6,0	5,7	6,0	1,4	0,3	1,5	1,9	1,6	1,8
Canada	5,4	5,9	5,3	5,4	5,4	5,9	1,3	1,3	1,2	1,3	1,3	2,1
Japan	5,4	5,8	5,3	6,6	5,5	5,0	2,3	2,0	2,4	2,7	2,7	3,7
Finland	5,5	5,7	5,6	6,8	6,0	5,4	1,6	1,1	1,6	1,2	1,6	2,0
Norway	5,5	5,5	5,8	6,0	5,8	5,5	1,8	1,2	2,0	1,8	1,6	1,6
Belgium	5,6	5,5	5,6	6,1	6,0	6,1	1,1	1,3	1,1	1,8	1,1	1,0
Italy	5,6	5,4	5,6	5,7	5,6	5,5	1,5	1,5	1,5	1,5	1,4	1,4
France	5,8	5,6	5,8	6,1	5,9	6,0	1,6	1,4	1,5	1,6	1,5	1,5
New Zealand	5,8	6,6	5,6	5,4	6,2	6,0	1,4	1,3	1,4	1,8	1,1	1,0
Israel	5,9	5,2	5,8	6,4	6,0	5,6	2,2	1,1	2,1	1,1	2,3	1,7
Australia	6,0	6,0	5,9	6,8	5,9	5,8	1,6	4,0	1,6	4,9	1,4	1,9
Chile	6,1	6,5	6,0	5,0	6,1	5,7	1,6	0,9	1,5	2,2	1,7	2,1
Poland	6,2	5,2	6,3	6,3	6,4	6,2	1,5	1,0	1,5	1,0	1,6	1,1
Spain	6,2	5,9	6,2	6,0	6,0	5,9	1,4	1,6	1,6	1,7	1,6	1,6
Czech Republic	6,3	5,6	6,5	6,5	6,8	6,1	1,0	0,7	1,6	1,1	1,6	0,9
South Africa	6,3	7,7	6,3	6,8	6,5	6,3	1,5	2,3	1,4	1,4	1,5	1,5
Ireland	6,6	5,5	6,8	6,2	6,6	6,0	2,2	1,3	2,4	3,3	2,3	2,2
Korea (South)	6,7	6,2	6,3	7,0	6,7	6,4	1,8	1,5	1,8	1,8	1,4	2,5
Mexico	7,4	8,0	7,4	6,7	7,5	7,3	2,3	1,5	2,4	2,4	2,6	2,7
Peru	7,8	7,2	7,8	6,5	8,1	7,8	2,6	1,2	2,5	2,1	2,5	2,8
Portugal	7,9	5,7	8,5	6,1	7,2	6,5	2,1	1,5	2,0	2,3	2,0	1,7
Russia	7,9	9,7	7,9	7,3	7,6	7,5	3,5	2,9	3,4	4,1	2,9	3,7
Indonesia	8,0	8,9	7,9	7,8	8,1	7,3	2,1	1,2	2,0	1,4	1,7	2,3
Colombia	8,1	8,3	8,1	8,4	7,9	7,5	3,9	1,4	3,8	3,4	3,7	4,3
Hungary	8,1	8,8	8,3	8,2	7,4	8,0	2,5	0,8	2,3	1,6	2,3	2,4
India	8,1	8,4	8,0	8,5	8,0	8,5	2,4	2,5	2,4	2,9	2,4	2,8
Turkey	8,1	9,3	7,9	8,2	8,4	8,1	3,4	2,5	3,3	2,9	3,4	3,0
Brazil	8,2	7,5	7,8	6,5	7,9	7,7	4,9	2,1	4,2	2,1	4,7	4,6
China	8,3	8,1	8,1	7,7	8,7	9,4	4,4	5,6	3,5	2,3	4,6	5,1
Thailand	8,4	7,3	8,0	7,6	8,1	7,9	1,9	0,9	1,8	0,6	1,8	2,8
Argentina	11,8	22,9	11,8	10,6	10,9	9,9	4,4	12,3	4,2	8,1	3,6	3,4
Greece	13,0	14,3	15,0	7,3	9,6	7,4	5,2	5,8	4,7	4,1	4,4	2,7

Welch (2000) performed two surveys with finance professors in 1997 and 1998, asking them what they thought the Expected MRP would be over the next 30 years. He obtained 226 replies, ranging from 1% to 15%, with an average arithmetic EEP of 7% above T-Bonds.[4] Welch

---

[4] At that time, the most recent Ibbotson Associates Yearbook reported an arithmetic HEP versus T-bills of 8.9% (1926–1997).

(2001) presented the results of a survey of 510 finance and economics professors performed in August 2001 and the consensus for the 30-year arithmetic EEP was 5.5%, much lower than just 3 years earlier. In an update published in 2008 Welch reports that the MRP "used in class" in December 2007 by about 400 finance professors was on average 5.89%, and 90% of the professors used equity premiums between 4% and 8.5%.

Johnson et al (2007) report the results of a survey of 116 finance professors in North America done in March 2007: 90% of the professors believed the Expected MRP during the next 30 years to range from 3% to 7%.

Graham and Harvey (2007) indicate that U.S. CFOs reduced their average EEP from 4.65% in September 2000 to 2.93% by September 2006 (st. dev. of the 465 responses = 2.47%). In the 2008 survey, they report an average EEP of 3.80%, ranging from 3.1% to 11.5% at the tenth percentile at each end of the spectrum. They show that average EEP changes through time. Goldman Sachs (O'Neill, Wilson and Masih 2002) conducted a survey of its global clients in July 2002 and the average long-run EEP was 3.9%, with most responses between 3.5% and 4.5%.

Ilmanen (2003) argues that surveys tend to be optimistic: *"survey-based expected returns may tell us more about hoped-for returns than about required returns".* Damodaran (2008) points out that *"the risk premiums in academic surveys indicate how far removed most academics are from the real world of valuation and corporate finance and how much of their own thinking is framed by the historical risk premiums... The risk premiums that are presented in classroom settings are not only much higher than the risk premiums in practice but also contradict other academic research".*

Table 5. Comparison of previous surveys

	Surveys of Ivo Welch					Fernandez et al (2009, 2010)			
	Oct 97–Feb 98*	Jan-May 99^{+}	Sep 2001**	Dec. 2007#	January 2009^{++}	US 2008	Europe 2008	US 2009	Europe 2009
Number of answers	226	112	510	360	143	487	224	462	194
Average	7.2	6.8	4.7	5.96	6.2	6.3	5.3	6.0	5.3
Std. Deviation	***2.0***	***2.0***	***2.2***	***1.7***	***1.7***	***2.2***	***1.5***	***1.7***	***1.7***
Max	15	15	20	20		19.0	10.0	12.0	12.0
Q3	8.4	8	6	7.0	7	7.2	6.0	7.0	6.0
Median	7	7	4.5	6.0	6	6.0	5.0	6.0	5.0
Q1	6	5	3	5.0	5	5.0	4.1	5.0	5.3
Min	1.5	1.5	0	2		0.8	1.0	2.0	2.0

* 30-Year Forecast. Welch (2000) First survey + 30-Year Forecast. Welch (2000) Second survey

** 30 year Equity Premium Forecast (Geometric). "The Equity Premium Consensus Forecast Revisited" (2001)

30-Year Geo Eq Prem Used in class. Welch, I. (2008), "The Consensus Estimate for the Equity Premium by Academic Financial Economists in December 2007". http://ssrn.com/abstract=1084918

++ In your classes, what is the main number you are recommending for long-term CAPM purposes? "Short Academic Equity Premium Survey for January 2009". http://welch.econ.brown.edu/academics/equpdate-results2009.html

Table 6. Estimates of the EEP (Expected Equity Premium) according to other surveys

Authors	Conclusion about EEP	Respondents
Pensions and Investments (1998)	3%	Institutional investors
Graham and Harvey (2007)	Sep. 2000. Mean: 4.65%. Std. Dev. = 2.7%	CFOs
Graham and Harvey (2007)	Sep. 2006. Mean: 2.93%. Std. Dev. = 2.47%	CFOs
Graham and Harvey (2014)	3.73%.	CFOs
Welch update	December 2007. Mean: 5.69%. Range 2% to 12%	Finance professors
O'Neill, Wilson and Masih (2002)	3.9%	Global clients Goldman

The magazine *Pensions and Investments* (12/1/1998) carried out a survey among professionals working for institutional investors: the average EEP was 3%. Shiller[5] publishes and updates an index of investor sentiment since the crash of 1987. While neither survey provides a direct measure of the equity risk premium, they yield a broad measure of where investors or professors expect stock prices to go in the near future. The 2004 survey of the Securities Industry Association (SIA) found that the median EEP of 1500 U.S. investors was about 8.3%. Merrill

---

[5] See http://icf.som.yale.edu/Confidence.Index

Lynch surveys more than 300 institutional investors globally in July 2008: the average EEP was 3.5%.

A main difference of this survey with previous ones is that this survey asks about the **Required** MRP, while most surveys are interested in the **Expected** MRP.

5. MRP or EP (Equity Premium): 4 different concepts

As Fernandez (2007, 2009b) claims, the term "equity premium" is used to designate four different concepts:

1. **Historical** equity premium (HEP): historical differential return of the stock market over treasuries.
2. **Expected** equity premium (EEP): expected differential return of the stock market over treasuries.
3. **Required** equity premium (REP): incremental return of a diversified portfolio (the market) over the risk-free rate required by an investor. It is used for calculating the required return to equity.
4. **Implied** equity premium (IEP): the required equity premium that arises from assuming that the market price is correct.

The four concepts (HEP, REP, EEP and IEP) designate different realities. The **HEP** is easy to calculate and is equal for all investors, provided they use the same time frame, the same market index, the same risk-free instrument and the same average (arithmetic or geometric). But the **EEP,** the **REP** and the **IEP** may be different for different investors and are not observable.

The **HEP** is the historical average differential return of the market portfolio over the risk-free debt. The most widely cited sources are Ibbotson Associates and Dimson *et al.* (2007).

Numerous papers and books assert or imply that there is a "market" EEP. However, it is obvious that investors and professors do not share "homogeneous expectations" and have different assessments of the **EEP**. As Brealey et al. (2005, page 154) affirm, *"Do not trust anyone who claims to know what returns investors expect".*

The **REP** is the answer to the following question: What incremental return do I require for investing in a diversified portfolio of shares over the risk-free rate? It is a crucial parameter because the REP is the key to determining the company's required return to equity and the WACC. Different companies may use, and in fact do use, different **REPs**.

The **IEP** is the implicit REP used in the valuation of a stock (or market index) that matches the current market price. The most widely used model to calculate the IEP is the dividend discount model: the current price per share (P_0) is the present value of expected dividends discounted at the required rate of return (Ke). If d_1 is the dividend per share expected to be received in year 1, and g the expected long term growth rate in dividends per share,

$$P_0 = d_1 / (Ke - g), \text{ which implies: } IEP = d_1/P_0 + g - R_F \qquad (1)$$

The estimates of the IEP depend on the particular assumption made for the expected growth (g). Even if market prices are correct for all investors, there is not an IEP common for all investors: there are many pairs (IEP, g) that accomplish equation (1). Even if equation (1) holds for every investor, there are many *required* returns (as many as expected growths, g) in the market. Many papers in the financial literature report different estimates of the IEP with great dispersion, as for example, Claus and Thomas (2001, IEP = 3%), Harris and Marston (2001, IEP = 7.14%) and Ritter and Warr (2002, IEP = 12% in 1980 and -2% in 1999). There is no a common **IEP** for all investors.

For a particular investor, the **EEP** is not necessary equal to the REP (unless he considers that the market price is equal to the value of the shares). Obviously, an investor will hold a diversified portfolio of shares if his EEP is higher (or equal) than his REP and will not hold it otherwise.

We can find out the REP and the EEP of an investor by asking him, although for many investors the REP is not an explicit parameter but, rather, it is implicit in the price they are prepared to pay for the shares. However, it is not possible to determine the REP for the market as a whole, because it does not exist: even if we knew the REPs of all the investors in the market, it would be meaningless to talk of a REP for the market as a whole. There is a distribution of REPs and we can only say that some percentage of investors have REPs contained in a range. The average of that distribution cannot be interpreted as the REP of the market nor as the REP of a representative investor.

Much confusion arises from not distinguishing among the four concepts that the phrase *equity premium* designates: Historical equity premium, Expected equity premium, Required equity premium and Implied equity premium. 129 of the books reviewed by Fernandez (2009b) identify Expected and Required equity premium and 82 books identify Expected and Historical equity premium.

Finance textbooks should clarify the MRP by incorporating distinguishing definitions of the four different concepts and conveying a clearer message about their sensible magnitudes.

6. Conclusion

Most surveys have been interested in the Expected MRP, but this survey asks about the Required MRP.

We provide the statistics of the Equity Premium or Market Risk Premium (MRP) used in 2016 for **71 countries**.

Most previous surveys have been interested in the Expected MRP, but this survey asks about the Required MRP. The paper also contains the references used to justify the MRP, comments from several persons that do not use MRP, and comments from others that do use MRP. Fernandez et al. (2011a)[6] has additional comments. The comments illustrate the various interpretations of the required MRP and its usefulness.

This survey links with the *Equity Premium Puzzle*: Fernandez et al (2009), argue that the equity premium puzzle may be explained by the fact that many market participants (equity investors, investment banks, analysts, companies…) do not use standard theory (such as a standard representative consumer asset pricing model…) for determining their Required Equity Premium, but rather, they use historical data and advice from textbooks and finance professors. Consequently, ex-ante equity premia have been high, market prices have been consistently undervalued, and the ex-post risk premia has been also high. Many investors use historical data and textbook prescriptions to estimate the required and the expected equity premium.

EXHIBIT 1. Mail sent on April 2016

We are doing a survey about the Market Risk Premium (MRP) or Equity Premium used to calculate the required return to equity in different countries.
We will be very grateful to you if you kindly reply to the following 2 questions.
Of course, no companies, individuals or universities will be identified, and only aggregate data will be made public.
Best regards and thanks, Pablo Fernandez

2 questions:
1. The Market Risk Premium that I am using in 2016
for USA is: _______%
for _Germany_ _ is: _______ %
for ___________ is: _______ %
for ___________ is: _______ %

2. Books or articles that I use to support this number:

---

[6] Fernandez, P., J. Aguirreamalloa and L. Corres (2011a), "US Market Risk Premium Used in 2011 by Professors, Analysts and Companies: A Survey...", downloadable in **http://ssrn.com/abstract=1805852**

EXHIBIT 2
COMMENTS OF RESPONDENTS TO THE SURVEY

I use Duff & Phelps: "Duff & Phelps has currently concluded on a 4.0% "normalized" risk free rate in developing its U.S. ERP (as compared to the 2.4% "spot rate" as of January 31, 2016)". "Duff & Phelps Increases U.S. Equity Risk Premium Recommendation to 5.5%, Effective January 31, 2016."

Market risk premium for USA is around 10%. Purely based on observation of deal flow and have seen upwards of 20% on some. Irrational exuberance at play in some gateway cities.

I'm not using any market premium. Just the old fashioned multiples and an overall view. For discounting I just use a common sense kind of rate depending on the company (size, quality etc), around 7.5%. With interest rates at these levels (negative – 9 bpt in Japan), what sense does a "market premium" make?
Market valuations have already been "distorted".

I do not believe in modern portfolio theory, so I do not calculate required return using the CAPM. I use judgement based on my assessment of risk with the company's WACC as my floor for required return.

I only deal with small, private companies and do not calculate market risk.

In our fund we use an outside investment advisor to manage the portfolio.

My approach considers the underlying value using traditional methods, and the value of an acquisition based on market opportunities of the combined units.

I do not use any MRP in my investment process. It is really hard to estimate.

MRP for USA is 10%. Use intuition and the fact that the RF is about 1% and historical return on the market is about 11%.

Mi modelo es diferente: cuando las economías son débiles, me concentro más en retornos intangibles que en retornos monetarios. Cuando las cosas son así, es cuando la gente nota cuales son los verdaderos amigos, y es cuando yo me concentro en afirmar relaciones.

We normally calculate market risk premium based on the market rate of interest less risk free rate of return for a given portfolio. This form of calculation is accepted by Chartered Institute of management Accountant (UK)

No utilizo risk premium, solo una tasa de 7% para actualizar cash flows, menos 1% de inflacion = 6%

You can estimate of the average equity risk premium for a particular set of firms by using the implied cost of capital using analysts forecasts. It is nonsense to talk about there being a risk premium for a particular country.

I can't be of much help in your survey: I believe in the doctrine of the "Absurdity of CAPM"

You can an estimate of the average equity risk premium for a particular set of firms by using the implied cost of capital using analysts forecasts. It is nonsense to talk about there being a risk premium for a particular country.
Mi concepción de riesgo es la que Howard Marks profesa, y es simple y llanamente, la posibilidad de pérdida permanente de capital. Así pues, establezco una rentabilidad mínima a todas mis inversiones en bolsa con acciones de un +15% anual. No distingo entre países. No creo ni en el WACC, ni en la prima de riesgo ni en activo libre de riesgo (existe tal cosa??).

Dada la alta volatilidad y la incertidumbre política actual prefiero no hacer predicciones.

I would use the risk premium in each market defined not as the traditional risk premium: Avg return on the S&P less the risk free rate, but rather the avg return on a market index less the return on cash cow stocks that pay large dividends (you can construct an index for such stocks), especially that the risk free return is very close to 1-2 almost everywhere and is sometimes negative as is -the case in Japan. I will then weigh each risk premium by the country GDP to total GDP in the countries in the study.

We do not usually calculate MRP in China in the Private Equity sector, instead, we usually calculate the IRR of those project, and will be in favor of IRR over 25%.

I do not use MRP. In evaluating today's equity opportunities, I look at historical P/E ratios. My conclusion regarding U.S equities is 4.5% for 2016.

The Market Risk Premium that I am using in 2016 for USA is: (5+7***i**)% **(a complex number)**

You don't define exactly what you mean by "Market Risk Premium". Different authorities define it in different ways. Is it expected return over short-term government securities (e.g. 30 or 90 day T-Bills), or longer-term government bonds? What about in countries with risky government debt, like Greece? You also don't specify over what time period. Given the literature on predictability of stock returns, a particular time period should be specified.

My starting point was a capm (beta) thinking, but I was not able to get reasonable/realistic return requirements for the low beta P&C insurance sector.
I believe there is an additional agent/volatility price that is not reflecting itself in the beta, but should be accounted for elsewhere. You would normally not let an agent invest in zero beta assets for you. These risks should disappear in a well diversified portfolio, but apparently they do not.
I believe investors have some kind of utility function (experience based) that might differ from the direct economic risk. Bad experience can change the view on the future performance and hence impact price of equity, despite the financial impact in diversified portfolio disappears.
I actually backed out a reasonable RR across my sector, and adjusted them individually (per company) according to the risk properties (in capm / beta thinking). Also I disclosed the rate used in the valuation.
I do not know if it is helpful, but there were some consistent thinking behind my approach, but also an understanding that the market gives us some unobserved information through pricing. I believe that I had one of most scientific approaches in the sector.

As a Project Finance person, most of my projects looking at Equity Returns are in emerging markets and my clients are greedy. The benchmark return since I started my job 20 years ago is 20% IRR and has never changed. At the end people accept 17 to 18 %.
To my experience large utilities go far below this (rather 10%), but would therefore never enter the real frontier states (i.e. Nigeria vs Turkey).
From my personal investment the question is what is fair and what is realistic.
Germany yields 5-6% (over 20 years) and France 8% (over 15 years), both take significant residual value of the assets risk, wind risk, but no tariff risk (price per KWh is fixed with France even adapting to (albeit non existing) inflation).
Compare this to a Lufthansa subordinated debt which yields 5%. What is the likelihood that the German Government will let Lufthansa go down, besides the fact that it is one of the best capitalized airlines.
On the other hand, wind farms generate constant cash flows. Equities are pretty volatile.
What should I expect from a Daimler investment? a great dividend and some up-side.
What is the real value of an Insurance (Allianz, Munich RE) in a negative interest environment.
Utilities are canceling dividends, the world as we know it is changing rapidly.
Am I going to define my equity return requirement as a margin over 10 year BUNDS? I hope I can do better than that.
So I go for cash flow is king and solid assets. I guess I take the 8% return from the French windfarm and consider it the less risky alternative to a portfolio of 5 top dividend payers in the DAX (which I also have, as a wise portfolio strategist).

I am curious on the following matters:
1) Does a risk-free asset exist, also in light of the recent events that have been characterizing the financial markets? 2) Do the role provided by the exchange rates is important for the valuation and the comparison of the MRPs across countries? 3) Do the visions of the academics and practitioners for estimating the MRPs are standardized to a common numeraire, in terms of currency?

Somos una Pyme y sólo usamos en presupuesto 2016 un valor mínimo exigido de EBT/ingresos del 9%.

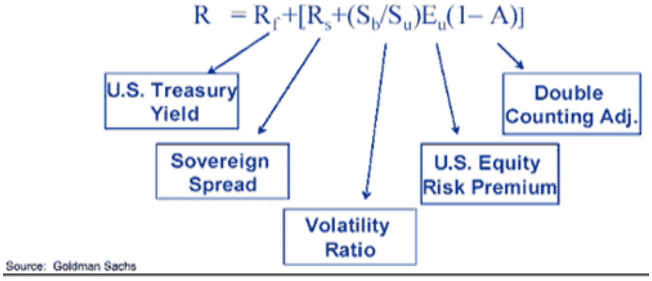
I don't use market risk premiums. We use bottom valuation analysis at a stock level for each region

In the globe with listed real estate securities. Measures that we do consider are regional spreads On 10yr Govt bonds to; dividend yields and the direct property yields.

I am aware of academic debates on this issue and remember from university days of some debate that 6% Was too low. I would think that required risk premiums would move around and in the future how useful Will it be in a world of low investment returns coupled with periods of high volatility particularly as more Govts and central banks interfere with the market pricing of so many different asset classes.
It is at the stock level that we determine return on equity but given the markets that we invest in being Listed global real estate there is not a lot of ROE dispersion between stocks. What we have found to be more useful. At a regional market level is compile forward looking Net Asset Values (NAVs) compared to current pricing and then calculate warranted total returns for each region. So we build from the bottom-up for required returns at the stock level which feeds into regional required returns.

The market risk premium used when calculating the required return to equity in our WACC-model is fixed at 5 percent. In the period 2007-2012 the market risk premium was fixed at 4 percent. The level of the premium is based on studies and surveys among Norwegian corporate finance utilities, member of The Norwegian society of financial analysts and the Oslo Stock Exchange. This is the market premium used in our regulation, other authorities and sectors might be using another premium. For more information about our WACC-model, please see
http://www.icer-regulators.net/portal/page/portal/ICER_HOME/publications_press/ICER_Chronicle/Art4_09

I use the following formula developed by Goldman Sachs for developing countries:



$$R = R_f + [R_s + (S_b/S_u)E_u(1 - A)]$$

Source: Goldman Sachs

MRP for the US is 6%. I derive it myself in a simple fashion. Since a Forward PE can be conceptualized as 1/(rE – g), and rE for the market is rF + 1*MRP, if we set rF = g (using insights on nominal productivity growth rates from Macro 101) and if we know the market's Forward PE, we can easily back out the MRP.

We generally use the Duff & Phelps 2015 Valuation Handbook as the source foe the equity risk premium and we use the long horizon (1926 to 2014) risk premium.

5.5% for US based on Duff & Phelps suggested ERP and the supply-side ERP after adjustment for WWII interest rates (both from D&P Valuation Handbook).

In my team we use a prudent 4% for developed Equity Markets. If the 10y were not so distorted, a lower rate of 2x the 10y yield could suffice.

http://www.absolute-strategy.com/x/erp.html

We apply a system of global enterprise (not equity) risk premiums in our valuation. Currently they average 2.25% in the range of 0.75-4.50% depending on industries, not countries. The system was designed by ourselves from general experience.

S&P 500 return over the past 5 years is 7% compounded. You could do the same calculation for the respective stock exchange indices for countries you are interested in.

Use intuition and the fact that the RF is about 1% and historical return on the market is about 11%.

I regret that you dropped a question on risk-free interest rate. Now that the negative interest policy is in effect in Euro Zone and Japan, I see several investment banks in Japan started to use negative risk-free rate in their CAPM application. 10Y Japanese Government Bond yield is indeed in negative territory, so that it is not illogical to use negative risk-free rate.

However, I doubt that the negative JGB yield will be sustainable for long, and that we should use it for our valuation of cash flows which survive much further than 10 years.

I'm using in most of my classes a RFR of 3% and a MRP of 6% this year -- but this is based upon your material and my bias on short-term rates (financial repression make them too low in the U.S.)

We generally use CAPM model to estimate Cost of Equity, where we use international benchmarks for Equity Risk Premium, i.e. 6% - 8% followed by estimation for 'beta' taken from Aswath Damodaran. We also add 'alpha' factor to address company specific risk premium, to allow adjustments in respect of factors such as aggressive forecasts, quality of financial information, experience of management, relative size, etc. Based on international practices adopted by almost every other professional services firm, we also consider valuation discounts, such as discounts for lack of marketability (private businesses), lack of liquidity (closely held stocks), size discounts (with reference to the comparable market players), etc.

The market watch survey shows that average analyst expectation for S&P500 for the end of 2016 was 2193. The end of 2015 index value was 2043. So, the average expected return was around 7.5%. Since the t-bill yield is close to zero, the market risk premium for 2016 that I use is 7.5%.

The Equity Risk Premium in 2015 (Graham, Harvey): http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2611793

I generally use 3.0-3.5% with reference to Dimson, Marsh and Staunton (2011).

10 yr average of bench mark nifty index is about 16%, risk free rate on the 364 Tbill is 7%, difference of 16-7 gives you 9%

www.market-risk-premia.com

I use a MRP of 7% which is the mid-point of the range quoted in "A Random Walk Down Wall Street" by Burton Malkiel. Professor Malkiel updates his rolling 25 year equity risk premiums every couple of years and the 6 to 8% range is fairly consistent.

References

Brealey, R.A., S.C. Myers and F. Allen (2005), *Principles of Corporate Finance*, 8th edition, McGraw-Hill/Irwin.

Claus, J.J. and J.K. Thomas (2001), "Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets," *Journal of Finance*. 55, (5), pp. 1629-66.

Damodaran, A. (2008), "Equity Risk Premiums (ERP): Determinants, Estimation and Implications", Working Paper.

Dimson, E., P. Marsh and M. Staunton (2007), "The Worldwide Equity Premium: A Smaller Puzzle," in *Handbook of investments: Equity risk premium*, R. Mehra, Elsevier.

Fernandez, P. (2007), "Equity Premium: Historical, Expected, Required and Implied", http://ssrn.com/abstract=933070

Fernandez, P. (2009a), "Market Risk Premium Used in 2008 by Professors: A Survey with 1,400 Answers", http://ssrn.com/abstract=1344209

Fernandez, P. (2009b), "The Equity Premium in 150 Textbooks", http://ssrn.com/abstract=1473225

Fernandez, P., J. Aguirremalloa and H. Liechtenstein (2009), "The Equity Premium Puzzle: High Required Premium, Undervaluation and Self Fulfilling Prophecy". IESE Business School WP. http://ssrn.com/abstract=1274816

Fernandez, P. and J. del Campo (2010a), "Market Risk Premium used in 2010 by Analysts and Companies: a survey with 2,400 answers", downloadable in http://ssrn.com/abstract=1609563

Fernandez, P. and J. del Campo (2010b), "Market Risk Premium Used in 2010 by Professors: A Survey with 1,500 Answers", downloadable in http://ssrn.com/abstract=1606563

Fernandez, P., J. Aguirreamalloa and L. Corres (2011a), "US Market Risk Premium Used in 2011 by Professors, Analysts and Companies: A Survey with 5.731 Answers", downloadable in http://ssrn.com/abstract=1805852

Fernandez, P., J. Aguirreamalloa and L. Corres (2011b), "The Equity Premium in Spain: Survey 2011 (in Spanish)", downloadable in http://ssrn.com/abstract=1822422

Fernandez, P., J. Aguirreamalloa and L. Corres (2011c), "Market Risk Premium Used in 56 Countries in 2011: A Survey with 6,014 Answers", downloadable in http://ssrn.com/abstract=1822182

Graham, J.R. and C.R. Harvey (2007), "The Equity Risk Premium in January 2007: Evidence from the Global CFO Outlook Survey," *Icfai Journal of Financial Risk Management,* Vol. IV, No. 2, pp. 46-61.

Graham, J.R. and C.R. Harvey (2014), "The Equity Risk Premium in 2014", http://ssrn.com/abstract=2422008

Harris, R.S. and F.C. Marston (2001), "The Market Risk Premium: Expectational Estimates Using Analysts' Forecasts," *Journal of Applied Finance*, Vol. 11.

Ilmanen, A. (2003), "Expected returns on stocks and bonds", *Journal of Portfolio Management* 29, pp. 7-27.

Johnson, D. T., T. Kochanek, T and J. Alexander (2007), "The Equity Premium Puzzle: A New Look", *Journal of the Academy of Finance,* Vol. 5, No. 1, pp. 61-71.

O'Neill, J., D. Wilson and R. Masih (2002), "The Equity Risk Premium from an Economics Perspective", Goldman Sachs, Global Economics Paper No. 84.

Pepperdine Cost of Capital Survey

Pinto et al. (2015), Equity Asset Valuation, 2 ed., Wiley, CFA Business Valuation text

Ritter, J.R. and R. Warr (2002), "The Decline of Inflation and the Bull Market of 1982 to 1999," *Journal of Financial and Quantitative Analysis*, Vol. 37, No. 1, pp. 29-61.

Welch, I. (2000), "Views of Financial Economists on the Equity Premium and on Professional Controversies", *Journal of Business*, Vol. 73, No. 4, pp. 501-537.

Welch, I. (2001), "The Equity Premium Consensus Forecast Revisited", Cowles Foundation Discussion Paper No. 1325.

Welch, I. (2007), "A Different Way to Estimate the Equity Premium (for CAPM and One-Factor Model Use Only)," SSRN n. 1077876.

Equity Premium:
Historical, Expected, Required and Implied

Pablo Fernandez
Professor of Finance. IESE Business School, University of Navarra
Camino del Cerro del Aguila 3.   28023 Madrid, Spain
e-mail: fernandezpa@iese.edu

January 29, 2013

The equity premium designates four different concepts: Historical Equity Premium (**HEP**); Expected Equity Premium (**EEP**); Required Equity Premium (**REP**); and Implied Equity Premium (**IEP**). We highlight the confusing message in the literature regarding the equity premium and its evolution. The confusion arises from not distinguishing among the four concepts and from not recognizing that although the HEP is equal for all investors, the REP, the EEP and the IEP differ for different investors.

A unique IEP requires assuming homogeneous expectations for the expected growth (g), but we show that there are several pairs (IEP, g) that satisfy current prices. We claim that different investors have different REPs and that it is impossible to determine the REP for the market as a whole, because it does not exist. We also investigate the relationship between (IEP – g) and the risk free rate.

There is a kind of schizophrenic approach to valuation: while all authors admit different expectations of equity cash flows, most authors look for a unique discount rate. It seems as if the expectations of equity cash flows are formed in a democratic regime, while the discount rate is determined in a dictatorship.

1. Introduction

The equity premium (also called *market risk premium*, *equity risk premium*, *market premium* and *risk premium*) is one of the most important, but elusive parameters in finance. Some confusion arises from the fact that the term equity premium is used to designate four different concepts:

1. **Historical** Equity Premium (HEP): historical differential return of the stock market over treasuries.
2. **Expected** Equity Premium (EEP): expected differential return of the stock market over treasuries.
3. **Required** Equity Premium (REP): incremental return of the market portfolio over the risk-free rate required by an investor in order to hold the market portfolio[1]. It is needed for calculating the required return to equity (cost of equity). The CAPM assumes that REP and EEP are unique and that **REP = EEP.**
4. **Implied** Equity Premium (IEP): the required equity premium that arises from a pricing model and from assuming that the market price is correct.

The four concepts are different[2]. The **HEP** is easy to calculate and is equal for all investors[3], but the **REP,** the **EEP** and the **IEP** are different for each investor and are not observable magnitudes. We also claim that there is not an **IEP** for the market as a whole: different investors have different **IEPs** and use different **REPs**. A unique IEP requires assuming homogeneous expectations for the expected growth (g), but there are several pairs (IEP, g) that satisfy current prices.

An anecdote from Merton Miller (2000, page 3) about the expected market return in the Nobel context: *"I still remember the teasing we financial economists, Harry Markowitz, William Sharpe, and I, had to put up with from the physicists and chemists in Stockholm when we conceded that the basic unit of our research, the expected rate of return, was not actually observable. I tried to tease back by reminding them of their neutrino –a particle with no mass whose presence was inferred only as a missing residual from the interactions of other particles. But that was eight years ago. In the meantime, the neutrino has been detected"*.

Different authors claim different relations among the four equity premiums defined above. These relationships vary widely:

- **HEP = EEP = REP** according to Brealey and Myers (1996); Copeland *et al* (1995); Ross *et al* (2005); Stowe *et al* (2002); Pratt (2002); Bruner (2004); Bodie *et al* (2003); Damodaran (2006); Goyal and Welch (2007); Ibbotson Ass. (2006).
- **EEP is smaller than HEP** according to Copeland *et al* (2000, HEP-1.5 to 2%); Goedhart *et al* (2005, HEP-1 to 2%); Bodie *et al* (1996, HEP-1%); Mayfield (2004, HEP-2.4%); Booth (1999, HEP-2%); Bostock (2004, 0.6 to 1.8%); Dimson *et al* (2006c, 3 to 3.5%); Siegel (2005b, 2 to 3%); Ibbotson (2002, < 4%); Campbell (2002, 1.5 to 2%); Campbell (2007, 4%)[4].
- **EEP is near zero** according to McGrattan and Prescott (2001); Arnott and Ryan (2001); Arnott and Bernstein (2002).
- Authors that try to find the **EEP doing surveys,** as Welch (2000, 7%); Welch (2001, 5.5%); Graham and Harvey (2007: 4.65% in 2000; 2.39% in nov. 05; 3.21% in nov. 06); O'Neill *et al* (2002, 3.9%).
- There is **a unique IEP and REP = IEP,** according to Damodaran (2001a); Arzac (2005); Jagannathan *et al* (2000); Harris and Marston (2001); Claus and Thomas (2001); Fama and French (2002); Goedhart *et al* (2002); Harris *et al* (2003); Vivian (2005).
- Authors that ***"have no official position"***, as Brealey and Myers (2000, 2003, 2005).
- Authors that claim ***"that no one knows what the REP is"***, as Penman (2003).
- Authors that claim that ***"it is impossible to determine the REP for the market as a whole, because it does not exist"***, as Fernandez (2002).
- Authors that claim that ***"different investors have different REPs"***, as Fernandez (2004).

---

[1] Or the extra return that the overall stock market must provide over the Government Bonds to compensate for the extra risk.

[2] We agree with Bostock (2004) when he says that *"understanding the equity premium is largely a matter of using clear terms"*.

[3] Provided they use the same time frame, the same market index, the same risk-free instrument and the same average (arithmetic or geometric).

[4] However, his figure 4 shows a world equity premium lower than 2% in the period 1985-2002.

The rest of this paper is organized as follows. In section 2 we revise different estimates of the Historical Equity Premium (HEP), note that not all the authors get the same result for the HEP, and analyze the data. We highlight the change in the market around 1960. Before that date, the dividend yield was higher than the risk-free rate, but after that date has been always smaller. In sections 3 and 4 we discuss different estimates of the Expected Equity Premium (EEP) and of the Required Equity Premium (REP). In section 5 we revise the equity premium puzzle. Section 6 is a revision of the prescriptions of the main finance textbooks about the risk premium. We highlight the confusing message of the textbooks regarding the equity premium and its evolution. In section 7, we show that there are several pairs (IEP, g) that explain current market prices and we argue that there is no a REP for the market as a whole, but rather different investors use different REPs. We also show a positive relationship between (IEP – g) and the risk free rate after 1960. Section 8 explains which REP uses the author. Finally, section 9 concludes.

2. Historical Equity Premium (HEP)

The HEP is the historical average differential return of the market portfolio over the risk-free debt[5]. The most widely cited source is Ibbotson Associates whose U.S. database starts in 1926. Another frequently used source is the Center for Research in Security Prices (CRSP) at the University of Chicago.

2.1. First studies of the historical equity return

Smith (1926) made the first empirical estimate of the long run return on stocks (only price changes) for the most actively traded stocks from 1901 to 1922, and showed that an equity investor (even without market timing or stock selection ability) outperformed a bond investor over this period[6].

Cowles (1939) published the first empirical study carefully done on the performance of the stock market. Cowles calculated the total return to equity from 1872 to 1937 for the NYSE, documenting a positive long term equity performance.

Fisher and Lorie (1964), using for the first time the database of stock prices completed at the University of Chicago's Center for Research in Security Prices (CRSP), showed that the average return from a random investment in NYSE stocks from 1926 to 1964 was 9.1% a year[7].

2.2. Estimates of the historical equity premium of the US

Table 1 contains the 1926-2005 average returns and HEP for the US according to Ibbotson Associates (2006). The HEP in table 1 is the difference between the average return on the S&P 500 and the return of Gov. Bonds or T-Bills. However, Ibbotson Associates (2006, page 73), use the income return (the portion of the total return that results from a periodic bond coupon payment) of the Gov. Bonds (5.2%) and consider that the relevant HEP during the period 1926-2005 is 7.1% (12.3-5.2).

Schwert (1990) and Siegel (1994, 1999, 2002, 2005a) studied the relationship between U.S. equity and bonds before 1926. The data on which they base their studies is less reliable than recent data, but the results are interesting, nevertheless. Table 2 shows their conclusions: the HEP and the inflation in the period 1802-1925 were substantially smaller than in subsequent years[8]. Note that table 1 provides a higher HEP than table 2 for the period after 1926 because Ibbotson do not consider the income return of the bonds.

---

[5] This average differential return may be arithmetic or geometric. Different stock market indexes are used as the market portfolio, and Government bonds of different maturities are used as risk-free debt. A good discussion of the geometric and arithmetic average is Jacquier, Kane, and Marcus (2003).

[6] Three years after publication, the market crash happened. Benjamin Graham blamed Smith's book for inspiring an *“orgy of uncontrolled speculation”*.

[7] For a more detailed history see Goetzmann and Ibbotson (2006).

[8] Siegel (1999) argues that this is because bond returns were exceptionally low after 1926, while total equity returns were relatively stable over the whole time period.

Wilson and Jones (2002) provide a monthly stock price index from 1871 through 1999. They note that the S&P Index returns have often been misrepresented[9] and reconstruct the weekly S&P Composite for the period 1926-56 containing more than 400 stocks (instead of 90 as the daily S&P Composite). They get some differences versus other used indexes that are summarized on table 3.

Ibbotson and Chen (2003) use 1926-2000 historical equity returns and conclude that the expected long-term equity premium (relative to the long-term government bond yield) is 5.9% arithmetically, and 3.97% geometrically.

Goetzmann and Ibbotson (2006) employ a new NYSE database for 1815–1925[10] to estimate the U.S. equity returns and the HEP since 1792 (but they mention that dividend data is absent pre-1825, and is incomplete in the period 1825–71). Their main results are in table 4.

Table 1. Returns and HEP according to Ibbotson Associates (2006). 1926-2005

	Average return		Standard	Serial
Nominal Returns 1926-2005	Arithmetic	Geometric	deviation	correlation
S&P 500	12,3%	10,4%	20,2%	3%
Income	*4,2%*	*4,2%*	*1,6%*	*89%*
Capital appreciation	*7,8%*	*5,9%*	*19,5%*	*3%*
Long-Term Gov. Bonds	5,8%	5,5%	9,2%	-8%
Income	*5,2%*	*5,2%*	*2,7%*	*96%*
Capital appreciation	*0,5%*	*0,4%*	*4,4%*	*-19%*
T-Bills	3,8%	3,7%	3,1%	91%
Inflation	3,1%	3,0%	4,3%	65%

HEP over Gov. Bonds	6,5%	4,9%
HEP over T-Bills	8,5%	6,7%

Table 2 - Real returns and HEP from Siegel (2005a)

arith. = arithmetic average. geom. = geometric average

	Average real returns (%)						
	Stocks		Bonds		HEP (%)		
	arith.	geom.	arith.	geom.	arith.	geom.	Inflation (%)
1802-1870	8.28	7.02	5.11	4.78	3.17	2.24	0.1
1871-1925	7.92	6.62	3.93	3.73	3.99	2.89	0.6
1926-2004	8.78	6.78	2.77	2.25	6.01	4.53	3.1
1802-2004	8.38	6.82	3.88	3.51	4.50	3.31	1.4

Table 3. Geometric average of the returns of different indexes in selected periods

(%)	Cowles	S&P	Wilson and Jones	Ibbotson	CRSP NYSE
1871-1925	7,24	7,28	7,28		
1926-1940	3,27	4,20	3,23	4,04	3,01
1941-1956		15,60	15,20	16,11	15,36
1957-1999		12,10	12,28	12,24	11,79
1926-1999		11.08	11.00	11.35	10.70
1871-1999		9,51	9,40		

Table 4. Average return of the US according to Goetzmann and Ibbotson (2006)

	1792-1925		
	Arithmetic return	Geometric return	Standard deviation
Stocks	7.93%	6.99%	14.64%
Bonds	4.17%	4.16%	4.17%
Comm. Paper	7.62%	7.57%	3.22%
Inflation	0.85%	0.61%	7.11%
HEP (Bonds)	3.76%	2.83%	

	1926-2004		
	Arithmetic return	Geometric return	Standard deviation
Stocks	12.39%	10.43%	20.32%
Gov. Bonds	5.82%	5.44%	9.30%
T-Bills	3.76%	3.72%	3.14%
Inflation	3.12%	3.04%	4.32%
HEP (Bonds)	6.57%	4.99%	
HEP (Bills)	8.63%	6.71%	

Total returns from 1871 to 1925 are constructed from the Price-Weighted NYSE and the Cowles Income Return Series.

---

[9] Standard & Poor's first developed stock price indices in 1923 and in 1927 created the Composite Index (90 stocks). On 1 March 1957, the Composite was expanded to 500 stocks and renamed S&P 500 Index (its market value was $173 billion, 85% of the value of all NYSE listed stocks). From 1926 to 1957 there were 2 different S&P Composite indexes: one was weekly and the other was daily. The S&P Composite daily covered 90 stocks until 1957; The S&P Composite weekly covered more than 400.

[10] See Goetzmann, Ibbotson, and Peng (2001), who collected U.S. stock market data by hand from 1815.

In a very interesting article, Siegel and Schwartz (2006) calculate the return of the original S&P 500 companies since 1957 until 2003 and find that their return has been higher than the return of the S&P 500[11]. The average geometric return of the S&P 500 was 10.85% (standard deviation of 17%), while the return of the original 500 companies was 11.31% (standard deviation of 15.7%).

Table 5. Different Historical Equity Premiums (HEP) in the US according to different authors

			Ibbotson	Shiller	WJ	Damodaran	Siegel	Max-min
HEP vs. LT Gov. Bonds	Geometric	1926-2005	4,9%	5,5%	4,4%	5,1%	4,6%	1,0%
		1926-1957	6,0%	7,3%	5,1%	5,8%		2,2%
		1958-2005	4,1%	4,2%	4,0%	4,5%		0,6%
	Arithmetic	1926-2005	6,5%	7,0%	5,8%	6,7%	6,1%	1,2%
		1926-1957	8,8%	10,1%	7,6%	8,7%		2,5%
		1958-2005	4,9%	5,0%	4,7%	5,4%		0,7%
HEP vs. T-Bills	Geometric	1926-2005	6,7%	6,0%	6,2%	6,3%	6,2%	0,7%
		1926-1957	8,2%	8,4%	7,3%	7,6%		1,1%
		1958-2005	5,6%	4,3%	5,4%	5,4%		1,3%
	Arithmetic	1926-2005	8,5%	7,7%	7,9%	8,2%	8,2%	0,8%
		1926-1957	11,1%	11,2%	9,9%	10,5%		1,4%
		1958-2005	6,8%	5,4%	6,6%	6,6%		1,5%

Ibbotson figures come from Ibbotson Associates (2006). Shiller figures come from *http://aida.econ.yale.edu/~shiller/data.htm*. WJ figures have been updated from Wilson and Jones (2002). Damodaran figures come from http://pages.stern.nyu.edu/~adamodar/. Siegel figures have been updated from Siegel (2005a).

Note that not all the authors get the same result, even for the HEP. Table 5 is a comparison of the HEP in the US according to different authors. The differences are substantial, especially for the period 1926-1957. The differences are mainly due to the stock indexes chosen. It is also important to keep in mind that the data from the 19th century and from the first part of the 20th century is quite poor and questionable. Table 6 shows the differences among the different indexes commonly used.

Table 6. Number of securities in the US indexes commonly used

	S&P composite weekly	Ibbotson	CRSP NYSE
1926-1957	228 stocks in 1927, 410 in 1928, 480 in 1956	S&P Composite daily: 90 stocks	Growing number of stocks: 592 in 1927; 1059 in 1957
1957-2006	abandoned	S&P Composite daily: 500 stocks	Growing number of stocks: 1500 in 1975; 2813 in 1999

2.3. A closer look at the historical data

Figure 1 shows that interest rates were lower than dividend yields until 1958 and than the earnings to price ratio until the 1980s. It suggests that many things have changed in the capital markets and that the last 40 years have been different than the previous ones. It is quite sensible to assume that the portfolio theory, the CAPM, the APT, the VAR analysis, the futures and options markets, the appearance of many mutual and hedge funds, the increase of investors, the legislation to protect investors, financial innovation, electronic trading, portfolio insurance, market participation,… have changed the behaviour and the risk attitudes of today's investors vs. past investors. In fact, financial markets are so different that the relative magnitude of dividend yields to interest rates has been reversed.

It is interesting to look at historical data to know what happened to our grandparents (or to our great grandparents), but it is not sensible to assume that their markets and their investment behaviour were similar to ours[12].

Figure 2 shows the evolution of the 20-year rolling correlation of (dividend yield – R_F) versus R_F (the yield on Government long-term bonds). Again, we may see that something has changed in the

---

[11] The market value of the S&P 500 companies that have survived from the original 1957 list was only 31% of the 2003 year-end S&P 500's market value. Since the S&P 500 was formulated, more than 900 new companies have been added to the index (and an equal number deleted from).

[12] Neither the exam of Ec1010 in 1932 is very useful for a student today.

markets because that correlation after 1960 has been lower than ever before. Figure 3 shows the raw data used to calculate the correlations of Figure 2 and permits to contrast the different behavior of the markets in the periods 1871-1959 and 1960-2005. In section 7 we analyze this data and derive implications.

Figure 4 shows the evolution of the 20-year rolling HEP (arithmetic and geometric) relative to the T-Bills. It may be seen that the periods with equity returns much higher than the T-Bill rates were the 50s and the 90s.

Figure 5 compares the 20-year rolling HEP with the current T-Bond yield. From 1960 to 2000 the HEP increased when the yield decreased and vice versa. It did not happen so clearly in previous years.

Figure 1. 10-year T-Bond yields, Earnings to Price ratio (E/P) and Dividend yield of the US

Source: Robert Shiller's Website: http://aida.econ.yale.edu/~shiller/data.htm

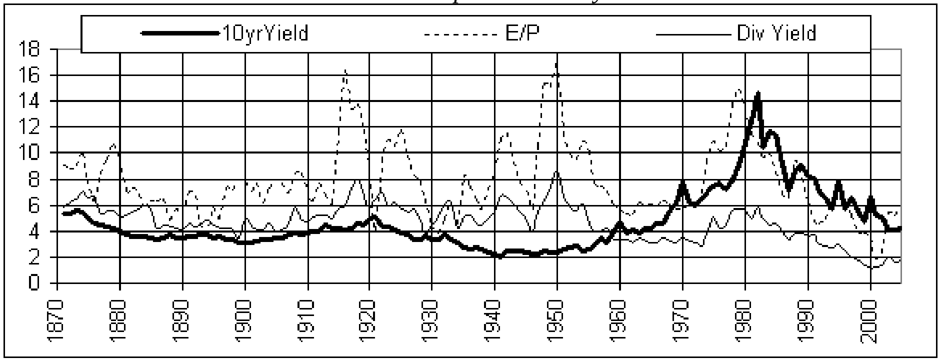


Figure 2. 20-year rolling correlation of (dividend yield – R_F) versus R_F (yield on T-Bonds). Monthly data.

Source of the raw data: Robert Shiller's Website: http://aida.econ.yale.edu/~shiller/data.htm

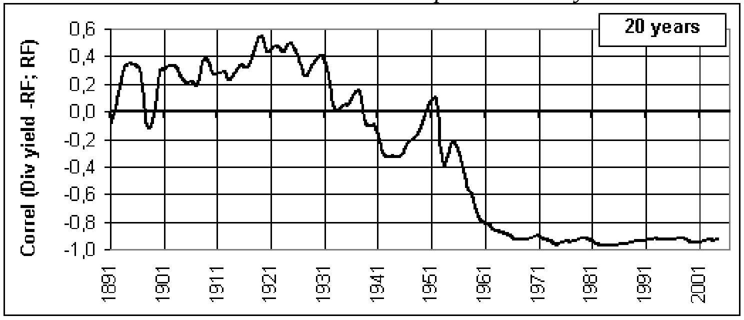


Figure 3. (Dividend yield – R_F) versus R_F (yield on Government long-term bonds)

Source of the raw data: Robert Shiller's Website: http://aida.econ.yale.edu/~shiller/data.htm

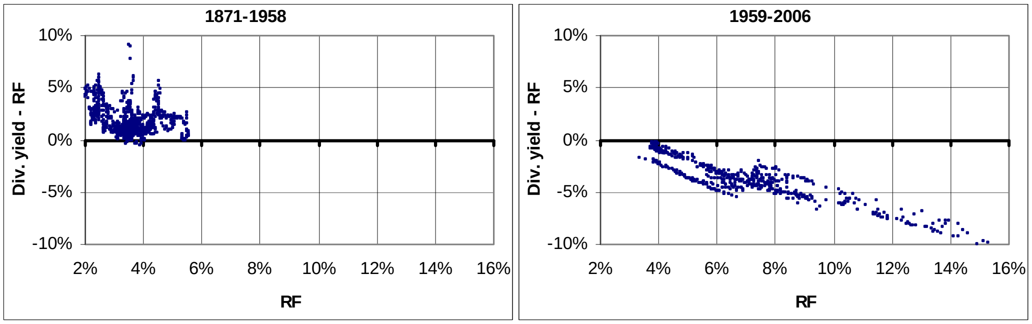


Figure 4. 20-year rolling HEP versus the T-Bills.

Source of the raw data: Robert Shiller's Website: http://aida.econ.yale.edu/~shiller/data.htm

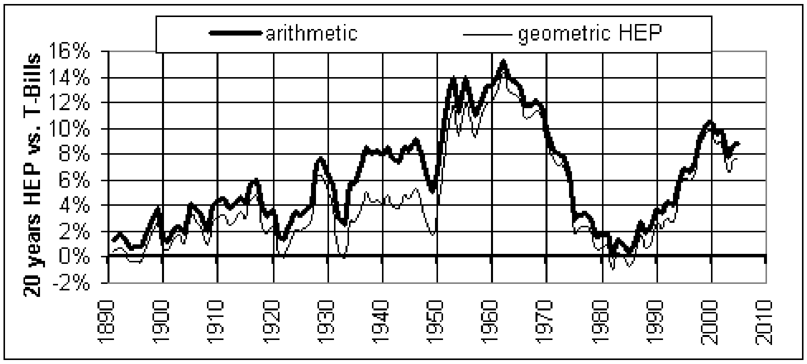
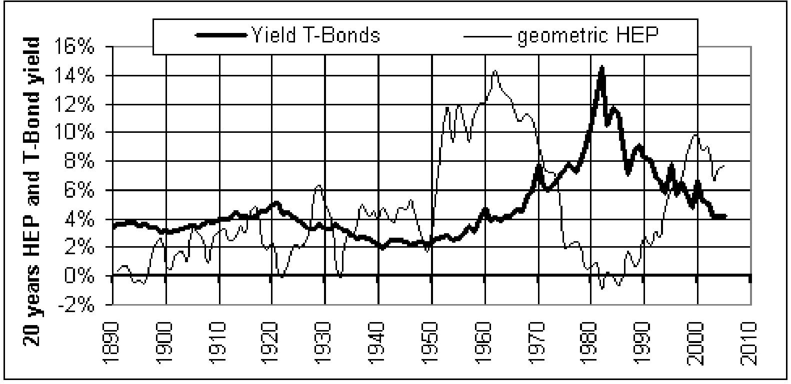


Figure 5. 20-year rolling geometric HEP versus the T-Bills, and T-Bond yield

Source of the raw data: Robert Shiller's Website: http://aida.econ.yale.edu/~shiller/data.htm



2.4. Estimates of the Historical Equity Premium (HEP) in other countries

Blanchard (1993) examined the evolution of stock and bonds rates over the period 1978 to 1992 for the US, Japan, Germany, France, Italy and the UK. He constructed 'world' rates of return (using relative GDP weights for the countries) and documented a postwar decline in the dividend yield and in various measures of the HEP.

Table 7. Equity return of selected countries, according to Jorion and Goetzmann (1999)

Country	Period	Nominal Return	Real Return	Dollar Return	Inflation
U.S.	21-96	6.95%	4.32%	6.95%	2.52%
Sweden	21-96	7.42%	4.29%	7.00%	3.00%
Germany	21-96	4.43%	1.91%	5.81%	2.47%
Canada	21-96	5.78%	3.19%	5.35%	2.51%
U.K.	21-96	6.30%	2.35%	5.20%	3.86%
France	21-96	9.09%	0.75%	4.29%	8.28%
Belgium	21-96	4.45%	-0.26%	3.51%	4.73%
Italy	28-96	10.10%	0.15%	3.22%	9.94%
Japan	21-96	7.33%	-0.81%	1.80%	8.21%
Spain	21-96	4.66%	-1.82%	1.53%	6.61%
Median 39 countries			0.75%	4.68%	
11 countries with continuous histories into the 1920s:		Mean	1.88%	5.09%	
		Median	2.35%	5.20%	

Jorion and Goetzmann (1999) constructed a database of capital gain indexes for 39 markets, with 11 of them starting in 1921(see table 7). However, they obtained pre-1970 dividend information only for 6 markets. They concluded that *"for 1921 to 1996, US equities had the highest real return for all countries, at 4.3%, versus a median of 0.8% for other countries. The high equity premium obtained for U.S. equities appears to be the exception rather than the rule"*. According to the authors, *"there are reasons to suspect that [the US] estimates are subject to survivorship"*.

However, Dimson and Marsh (2001) do not find survivorship bias for the US. They calculate the geometric HEP for 1955-1999 of US, UK, Germany and Japan and get 6.2%, 6.2%, 6.3% and 7.0%.

Table 8. HEP vs. short (30 days) and long term (10 or 30 years) fixed income in 17 countries. 1900-2005. Annualized returns. *Source: Table 3 of Dimson, Marsh and Staunton (2006c)*

	HEP relative to					
% p.a.	Bills			Bonds		
Country	Geometric Mean	Arithmetic Mean	Standard Error	Geometric Mean	Arithmetic Mean	Standard Error
Australia	7,08	8,49	1,65	6,22	7,81	1,83
Japan	6,67	9,84	2,70	5,91	9,98	3,21
South Africa	6,20	8,25	2,15	5,35	7,03	1,88
Germany	3,83	9,07	3,28	5,28	8,35	2,69
Sweden	5,73	7,98	2,15	5,21	7,51	2,17
U.S.	5,51	7,41	1,91	4,52	6,49	1,96
U.K.	4,43	6,14	1,93	4,06	5,29	1,61
Italy	6,55	10,46	3,12	4,30	7,68	2,89
Canada	4,54	5,88	1,62	4,15	5,67	1,74
France	6,79	9,27	2,35	3,86	6,03	2,16
Netherlands	4,55	6,61	2,17	3,86	5,95	2,10
Ireland	4,09	5,98	1,97	3,62	5,18	1,78
Belgium	2,80	4,99	2,24	2,57	4,37	1,95
Norway	3,07	5,70	2,52	2,55	5,26	2,66
Spain	3,40	5,46	2,08	2,32	4,21	1,96
Denmark	2,87	4,51	1,93	2,07	3,27	1,57
Switzerland	3,63	5,29	1,82	1,80	3,28	1,70
Average	4,81	7,14	2,21	3,98	6,08	2,11
World-ex U.S.	4,23	5,93	1,88	4,10	5,18	1,48

Dimson *et al* (2006c) use a unique database to calculate the historical equity premium for 17 countries over 106 years (1900-2005). Their estimates (see Table 8) are lower than frequently quoted HEPs mainly due to the incorporation of the earlier part of the 20th century as well as the opening years of the 21st century[13].

But, apart from the historical interest, how useful and accurate is that data? As Dimson *et al* (2006c) point out, *"virtually all of the 16 countries experienced trading breaks … often in wartime. The U.K. and European exchanges, and even the NYSE, closed at the start of World War I…Similarly, the Danish, Norwegian, Belgian, Dutch and French markets …when Germany invaded in 1940, and even the Swiss market closed from May to July 1940 for mobilization. … Japan after the Great Tokyo Earthquake of 1923. …Germany and Japan from towards the end of World War II, and Spain during the Civil War"*. They claim that *"we were able to bridge these gaps"*, but this assertion is questionable. They admit that *"the end-year index levels recorded for Germany for 1943–47, Japan for 1945, and Spain for 1936–38 cannot be regarded as market-determined values"*. Dimson *et al* (2006c) explain in their footnote 7 that *"In Spain, trading was suspended during the Civil War from July 1936 to April 1939, and the Madrid exchange remained closed through February 1940; over the closure we assume a zero change in nominal stock prices and zero dividends"*. It is not clear why this assumption is a reasonable one. They also mention one *"unbridgeable discontinuity, namely, bond and bill (but not equity) returns in Germany during the hyperinflation of 1922–23, when German bond and bill investors suffered a total loss of –100%. …bonds and bills can become riskier than equities. When reporting equity premiums for Germany … we thus have no alternative but to exclude the years 1922–23"*.

In a previous work Dimson, Marsh and Staunton (2002) show that the HEP was generally higher for the second half century: the World had 4.7% in the first half, compared to 6.2% in the second half.

Table 9 contains some of the HEPs reported by different authors for the US.

Table 9. Historical Equity Premium (HEP) for the US according to different authors

---

[13] Their database contains annual returns on stocks, bonds, bills, inflation, and currencies for 17 countries from 1900–2005, and is described in Dimson *et al* (2006a and 2006b). They construct a World equity index (U.S. dollars index of 17 countries weighted by its starting-year market capitalization or by its GDP, before capitalizations were available) and a World bond index, constructed with each country weighted by its GDP. The series were compiled to avoid the survivorship bias that can arise from backfilling. Their choice of international markets was limited by their requirement to have data for the whole century.

Author(s)	Reference/average	Period for HEP	Value
Siegel (2002)	T-Bonds, geo.	1926-2001	4.9%
Ibbotson and Chen (2003)	T-Bonds, geo.	1926-2000	3.97%
Siegel (2005a)	T-Bonds, geo.	1926-2004	4.53%
Ibbotson Associates (2006)	T-Bonds arith. capital aprec. only	1926-2005	7.1%
Goetzmann and Ibbotson (2006)	T-Bonds, geo.	1792-1925	2.83%
Goetzmann and Ibbotson (2006)	T-Bonds, geo.	1926-2004	4.99%
Goyal and Welch (2007)		1872-2004	4.77%
Goyal and Welch (2007)		1927-2004	6.35%
Dimson & al.(2006c)	T-Bonds, geo. US	1900-2005	4.52%
Dimson & al.(2006c)	T-Bonds, geo. World	1900-2005	4.04%

This section has revised different estimates of the Historical Equity Premium (HEP) and permits to note that not all the authors get the same result for the HEP. We highlight the change in the market around 1960. Before that date, the dividend yield was higher than the risk-free rate, but after that date has been always smaller. We question the usefulness of historical data to predict the future.

3. Expected Equity Premium (EEP)

The **Expected** Equity Premium (EEP) is the answer to a question we would all (especially analysts and fund managers) like to answer accurately in the short term, namely: what incremental return do I expect from the market portfolio over the risk-free rate over the next years? Campbell (2007, pg. 1) identifies the EEP with the REP: *"What return should investors expect the stock market to deliver, above the interest rate on a safe short-term investment? In other words, what is a reasonable estimate of the equity premium?"*

Estimates of the EEP based on historical analysis presume that the historical record provides an adequate guide for future expected long-term behaviour. However, the HEP changes over time, and it is not clear why capital market data from the 19th century or from the first half of the 20th century may be useful in estimating expected returns in the 21st century.

Numerous papers assert that there must be **an** EEP common to all investors (to the representative investor). But it is obvious that investors do not share "homogeneous expectations"[14] and, also, that many investors do not hold the market portfolio but, rather, a subgroup of stocks and bonds[15]. Heterogeneous investors do not hold the same portfolio of risky assets; in fact, no investor must hold the market portfolio to clear the market.

We claim in section 7 that without "homogeneous expectations" there is **not one** EEP (but several), and there is **not one** REP (but several).

3.1. The Historical Equity Premium (HEP) is not a good estimator of the EEP

Although many authors consider that the equity premium is a stationary process, and then the HEP is an unbiased estimate of the EEP (*unconditional* mean equity premium), we do not agree with that statement: the HEP is not a good estimator of the EEP. For example, Mehra and Prescott (2003) state that *"…over the long horizon the equity premium is likely to be similar to what it has been in the past"*.

The magnitude of the error associated with using the HEP as an estimate of the EEP is substantial. Shiller (2000) points out that *"the future will not necessarily be like the past"*. Booth (1999) concludes that the HEP is not a good estimator of the EEP and estimates the later in 200 basis points smaller than the HEP[16]. Mayfield (2004) suggest that a structural shift in the process governing the volatility of market returns after the 1930s resulted in a decrease in the expected level of market risk, and concluded that EEP = HEP – 2.4% = 5.9% over the yield on T-bills (4.1% over yields on T-bonds).

---

[14] Brennan (2004) also admits that "*different classes of investor may have different expectations about the prospective returns on equities which imply different assessments of the risk premium*".

[15] But, even with "homogeneous expectations" (all investors have equal EEP), the REP would not be equal for all investors. In that situation, the investors with lower REP would clear the market.

[16] He also points out that the nominal equity return did not follow a random walk and that the volatility of the bonds increased significantly over the last 20 years.

Survivorship bias[17] was identified by Brown, Goetzmann and Ross (1995) as one of the main reasons why the results based on historical analyses can be too optimistic. They pointed out that the observed return, *conditioned on survival* (HEP), can overstate the unconditional expected return (EEP). However, Li and Xu (2002) show that the survival bias fails to explain the equity premium puzzle: *"To have high survival bias, the probability of market survival over the long run has to be extremely small, which seems to be inconsistent with existing historical evidence"*. Siegel (1999, p. 13) mentions that *"Although stock returns may be lower in foreign countries than in the U.S., the real returns on foreign bonds are substantially lower"*.

Pastor and Stambaugh (2001) present a framework allowing for structural breaks in the risk premium over time and estimate that the EEP fluctuated between 4% and 6% over the period from 1834 to 1999, declined steadily since the 1930s (except for a brief period in the mid-1970s) and had the sharpest drop in the last decade of the 20th century. Using extra information from return volatility and prices, they narrow the confidence interval of their estimation (two standard deviations) to plus or minus 280 basis points around 4.8%.

Constantinides (2002) addresses different ways in which we may account for biases in the sample mean premium in order to estimate the expected premium and draws a sharp distinction between conditional, short-term forecasts of the mean equity premium and estimates of the unconditional mean. He says that the conditional EEPs at the end of the 20th century and the beginning of the 21st are substantially lower than the estimates of the unconditional EEP (7%) *"by at least three measures"*. But he concludes that *"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"*.

Dimson *et al* (2003) highlight the survivorship bias relative to the market, *"even if we have been successful in avoiding survivor bias within each index, we still focus on markets that survived"* and concluded that the geometric EEP for the world's major markets should be 3% (5% arithmetic). Dimson *et al* (2006c) admit that *"we cannot know today's consensus expectation for the equity premium"*, but they conclude that *"investors expect an equity premium (relative to bills) of around 3-3½% on a geometric mean basis"*, substantially lower than the HEP found in their own study.

3.2. Surveys

A direct way to obtain an expectation of the equity premium is to carry out a survey of analysts or investors although Ilmanen (2003) argues that surveys tend to be optimistic: *"because of behavioural biases, survey-based expected returns may tell us more about hoped-for returns than about required returns"*.

Welch (2000) performed two surveys with finance professors in 1997 and 1998, asking them what they thought the EEP was over the next 30 years. He obtained 226 replies, ranging from 1% to 15%, with an average arithmetic EEP of 7% above T-Bonds.[18] Welch (2001) presented the results of a survey of 510 finance and economics professors performed in August 2001 and the consensus for the 30-year arithmetic EEP was 5.5%, much lower just 3 years earlier.

Graham and Harvey (2005) indicate that U.S. CFOs reduced their average EEP from 4.65% in September 2000 to 2.93% by September 2005. Over this period, the HEP had fallen only 0.4%.

Goldman Sachs (O'Neill, Wilson and Masih, 2002) conducted a survey of its global clients in July 2002 and the average long-run EEP was 3.9%, with most responses between 3.5% and 4.5%. The magazine *Pensions and Investments* (12/1/1998) carried out a survey among professionals working for institutional investors and the average EEP was 3%.

3.3. Regressions

Attempts to predict the equity premium typically look for some independent lagged predictors (X) on the equity premium: $\text{Equity Premium}_t = a + b \cdot X_{t-1} + \varepsilon_t$

---

[17] "Survivorship" or "survival" bias applies not only to the stocks within the market (the fact that databases contain data on companies listed today, but they tend not to have data on companies that went bankrupt or filed for bankruptcy protection in the past), but also for the markets themselves ("US market's remarkable success over the last century is typical neither of other countries nor of the future for US stocks" (Dimson *et al* 2004)).

[18] The interest rate paid by long-term T-bonds in April 1998 was approximately 6%. At that time, the most recent Ibbotson Associates Yearbook was the 1998 edition, with an arithmetic HEP versus T-bills of 8.9% (1926–1997).

Many predictors have been explored in the literature. Some examples are:

- Dividend yield: Ball (1978), Rozeff (1984), Campbell (1987), Campbell and Shiller (1988), Fama and French (1988), Hodrick (1992), Campbell and Viceira (2002), Campbell and Yogo (2003), Lewellen (2004), and Menzly, Santos, and Veronesi (2004). Cochrane (1997) has a good survey of the dividend yield prediction literature.
- The short term interest rate: Hodrick (1992).
- Earnings price and payout ratio: Campbell and Shiller (1988), Lamont (1998) and Ritter (2005).
- The term spread and the default spread: Avramov (2002), Campbell (1987), Fama and French (1989), and Keim and Stambaugh (1986).
- The inflation rate (money illusion): Fama and Schwert (1977), Fama (1981), and Campbell and Vuolteenaho (2004a,b), and Cohen, Polk and Vuolteenaho (2005).
- Interest rate and dividend related variables: Ang and Bekaert (2003).
- Book-to-market ratio: Kothari and Shanken (1997).
- Value of high and low-beta stocks: Polk, Thompson and Vuolteenaho (2006)[19].
- Consumption and wealth: Lettau and Ludvigson (2001).
- Aggregate financing activity: Baker and Wurgler (2000) and Boudoukh *et al* (2006).

Goyal and Welch (2007) used most of the mentioned predictors and could not identify one that would have been robust for forecasting the equity premium and, after all their analysis, they recommended *"assuming that the equity premium is 'like it always has been'"*. They also show that most of these models have not performed well for the last thirty years, that are not stable, and that are not useful for market-timing purposes.

However, Campbell and Thompson (2007) claim that some variables (ratios, patterns, levels of sort and long term interest rates) are correlated with subsequent market returns and that *"forecasting variables with significant forecasting power insample generally have a better out-of-sample performance than a forecast based on the historical average return"*. They explore the mapping from R^2 statistics in predictive regressions to profits and welfare gains for market timers. *"The basic lesson is that investors should be suspicious of predictive regressions with high R^2 statistics, asking the old question 'If you're so smart, why aren't you rich?'"*

3.4. Other estimates of the expected equity premium

Siegel (2002, page 124) concluded that "the future equity premium is likely to be in the range of 2 to 3%, about one-half the level that has prevailed over the past 20 years" [20]. Siegel (2005a, page 172) affirms that *"over the past 200 years, the equity risk premium has averaged about 3%"*. Siegel (2005b) maintains that *"although the future equity risk premium is apt to be lower than it has been historically, U.S. equity returns of 2-3% over bonds will still amply reward those who will tolerate the short-term risk of stocks"*. However, in a presentation at the SIA annual meeting (November 10, 2005) Siegel maintained that *"equity premium is 4% to 5% now"*.

In the *TIAA-CREF Investment Forum* of June 2002, Ibbotson forecasted *"less than 4% in excess of long-term bond yields"*, and Campbell *"1.5% to 2%"*.

McGrattan and Prescott (2001) did not find corporate equity overvalued in 2000 and forecasted that the real returns on debt and equity should both be near 4%: *"Therefore, barring any institutional changes, we predict a small equity premium in the future"*.

Arnott and Ryan (2001) claim that the expected equity premium is near zero. They base their conclusion on the low dividend yield and their low expectation of dividend growth. Arnott and Bernstein (2002) also conclude that *"the current risk premium is approximately zero"*.

---

[19] Polk, Thompson, and Vuolteenaho (2006) argue that if the CAPM holds, then a high equity premium implies low prices for stocks that have high betas. Therefore, value stocks should tend to have high betas. This was true from the 1930's through the 1950's, but in recent decades growth stocks have had higher betas than value stocks. Polk, Thompson, and Vuolteenaho argue that this change in cross-sectional stock pricing reflects a decline in the equity premium.

[20] Siegel also affirms that: "Although it may seem that stocks are riskier than long-term government bonds, this is not true. The safest investment in the long run (from the point of view of preserving the investor's purchasing power) has been stocks, not Treasury bonds".

Bostock (2004) concludes that according to historical average data, equities should offer a risk premium over government bonds between 0.6% and 1.8%.

Grabowski (2006) concludes that *"after considering the evidence, any reasonable long-term estimate of the normal EEP as of 2006 should be in the range of 3.5% to 6%"*.

Maheu and McCurdy (2006) claim that the US Market had *"three major structural breaks (1929, 1940 and 1969), and possibly a more recent structural break in the late 1990s"*, and suggest an EEP in 2004 between 4.02% and 5.1%.

Table 10. Estimates of the EEP (Expected Equity Premium) according to different authors

Authors	Conclusion about EEP	Note
Surveys		
Pensions and Investments (1998)	3%	Institutional investors
Graham and Harvey (2000)	4.65%	CFOs
Welch (2000)	7% arithmetically, 5.2% geometrically	Finance professors
Welch (2001)	5.5% arithmetically, 4.7% geometrically	Finance professors
O'Neill, Wilson and Masih (2002)	3.9%	Global clients Goldman
Graham and Harvey (2005)	2.93%	CFOs
Other publications		
Booth (1999)	EEP = HEP - 2%	
Pastor and Stambaugh (2001)	4 -6%	
McGrattan and Prescott (2001)	near zero	
Arnott and Ryan (2001)	near zero	
Arnott and Bernstein (2002)	near zero	
Siegel (2002, 2005b)	2 - 3%	
Ibbotson (2002)	< 4%	
Campbel (2002)	1.5 - 2%	
Mayfield (2004)	EEP = HEP - 2.4%= 5.9% + T-Bill	
Bostock (2004)	0.6 – 1.8%	
Goyal and Welch (2007)	EEP = HEP	
Dimson, Marsh and Stauton (2006c)	3 - 3.5%	
Grabowski (2006)	3.5 – 6%	
Maheu and McCurdy (2006)	4.02% and 5.1%.	
Ibbotson Associates (2006)	EEP = HEP = 7.1%	

4. Required and implied equity premium

The Required Equity Premium (REP) of an investor is the incremental return that she requires, over the risk-free rate, for investing in a diversified portfolio of shares. It is a crucial parameter in valuation and capital budgeting because the REP is the key to determining the company's required return to equity and the required return to any investment project. The HEP is misleading for predicting the REP. If there was a reduction in the REP, this fall in the discount rate led to re-pricing of stocks, thus adding to the magnitude of HEP. The HEP, then, overstates the REP.

The IEP is the implicit REP used in the valuation of a stock (or a market index) that matches the current market value with an estimate of the future cash flows to equity. The IEP is also called the *ex ante* equity premium. However, the existence of *a unique* IEP implies to consider that the equity market can be explained with a representative consumer, or to consider that all investors have at any moment the same expectations about future cash flows and use the same discount rate to value each company.

Two models are widely used to calculate the IEP: the Gordon (1962) model (constant dividend growth model) and the residual income (or abnormal return) model.

According to the Gordon (1962) model, the current price per share (P_0) is the present value of expected dividends discounted at the required rate of return (k). If d_1 is the dividend per share expected to be received at time 1, and g the expected long term growth rate in dividends per share[21],

$P_0 = d_1 / (k - g)$, which implies: $k = d_1/P_0 + g$. $IEP = d_1/P_0 + g - R_F$ (1)

The abnormal return method is another version of the Gordon (1962) model when the "clean surplus" relation holds ($d_t = e_t – (BV_t – BV_{t-1})$, being d the dividends per share, e the earnings per share and bv the book value per share):

$P_0 = bv_0 + (e_1 – k\, bv_0) / (k - g)$, which implies: $k = e_1/P_0 + g\,(1 - bv_0/ P_0)$[22] (2)

---

[21] Although we say "dividends per share", we refer to equity cash flow per share: dividends, repurchases and all expected cash for the shareholders.

[22] Comparing the two models, it is clear than in a growing perpetuity, $D_1 = E_1 – g\, BV_0$. The equivalence of the two models may be seen in Fernandez (2005)

Jagannathan, McGrattan and Scherbina (2000) use the Gordon model, assume that dividends will growth as fast as GNP, and come with an estimate of 3.04%. They mention that *"to get the estimate up to Brealey and Myer's 9.2%, we would need to assume nominal dividend growth of 13.2%. This is an unreasonable assumption"*. They also revise Welch (2000) and point out that *"apparently, finance professors do not expect the equity premium to shrink"*.

Claus and Thomas (2001) calculate the equity premium using the Gordon model and the residual income model, assuming that g is the consensus of the analysts' earnings growth forecasts for the next five years and that the dividend payout will be 50%. They also assume that the residual earnings growth after year 5 will be the current 10-year risk-free rate less 3%. With data from 1985 to 1998, they find that the IEP is smaller than the HEP, and they recommend using a REP of about 3% for the US, Canada, France, Germany, Japan and UK.

Harris and Marston (2001), using the dividend discount model and estimations of the financial analysts about long-run growth in earnings, estimate an IEP of 7.14% for the S&P 500 above T-Bonds over the period 1982-1998. They also claim that the IEP move inversely with government interest rates, which is hard to believe.

Easton, Taylor, Shroff and Sougiannis (2002) used the residual income model with IBES data for expected growth[23], and estimated an average IEP of 5.3% over the years 1981-1998.

Goedhart, Koller and Wessels (2002) used the dividend discount model (considering also share repurchases), with GDP growth as a proxy for expected earnings growth and with the average inflation rate of the last 5 years as a proxy for expected inflation. Table 11 contains their results that they report. They conclude that *"we estimate that the real cost of equity has been remarkably stable at about 7% in the US and 6% in the UK since the 1960s. Given current, real long-term bond yields of 3% in the US and 2.5% in the UK, the implied equity risk premium is around 3.5% to 4% for both markets"*.

Table 11. IEP and real cost of equity in the US and the UK according to Goedhart *et al* (2002)

	US		UK	
	1962-1979	1990-2000	1962-1979	1995-2000
Market risk premium	**5.0%**	**3.6%**	**4.3%**	**3.0%**
Real risk-free rate	2.2%	3.1%	1.4%	2.8%
Real cost of equity	7.2%	6.7%	5.7%	5.8%

Fama and French (2002), using the discounted dividend model, estimated the IEP for the period 1951-2000 between 2.55% and 4.32%, far below the HEP (7.43%). For the period 1872-1950, they estimated an IEP (4.17%) similar to the HEP (4.4%). They claimed that in the period 1951-2000 *"a decline in the expected stock return is the prime source of the unexpected capital gain"*, and that *"the unconditional EEP of the last 50 years is probably far below the realized premium"*[24].

Ritter and Warr (2002) claim that in 1979-1997, the IEP declined from +12% to -4%. However, Ritter estimate of the IEP in 2006 is a little over 2% on a geometric basis.

Harris, Marston, Mishra and O'Brien (2003) estimated discount rates for several companies using the dividend discount model and assuming that g was equal to the consensus of the analysts' growth of dividends per share forecasts. They found an IEP of 7.3% (if betas calculated with a domestic index) and 9.7% (when betas calculated with a world index).

Many authors use an expected growth of dividends per share (g) equal to the consensus of the analysts' forecasts, but Doukas, Kim and Pantzalis (2006) find that stock returns are positively associated with analyst's divergence of opinion, and consider the divergence of opinion as risk.

Vivian (2005) replicated Fama and French (2002) to the UK, obtained similar results (see table 12), and concluded that the discount rate (REP) declined in the later part of the 20th Century.

Table 12. REP and HEP in the US and in the UK according to Fama and French (2002) and Vivian (2005)

Table I of Fama and French (2002)

US	REP	HEP
1872-2000	3.54%	5.57%
1872-1950	4.17%	4.40%
1951-2000	2.55%	7.43%

Table 1 of Vivian (2005)

UK	REP	HEP
1901-2002	4.41%	5.68%
1901-1950	4.22%	3.49%
1951-2002	4.60%	7.79%
1966-2002	3.00%	6.79%

---

[23] Although Chan, Karceski and Lakonishok (2001) report that *"IBES forecasts are too optimistic and have low predictive power for long-term growth"*.

[24] Fama and French (1992) report that in the period 1941-1990 an equally weighted index outperformed the value weighted (average monthly returns of 1.12% and 0.93%) in the whole period and in most sub sample periods.

O'Hanlon and Steele (2000) proposed calculating the REP using accounting figures and got a variety of estimates between 4 and 6%.

Glassman and Hassett (2000) calculated in their book Dow 36,000 that the REP for the U.S. in 1999 was 3%, arguing that stocks should not carry any risk premium at all, and that stock prices will rise dramatically further once investors come to realize this fact[25].

Faugere and Erlach (2006) claimed that the equity premium tracks the value of a put option on the S&P 500. However, their conclusion is not very helpful: *"using an 8.1% premium in valuation formulas and capital budgeting problems may be appropriate, since the observed level of the long-run equity premium is fully consistent with the observed steady-state GDP growth and consistent with risk explanations as well. However, if one believes that the recent 1990's trends in dividend yields, interest rates, taxes and inflation represent permanent regime shifts, our model can be parameterized to yield a 3.5% equity premium"*.

Donaldson, Kamstra and Kramer (2006) simulate the distribution from which interest rates, dividend growth rates, and equity premia are drawn and claim that *"the true ex ante equity premium is 3.5% pus or minus 50 basis points"*. They say that previous studies *"estimate the equity premium with great imprecision: often a 5% to 6% ex post estimate can not be statistically distinguished from an ex ante value as low as 1% or as high as 10%"*.

One problem of all these estimates is that they depend on the particular assumption made for the expected growth.

Table 13. Implied Equity Premium **(IEP)** and Required Equity Premium **(REP)** according to different authors

Author(s)	Method		IEP = REP
O'Hanlon and Steele (2000)	accounting		4 to 6%
Jagannathan & al (2000)	DDM		3.04%
Glassman and Hasset (2000)			3%
Harris and Marston (2001)	DDM		7.14%
Claus and Thomas (2001)	RIM	1985-1998	3%
Fama and French (2002)	DDM	1951-2000	2.55%
Fama and French (2002)	DDM	1872-1950	4.17%
Goedhart, Koller and Wessels (2002)	DDM	1990-2000	3.5 to 4%
Ritter (2002)	DDM	2001	0.7%
Ritter and Warr (2002)	RIM	1979-1997	+12% to -4%.
Harris & al (2003)	DDM		7.3%
Vivian (2005)	DDM & RIM	1951-2002 UK	4.6%
Ibbotson Associates (2006)	REP=EEP=HEP	1926-2005	7.1%
Donaldson, Kamstra and Kramer (2006)	DDM	1952-2004	3.5%

DDM = dividend discount model. RIM = residual income model

5. The equity premium puzzle

The **equity premium puzzle**, a term coined by Mehra and Prescott (1985), is the inability of a *standard representative consumer asset pricing model*, using aggregate data, to reconcile the HEP. To reconcile the model with the HEP, individuals must have implausibly high risk aversion according to standard economics models[26]. Mehra and Prescott (1985) argued that stocks should provide at most a 0.35% premium over bills. Even by stretching the parameter estimates, Mehra and Prescott (2003) concluded that the premium should be no more than 1%. This contrasted starkly with their HEP estimate of 6.2%.

5.1. Attempts to solve the equity premium puzzle

This puzzle has lead to an extensive research effort in both macroeconomics and finance. Over the last 20 years, researchers have tried to resolve the puzzle by generalizing and adapting (weakening one or more of the assumptions) the Mehra-Prescott (1985) model, but still there is not a solution generally accepted by the economics profession. Some of the adapted assumptions include:

- alternative assumptions about preferences (state separability, leisure, precautionary savings) or generalizations to state-dependent utility functions: Abel (1990); Constantinides (1990); Epstein

---

[25] Not to be outdone, Kadlec and Acampora (1999) gave their book the title, *Dow 100,000: Fact or Fiction?*

[26] Kocherlakota (1996) reduces the models to just 3 assumptions: individuals have preferences associated with the standard utility function, asset markets are complete (individuals can write insurance contracts against any contingency), and asset trading is costless.

and Zin (1991); Benartzi and Thaler (1995); Bakshi and Chen (1996); Campbell and Cochrane (1999); and Barberis, Huang, and Santos (2001),

- narrow framing[27]: Barberis and Huang (2006),
- probability distributions that admit disastrous events such as fear of catastrophic consumption drops: Rietz (1988); Mehra and Prescott (1988), Barro (2005),
- survivorship bias: Brown, Goetzmann, and Ross (1995),
- liquidity premium: Bansal and Coleman (1996),
- taxes and regulation: McGrattan and Prescott (2005),
- the presence of uninsurable income shocks or incomplete markets: Mankiw (1986); Constantinides and Duffie (1996); Heaton and Lucas (1996) and (1997); Storesletten, Telmer, and Yaron (1999),
- relative volatility of stocks and bonds: Asness (2000)
- limited stock market participation and limited diversification: Saito (1995), Basak and Cuocco (1998), Heaton and Lucas (2000), Vissing-Jorgensen (2002), Gomes and Michaelides (2005),
- distinguishing between the cash flows to equity and aggregate consumption: Brennan and Xia (2001), who claim to be able to justify an equity premium of 6%.
- borrowing constraints: Constantinides, Donaldson, and Mehra (2002),
- other market imperfections: Aiyagari and Gertler (1991); Alvarez and Jermann (2000),
- disentangling the equity premium into its cash flow and discounting components: Bakshi and Chen (2006);
- measurement errors and poor consumption growth proxies: Breeden, Gibbons, and Litzenberger (1989), Mankiw and Zeldes (1991), Ferson and Harvey (1992), Ait-Sahalia, Parker, and Yogo (2004).

There are several excellent surveys of this work, including Kocherlakota (1996), Cochrane (1997) and Mehra and Prescott (2003 and 2006). Kocherlakota (1996) says that *“while there are several plausible explanations for the low level of Treasury returns, the large equity premium is still largely a mystery to economists”*.

Rietz (1988) and Barro (2005) suggest that low-probability disasters, such as a small a large “crash” in consumption, may justify a large equity premium. However, Mehra and Prescott (1988) challenge Rietz to identify such catastrophic events and estimate their probabilities.

McGrattan and Prescott (2005) argue that the 1960-2001 HEP is mainly due to changes in taxes and regulatory policy during this period. They also say that *“Allowing for heterogeneous individuals will also help quantify the effects of increased market participation and diversification that has occurred in the past two decades. Until very recently, mutual funds were a very expensive method of creating a diversified equity portfolio”*.

Limited stock market participation can increase the REP by concentrating stock market risk on a subset of the population. To understand why limited participation may have quantitative significance for the REP, it is useful to review basic facts about the distribution of wealth, and its dynamics over time. Mishel, Bernstein and Allegretto (2006) document that wealth and stock holdings in the U.S. remain highly concentrated in dollar terms: in 2004, the wealthiest 10% held 78.8% of the stocks (84% in 1989 and 76.9% in 2001), and the wealthiest 20% held over 90% of all stocks. Only 48.6% of U.S. households held stocks in 2004 (51.9% in 2001 and 31.7% in 1989) and only 34.9% (40.1% in 2001 and 22.6% in 1989) held stock worth more than $5,000. Of this 34.9%, only 13.5% had direct holdings. Mankiw and Zeldes (1991) reported that 72.4% of the 2998 families in their survey held no stocks at all. Among families that held more than $100,000 in other liquid assets, only 48% held stock. The covariance of stock returns and consumption of the families that hold stocks is triple than that of no stockholders ant it may explain part of the puzzle.

Brennan (2004) highlights the “*democratization of Equity Investment*”: *“The increase in the number of participants in equity markets was accompanied by a massive increase in the scale of the equity mutual fund industry: the assets under management rose from $870 per capita in 1989 to over $14,000 per capita in 1999, before declining to a little over $12,000 per capita in 2001. On the other hand, holdings of bond mutual funds grew only from $966 per capita in 1989 to $2887 in 1989. In other*

---

[27] Narrow framing is the phenomenon documented in experimental settings whereby, when people are offered a new gamble, they sometimes evaluate it in isolation, separately from their other risks.

words, while bond funds roughly tripled, equity funds went up by a factor of over 14!" and *"the share of corporate equity held by mutual funds rose from 6.6% in 1990 to 18.3% in 2000"*.

Heaton and Lucas (2000) introduced Limited Participation and Limited Diversification in an overlapping generations model and concluded that the increases in participation of the past two decades are unlikely to cause a significant reduction in the EEP, but that improved portfolio diversification might explain a fall in the EEP of several percentage points.

There is some promising research on heterogeneity. Abel (1991) hoped that *"incorporating differences among investors or more general attitudes toward risk can explain the various statistical properties of asset returns"*. Levy and Levy (1996) mentioned that the introduction of a small degree of diversity in expectations changed the dynamics of their model and produced more realistic results. Constantinides and Duffie (1996) introduced heterogeneity in the form of uninsurable, persistent and heteroscedastic labor income shocks. Bonaparte (2006) used micro data on households' consumption and provides a new method on estimating asset pricing models, considering each household as living on an island and taking into account its lifetime consumption path. Due to the great deal of heterogeneity across households, he replaced the representative agent with an average agent.

Bakshi and Chen (2006) claim that *"disentangling the equity premium into its cash flow and discounting components produces an economic meaningful equity premium of 7.31%"*.

Shalit and Yitzhaki (2006) show that at equilibrium, heterogeneous investors hold different risky assets in portfolios, and no one must hold the market portfolio.

It is interesting the quotation in Siegel and Thaler (1997): *"no economic theorist has been completely successful in resolving the [equity premium] puzzle"* ... but ... *"most economists we know have a very high proportion of their retirement wealth invested in equities (as we do)"*.

6. The equity premium in the textbooks

This section contains the main messages about the equity premium conveyed in the finance textbooks and valuation books. More details may be found in Fernandez (2006). Figure 6 collects the evolution of the Required Equity Premium (REP) used or recommended by the textbooks and by the academic papers mentioned on previous sections. Table 14 contains the equity premium recommended and used in different editions of several textbooks. Ritter (2002) mentions the use of the historical equity risk premium in textbooks as an estimate of the future as one of the "*The Biggest Mistakes We Teach*". Looking at Figure 6 and at Table 14, it is quite obvious that there is not much consensus, creating a lot of confusion among students and practitioners (and finance authors, also) about the Equity Premium.

Brealey and Myers considered REP = EEP = HEP in the 2nd, 3rd, 4th and 5th editions (1984, 1988, 1991 and 1996), using Ibbotson data that ranged from 8.2 to 8.5% (arithmetic HEPs over T-Bills in periods starting in 1926). In the 6th, 7th and 8th editions (2000, 2003 and 2005 with Allen), they said that *"Brealey, Myers and Allen have no official position on the exact market risk premium, but we believe that a range of 5 to 8.5 percent is reasonable for the risk premium in the United States."* (In the previous editions the ranges was 6 to 8.5%).

Copeland, Koller and Murrin (McKinsey) used a REP = geometric HEP versus Government T-Bonds in the two first editions (1990 and 1995). However, they changed criteria in the 3rd and 4th editions: they advised to use the arithmetic HEP of 2-year returns versus Government T-Bonds reduced by a survivorship bias. In the 1st edition (1990), they recommended 5-6%, in the 2nd edition (1995) they recommended 5-6%, in the 3rd edition (2000) they recommended 4.5-5% ("*we substract a 1.5 to 2% survivorship bias from the long-term arithmetic average of 6.5%"*) and in the 4th edition (Koller, Goedhart and Wessels, 2005) they recommended 3.5-4.5% ("*we subtract a 1% to 2% survivorship bias from the long-term arithmetic average of 5.5%"*).

Ross, Westerfield and Jaffe recommended in all editions they REP = EEP = arithmetic HEP vs. T-Bills, using Ibbotson data. In (1988, 2nd edition), (1993, 3rd edition) and (1996, 4th edition) they recommended 8.5%. In (1999, 5th edition) 9.2%; in (2002, 6th edition) 9.5%; and in (2005, 7th edition) 8.4%.

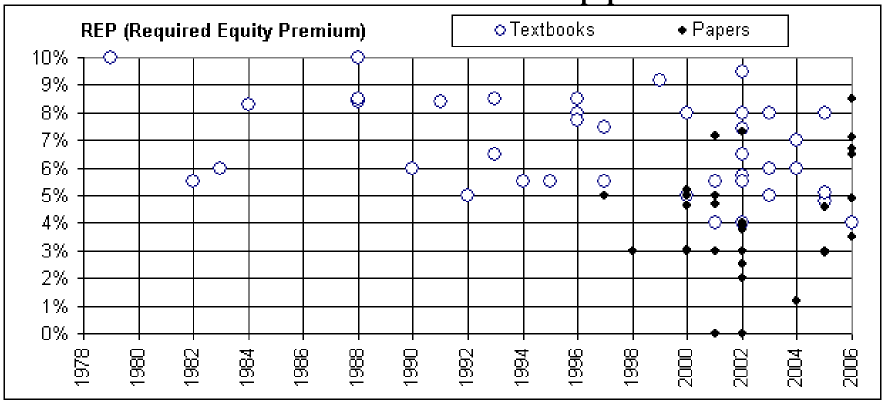
Bodie, Kane and Marcus (1993, 2nd edition) used a REP = EEP = 6.5% to value Hewlett-Packard. In the 3rd edition (1996, page 535), they used a REP = EEP = HEP – 1% = 7.75% to value Motorola. In the 5th edition (2002, page 575), they valued Motorola using a REP = 6.5%. In the 6th edition (2003), they used in the examples different REPs: 8% (pages 426, 431) and 5% (page 415).

Damodaran (1994, 2002) recommended REP = EEP = geometric HEP versus T-bonds. In 1997 he used a REP = arithmetic HEP versus T-Bills. In 2001a and 2006 he recommended REP = EEP = IEP. Damodaran *on Valuation* (1994), recommended an EEP of 5.5%, the geometric HEP using T-bonds for the period 1926-1990. Damodaran (2001a, 2006, 2nd edition) used a REP =IEP of 4% for the US. because *"the implied premium for the US and the average implied equity risk premium has been about 4% over the past 40 years"*. Damodaran (1996, 1997, 2001b, 2001c and 2002), however, used a REP of 5.5%. In (1996. page 48) he shows that 5.5% is the geometric HEP versus T-bonds in the period 1926-90.

Copeland and Weston (1979, 1988) used a REP = 10%. However, Weston and Copeland (1992), used a REP = 5%.

Van Horne (1968, 1st ed.) still did not mention the CAPM or the equity premium. In (1983, 6th ed.), he used a REP = 6% He justified it: *"Suppose, for easy illustration, that the expected risk-free rate is an average of the risk-free rates that prevailed over the ten-year period and that the expected market return is average of market returns over that period"*. In (1992, Fundamentals, 8th ed.), he used a REP = 5% and justified it: *"Assume that a rate of return of about 13% on stocks in general is expected to prevail and that a risk-free rate of 8% is expected"*.

Figure 6. Evolution of the Required Equity Premium (REP) used or recommended in the most important finance textbooks and academic papers



Penman (2001, 1st ed.) said that *"the market risk premium is a big guess. Research papers and textbooks estimate it in the range of 4.5% to 9.2%. … No one knows what the market risk premium is"*. In (2003, 2nd ed.), he admitted that *"we really do not have a sound method to estimate the cost of capital… Estimates [of the equity premium] range, in texts and academic research, from 3.0% to 9.2%"*, and he used 6%.

Weston and Brigham (1968) still did not defined equity premium. In (1982, 6th edition) they said that *"the market risk premium can be considered relatively stable at 5 to 6% for practical application"*. Weston, Chung and Siu (1997) recommended 7.5%. Bodie and Merton (2000) used 8% for USA.

Stowe, Robinson, Pinto and McLeavey (2002), in their book for the CFA (Chartered Financial Analysts) Program use (page 49) a REP = Geometric HEP using T-Bonds during 1926-2000, according to Ibbotson = 5.7%. Pratt (2002) assumes that REP=EEP=HEP and uses 7.4% (page 68) and 8% (page 74). Hawawini and Viallet (2002) use a REP = 6.2% = geometric HEP over T-bonds in the period 1926-1999 according to Ibbotson.

Fernandez (2002) is the only finance textbook claiming that *"it is impossible to determine the premium for the market as a whole, because it does not exist"*. He also mentions that we *"could only talk of a market risk premium if all investors had the same cash flow expectations… However, expectations are not homogeneous"*. Fernandez (2004, 2001) also mentioned that "*the HEP, the EEP and the REP are different concepts*" and that "*different investors have different REPs*". In the examples he uses REP = 4%.

Table 14. Equity premiums recommended and used in textbooks

Author(s) of the Textbook	Assumption	Period for HEP	REP recommended	REP used
Brealey and Myers				

2nd edition. 1984	REP=EEP= arith HEP vs. T-Bills	1926-81	8.3%	8.3%
3rd edition. 1988	REP=EEP= arith HEP vs. T-Bills	1926-85	8.4%	8.4%
4th edition. 1991	REP=EEP= arith HEP vs. T-Bills	1926-88	8.4%	8.4%
5th edition. 1996	REP=EEP= arith HEP vs. T-Bills		8.2 - 8.5%	
6th and 7th edition. 2000 and 2003	No official position		6.0 - 8.5%	8.0%
8th edition. 2005 (with Allen)	No official position		5.0 - 8.5%	
Copeland, Koller and Murrin (McKinsey)				
1st edition. 1990	REP=EEP= geo HEP vs. T-Bonds	1926-88	5 - 6%	6%
2nd ed. 1995	REP=EEP= geo HEP vs. T-Bonds	1926-92	5 - 6%	5.5%
3rd ed. 2000	REP=EEP= arith HEP – 1.5-2%	1926-98	4.5 - 5%	5%
4th ed. 2005. Goedhart, Koller & Wessels	REP=EEP= arith HEP – 1-2%	1903-2002	3.5 – 4.5%	4.8%
Ross, Westerfield and Jaffe				
2nd edition. 1988	REP=EEP= arith HEP vs. T-Bills	1926-88	8.5%	8.5%
3rd edition. 1993	REP=EEP= arith HEP vs. T-Bills	1926-93	8.5%	8.5%
4th edition. 1996	REP=EEP= arith HEP vs. T-Bills	1926-94	8.5%	8.5%
5th edition. 1999	REP=EEP= arith HEP vs. T-Bills	1926-97	9.2%	9.2%
6th edition. 2002	REP=EEP= arith HEP vs. T-Bills	1926-99	9.5%	9.5%
7th edition. 2005	REP=EEP= arith HEP vs. T-Bills	1926-02	8.4%	8%
Van Horne, 6th edition. 1983				6.0%
8th edition. 1992			3 - 7%	5.0%
Copeland and Weston (1979 and 1988)				10%
Weston and Copeland (1992)				5%
Bodie, Kane and Marcus				
2nd edition. 1993	REP=EEP		6.5%	6.5%
3rd edition. 1996	REP=EEP=arith HEP vs. T-Bills - 1%		7.75%	7.75%
5th edition. 2002			6.5%	6.5%
2003	REP=EEP= arith HEP vs. T-Bills	1926-2001		5%; 8%
Damodaran 1994 Valuation. 1st ed.	REP=EEP= geo HEP vs.T-Bonds	1926-90	5.5%	5.5%
1996, 1997, 2001b, 2001c	REP=EEP= geo HEP vs.T-Bonds		5.5%	5.5%
2001a	average IEP	1970-2000	4%	4%
2002	REP=EEP= geo HEP vs.T-Bonds	1928-00	5.51%	5.51%
2006 Valuation. 2nd ed.	REP=EEP= geo HEP vs.T-Bonds	1928-2004	4.84%	4%
Weston & Brigham (1982)			5-6%	
Weston, Chung and Siu (1997)			7.5%	
Bodie and Merton (2000)				8%
Stowe *et al* (2002)	REP=EEP= geo HEP vs.T-Bonds	1926-00	5.7%	5.7%
Hawawini and Viallet (2002)	REP=EEP= geo HEP vs.T-Bonds	1926-99		6.2%
Pratt (2002)	REP=EEP=HEP			7.4%, 8%
Fernandez (2002)	"is impossible to determine the premium for the market as a whole"			
Penman (2003)	"No one knows what the REP is"			6%
Fernandez (2001, 2004)	"different investors have different REPs"			4%
Bruner (2004)	REP=EEP= geo HEP vs.T-Bonds	1926-2000	6%	6%
Palepu, Healy and Bernard (2004)	REP=EEP= arith HEP vs.T-Bonds	1926-2002	7%	7%
Weston, Mitchel & Mulherin (2004)	REP=EEP= arith HEP vs.T-Bonds	1926-2000	7.3%	7%
Arzac (2005)	REP=IEP		5.08%	5.08%

Palepu, Healy and Bernard (2004, page 8-3) mention that the HEP "*constitutes an estimate of the REP*" and use REP = 7% in the examples (page 8-5).

Weston, Mitchel and Mulherin (2004) mention that the arithmetic HEP over T-bonds in the period 1926-2000 according to Ibbotson was 7.3% and (page 260) they use REP = EEP = 7%.

Bruner (2004) used a REP of 6% because *"from 1926 to 2000, the risk premium for common stocks has averaged about 6% when measured geometrically"*.

Arzac (2005) uses a REP = IEP = 5.08% for a valuation done in December 2002 (the IEP equity premium as of that date calculated using the Gordon equation).

In the following section we claim that the confusion comes from the fact that **there is not a REP** for the market as a whole: different investors use different **REPs**. Last sentence may me rewritten as: **there is not an IEP** for the market as a whole: different investors use different **IEPs**. A unique IEP requires assuming homogeneous expectations for the expected growth (g), but there are several pairs (IEP, g) that satisfy current prices.

7. There is not an IEP, but many pairs (IEP, g) which are consistent with market prices

Even if market prices are correct for all investors, there is not a unique REP common for all investors. In a simple Gordon model, there are many pairs (Ke, g) that satisfy equation (1). As Ke is the sum of the Implied Equity Premium (IEP) plus the risk-free rate (R_F), there are many pairs (IEP, g) that satisfy equation (1). A unique IEP requires assuming homogeneous expectations for the expected growth (g). If equation (1) holds, the *expected* return for the shareholders is equal to the *required* return for the shareholders (Ke), but there are many *required* returns (as many as expected growths, g) in the market. On top of that, IEP and g change over time.

If investors' expectations were homogenous, it would make sense to calculate a unique IEP, as all investors would have the market portfolio and the same expectations regarding the portfolio[28]. However, as expectations are not homogenous[29], different investors use different **REPs**: investors who expect higher growth will have a higher REP. Heterogeneous investors do not hold the same portfolio of risky assets; in fact, no investor must hold the market portfolio to clear the market: it does not make sense to search for a common REP because it does not exists.

We can find out an investor's REP by asking him, although for many investors the REP is not an explicit parameter but, rather, an implicit one that manifests in the price they are prepared to pay for shares[30]. However, it is impossible to determine the REP for the market as a whole, because it does not exist. Even if we knew the market premiums of all the investors who operated on the market, it would be meaningless to talk of a premium for the market as a whole.

A rationale for this may be found in the aggregation theorems of microeconomics, which in actual fact are non-aggregation theorems. One model that works well individually for a number of people may not work for all of the people together[31]. For the CAPM, this means that although the CAPM may be a valid model for each investor, it is not valid for the market as a whole, because investors do not have the same return and risk expectations for all shares. Prices are a statement of expected cash flows discounted at a rate that includes the risk premium. Different investors have different cash flow expectations and different future risk expectations. One could only talk of an equity premium if all investors had the same cash flow expectations.

Reallocating terms in equation (1), we get:

$$IEP – g = d_1/P_0 - R_F \qquad (3)$$

There are many pairs (IEP, g) that satisfy the Gordon equation at any moment. All the papers that we revised on section 5 assume that there is an "expected growth rate for the market" and get an "IEP for the market". But without homogeneous expectations, there is not an "expected growth rate for the market".

Similarly, for having an EEP common for all investors we need to assume homogeneous expectations (or a representative investor) and, with our knowledge of financial markets, this assumption is not reasonable. A theory with a representative investor cannot explain either why the annual trading volume of most exchanges more than double the market capitalization.

We also find that the difference (IEP – g),[32] is related to the risk free rate in the period after 1960. Figure 7 shows the relationship for the period after 1980 for the US, Spain and the UK. It may be seen the high negative correlation between (IEP – g) and the risk free rate in the three markets. Table 15 presents the regressions for more countries.

Figure 7. Correlations (d_1/P_0 - R_F) – (R_F) for the US, Spain and the UK. Monthly data.
(d_1/P_0 - R_F) = IEP – g. *Source of the data: Datastream*

---

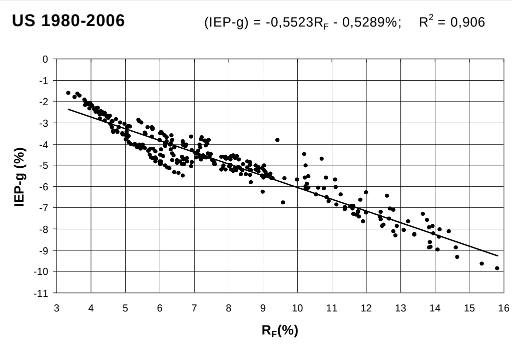
[28] Even then, this method requires knowing the expected growth of dividends. A higher growth estimate implies a higher premium.

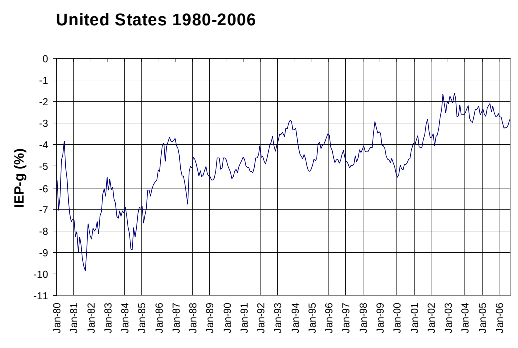
[29] Doukas, Kim and Pantzalis (2006) document analysts' divergence of opinion.

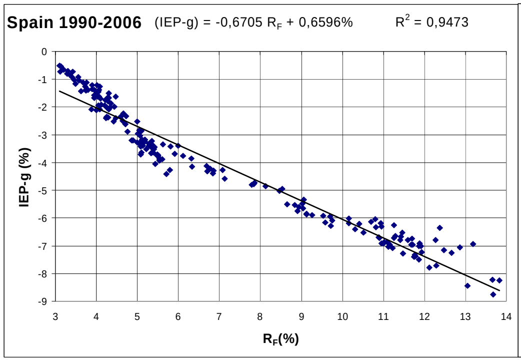
[30] An example: An investor is prepared to pay 80 euros for a perpetual annual cash flow of 6 euros in year 1 and growing at an annual rate of 3%, which he expects to obtain from a diversified equity portfolio. This means that his required market return is 10.5% ([6/80] + 0.03).

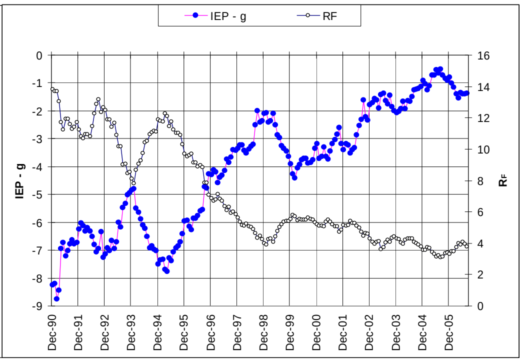
[31] As Mas-Colell *et al.* (1995, page 120) say, "it is not true that whenever aggregate demand can be generated by a representative consumer, this representative consumer's preferences have normative contents. It may even be the case that a positive representative consumer exists but that there is no social welfare function that leads to a normative representative consumer."

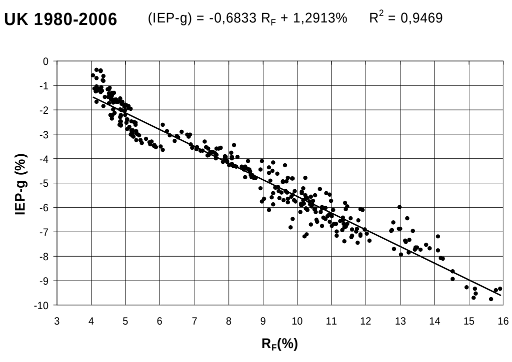
[32] (d_1/P_0 - R_F) is equal to (IEP – g)











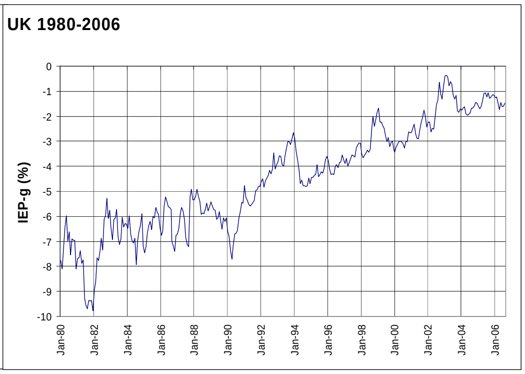


Table 15. Regressions with monthly data of Y (IEP – g) on R_F (10 year Gov. Bond Yield)
Monthly data. (d_1/P_0 - R_F) = IEP – g. *Source of the data: Datastream*

	Full period	(R squared)		Without 1997-02	(R squared)
USA 1980-2006	Y = -0.5523 R_F - 0.5289%	0.9060		Y = -0.5864 R_F - 0.1278%	0.9417
Germany 1980-2006	Y = -0.7192 R_F + 0.5907%	0.8205		Y = -0.7569 R_F + 0.9362%	0.8427
UK 1980-2006	Y = -0.6833 R_F + 1.2913%	0.9469		Y = -0.7195 R_F + 1.7119%	0.9551
France 1988-2006	Y = -0.9587 R_F + 2.5862%	0.9245		Y = -1.0273 R_F + 3.2364%	0.9625
Italy 1991-2006	Y = -1.0693 R_F + 3.0398%	0.9563		Y = -1.1223 R_F + 3.7155%	0.9730
Spain 1991-2006	Y = -0.6705 R_F + 0.6596%	0.9473		Y = -0.7135 R_F + 1.1954%	0.9747

8. How do I calculate the REP?

For calculating the cost of equity (required return to equity cash flows) of a company, a valuator has to answer the following question: which differential rate over current T-Bond yields do I think compensates the risk of holding the shares? If there is only an owner of the shares, we can directly ask him the question. But if it is a traded company, the valuator has to make a prudential judgment. As Grabowski (2006), points out, *"the entire appraisal process is based on applying reasoned judgment to the evidence derived from economic, financial and other information and arriving at a well reasoned opinion of value"*.

We need the cost of equity to discount the expected equity cash flows of the company. Note that there is a kind of schizophrenic approach to valuation: while all authors admit that different valuators and investors may have different expectations of equity cash flows, most authors look for a unique discount rate. It seems as if the expectations of equity cash flows are formed in a democratic regime, while the discount rate is determined in a dictatorship. In any market, different investors may have different expectations of equity cash flows and different evaluations of its risk (that translate into different discount rates). Then, in the case of a traded company, there are investors that think that the company is undervalued (and buy or hold shares), investors that think that the company is overvalued (and sell or not buy shares), and investors that think that the company is fairly valued (and sell or hold shares). The investors that did the last trade, or the rest of the investors that held or did not have shares do not have a common REP (nor common expectations of equity cash flows).

For calculating the REP, we must answer the same question, but thinking in a diversified portfolio of shares, instead in just the shares of a company. In the valuations that I have done in the 21st century I have used REPs between 3.8 and 4% for Europe and for the U.S. Given the yields of the T-Bonds, I think[33] that an additional 4% compensates the additional risk of a diversified portfolio.

9. Conclusion

The equity premium (also called *market risk premium*, *equity risk premium*, *market premium* and *risk premium*), is one of the most important, discussed but elusive parameters in finance. Much of the confusion arises from the fact that the term equity premium is used to designate four different concepts (although many times they are mixed): Historical Equity Premium (HEP), Expected Equity Premium (EEP); Required Equity Premium (REP) and Implied Equity Premium (IEP).

In the finance literature and in valuation textbooks, there are authors that claim different identities among the four equity premiums defined above: some claim that **HEP = EEP = REP**; others claim that **EEP is smaller than HEP;** others claim that there is **a unique IEP and that REP = IEP**; others ***"have no official position"***; others claim that **EEP is near zero;** others try to find the **EEP doing surveys;** others affirm ***"that no one knows what the REP is"***.

The **HEP** is equal for all investors, but the **REP,** the **EEP and** the **IEP** are different for different investors. There is no an **IEP** for the market as a whole: different investors have different **IEPs** and use different **REPs**. A unique IEP requires assuming homogeneous expectations for the expected growth (g), but there several pairs (IEP, g) that satisfy current prices.

We claim that different investors have different REPs and that it is impossible to determine the REP for the market as a whole, because it does not exist. Heterogeneous investors do not hold the same portfolio of risky assets; in fact, no investor must hold the market portfolio to reach equilibrium.

There is a kind of schizophrenic approach to valuation: while all authors admit that different valuators and investors may have different expectations of equity cash flows, most authors look for a unique discount rate. It seems as if the expectations of equity cash flows are formed in a democratic regime, while the discount rate is determined in a dictatorship. In any market, different investors may have different expectations of equity cash flows and different evaluations of its risk (that translate into different discount rates).

It has been argued that, from an economic standpoint, we need to establish the primacy of the EEP, since it is what guides investors' decisions. However, the REP is more important for many important decisions, among others, valuations of projects and companies, acquisitions, and corporate investment decisions. On the other hand, EEP is important only for the investors that hold the market portfolio.

For calculating the cost of equity (required return to equity cash flows) of a company, a valuator has to answer the following question: which differential rate over current T-Bond yields do I think compensates the risk of holding the shares? If there is only an owner of the shares, we can directly ask him the question. But if it is a traded company, the valuator has to make a prudential judgment. There are investors that think that the company is undervalued (and buy or hold shares), investors that

---

[33] And also my clients that are able to answer to that question.

think that the company is overvalued (and sell or not buy shares), and investors that think that the company is fairly valued (and sell or hold shares). For calculating the REP, we must answer the same question, but thinking in a diversified portfolio of shares, instead in just the shares of a company. Recently, I have used REPs between 3.8 and 4% for Europe and for the U.S. Given the yields of the T-Bonds, I think that an additional 4% compensates the additional risk of a diversified portfolio.

References

Abel, A.B. (1990), "Asset Prices under Habit Formation and Catching Up with the Joneses", *American Economic Review*, vol. 80, no. 2 (May), pp. 38–42.

Abel, A.B. (1991), "The Equity Premium Puzzle", *Business Review* (Federal Reserve Bank of Philadelphia), pp. 3-14.

Ait-Sahalia, Y., J. A. Parker and M. Yogo (2004), "Luxury Goods and the Equity Premium", *Journal of Finance* 59, pp. 2959-3004.

Aiyagari, S.R., and M. Gertler (1991), "Asset Returns with Transactions Costs and Uninsured Individual Risk", *Journal of Monetary Economics*, vol. 27, no. 3 (June), pp. 311–331.

Alvarez, F., and U. Jermann (2000), "Efficiency, Equilibrium, and Asset Pricing with Risk of Default", *Econometrica*, vol. 68, no. 4 (July), pp.775–797.

Ang, A. and G. Bekaert (2001), "Stock Return Predictability: Is It There?", Unpublished paper, Graduate School of Business, Columbia University.

Arnott, R. D. and R. J. Ryan (2001), "The Death of the Risk Premium", *Journal of Portfolio Management*, Spring, pp. 61-74.

Arnott, Robert D. and Peter L. Bernstein (2002), "What Risk Premium is 'Normal'?", *Financial Analysts Journal*, Vol. 58, No. 2, pp. 64-84.

Arzac, Enrique R. (2005), *Valuation for Mergers, Buyouts, and Restructuring*, John Wiley & Sons Inc.

Asness, C.S. (2000), "Stocks versus Bonds: Explaining the Equity Risk Premium", *Financial Analysts Journal*, March/April, Vol. 56, No. 2, pp.96-113.

Avramov, D. (2002), "Stock Return Predictability and Model Uncertainty", *Journal of Financial Economics* (3), pp. 423–458.

Baker, M and J. Wurgler (2000), "The Equity Share in New Issues and Aggregate Stock Returns", *Journal of Finance,* 55, 5, pp. 2219-57.

Bakshi, G. and Z. Chen (1996), "The Spirit of Capitalism and Stock Market Prices", *American Economic Review* 86, pp.133-157.

Bakshi, G. and Z. Chen (2006), "Cash Flow Risk, Discounting Risk, and the Equity Premium Puzzle", *Handbook of Investments: Equity Premium*, edited by Rajnish Mehra.

Ball, R. (1978), "Anomalies in Relationships Between Securities' Yields and Yield Surrogates", *Journal of Financial Economics* 6, pp. 103—126.

Bansal, R., and J.W. Coleman (1996), "A Monetary Explanation of the Equity Premium, Term Premium, and Risk-Free Rate Puzzles", *Journal of Political Economy*, vol. 104, no. 6 (December), pp.1135–71.

Barberis, N. and M. Huang (2006), "The Loss Aversion/Narrow Framing Approach to the Equity Premium Puzzle", *Handbook of Investments: Equity Premium*, edited by Rajnish Mehra.

Barberis, N., M. Huang and J. Santos (2001), "Prospect Theory and Asset Prices", *Quarterly Journal of Economics*, vol. 116, pp.1–53.

Barro, R. J. (2005), "Rare Events and the Equity Premium", NBER Working Paper No. W11310.

Basak, S., and D. Cuoco (1998), "An Equilibrium Model with Restricted Stock Market Participation", *Review of Financial Studies* 11, pp. 309-341.

Benartzi, S., and R.H. Thaler (1995), "Myopic Loss Aversion and the Equity Premium Puzzle", *Quarterly Journal of Economics*, vol. 110, no. 1 (February), pp.73–92.

Blanchard, O. (1993), "The Vanishing Equity Premium", *Finance and the International Economy* 7, pp. 23-39.

Bodie, Z. and R. Merton (2000), *Finance*, New Jersey: Prentice Hall.

Bodie, Z., A. Kane, and A. J. Marcus (2004), *Investments*, 6th edition. NY: McGraw Hill. (6th edition in 2004). Previous editions: 1989, 1993, 1996, 1999, 2002.

Bodie, Z., A. Kane, and A. J. Marcus (2003), *Essentials of Investments*, 5th edition. NY: McGraw Hill.

Bonaparte, Y. (2006), "The Equity Premium Puzzle: A Reconciliation", The University of Texas at Austin, Available at SSRN: paper n. 889410.

Booth, L. (1999), "Estimating the Equity Risk Premium and Equity Costs: New Ways of Looking at Old Data", *Journal of Applied Corporate Finance*, Vol. 12 No. 1, pp. 100-112.

Bostock, P. (2004), "The Equity Premium", *Journal of Portfolio Management* 30(2), pp. 104-111.

Boudoukh, J., R. Michaely, M.P. Richardson and M.R. Roberts (2006),"On the Importance of Measuring Payout Yield: Implications for Empirical Asset Pricing", Forthcoming, *Journal of Finance*

Brealey, R.A. and S.C. Myers (2003), *Principles of Corporate Finance*, 7th edition, New York: McGraw-Hill. Previous editions: 1981, 1984, 1988, 1991, 1996 and 2000.

Brealey, R.A., S.C. Myers and F. Allen (2005), *Principles of Corporate Finance*, 8th edition, McGraw-Hill/Irwin.

Breeden, D., M. Gibbons and R. Litzenberger (1989), "Empirical Test of the Consumption-Oriented CAPM", *Journal of Finance* 44 (2), pp.231-262.

Brennan, M. (2004), "How Did It Happen?", *Economic Notes* by Banca Monte dei Paschi di Siena, vol. 33, no. 1, pp. 3–22.

Brennan, M. and Y. Xia (2001), "Stock Price Volatility and the Equity Premium", *Journal of Monetary Economics* 47, pp. 249-283

Brown, S. J., W. N. Goetzmann and S. A. Ross (1995), "Survival", *Journal of Finance*, July, pp. 853-873.

Bruner, Robert F. (2004), *Applied Mergers and Acquisitions*, NY: John Wiley & Sons.

Campbell, J. Y. (1987), "Stock Returns and the Term Structure", *Journal of Financial Economics* 18, pp. 373—399.

Campbell, J. Y. (2002), *TIAA-CREF Investment Forum,* June.

Campbell, J. Y. (2007), "Estimating the Equity Premium", NBER Working Papers from National Bureau of Economic Research (NBER) n. 13423

Campbell, J.Y. and J.H. Cochrane (1999), "By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior", *Journal of Political Economy*, vol. 107, no. 2 (April), pp. 205– 251.

Campbell, J. Y., and R. J. Shiller (1988), "Stock Prices, Earnings, and Expected Dividends", *Journal of Finance*, 43(3), pp. 661-676.

Campbell, J. Y. and S.B. Thompson (2005), "Predicting the Equity Premium Out of Sample: Can Anything Beat the Historical Average?", forthcoming *Review of Financial Studies*

Campbell, J. Y. and L. M. Viceira (2002), *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors,* New York: Oxford University Press.

Campbell, J. Y. and T. Vuolteenaho (2004), "Inflation Illusion and Stock Prices", *American Economic Review*, vol. 94(2), pp. 19-23.

Campbell, J. Y and M. Yogo (2003), "Efficient Tests of Stock Return Predictability", Working Paper, Harvard University and NBER.

Chan, L., J. Karceski and J. Lakonishok (2001), "The Level and Persistence of Growth Rates", NBER Working Paper 8282.

Claus, J.J. and J.K. Thomas (2001), "Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stock Markets", *Journal of Finance*. 55, (5), pp. 1629-66.

Cochrane, J.H. (1997), "Where is the Market Going? Uncertain Facts and Novel Theories", *Economic Perspectives*, Vol. 21, pp. 3–37.

Cohen, R.B, C. Polk, and T. Vuolteenaho (2005), "Money Illusion in the Stock Market: The Modigliani-Cohn Hypothesis," *Quarterly Journal of Economics* 120(2), pp. 639–68.

Constantinides, G.M (1990) "Habit Formation: A Resolution of the Equity Premium Puzzle", *Journal of Political Economy*, vol. 98, no. 3 (June), pp.519-543.

Constantinides, G.M. (2002), "Rational Asset Prices", *Journal of Finance* 57(4), pp. 1567-1591.

Constantinides, G. M. and D. Duffie (1996), "Asset Pricing with Heterogeneous Consumers", *Journal of Political Economy* 104, 2, pp. 219-240.

Constantinides, G.M., J.B. Donaldson, and R. Mehra (2002), "Junior Can't Borrow: A New Perspective on the Equity Premium Puzzle", *Quarterly Journal of Economics*, vol. 117, no. 1 (February), pp. 269-296.

Copeland, T. E., T. Koller, and J. Murrin (2000), *Valuation: Measuring and Managing the Value of Companies.* 3rd edition. New York: Wiley. Previous editions: 1990 and 1995.

Copeland, T. E., and J. F. Weston (1988), *Financial Theory and Corporate Policy.* 3rd edition, Reading, MA: Addison-Wesley. First edition: 1979.

Cowles, A. (1939), *Common Stock Indexes,* Principia Press, Bloomington, Indiana.

Damodaran, A. (2006), *Damodaran on Valuation*, 2nd edition. New York: John Wiley and Sons. 1st edition: (1994).

Damodaran, A. (2001a), *The Dark Side of Valuation*, New York: Prentice-Hall.

Damodaran, A. (2001b), *Corporate Finance: Theory and Practice*. 2nd edition, New York: John Wiley and Sons.

Damodaran, A. (2001c), *Corporate Finance: Theory and Practice*. 2nd *international* edition, New York: John Wiley and Sons.

Damodaran, A. (2002), *Investment Valuation*, New York: John Wiley and Sons.

Dimson, E. and P. Marsh (2001), "U.K. Financial Market Returns, 1955-2000", *Journal of Business* 74, n.1, pp. 1-31.

Dimson, E., P. Marsh and M. Staunton (2000), The Millennium Book: A Century of Returns. ABN AMRO/London Business School.

Dimson, E., P. Marsh and M. Staunton (2002), *Triumph of the Optimists: 101 Years of Global Investment Returns*. New Jersey: Princeton University Press.

Dimson, E., P. Marsh and M. Staunton (2003), "Global Evidence on the Equity Risk Premium", *Journal of Applied Corporate Finance*, 15:4, pp. 27-38.

Dimson, E., P. Marsh and M. Staunton (2004), "Irrational Optimism", *Financial Analysts Journal*, Vol. 60, No. 1, pp. 15–25.

Dimson, E., P. Marsh and M. Staunton (2006a), *Global Investment Returns Yearbook 2006*. ABN AMRO/London Business School.

Dimson, E., P. Marsh and M. Staunton (2006b), *DMS Global Returns data module*. Chicago, IL: Ibbotson Associates.

Dimson, E., P. Marsh and M. Staunton (2006c), "The Worldwide Equity Premium: A Smaller Puzzle", SSRN Working Paper No. 891620.

Donaldson, G., M. J. Kamstra, and L. A. Kramer (2006), "Estimating the Ex Ante Equity Premium", Rotman School of Management Working Paper. Available at SSRN: http://ssrn.com/abstract=945192

Doukas, J.A., C.F. Kim and C. Pantzalis (2006), "Divergence of Opinion and Equity Returns", *Journal of Financial and Quantitative Analysis* 41 (3), pp. 573-606.

Easton, P., G. Taylor, P. Shroff and T. Sougiannis (2002), "Using Forecasts of Earnings to Simultaneously Estimate Growth and the Rate of Return on Equity Investment", *Journal of Accounting Research* 40(3), pp. 657-676.

Epstein, L. G. and S.E. Zin (1991), "The Independence Axiom and Asset Returns", NBER Working Paper No. T0109.

Fama, E.F. (1981), "Stock Returns, Real Activity, Inflation and Money", *American Economic Review*, 4, pp. 545 - 65.

Fama, E.F. and K. R. French (1988), "Dividend Yields and Expected Stock Returns", *Journal of Financial Economics* 22, pp. 3-27.

Fama, E. F. and K. R. French (1989), "Business Conditions and Expected Returns on Stocks and Bonds", *Journal of Financial Economics* 25, pp. 23-49.

Fama, E.F. and K.R. French (1992), "The Cross-Section of Expected Stock Returns", *Journal of Finance* 47, pp. 427-466.

Fama, E.F. and K.R. French (2002), "The Equity Risk Premium", *Journal of Finance* 57 no. 2, pp. 637-659.

Fama, E.F. and G. W. Schwert (1977), "Asset Returns and Inflation", *Journal of Financial Economics* 5, pp. 115-146

Faugere, C. and J. Van Erlach (2006), "The Equity Premium: Consistent with GDP Growth and Portfolio Insurance", *Financial Review,* Vol. 41, No. 4, November.

Fernandez, P. (2002), *Valuation Methods and Shareholder Value Creation*. Academic Press, San Diego, CA.

Fernandez, P. (2004), *Valoración de Empresas*. 3rd edition. Ediciones Gestion 2000. Spain. 2nd edition: 2001.

Fernandez, P. (2005), "Equivalence of Ten Different Methods for Valuing Companies by Cash Flow Discounting", *International Journal of Finance Education,* Vol. 1 (1), pp. 141-168

Fernandez, P. (2006), "The Equity Premium in Finance and Valuation Textbooks", IESE Working Paper n. 657, 15 pages.

Ferson, W. E., and C. R. Harvey (1992), "Seasonality and Consumption–Based Asset Pricing", *Journal of Finance* 47, pp. 511-552.

Fisher, L. and J. Lorie (1964), "Rates of Return on Investments in Common Stock", *Journal of Business*, vol. 37, pp. 1-21.

Glassman, J. K. and K. A. Hassett (2000), *Dow 36.000: The new strategy for profiting from the coming rise in the stock market*, Three Rivers.

Goedhart, M., T. Koller and D. Wessels (2002), "The Real Cost of Equity", McKinsey & Company, N.5, Autumn, pp. 11-15.

Goetzmann, W.N. and R.G. Ibbotson (2006), "History and the Equity Risk Premium", in R. Mehra (Ed.), *Handbook of Investments: Equity Risk Premium*. Amsterdam: Elsevier.

Goetzmann, W.N., R.G. Ibbotson and L. Peng (2001), "A New Historical Database for the NYSE 1815 to 1925: Performance and Predictability", *Journal of Financial Markets*, Vol. 4, No. 1, pp. 1–32.

Gomes, F. and A. Michaelides (2005), "Asset Pricing with Limited Risk Sharing and Heterogeneous Agents", manuscript, London School of Economics.

Gordon, M. (1962), *The Investment, Financing and Valuation of the Corporation,* Homewood, IL. Irwin.

Goyal, A. and I. Welch (2003), "Predicting the Equity Premium with Dividend Ratios", *Management Science* 49(5), 639–654.

Goyal, A. and I. Welch (2007), "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction", *Review of Financial Studies*, forthcoming.

Graham, J.R. and C.R. Harvey (2005), "The Equity Risk Premium in September 2005: Evidence from the Global CFO Outlook Survey", Working Paper, Duke University, September.

Graham, J.R. and C.R. Harvey (2007), "The Equity Risk Premium in January 2007: Evidence from the Global CFO Outlook Survey", Working Paper, Duke University, Available at SSRN: http://ssrn.com/abstract=959703

Grabowski, R.J. (2006), "Equity Risk Premium: 2006 Update", *Business Valuation Review*, Summer.

Harris, R.S. and F.C. Marston (2001), "The Market Risk Premium: Expectational Estimates Using Analysts' Forecasts", *Journal of Applied Finance*, Vol. 11.

Harris, R.S., F.C. Marston, D.R. Mishra and T.J. O'Brien (2003), "Ex Ante Cost of Equity Estimates of S&P 500 Firms: The Choice Between Global and Domestic CAPM", *Financial Management*, Vol. 32, No. 3, Autumn.

Hawawini, G. and C. Viallet (2002), *Finance for Executives*, 2nd edition, South-Western, Thompson Learning.

Heaton, J. and D.J. Lucas (1996), "Evaluating the Effects of Incomplete Markets on Risk Sharing and Asset Pricing", *Journal of Political Economy*, vol. 104, no. 3 (June):443–487.

Heaton, J. and D.J. Lucas (1997), "Market Frictions, Savings Behavior and Portfolio Choice", *Journal of Macroeconomic Dynamics,* vol. 1, no. 1:76–101.

Heaton, J. and D.J. Lucas (2000), "Stock Prices and Fundamentals", *NBER Macroeconomics Annual*.

Hodrick, R. J. (1992), "Dividend Yields and Expected Stock Returns: Alternative Procedures for Inference and Measurement", *Review of Financial Studies* 5, pp. 357—386.

Ibbotson Associates (2006), *Stocks, Bonds, Bills, and Inflation, Valuation Edition, 2006 Yearbook.*

Ibbotson, R. (2002), *TIAA-CREF Investment Forum,* June.

Ibbotson, R. and P. Chen (2003), "Long-Run Stock Returns: Participating in the Real Economy", *Financial Analysts Journal*, Vol. 59, No. 1, pp. 88-98.

Ilmanen, A. (2003), "Expected returns on stocks and bonds", *Journal of Portfolio Management* 29, pp. 7-27.

Jacquier, E., A. Kane, and A.J. Marcus (2003), "Geometric or Arithmetic Mean: A Reconsideration", *Financial Analysts Journal*, Vol. 59, No. 6, pp. 46-53.

Jagannathan, R., E.R. McGrattan, and A.D. Shcherbina (2000), "The Declining U.S. Equity Premium", *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 24, pp. 3–19.

Jorion, P. and W. N. Goetzmann (1999), "Global Stock Markets in the Twentieth Century", *Journal of Finance* 54 (June), pp. 953-80.

Kadlec, C. and R. Acampora (1999), *Dow 100,000: Fact or Fiction?*, New Jersey: Prentice Hall.

Keim, D. and R. Stambaugh (1986), "Predicting Returns in the Stock and Bond Markets", *Journal of Financial Economics* 17, pp. 357—390.

Kocherlakota, N.R. (1996), "The Equity Premium: It's Still a Puzzle", *Journal of Economic Literature*, Vol. 34, pp. 42-71.

Koller, T., M. Goedhart and D. Wessels (2005), *Valuation: Measuring and Managing the Value of Companies*, 4th Edition, McKinsey & Company, Inc. Wiley.

Kothari, S. and J. Shanken (1997), "Book-to-Market, Dividend Yield, and Expected Market Returns: a Time-Series Analysis", *Journal of Financial Economics* 44, pp.169-203.

Lamont, Owen (1998), "Earnings and Expected Returns", *Journal of Finance* 53 (5), pp. 1563-1587.

Lettau, M., and S. C. Ludvigson (2001): "Consumption, Aggregate Wealth and Expected Stock Returns", *Journal of Finance* 56(3), pp. 815-849.

Levy, M. and H. Levy (1996), "The Danger of Assuming Homogeneous Expectations", *Financial Analysts Journal*, May/June, pp. 65-70.

Lewellen, J. (2004), "Predicting Returns with Financial Ratios", *Journal of Financial Economics* 74, pp. 209–235.

Li, H. and Y. Xu (2002), "Survival Bias and the Equity Premium Puzzle", *Journal of Finance* 57, pp. 1981-1993.

Maheu, J. M. and T.H. McCurdy (2006), "How Useful are Historical Data for Forecasting the Long-run Equity Premium?", University of Toronto Working Paper.

Mankiw, N.G. (1986), "The Equity Premium and the Concentration of Aggregate Shocks", *Journal of Financial Economics*, vol. 17, no. 1 (September):211–219.

Mankiw, N. G. and S. P. Zeldes (1991), "The Consumption of Stockholders and Nonstockholders", *Journal of Financial Economics* 29, pp. 97-112.

Mas-Colell, A., M. D. Whinston and J. R. Green (1995), *Microeconomic Theory*, Oxford University Press.

Mayfield, E. S. (2004), "Estimating the Market Risk Premium", *Journal of Financial Economics*.

McGrattan, R. E. and E.C. Prescott (2001), "Is the Stock Market Overvalued?" NBER, Working Paper No. 8077.

McGrattan, R. E. and E.C. Prescott (2005), "Taxes, Regulations, and the Value of U.S. and U.K. Corporations", *Review of Economic Studies* 72, pp. 767–96, July.

Mehra, R. (2003), "The Equity Premium: Why is it a Puzzle?", *Financial Analysts Journal*, Vol. 59, pp. 54–69.

Mehra, R. and E. Prescott (1985), "The Equity Premium: A Puzzle", Journal of Monetary Economics, Vol. 15, pp. 145–161.

Mehra, R. and E. Prescott (1988), "The Equity Risk Premium: A Solution?", Journal of Monetary Economics, Vol. 22, pp. 133–136.

Mehra, R. and E. Prescott (2003), "The Equity Premium in Retrospect", in G.M. Constantinides, M. Harris, and R.M. Stulz (Eds.), Handbook of the Economics of Finance: Volume 1B Financial Markets and Asset Pricing. Amsterdam: Elsevier.

Mehra, R. and E. Prescott (2006), "The Equity Premium: What have we learned in 20 years?", in R. Mehra (Ed.), Handbook of Investments: Equity Risk Premium in the Handbook of the Economics of Finance series. Amsterdam: Elsevier.

Menzly, L., J. Santos and P. Veronesi (2002), "The Time Series of the Cross Section of Asset Prices", CRSP Working Paper No. 541.

Miller, M.H. (2000), "The History of Finance: An Eyewitness Account", *Journal of Applied Corporate Finance*, Vol. 13 No. 2, pp. 8–14.

Mishel, L., J. Bernstein, and S. Allegretto (2006), *The State of Working America*, Cornell University Press.

Modigliani, F. and R. A. Cohn (1979), "Inflation, Rational Valuation and the Market", *Financial Analysts Journal*, Vol. 35, No. 2, pp, 24-44

O'Hanlon, J. and A. Steele (2000), "Estimating the Equity Risk Premium Using Accounting Fundamentals", *Journal of Business Finance & Accounting* 27 (9&10), pp. 1051-1083.

O'Neill, J., D. Wilson and R. Masih (2002), "The Equity Risk Premium from an Economics Perspective", Goldman Sachs, Global Economics Paper No. 84.

Palepu, K.G., P.M. Healy and V.L. Bernard (2004), *Business Analysis and Valuation: Using Financial Statements, Text and Cases*, 3rd ed., South-Western College Pub.

Pastor, L. and R. F. Stambaugh (2001), "The Equity Premium and Structural Breaks", *Journal of Finance*, 56, No. 4, pp. 1207-1239.

Penman, S.H. (2003), *Financial Statement Analysis and Security Valuation*. 2nd edition, McGraw-Hill. 1st ed. in 2001.

Polk, C. K., S. B. Thompson and T. Vuolteenaho (2006) 'Cross-sectional forecasts of the equity premium', *Journal of Financial Economics* 81, 101—141

Pratt, S.P. (2002), *Cost of Capital: Estimation and Applications*, 2nd edition, Wiley.

Rietz, T.A. (1988) "The Equity Risk Premium: A Solution", *Journal of Monetary Economics*, vol. 22, no. 1 (July), pp. 117–131.

Ritter, J.R. (2002), "The Biggest Mistakes We Teach", *Journal of Financial Research,* Vol. 25, pp. 159-168.

Ritter, J.R. (2005), “Economic Growth and Equity Returns”, *Pacific-Basin Finance Journal* 13, pp. 489–503

Ritter, J.R. and R. Warr (2002), "The Decline of Inflation and the Bull Market of 1982 to 1999", *Journal of Financial and Quantitative Analysis*, Vol. 37, No. 1, pp. 29-61.

Ross, S. A., R. W. Westerfield and J. F. Jaffe (2005), *Corporate Finance*, 7th edition, Homewood, IL: McGraw-Hill/Irwin. Previous editions: 1998, 1993, 1996, 1999 and 2002.

Rozeff, M.S. (1984), “Dividend Yields Are Equity Risk Premiums”, *Journal of Portfolio Management*, pp. 68-75,

Saito, M. (1995), “Limited Market Participation and Asset Pricing”, manuscript, University of British Columbia.

Schwert, G.W. (1990), “Indexes of U.S. Stock Prices from 1802 to 1987”, *Journal of Business*, Vol. 63 (1990), pp. 399–426.

Shalit, H. and S. Yitzhaki (2006), "Capital Market Equilibrium with Heterogeneous Investors", SSRN 899276 .

Shiller, R. J. (2000), *Irrational Exuberance*, Princeton University Press, Princeton New Jersey, 2000.

Siegel, J. J. (1999), “The Shrinking Equity Premium”, *Journal of Portfolio Management*, Fall, pp. 10-17.

Siegel, J. J. (2002), *Stocks for the Long Run*, 3rd edition, New York: Irwin. 2nd ed. in 1998, 1st ed. in 1994.

Siegel, J. J. (2005a), “Perspectives on the Equity Risk Premium”, *Financial Analysts Journal*, Vol. 61, No. 6, pp. 61-71.

Siegel, J.J. (2005b), The Future for Investors: Why the Tried and the True Triumph Over the Bold and the New. NY: Crown Business.

Siegel, J.J. and J.D. Schwartz (2006), “The Long-Term Returns on the Original S&P 500 Firms”, *Financial Analysts Journal*, Vol. 62, No. 1, pp. 18-31.

Siegel, J.J. and R. Thaler (1997), “The Equity Premium Puzzle”, *Journal of Economic Perspectives* 11(1), pp. 191-200.

Smith, E. L. (1926), *Common Stocks as Long Term Investments*,

Storesletten, K., C.I. Telmer and A. Yaron (1999), "Asset Pricing with Idiosyncratic Risk and Overlapping Generations", Universitat Pompeu Fabra Working Paper No. 405.

Stowe, J.D., T.R. Robinson, J.E. Pinto and D.W. McLeavey (2002), *Analysis of Equity investments: Valuation.* AIMR (Association for Investment Management and Reasearch).

Van Horne, J. C. (1986), *Fundamentals of Financial Management and Policy*, 6th edition, Englewood Cliffs, NJ: Prentice-Hall. Previous editions: 1971, 1974, 1977, 1980 and 1983.

Van Horne, J. C. (1992), *Financial Management and Policy*, 9th edition, Englewood Cliffs, NJ: Prentice-Hall. Previous editions: 1968, 1971, 1974, 1977, 1980, 1983.

Vissing-Jorgensen, A. (2002), “Limited Asset Market Participation and the Elasticity of Intertemporal Substitution, *Journal of Political Economy* 110, pp. 835-53.

Vivian, A. (2005), “The Equity Premium: 101 Years of Empirical Evidence from the UK”, University of Durham. Available at SSRN number 766184.

Welch, I. (2000), “Views of Financial Economists on the Equity Premium and on Professional Controversies”, *Journal of Business*, Vol. 73, No. 4, pp. 501-537.

Welch, I. (2001), “The Equity Premium Consensus Forecast Revisited”, Cowles Foundation Discussion Paper No. 1325. SSRN n. 285169.

Weston, J. F. and E. F. Brigham (1968), *Essentials of Managerial Finance,* Holt, Rinehart and Winston.

Weston, J. F. and T. E. Copeland (1992), *Managerial Finance,* 9th edition, The Dryden Press.

Weston, J. F., S. Chung and J. A. Siu (1997), *Takeovers, Restructuring and Corporate Governance,* 2nd edition, New Jersey: Prentice-Hall.

Weston, J. F., M.L. Mitchel and J.H. Mulherin (2004), *Takeovers, Restructuring, and Corporate Governance,* 4th edition, Pearson Education, Prentice Hall.

Williams, J.B. (1938), *The Theory of Investment Value*, Harvard University Press, Cambridge, MA.

Wilson, J. and C. Jones (2002), “An Analysis of the S&P 500 Index and Cowles’s Extensions: Price Indexes and Stock Returns, 1870–1999”, *Journal of Business*, Vol. 75, pp. 505–533.

Analyst Long-term Growth Forecasts, Accounting Fundamentals and Stock Returns

Working Paper Draft Date: 4/4/2016

Abstract:

We decompose consensus analyst long-term growth forecasts into a hard growth component that captures accounting information (asset and sales growth, profitability and equity dilution) and an orthogonal soft growth component. The soft component does not forecast future returns, and the hard component does forecast future returns, but in a perverse way. Specifically, stocks with accounting information indicating favorable long-term growth forecasts tend to realize negative future excess returns. This and other evidence we present is consistent with biased long-term growth forecasts generating stock mispricing.

Contact Info:

Gregg Fisher

Gerstein Fisher
Chief Investment Officer
565 Fifth Avenue, 27th Floor
New York, NY 10017
United States
212-968-0707 ext. 111 (Phone)

Ronnie Shah[1]

Gerstein Fisher
Senior Director of Research
565 Fifth Avenue, 27th Floor
New York, NY 10017
United States
212-968-0707 ext. 138 (Phone)

Sheridan Titman

University of Texas at Austin - Department of Finance
McCombs School of Business
Walter W. McAllister Centennial Chair in Financial Services
Austin, TX 78712
United States
512-232-2787 (Phone)

---

[1] Contact author. The views expressed here are those of the authors and not necessarily those of any affiliated institution. We thank members of Gerstein Fisher Investment Strategy Group for their research assistance. This research has benefited from discussion with Michael Clement, Yong Yu and Sunny Yang.

I. Introduction

The Gordon growth model expresses a stock's price as a function of its current dividends, a discount rate, and long-term growth expectations. Of the three relevant components of price, determining long-term growth expectations requires the most judgement and is the most likely to be subject to systematic mistakes. This paper analyzes potential errors in long-term growth expectations by examining the long-term consensus (mean) forecasts of earnings reported by sell-side analysts.[2] Consistent with earlier work, we find evidence of systematic errors in the forecasts, as well as evidence that these errors are reflected in stock prices in ways that are consistent with various return anomalies discussed in the academic finance literature.

To better understand the biases in long-term growth forecasts we decompose the forecasts into what we call a hard component, which can be explained by accounting and choice variables, and a soft component, which is the residual. Elements of the hard component include accounting ratios that capture profitability and changes in sales, as well as choices that influence asset growth and equity dilution. As we show, both components of long-term growth are related to current stock prices, suggesting that either the forecasts or the rationale used by the forecasters influence stock prices.[3] However, our evidence indicates that the forecasts of sell-side analysts are systematically biased, and that these biases may have influenced stock prices in ways that make their returns predictable.

---

[2] Analysts periodically provide forecasts of the current, one- and two-year forward EPS and a longer-term growth rate (LTG) that reflects expected annual percentage changes in EPS after the two-year EPS forecast. The exact forecast period for LTG is subjective and can vary by analyst. Da and Warachka (2011) explain that LTG reflects an analyst's perception of EPS growth over the three-year period starting two years from now.

[3] There is a large literature that links analyst long-term growth forecasts to stock prices. Easton, Taylor, Shroff and Sougiannis (2001), Bradshaw (2004), Claus and Thomas (2001), Gebhardt, Lee and Swaminathan (1998) and Nekrasov and Ogneva (2011) use analyst long-term growth as an input for a residual income valuation model to estimate the cost of capital. Bandyopadhyay, Brown and Richardson (1995) examine 128 Canadian firms and find that 60% of the variation in analyst stock price recommendations can be explained by long-term earnings growth forecasts.

The observed biases are linked to the hard component of the growth forecasts. In particular, the forecasts suggest that analysts believe profits are mean reverting, but profitability actually tends to be fairly persistent. The forecasts also indicate that analysts believe that high past sales growth is a good predictor of future earnings growth. However, we find that high sales growth is actually weakly negatively associated with future earnings growth. Endogenous firm decisions, such as the rate of asset growth, and the use of external financing, are associated with higher growth forecasts, but the relationship between these choices and actual earnings growth is actually negative. The soft component of the growth forecasts does in fact correctly predict actual growth, although in some tests the relationship is relatively weak.

The above evidence is consistent with the idea that the logic of mapping hard information to expected future growth rates may be leading investors astray. If this is the case, investors may be able to profit with trading strategies that buy stocks when the hard component of growth is unfavorable and sell when the hard component is favorable. Our evidence, which is consistent with other papers in the investment anomalies literature, indicates that this is indeed the case.

Our paper is not the first to describe biases in analyst long-term growth forecasts and relate these biases to abnormal stock returns.[4] Previous research by Dechow and Sloan (1997), Chan, Karceski and Lakonishok (2003), La Porta (1996) and Sloan and Skinner (2002) find evidence that overly optimistic equity analyst forecasts contribute to the value premium and that growth stocks underperform when high expectations are not met. Copeland, Dolgoff, and Moel (2004) show that innovations in analyst long-term growth estimates are positively correlated with contemporaneous stock returns. A more recent paper by Da and Warachka (2011) conjectures that short-term earnings forecasts are much more accurate than the long-term forecasts and shows that a strategy that exploits differences between these forecasts generates excess returns.

We contribute to this literature in a number of ways. In particular, we are the first to consider how the various types of hard information, such as endogenous choices like asset growth and equity issues may influence long-term growth forecasts. Second, we are the first to seriously consider the challenges associated with estimating realized long-term earnings growth in a sample with considerable survivorship bias – close to 1/3 of our sample has missing realized five-year earnings growth as reported by I/B/E/S. Some of the missing firms were acquired and some went bankrupt, so our sample of survivors is clearly biased. As we will describe in detail later, to address this problem, we use the market-adjusted returns measured until the firm is no longer in the database to create a proxy for EPS growth rate.

Our paper is also related to the literature that examines the relation between information disclosed in firms' financial statements and future stock returns. For example, Novy-Marx (2013) finds that highly profitable firms outperform low profit firms. Lakonishok, Shleifer and Vishny (1994) report a negative relation between sales growth and future returns. There is also a larger literature that explores whether various measures of asset growth and equity dilution explain stock returns.[5] This literature suggests two potential explanations for why analysts provide favorable long-term growth forecasts for firms growing assets and raising external equity. The first explanation, discussed in Daniel and Titman (2006), is that executives tend to raise capital when soft information about growth prospects is most favorable. If analysts tend to overreact to this soft information, then we will see a relation between favorable analyst forecasts, increases in external financing, and negative future returns. A second, somewhat more cynical explanation is that analysts issue optimistic growth forecasts for firms that are likely to be raising capital externally. The idea here is that analysts that make optimistic

---

[5] Pontiff and Woodgate (2008), Daniel and Titman (2006) and Bradshaw, Richardson and Sloan (2006) find that firms that repurchase shares outperform those that issue additional shares. Cooper, Gulen and Schill (2008) and Titman and Wei (2004) find evidence that asset and capital investment growth, respectively, are negatively related to future returns.

long-term growth forecast make it easier for their investment bankers to generate underwriting business.[6]

One can potentially distinguish between these explanations by examining our evidence on data both before and after the enactment of the global research analyst settlement in September 2002 (See Kadan, Madureira and Wang (2009), Clarke, Kohrana, Patel and Rau (2011) and Loh and Stulz (2011) for more information on the global research analyst settlement), which curtailed the ability of investment bankers to influence sell-side recommendations. Consistent with the idea that the settlement changed analyst behavior, we find that the relation between hard information and future returns are weaker in the post-settlement period. This evidence, however, should be interpreted with caution given the short post-global settlement sample period and confounding events such as the inclusion of certain accounting ratios in quantitative investment models (McLean and Pontiff (2014) and Chordia, Subrahmanyam and Tong (2014)) and the effect of regulation-FD (Agrawal, Chadha and Chen (2006) and Mohanram and Sunder (2006)).

The rest of this paper is organized as follows. The first section describes the data used in our analysis and the characteristics of high and low forecasted growth firms. The second section presents the decomposition of analyst long-term growth forecasts and examines the persistence of long-term growth forecasts and different accounting and valuation ratios. The third section presents the main analysis, exploring how various measures of expected growth are related to valuation ratios and realized earnings growth. The fourth section analyzes how different components of long-term growth forecasts predict future stock returns. The fifth section discusses pre- and post-Global Settlement evidence and evaluates various explanations for our results. The final section concludes.

II. Data

---

[6] For a discussion of this more cynical view see Cragg and Malkiel (2009), Dechow, Hutton and Sloan (2000), Lin and McNichols (1998), Teoh and Wong (2002).

Our main variable of interest, consensus analyst long-term growth (LTG), is taken from I/B/E/S and reflects the mean analyst estimate of annualized earnings growth.[7] There are a few challenges associated with using this measure as an estimate of projected growth. First, each individual analyst long-term growth estimate is updated periodically at the discretion of the analyst, which creates the possibility of stale data. However, as we show, consensus analyst growth forecasts are very persistent through time, suggesting that the individual analyst forecasts change very slowly. Second, analysts do not always produce a long-term growth estimate to go alongside their shorter-term forecasts.

The starting sample for this study includes all NYSE, AMEX and NASDAQ stocks listed on both the Center for Research in Security Prices (CRSP) return files and the Compustat annual industrial files from 1982 through 2014. Information on stock returns, market capitalizations and prices are from the CRSP database. Balance and income sheet information, shares outstanding and GICS industry codes are from the COMPUSTAT database. Analyst long-term consensus growth forecasts (LTG), current stock prices, next year's consensus EPS and actual five-year annual EPS growth rates are from Institutional Brokers Estimate System (I/B/E/S) Summary file. I/B/E/S compiles these forecasts on the third Thursday of every month.

We exclude stocks that have negative or missing book equity, missing industry codes, LTG estimates, or missing accounting data required to construct the different variables used in this study. Two of our measures require non-zero information on sales and assets in year *t-2*, which mitigates backfilling biases. While we include financial stocks, excluding those securities has very little impact on the results reported in the paper. Our final sample has an average of 2,213 firms in each year.

---

[7] Our empirical results are economically similar using the median consensus forecast instead of the mean.

Following Fama and French (1992), we form all of our variables at the end of June in year *t*, using fiscal year *t-1* accounting information and analyst estimates from June of year *t*. For valuation ratios such as Price/Book, we use market equity from December of year *t-1*. For EPS valuation ratios based on analyst estimates and measures of company size, we use market equity from June of year *t* to measure the information in the numerator and the denominator at the same point in time. Stock returns are adjusted for stock delisting to avoid survivorship bias, following Shumway (1997). Portfolios used in various asset pricing tests are formed once a year on the last day in June, allowing for a minimum of a six-month lag between the end of the financial reporting period and portfolio formation.

Variable definitions are as follows. Realized EPS growth (REAL EPS) is from I/B/E/S and reflects the annualized growth rate in EPS over the past five years. Equity dilution (EQDIL) is measured as the percentage growth in split-adjusted shares outstanding. Sales growth (△SALES) is constructed as the year-over-year percentage growth in revenues divided by split-adjusted shares outstanding. Asset growth (△ASSETS) is equal to the year-over-year percentage growth in assets divided by split-adjusted shares outstanding. Profitability (ROA) is defined as operating income before depreciation scaled by assets. SIZE is the logarithm of company market capitalization measured at the end of June.[8] P/B is the logarithm of the market equity to book equity. P/E_{t+1} is the logarithm of the forward price to earnings calculated as the analyst consensus EPS for the next year divided by the price per share. Change in analyst long-term earnings forecasts (△LTG) is the year-over-year change in analyst consensus long-term earnings forecasts. Each year, variables are cross-sectionally winsorized to reduce the effect of outliers by setting values greater than the 99th percentile and less than the 1st percentile to the 99th and 1st

---

[8] To calculate book equity, we use the following logic which is largely consistent with the tiered definitions used by Fama and French (1992). Book equity is equal to shareholders' equity plus deferred taxes less preferred stock. If shareholders' equity is missing, we substitute common equity. If common equity and shareholders' equity are both missing, the difference between assets and liabilities less minority interest is selected. Deferred taxes are deferred taxes and/or investment tax credit. Preferred stock is redemption value if available; otherwise, carry value of preferred stock is used. We set to zero the following balance sheet items, if missing: preferred stock, minority interest, and deferred taxes.

percentile breakpoint values, respectively. All variables are updated annually at the end of June of each year. Our variable definitions are largely consistent with previous studies.

[Insert Figure 1 Here]

Figure 1 reports the average and median annual consensus analyst long-term growth forecast (LTG) from 1982 to 2014 and five-year realized EPS annualized growth rate from 1982 to 2009. The mean estimated growth rate over this period is remarkably stable, increasing from 15.4% in 1982 to 19.7% in 2001 and then decreasing to 14.0% in 2014. The actual five-year growth rate (1982 reflects the five-year growth rate between years 1982 and 1987) fluctuates from slightly higher than 0% to 17.8%. The median cross-sectional forecast and realized earnings growth rates show a similar pattern. Realized growth tends to be high following recessions (1991, 2003, and 2008) and much lower in periods that include recessions in the five-year window.

At the end of June of each year *t* stocks are allocated into quintiles based on LTG. Table 1 reports formation period (using accounting information from year *t-1*) value-weighted summary statistics for various accounting ratios, price-ratio variables and market capitalizations for each of the five quintile portfolios. The first quintile portfolio contains the firms with the lowest expected growth; the fifth quintile portfolio contains the firms with the highest expected growth. Over our sample period, analysts expect the lowest growth firms to average 7% annualized growth in earnings per share, while the top group has average projected EPS growth rates that are four times as large. The distribution of LTG is right-skewed: the middle group (3rd quintile) has close to a 14% lower growth rate than the highest growth group, but only a 7% higher growth rate than the lowest growth group.

[Insert Table 1 Here]

Although the following comparison is plagued with clear survival bias, it is useful to compare the long-term growth forecasts with realized EPS growth. Realized EPS growth does line up with projected growth – increasing monotonically from a low of 3.0% for the quintile portfolio with the lowest LTG to a high of 13.6% for the highest LTG. The average forecast error, defined as the difference between the forecast and the actual growth, also increases monotonically moving from left to right, rising from 3.9% for the lowest LTG growth to 14.4% for the highest LTG group. Even the lowest expected growth firms based on LTG miss their long-term earnings projections, although the misses are relatively small. In contrast, the highest expected growth firms have average realized growth that is more than 50% less than their ex-ante forecast.

The second section of Table 1 Panel B shows that many of the accounting variables used in our study have a meaningful relation with long-term growth forecasts. High expected growth firms tend to have greater equity dilution (EQDIL) and higher past sales (ΔSALES) and asset growth (ΔASSETS). We also observe the same asymmetry associated with expected growth rates – the highest growth group has equity dilution ratios, sales and asset growth rates that are twice as large as the 4th quintile, while the difference between the 3rd and 4th quintile is not as large. Our last non-price variable, profitability (ROA), does not appear to be related to consensus long-term analyst growth.

The third section of Table 1 Panel B examines how price-related variables are related to growth expectations. The results show that low growth rate firms are not the largest firms in our sample, with a time-series average of yearly cross-sectional mean capitalization (SIZE) of 30.9 BN, but are larger than the highest growth rate firms, which have capitalizations of 19.8 BN. High growth firms also tend to have much higher valuation ratios (P/B, P/E_{t+1}) – the highest growth group has a market capitalization that is on average 39x next-period expected earnings, while the lowest growth group has a market capitalization that is only 14x next-period expected earnings. This is consistent with the idea that greater growth opportunities are reflected in higher valuation ratios.

III. Decomposing Growth Expectations

Table 2 presents regressions that document the relation between the hard information variables and long-term growth forecasts. The first four rows of Table 2 display univariate panel regressions of LTG on different firm characteristics using annual data from 1982 to 2014. Errors are clustered by firm and year. Long-term growth is measured as of June of year *t*, while the independent variables use accounting information from fiscal year *t-1*. Similar to Table 1, equity dilution (EQDIL), sales growth (ΔSALES) and asset growth (ΔASSETS) are all positively related to LTG. The fourth variable, profitability (ROA), is negatively related to long-term growth, but is not reliably different from zero (T-stat=1.65). Past sales growth has the highest explanatory power, explaining 10% of the variation in long-term growth.

[Insert Table 2 Here]

Rows 5 through 8 report our estimates of multivariate cross-sectional regressions of LTG on the four non-price accounting variables. The regressions are run both with and without fixed effects that capture variation in long-term growth forecasts by industry and year. In most regressions, the coefficients of both the accounting variables and the industry and firm fixed effects are statistically significant, indicating that we can explain analyst long-term growth forecasts with hard information.

The positive coefficients on sales growth indicate an expectation that the past sales growth will persist into the future, which should in turn lead to future EPS growth. Higher asset growth, or growth of certain quantities on the balance sheet, such as property, plant and equipment, can indicate the firm is making presumably positive NPV investments that will generate future earnings. Equity issuances can also indicate the presence of growth opportunities due to a need for additional capital, while share repurchases may indicate the lack of growth opportunities. The negative coefficient on profitability signifies expected mean reversion, as those low profit firms are expected to have the highest growth in EPS when compared to high profit firms.

The panel regressions reported in Table 2 implicitly assumes that the multivariate relation between the hard information variables and analyst long-term consensus growth forecasts are constant over time. Figure 2 displays the time-series Fama-MacBeth coefficients of contemporaneous accounting variables from a regression explaining analyst long-term growth forecasts. As the figure shows, most relationships are stable over time and all of the equity dilution, sales and asset growth coefficients are positive. The profitability coefficient varies the most, reaching a minimum in the late 90s, during which many technology firms had poor profits but high future expected growth. There does not appear to be a large difference in the coefficient estimate before and after the global settlement (August 2002).

[Insert Figure 2 Here]

In the tests that follow, we decompose analyst long-term growth forecasts into two parts. The first component, which we call *Hard Growth*, is the fitted values from the regression reported in the last row of Table 2 and reported in Equation 1.

$$\text{Hard Growth} = 0.04 + 0.08\ \text{EQDIL} + 0.05\ \Delta\text{SALES} + 0.04\ \Delta\text{ASSETS} -0.12\ \text{ROA} \qquad (1)$$

The second component, denoted *Soft Growth*, is the difference between LTG and Hard Growth. Soft Growth reflects analyst private views or information content in LTG that is unexplained by observable accounting variables.

For our measure of Hard Growth, we use the coefficients of the independent variables from the equation reported above, but we do not include the coefficients on industry or time dummies to avoid any forward-looking bias. This assumption is not material – when we use only same period information to form hard and soft growth measures, the results presented in later sections are not materially different.

To better understand how growth expectations are incorporated into market prices, Table 3 estimates the relation between the components of long-term growth and two valuation ratios. Panel A reports results for log price-to-book (P/B) and Panel B reports results for log of forward earnings-to-price (P/E_{t+1}). The first four rows of each panel examine the relation between the valuation ratios and the four accounting ratios. For the P/B ratio, each of the four accounting variables is significantly positively related, with R^2 ranging from 0.11 to 0.29. Given P/B ratio reflects the market's expectations of growth opportunities: the coefficients on the positive indicators of growth (EQDIL, ΔASSETS, ΔSALES) have the correct sign, while the coefficient on the negative indicator of growth, ROA, has the incorrect sign, although it has the lowest t-statistics of the four variables. For the P/E_{t+1} ratio displayed in Panel B, the three variables that indicate growth all have the predicted positive sign, although sales growth is not statistically significant. ROA has a negative sign and is statistically significant after controlling for industry variation.

[Insert Table 3 here]

The last four rows of each panel in Table 3 use Hard Growth (the fitted values from the last regression reported in Table 2) and Soft Growth (the difference between LTG and Hard Growth or the residual of the same regression) as independent variables. For both valuation ratios, we find that Soft Growth has a positive and highly significant relation with value. Hard Growth is also positive and significant in most regressions, but the relationships are not as strong. Indeed, all of the regressions are consistent with both the hard and soft information in the analyst forecasts being incorporated into market prices.

IV. Do Growth Estimates Predict Future Earnings Growth?

We next examine whether the soft and hard components of forecasted earnings growth actually predict realized earnings growth (REAL EPS). I/B/E/S and Dechow and Sloan (1997) estimate realized earnings growth over the past five years using an AR(1) regression of log (EPS) using six annual observations between years *t* and *t+5*, where year *t* is the reference year that LTG is measured. Hence, one can estimate the extent to which long term growth forecasts and the various components of expect growth predict actual growth.

Unfortunately, sample selection bias creates a major problem for this analysis. Estimating realized earnings growth requires future realizations of non-negative EPS values, and a number of firms in the sample experience negative earnings and a number of other firms drop out of our sample. Specifically, in our sample from 1982 to 2009, we have five-year earnings growth rates for only two-thirds of the original sample (41,957 out of 63,842 firm-years). For those stocks with five-year earnings growth data (REAL EPS), 97.4% have a full 60 months of stock returns, and the average compound return is 14.4% per year for this sample. In comparison, only 22.5% of stocks with missing REAL EPS data have 60 months of stock returns – those firms with 60 months of data, but missing REAL EPS data, have stock returns that averaged only 5.37% per year.

Clearly, the firms with missing data performed worse than those that stayed in our data base. However, firms leave the sample for a variety of reasons, such as mergers, as well as bankruptcy and negative future earnings. Hence, in addition to losing firms that do very poorly, we lose some because the firms did very well – as a result, the bias should affect both low and high expected growth firms. Indeed, we find that 42% of the high expected growth firms (top quintile based on LTG each year) and 27% of low expected growth firms (lowest quintile) have missing five-year earnings growth information.

Heckman's (1979) two-stage selection model provides a potential solution for this sample selection problem. However, this approach requires an instrument that is correlated with whether or not REAL EPS is missing but which is uncorrelated with actual EPS growth. Unfortunately, we have not been able to come up with a good instrument. What we do instead is come up with proxies for the missing data. Specifically, we calculate the five-year market-adjusted return $R_{i,MAR(t,t+5)}$ as the difference between the compound annual five-year stock return $R_{i(t,t+5)}$ measured from July of year *t* to June of year *t+5* less the compound annual market return $R_{Mkt(t,t+5)}$ measured over the same period.[9]

$$R_{i,MAR(t,t+5)} = R_{i(t,t+5)} - R_{Mkt(t,t+5)} \qquad [2]$$

Figure 3 reports value-weighted, market-adjusted returns $R_{MAR(t,t+5)}$ for decile portfolios formed by ranking stocks on I/B/E/S five-year realized EPS growth rate (REAL EPS). We include all stocks that have non-missing EPS data. Moving from left-to-right, the average five-year market-adjusted return rises from -19.0% to 8.6%. The monotonic relation between the EPS growth and stock returns is consistent with Ball and Brown (1968), Ball, Kothari and Watts (1993), Daniel and Titman (2006) and suggests that return information is a good proxy for EPS growth.

[Insert Figure 3 Here]

The approach we take fills in missing earnings data, which reflect close to 1/3 of our sample, with estimates based on observed stock returns. Specifically, our matching process involves calculating the percentile rank of $R_{MAR(t,t+5)}$ for a given year using all firms (including those with missing REAL EPS), defined as the percent of firms with a lower $R_{MAR(t,t+5),}$ and takes values between 0 and 100. We then do the same exercise calculating the percentile rank of REAL EPS using the sample of non-missing firms from Figure 3.

---

[9] When a firm has less than 60 months of data, we use the available return data to estimate compound annual market-adjusted returns.

For each missing REAL EPS observation, we then assign the average five-year EPS growth rate estimated in the same year for the REAL EPS percentile rank that corresponds to the same percentile rank of $R_{MAR(t,t+5)}$. Our procedure matches a distressed firm with poor stock returns and missing EPS growth rate, potentially due to negative earnings or a bankruptcy a low EPS growth rate. Similarly, the procedure matches a firm that has high stock returns and a missing five-year EPS growth rate, possibly due to a corporate action such as a merger, with a high EPS growth rate.

Figure 4 displays a histogram of $R_{MAR(t,t+5)}$ for those firms with missing REAL EPS data. This figure provides a sense of the distribution of market-adjusted stock returns for the sample with missing data and whether firms are matched to low or high realized EPS growth rates. The matched firms often have very low or very high market-adjusted returns – 22% of the missing sample in which $R_{MAR(t,t+5)}$ was in the bottom decile of future average returns, while 19% were in the top decile. In contrast, only 11% of the missing sample had future five-year returns that were either in the fifth or sixth deciles.

We examine why firms have missing REAL EPS. For those firms in the highest decile of market-adjusted returns, 93% were delisted because of a merger or acquisition. Among those in the lowest decile of market-adjusted returns, almost all of those firms were either delisted over the next five years because of bankruptcy or had negative earnings over the five-year period.

[Insert Figure 4 Here]

Table 4 reports results for a panel regression of 5-year realized EPS growth (REAL EPS) on our measures of hard and soft information. When REAL EPS is missing, we assign a future EPS growth rate as described above. Errors are clustered by industry and firm, which help to correct for the overlapping nature of estimating realized EPS growth over five years. The first two rows display results without inclusion of LTG; the third and fourth rows include LTG. In our fourth specification reported on the fourth row, we find equity dilution (T-stat=7.41), sales growth (T-stat=2.67) and asset growth (T-stat=2.16) are all significantly negatively related to actual growth, despite being positively related to forecasted growth. Profitability is also reliably positively related to actual growth (T-stat=5.02), even though profitability loads negatively on forecasted growth. We also find a negative relation between LN (P/B) ratio (T-stat=3.11) and realized growth, suggesting that growth stocks have lower earnings growth when compared to value stocks. After including industry and year dummies, the coefficient on analyst long-term growth (T-stat=1.00) is no longer significant, indicating that analyst long-term estimates are relatively poor predictors of actual earnings growth after controlling for hard information, and industry and year fixed effects.

[Insert Table 4 Here]

The last two rows of Table 4 report regression results of hard and soft growth on realized five-year earnings growth. In our first specification in row 5, we find a negative and significant relation between hard growth (T-stat=4.39), and realized earnings growth. We also find a significant positive relation between soft growth (T-stat=2.58) and realized earnings growth. After including industry and year dummies reported in the last row of Table 4, the coefficient on soft growth declines from 0.11 to 0.02 and is no longer significantly different from zero (T-stat=0.63). A straightforward extension of our analysis (which, for the sake of brevity, we do not report) is that hard accounting information also explains analyst forecast errors; i.e. the difference between the realized 5-year earnings growth and the analyst long-term consensus growth forecast.

To understand the importance of these results, recall that Table 2 shows that sales and asset growth and equity dilution variables are positively related to analyst long-term growth expectations, while profitability is negatively related. Table 4 illustrates the opposite: profitability is positively related to actual earnings growth, but sales and asset growth and equity dilution is negatively related. These results are consistent with a bias in how analysts and markets perceive hard information when making earnings growth forecasts and setting prices.

Analysts, and by extension financial markets, may make mistakes due to the way they interpret the persistence of certain accounting variables. Increasing sales and high profitability is generally associated with greater earnings growth. Similarly, endogenous variables such as asset growth and equity dilution may indicate future investment or the presence of growth opportunities. In Figure 3, we report Spearman rank correlations for each variable and their future values to examine the persistence of different variables that are related to growth expectations. The x-axis reflects the number of years between the current and future variable values. Correlations for each measure decline as more time elapses.

[Insert Figure 3 Here]

Our results suggest that analysts make mistakes when interpreting the persistence of accounting information while setting growth expectations. The “level” variables based on ratios of balance sheet information or market prices (ROA, P/B, P/E_{t+1}) tend to have high persistence, initially ranging from 0.70 to 0.84 for a one-year lag (t+1) and falling to 0.43 to 0.62 for a five-year lag (t+5). Value companies tend to stay value companies, and profitable firms tend to stay profitable. In contrast, the “change” variables, or those variables based on differences in balance sheet quantities (EQDIL, ΔASSETS, ΔSALES), exhibit far less persistence: one-year lag correlations are between 0.41 to 0.27 and decline to 0.20 to 0.11 for a five-year lag. Analyst long-term growth (LTG) is also very persistent, with serial correlations that decline from 0.84 (one-year) to 0.61 (five-year).

The correlations reported in Table 2 and Equation 1 show how analysts expect certain accounting quantities will affect future earnings growth. For example, profitability has a negative loading on LTG, indicating that analysts believe that low profit firms today will have higher earnings growth and hence high future profits. In reality, profitability is fairly persistent and low profit firms do not have higher earnings growth when compared to high profit firms. Sales growth also has a positive correlation with analyst long-term earnings growth forecasts indicating that analysts expect sales growth will persist in the future, even though it is actually not very persistent and a negative (weak) indicator of actual earnings growth. Similarly, endogenous variables such as asset growth and equity dilution which should reflect growth opportunities load positively on LTG. However, these indicators of growth are also not very persistent and are actually negatively related to actual earnings growth.

As we show, there is a tendency for these mistakes to at least partially correct over the following year. Table 5 reports regressions of year-over-year changes in analyst consensus long-term growth (LTG) on accounting and manager choice variables. The first four rows show that change variables (equity dilution, asset and sales growth) are associated with strong negative revisions in LTG. The coefficient on the fourth variable, ROA, does not predict innovations in LTG. Our composite variable, Hard Growth, also predicts when LTG forecasts will be revised downwards.

[Insert Table 5 Here]

If LTG forecasts do in fact reflect market beliefs, and if their revisions can be predicted with the Hard Growth component, then one might conjecture that the Hard Growth component also predicts returns. As we show in the next section, this is indeed the case.

V. Do Errors in Growth Forecasts Lead to Return Predictability?

Our final analysis, reported in Table 6, examines how the different components of long-term growth forecasts explain differences in average stock returns. Panel A of the Table reports average value-weighted returns for portfolios formed on LTG, Hard Growth and Soft Growth for those firms with available LTG and accounting data. Consistent with

Jung, Shane and Yang (2012), we find that analysts' consensus long-term growth expectations are unrelated to future stock returns. Our measure of Hard Growth, however, is strongly negatively related to average returns. Average returns for value-weighted portfolios formed on Hard Growth reported in the 2nd row of Table 6 Panel A decline from 1.19 for decile 1 (lowest growth) to 1.04 for decile 9. The last decile, which includes the firms with the highest Hard Growth indicators (low profitability, high external financing, high asset and sales growth), has monthly returns that are 55 basis points lower than the previous decile; the difference between the top and bottom decile is -0.60% per month (T-stat=2.66). In contrast, the last row of Table 6 Panel A shows that Soft Growth, which reflects analysts' views that is unrelated to accounting information, is unrelated to stock returns.

[Insert Table 6 Here]

Panels B and C of the table report these same portfolio returns for smaller firms and for a larger sample that also includes firms that do not have LTG data. Panel B, which reports returns on the smallest half of the firms (based on market capitalization), shows stronger results – the average return of the top decile is 0.86% less per month (T-stat=3.88) when compared to the average return of the bottom decile. Panel C examines a larger data on firms with data available to measure Hard Growth, but including firms that may not have LTG forecasts. Not requiring LTG estimates doubles the sample size to an average of 4,045 firms per month. As we show, with this larger sample that more closely reflects the samples used in earlier studies of these return anomalies, we find a very strong relation between our estimate of hard growth and stock returns – the average return of a portfolio that is long the highest decile of hard growth firms and short the lowest decile of hard growth firms is -0.79% (T-stat = 3.38).

[Insert Table 7 Here]

Table 7 reports results from Fama-MacBeth regressions of monthly returns on our hard and soft growth measures, with controls for firm size and book-to-market. There is evidence of a weak size (insignificant in all regressions) and stronger value effect (significant in every regression except one) in our sample. In the first regression on the left of the table, LTG is not related to average returns. The second regression includes variables that capture accounting information and manager decisions. We find a significant and positive relation between equity dilution (T-stat=5.25) and asset growth (T-stat=4.39) and average returns. The coefficient of sales growth (T-stat=1.86) is positive and the coefficient of profitability (T-stat=1.66) is negative, the significance of each is marginal. Including LTG in the third regression causes the significance of all the variables to increase – with sales growth (T-stat=2.12) and profitability (T-stat=2.16) now significantly different from zero at the 5% level. The t-statistics and coefficients on the hard information variables reported in the 4th regression are even stronger after including fixed effects that capture differences in industry returns each month.

The final two regressions examine how hard and soft growth relate to average returns. The results largely mirror those reported in Table 6, with LTG and soft growth not related to average returns while hard growth is strongly negatively related to average returns. The Fama-MacBeth approach equal-weights stock returns in each cross-section, compared to the value-weighted portfolio returns reported in the previous table. Our results suggest that hard growth generates a larger difference in returns among smaller stocks when compared to larger stocks, which is consistent with the results presented in Table 6 Panels B and C.

VI. The Effect of the Global Analyst Research Settlement on Long-term Growth Forecasts

The results presented in the previous sections suggest the market misinterprets hard information that signals high growth leading to underperformance, particularly for firms with the most extreme growth forecasts. One possibility explored in Dechow, Hutton and Sloan (2000) is that analysts hype those firms to gain more investment banking business and make it easier for firms to issue equity or debt. An alternative explanation is that managers tend to invest when intangible information is positive and that investors tend to over-react to intangible information (Daniel and Titman (2006)). Manager choice variables such as equity dilution and asset growth signal favorable or unfavorable intangible information, which leads to return predictability.

Rule NASD 2711 and NYSE 472, better known as the Global Analyst Research Settlement, were regulations to reduce the ability of investment banks to influence analysts' stock recommendations. The ruling required the analysts to provide disclosure of any conflict they (or their firm) may have with the recommended stock. We follow Kadan, Madureira and Wang (2009), Clarke, Khorana, Patel and Rau (2011) and Loh and Stulz (2011) by assigning the period starting with September 2002 as the post-global settlement. Analyzing our tests pre- and post-global settlement allows us to better understand how analysts change how (i) analysts form their forecasts, (ii) forecasts are incorporated into market prices, (iii) actual earnings growth is related to hard and soft information, and (iv) whether hard and soft information still has the ability to predict future stock returns.

Our decomposition is important, as we are able to explain how analysts, markets and actual earnings growth differentially react to information on long-term growth forecasts. The competing explanations provided by Dechow, Hutton and Sloan (2000) and Daniel and Titman (2006) are more relevant for managerial decisions related to capital issuance and retirements, or the level of capital expenditures and are less relevant for firm characteristics that are largely out of the control of the manager, such as sales growth or profitability.

Returning to Figure 2, we do not find meaningful differences in the way analysts form their long-term growth expectations: changes in sales and asset growth and equity dilution is positively related to LTG, while ROA is negatively related to LTG. Our results suggest that Global Settlement did not change how analysts process hard information.

[Insert Table 8 Here]

Table 8 replicates the main analyses in our paper for the pre-Global Settlement period from July 1982 to August 2002 and the post-Global Settlement period from September 2002 to December 2014. In our analysis presented in Table 8, we do not include ΔSALES and ROA as independent variables and instead focus on the manager choice variables that related to the competing explanations for our results: EQDIL and ΔASSETS. Table 8 Panel A reports our split-sample results for the panel regressions from Tables 3 and 4. In the early period, we find a very strong correlation between asset growth and the natural log of the price-to-book ratio (T-stat=12.79), consistent with Fama and French (2015), who find a high correlation between HML (low price-to-book less high price-to-book factor) and CMA (low asset growth less high asset growth), and a weaker but still statistically positive relation between log price-to-book and equity dilution (T-stat=2.75). In the later period, we find the coefficient on equity dilution becomes negative (T-stat=6.54), and there is still a positive relation with asset growth (T-stat=7.67). The weaker results in the post-global settlement period for manager choice variables help explain why Hard Growth (T-stat=0.49) is insignificantly positively related to price-to-book ratio.

For the natural log of forward earnings-to-price ratios reported in rows 5 through 8 of Table 8 Panel A, we find a positive correlation between both manager choice variables and price-to-book ratio in the pre-GS period, but the asset growth's coefficient sign flips in the post-GS period. Despite the negative relation between △ASSETS and LN (P/B), the coefficient on Hard Growth (T-stat=2.21) in the later period is still significantly different from zero.

The next four rows display regression results for the pre- and post-GS periods for regressions predicting five-year realized earnings growth. Before global settlement, price-to-book ratio is significantly negative related to actual EPS growth (T-stat=2.66, 3.70), while after global settlement price-to-book is unrelated to actual EPS growth (T-stat=0.64, 0.70). The coefficient on asset growth is significantly negative in the early period (T-stat=2.14), but becomes insignificant in the later period (T-stat=0.50). Equity dilution is a little stronger in the later period, when compared to the earlier period. We find a slightly higher Hard Growth coefficient estimate in the post-global settlement period (0.64) when compared to the pre-global settlement period (0.70).

The last four rows reports split-sample regression results predicting year-over-year changes in LTG. In both sub-periods, we find that equity dilution and asset growth predict negative innovations in LTG, but the coefficient on equity dilution in the post-GS period while significantly different from zero is roughly half of what it was in the pre-GS period. We also find that hard growth is associated with negative future changes in LTG in both sub-periods.

Table 8 Panels B and C report pre- and post-GS period average returns for value-weighted portfolios formed on various growth measures. The return earned by going long firms in the highest decile of equity dilution and going short the lowest decile of equity dilution declines from -0.90% (T-stat=4.47) in the earlier period to -0.43% (T-stat=1.81) in the later period. The long/short return for asset growth is negative and marginally significant in the early period (-0.53), but is positively and insignificant in the later period (0.24%). These results help explain why the difference between the highest decile portfolio and lowest decile portfolio of Hard Growth in the early period is -0.74% (T-stat=2.25) in the early period, but shrinks to -0.36% (T-stat=1.49) in the later period.

As we show, soft growth which reflects analysts' private views are positively related to valuations (P/B, P/E_{t+1}), is (weakly) positively related to actual growth, and does not explain stock returns. Our findings suggest that this component of analyst long-term growth is accurately incorporated into market prices, and that when those growth expectations are met there is no material return predictability. There is also very little change in how soft growth is related to valuations and actual earnings growth pre- and post-global settlement.

In contrast, analysts in the post-global settlement period still assign higher growth expectations to firms with low profitability, high past sales and asset growth and high external financing *despite the regulation*'s *potential influence* on the bias of these estimates. Firms with these characteristics also experience negative revisions in long-term growth forecasts in the post-GS period. Our evidence suggests regulation did not materially change how analysts interpret hard information when making long-term growth forecasts – thus, either the analysts are still trying to gain investment banking business by issuing overly optimistic growth forecasts, or are making genuine mistakes when setting long-term earnings growth expectations. However, it is hard to draw conclusions due to the small sample size of the post-GS period.

Our findings suggest the market, however, isn't fooled by this analyst behavior after August 2002 and potentially learned from the mistakes made when setting prices during the dot-com period between 1998 and 2002 as the relation between hard growth and the log of the price-to-book ratio is weaker. Hard information is a negative predictor of realized earnings growth in both sample periods. In the post-GS period, we find weaker evidence that hard information predicts future returns, which suggests our results are driven by former hypothesis related to analysts hyping stock prices to win investment banking business. However, there is an alternative explanation related to certain market participants exploiting profitability, asset growth or external financing factors to correct and profit from investor mistakes related to mispricing associated with long-term growth forecasts. Of course, we cannot rule out that the weaker results in the latter period are a result of a small sample size instead of a shift in investor behavior or other informed traders exploiting this mispricing.

VII. Conclusion

There is now substantial evidence linking various income statement and balance sheet items to future excess stock returns. While it is possible that these excess returns are associated with systematic sources of risk that investors wish to avoid, the magnitudes of the observed abnormal returns and the Sharpe ratios that can be obtained by exploiting the strategies are simply too large to be consistent with equilibrium risk premia. In other words, during our sample period, the evidence suggests that the consensus views of investors were incorrect along some meaningful dimensions.

To explore this hypothesis, we use the consensus analyst long-term earnings growth forecast as a proxy for growth expectations and examine how these expectations are influenced by various accounting variables. Our focus is on two variables that are under the direct control of a firm's management – the extent to which the firm issued or repurchased its shares and the extent to which it grew is assets and two variables that management can only indirectly control – the sales growth and profitability of the firm. As we show, these variables explain the consensus long-term growth forecasts of analysts, and as such, they also influence stock prices. However, the sign of the correlation between these variables and realized earnings growth is inconsistent with the correlation between these variables and both analyst long-term earnings growth forecasts and firm valuations. Thus, high market prices reflect faulty growth expectations and sorting stocks on these accounting variables produces meaningful differences in average returns.

It would be nice to have better intuition about why the analysts and investors made these mistakes. One possibility, explored in a number of papers, is that analysts bias their earnings forecasts to cater to firms that are likely to need future investment banking services. Another possibility is that market prices influence management choices. If the market and the analyst community view the firm favorably, the firm is more likely to raise capital, grow its assets, and may feel less compelled to increase sales and profitability. In other words, the favorable view of the market may in some cases sow its own seeds of destruction. Finally, it’s possible that the analysts simply made mistakes in our sample period.

While we have made a preliminary exploration of these issues by looking at how long-term earnings growth forecasts have changed over time, our results are not conclusive. Hopefully, future research can help better understand the cause of these earnings forecast errors.

References

Agrawal, Anup, Sahiba Chadha, and Mark A. Chen. "Who Is Afraid of Reg FD? The Behavior and Performance of Sell-Side Analysts Following the SEC's Fair Disclosure Rules*." The Journal of Business 79.6 (2006): 2811-2834.

Bandyopadhyay, Sati P., Lawrence D. Brown, and Gordon D. Richardson. "Analysts' use of earnings forecasts in predicting stock returns: Forecast horizon effects." International Journal of Forecasting 11.3 (1995): 429-445.

Barberis, Nicholas, Andrei Shleifer, and Robert Vishny. "A model of investor sentiment." Journal of financial economics 49.3 (1998): 307-343.

Bauman, W. Scott, and Richard Dowen. "Growth projections and common stock returns." Financial Analysts Journal 44.4 (1988): 79-80.

Bradshaw, Mark T., Scott A. Richardson, and Richard G. Sloan. "The relation between corporate financing activities, analysts' forecasts and stock returns." Journal of Accounting and Economics 42.1 (2006): 53-85.

Bradshaw, Mark T. "How do analysts use their earnings forecasts in generating stock recommendations?" The Accounting Review 79.1 (2004): 25-50.

Chan, Louis KC, Jason Karceski, and Josef Lakonishok. "The level and persistence of growth rates." The Journal of Finance 58.2 (2003): 643-684.

Chordia, Tarun, Avanidhar Subrahmanyam, and Qing Tong. "Have capital market anomalies attenuated in the recent era of high liquidity and trading activity?" Journal of Accounting and Economics 58.1 (2014): 41-58.

Clarke, Jonathan E., Ajay Khorana, Ajay Patel, and P. Raghavendra Rau. "Independents' day? Analyst behavior surrounding the Global Settlement." Annals of Finance 7, no. 4 (2011): 529-547.

Claus, James, and Jacob Thomas. "Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets." Journal of Finance (2001): 1629-1666.

Cooper, Michael J., Huseyin Gulen, and Michael J. Schill. "Asset growth and the cross-section of stock returns." The Journal of Finance 63.4 (2008): 1609-1651.

Copeland, Tom, Aaron Dolgoff, and Alberto Moel. "The role of expectations in explaining the cross-section of stock returns." Review of Accounting Studies 9.2-3 (2004): 149-188.

Cragg, John G., and Burton G. Malkiel. Expectations and the structure of share prices. University of Chicago Press, 2009.

Da, Zhi, and Mitch Warachka. "The disparity between long-term and short-term forecasted earnings growth." Journal of Financial Economics 100.2 (2011): 424-442.

Daniel, Kent, and Sheridan Titman. "Market reactions to tangible and intangible information." The Journal of Finance 61.4 (2006): 1605-1643.

Daniel, Kent, David Hirshleifer, and Avanidhar Subrahmanyam. "Investor psychology and security market under-and overreactions." the Journal of Finance 53.6 (1998): 1839-1885.

Dechow, Patricia M., and Richard G. Sloan. "Returns to contrarian investment strategies: Tests of naive expectations hypotheses." Journal of Financial Economics 43.1 (1997): 3-27.

Dechow, Patricia M., Amy P. Hutton, and Richard G. Sloan. "The Relation between Analysts' Forecasts of Long-Term Earnings Growth and Stock Price Performance Following Equity Offerings." Contemporary Accounting Research17.1 (2000): 1-32.

Easton, Peter, et al. "Using forecasts of earnings to simultaneously estimate growth and the rate of return on equity investment." Journal of Accounting Research 40.3 (2002): 657-676.

Fama, Eugene F., and Kenneth R. French. "The cross-section of expected stock returns." the Journal of Finance 47.2 (1992): 427-465.

Fama, Eugene F., and Kenneth R. French. "A five-factor asset pricing model." Journal of Financial Economics 116.1 (2015): 1-22.

Finger, Catherine A., and Wayne R. Landsman. "What do analysts' stock recommendations really mean?" Review of Accounting and Finance 2.2 (2003): 67-87.

Frankel, Richard, and Charles MC Lee. "Accounting valuation, market expectation, and cross-sectional stock returns." Journal of Accounting and economics 25.3 (1998): 283-319.

Gebhardt, William R., Charles MC Lee, and Bhaskaran Swaminathan. "Toward an implied cost of capital." Journal of accounting research 39.1 (2001): 135-176.

Heckman, James J. "Sample selection bias as a specification error."Econometrica: Journal of the econometric society (1979): 153-161.

Hong, Harrison, Terence Lim, and Jeremy C. Stein. "Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies." The Journal of Finance 55.1 (2000): 265-295.

Jung, Boochun, Philip B. Shane, and Yanhua Sunny Yang. "Do financial analysts' long-term growth forecasts matter? Evidence from stock recommendations and career outcomes." Journal of Accounting and Economics 53.1 (2012): 55-76.

Kadan, Ohad, Leonardo Madureira, Rong Wang, and Tzachi Zach. "Conflicts of interest and stock recommendations: The effects of the global settlement and related regulations." Review of Financial Studies 22, no. 10 (2009): 4189-4217.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny. "Contrarian investment, extrapolation, and risk." The journal of finance 49.5 (1994): 1541-1578.

La Porta, Rafael. "Expectations and the cross-section of stock returns." The Journal of Finance 51.5 (1996): 1715-1742.

Lin, Hsiou-wei, and Maureen F. McNichols. "Underwriting relationships, analysts' earnings forecasts and investment recommendations." Journal of Accounting and Economics 25.1 (1998): 101-127.

Loh, Roger K., and René M. Stulz. "When are analyst recommendation changes influential?." Review of Financial Studies 24, no. 2 (2011): 593-627.

McLean, D., Pontiff, J. 2014. Does academic research destroy return predictability? Working paper.

Mohanram, Partha S., and Shyam V. Sunder. "How Has Regulation FD Affected the Operations of Financial Analysts?*." Contemporary Accounting Research 23.2 (2006): 491-525.

Novy-Marx, Robert. "The other side of value: The gross profitability premium."Journal of Financial Economics 108.1 (2013): 1-28.

Pontiff, Jeffrey, and Artemiza Woodgate. "Share Issuance and Cross-sectional Returns." The Journal of Finance 63.2 (2008): 921-945.

Ramnath, Sundaresh, Steve Rock, and Philip B. Shane. "A review of research related to financial analysts' forecasts and stock recommendations." Available at SSRN 848248 (2008).

Skinner, Douglas J., and Richard G. Sloan. "Earnings surprises, growth expectations, and stock returns or don't let an earnings torpedo sink your portfolio." Review of accounting studies 7.2-3 (2002): 289-312.

Sharpe, Steven A. "How does the market interpret analysts' long-term growth forecasts?" Journal of Accounting, Auditing & Finance 20.2 (2005): 147-166.

Stickel, Scott E. "Analyst incentives and the financial characteristics of Wall Street darlings and dogs." The journal of investing 16.3 (2007): 23-32.

Shumway, Tyler. "The delisting bias in CRSP data." Journal of Finance (1997): 327-340.

Teoh, Siew Hong, and Tak Jun Wong. "Why New Issues and High-Accrual Firms Underperform: The Role of Analysts' Credulity." Review of Financial Studies 15.3 (2002): 869-900.

Titman, Sheridan, Kuo-Chiang Wei, and Feixue Xie. "Capital investments and stock returns." Journal of financial and Quantitative Analysis 39.04 (2004): 677-700.

Figure 1. Average Consensus Analyst Long-term Growth Estimates and Realized 5-year EPS Growth Rate from 1982 to 2014. The figure plots cross-sectional mean and median estimates for LTG and REAL EPS by year. LTG is the mean estimate of all analysts' expectations of the future EPS annual growth rate measured in the 3rd week of June of year *t*. REAL EPS is the five-year average annualized realized EPS growth rate between year *t* and year *t+5*.

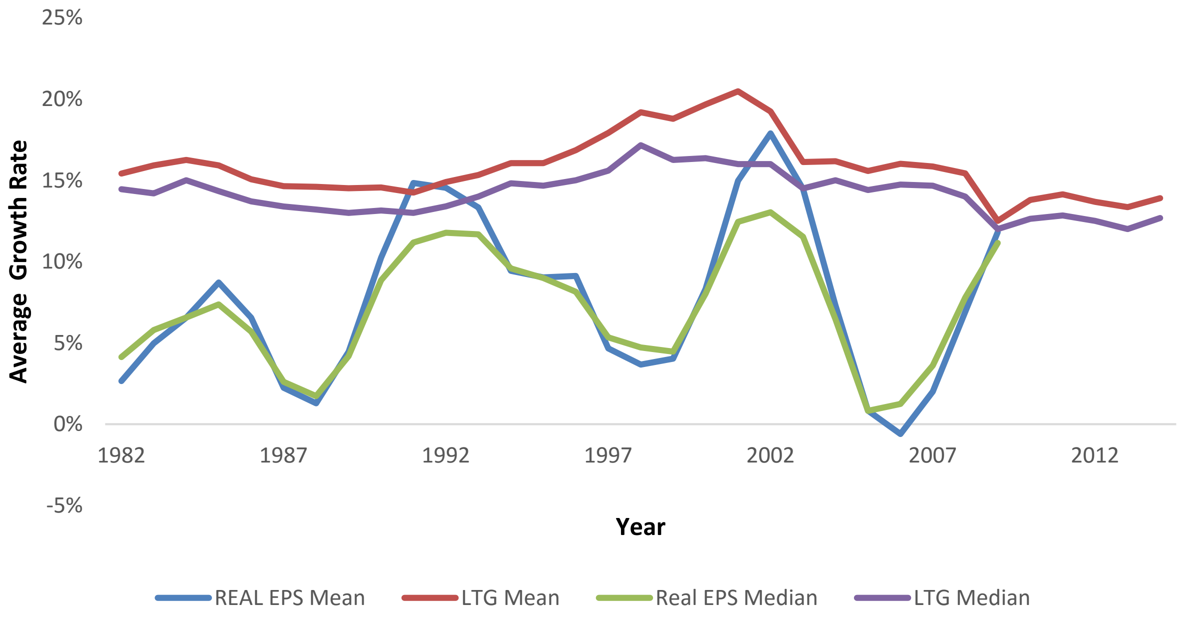


Table 1. Sample Summary Statistics from 1982 to 2014. This table presents summary statistics for firms that meet the restrictions described in the data section. The first panel describes the distribution of analyst long-term growth forecasts, LTG. At the end of June of each year *t*, stocks are ranked on LTG and then allocated to five groups, each with an equal number of stocks. The second panel reports value-weighted averages for LTG, 5-year realized earnings growth, accounting ratios, valuation ratios and market capitalization for each quintile portfolio using information available at the portfolio formation date. Variable definitions are as follows. LTG measures the mean estimate of all analysts' expectations of the future EPS annual growth rate measured in the 3rd week of June of year *t*. REAL EPS is the five-year average annualized future EPS growth rate between year *t* and year *t+5*. EqDil (equity dilution) is the percentage change in split-adjusted shares outstanding from year *t-2* to year *t-1*. ΔSales (sales growth) is the percentage change in revenues per split-adjusted share from year *t-2* to year *t-1*. ΔAssets (asset growth) is the percentage change in assets per split-adjusted share from *t-2* to *t-1*. ROA (profitability) is operating income in year *t-1* divided by assets for year *t-1*. SIZE x 10^9 is market capitalization (in millions) as of June of year *t*. P/B (price/book ratio) is market capitalization as of December of year t-1, divided by book equity in year *t-1*. P/E_{t+1} (price/forward earnings ratio) is price per share divided by fiscal year 1 analyst consensus earnings per share measured in the 3rd week of June of year *t*. The sample has an average of 2,213 firms per year.

Panel A. Average Analyst Long-Term Growth Statistics

p1	Median	Mean	p99	σ
0.010	0.142	0.158	0.484	0.084

Panel B. Average Firm Characteristics by Analyst Long-Term Growth Quintile

	1	2	3	4	5
Growth Variables					
LTG	0.070	0.111	0.141	0.181	0.280
REAL EPS	0.030	0.057	0.070	0.087	0.136
Non-Price Variables					
EQDIL	0.024	0.018	0.015	0.037	0.076
ΔSALES	0.048	0.070	0.098	0.155	0.311
ΔASSETS	0.059	0.091	0.122	0.181	0.335
ROA	0.140	0.145	0.170	0.188	0.171
Price Variables					
SIZE x 10^9	30.91	32.93	26.55	23.34	19.80
P/B	1.98	3.18	3.70	4.80	6.54
P/E_{t+1}	14.31	16.15	19.04	23.60	39.00

Table 2. Panel Regression Explaining Long-Term Growth from 1982 - 2014. This table reports results from panel regressions of analyst long-term growth (LTG) on past accounting growth measures. LTG is the mean estimate of all analysts' expectations of the EPS annual growth rate between year *t+2* to year *t+5* measured in the 3rd week of June of year *t*. EQDIL (equity dilution) is the percentage change in split-adjusted shares outstanding from fiscal year-end in *t-2* to *t-1*. ΔSALES (sales growth) is the percentage change in revenues per split-adjusted share from *t-2* to *t-1*. ΔASSETS (asset growth) is the percentage change in assets per split-adjusted share from year *t-2* to year *t-1*. ROA (profitability) is operating income in year *t-1* divided by assets in year *t-1*. N is the average number of stocks each year. Certain regressions use industry (Based on GICs 10 sector definitions) and year fixed effects. T-statistics are reported in parentheses based on robust standard errors that are clustered by firm and industry. The number of firm-year observations is 74,130.

	Intercept	EQDIL	ΔSALES	ΔASSETS	ROA	R^2	Industry Fixed Effect?	Year Fixed Effect?
Coefficient	0.16	0.12				0.04	No	No
t-stat	(11.75)	(4.02)						
Coefficient	0.15		0.08			0.10	No	No
t-stat	(11.35)		(13.56)					
Coefficient	0.15			0.08		0.07	No	No
t-stat	(10.62)			(12.68)				
Coefficient	0.17				-0.11	0.02	No	No
t-stat	(8.23)				(1.65)			
Coefficient	0.15	0.10	0.06	0.05	-0.11	0.17	No	No
t-stat	(8.23)	(9.36)	(13.99)	(8.12)	(1.87)			
Coefficient	0.07	0.09	0.05	0.04	-0.12	0.34	Yes	No
t-stat	(20.92)	(7.50)	(10.46)	(13.40)	(4.54)			
Coefficient	0.14	0.09	0.06	0.05	-0.10	0.20	No	Yes
t-stat	(10.77)	(11.18)	(15.13)	(7.68)	(1.85)			
Coefficient	0.04	0.08	0.05	0.04	-0.12	0.37	Yes	Yes
t-stat	(7.56)	(8.43)	(10.52)	(14.23)	(4.64)			

Figure 2. Coefficient Estimates from Annual Regressions Explaining Long-Term Growth from 1982 - 2014. This figure plots the time-series of coefficients from a Fama-Macbeth regression of analyst long-term growth on equity dilution, sales growth, asset growth, profitability variables and industry dummies. LTG measures the mean estimate of all analysts' expectations of the EPS annual growth rate between year *t+2* to year *t+5* measured in the 3rd week of June of year *t*. EQDIL (equity dilution) is the percentage change in split-adjusted shares outstanding from fiscal year-end in *t-2* to *t-1*. ΔSales (sales growth) is the percentage change in revenues per split-adjusted share from *t-2* to *t-1*. ΔAssets (asset growth) is the percentage change in assets per split-adjusted share from *t-2* to *t-1*. ROA (profitability) is operating income in *t-1* divided by assets in *t-1*.

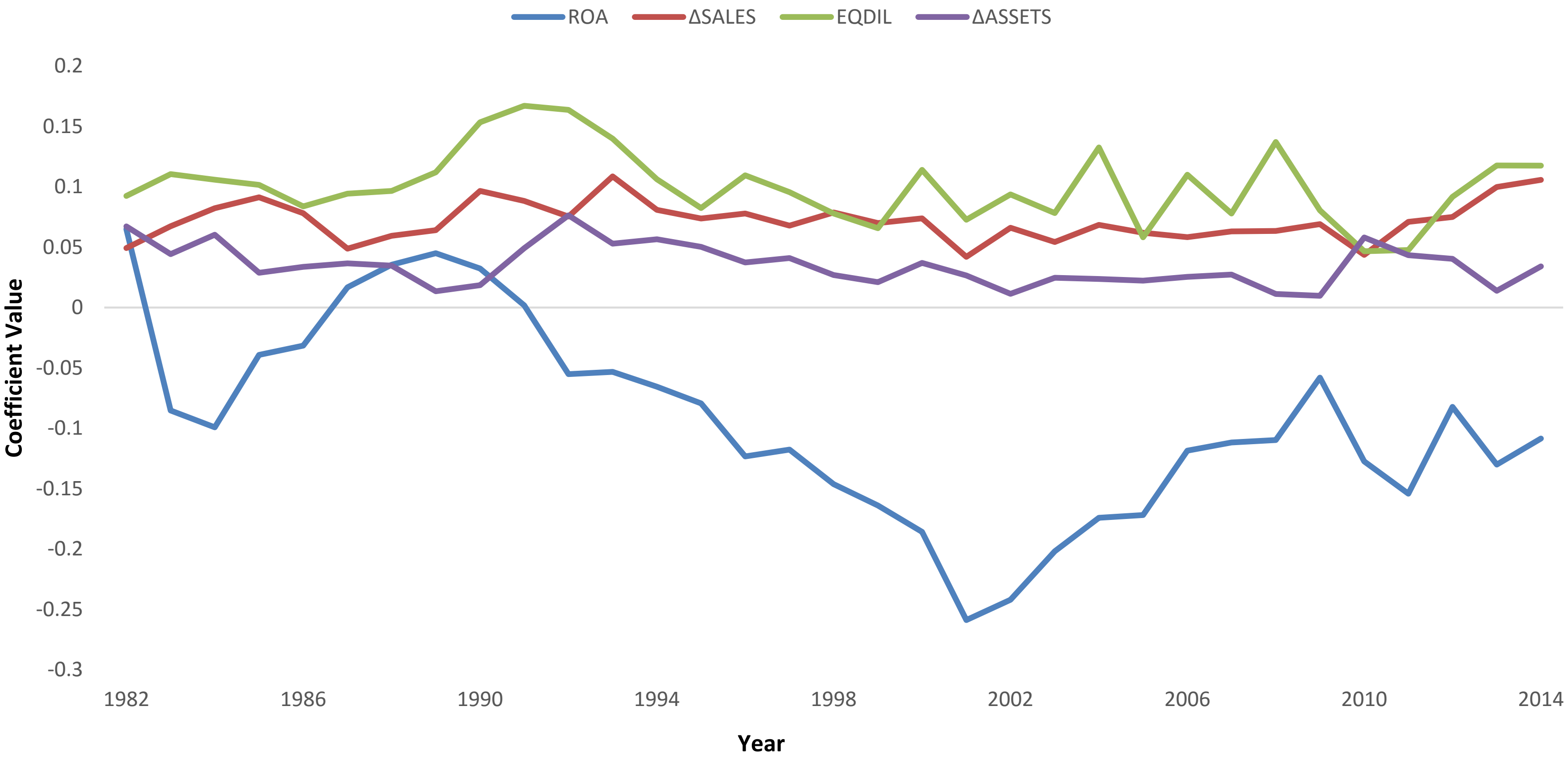


Table 3. Panel Regression Explaining Price-to-Book and Price-to-Forward Earnings Valuation Ratios from 1982 to 2014. The dependent variable for the regression is either the natural log of P/B ratio (Panel A) or the natural log of the P/E_{t+1} ratio (Panel B). P/B (price/book ratio) is market capitalization as of December of year t-1, divided by book equity in year *t-1*. P/E_{t+1} (price/forward earnings ratio) is price per share divided by fiscal year 1 analyst consensus earnings per share measured in the 3rd week of June of year *t*. EqDil (equity dilution) is the percentage change in split-adjusted shares outstanding from fiscal year-end in *t-2* to *t-1*. ΔSales (sales growth) is the percentage change in revenues per split-adjusted share from *t-2* to *t-1*. ΔAssets (asset growth) is the percentage change in assets per split-adjusted share from *t-2* to *t-1*. ROA (profitability) is operating income in *t-1* divided by assets for *t-1*, Hard Growth is the fitted value from the last regression listed in Table 2 and Soft Growth is equal to LTG minus Hard Growth. The independent variables are constructed using financial statement data from the fiscal period ending in year t-1. N is the average of firms each year. For brevity, the intercept is not reported. Robust standard errors are clustered by firm and industry.

Panel A. P/B

	EQDIL	**ΔSALES**	**ΔASSETS**	**ROA**	**Hard Growth**	**Soft Growth**	**R^2**	**Industry Fixed Effect?**	**Year Fixed Effect?**	**N**
Coefficient	0.38	0.40	0.26	1.60			0.11	No	No	2,213
t-stat	(5.98)	(6.18)	(7.16)	(2.59)						
Coefficient	0.33	0.40	0.26	1.81			0.20	No	Yes	2,213
t-stat	(4.43)	(6.53)	(7.46)	(3.02)						
Coefficient	0.33	0.31	0.22	1.71			0.21	Yes	No	2,213
t-stat	(5.06)	(7.75)	(9.95)	(2.82)						
Coefficient	0.28	0.31	0.22	1.85			0.29	Yes	Yes	2,213
t-stat	(3.84)	(7.92)	(9.38)	(3.11)						
Coefficient					2.02	3.74	0.16	No	No	2,213
t-stat					(3.14)	(11.74)				
Coefficient					1.38	3.01	0.27	Yes	Yes	2,213
t-stat					(2.89)	(11.73)				

Panel B. P/E$_{t+1}$

	EQDIL	ΔSALES	ΔASSETS	ROA	Hard Growth	Soft Growth	R^2	Industry Fixed Effect?	Year Fixed Effect?	N
Coefficient	0.21	0.06	0.14	-0.62			0.02	No	No	2,022
t-stat	(5.34)	(0.90)	(3.16)	(0.86)						
Coefficient	0.21	0.06	0.14	-0.43			0.13	No	Yes	2,022
t-stat	(4.94)	(0.84)	(3.87)	(0.61)						
Coefficient	0.14	0.01	0.09	-1.25			0.14	Yes	No	2,022
t-stat	(3.39)	(0.16)	(2.71)	(3.69)						
Coefficient	0.14	0.01	0.10	-1.10			0.23	Yes	Yes	2,022
t-stat	(3.05)	(0.12)	(3.41)	(3.53)						
Coefficient					2.20	2.80	0.14	No	No	2,022
t-stat					(3.44)	(7.85)				
Coefficient					2.10	2.32	0.28	Yes	Yes	2,022
t-stat					(4.24)	(8.39)				

Figure 3. Value-weighted Average Market-Adjusted Return for Portfolios Formed on Realized EPS Growth Rate from 1982 to 2009. At the end of June of year *t*, stocks are allocated to ten portfolios according to realized EPS growth rate (REAL EPS). The figure reports the average value-weighted (using market capitalization as of the end of June in year *t*), market-adjusted five-year return measured over the 60 months starting in July of year *t*. There is an average of 1,498 firms per year with non-missing five-year EPS growth rates.

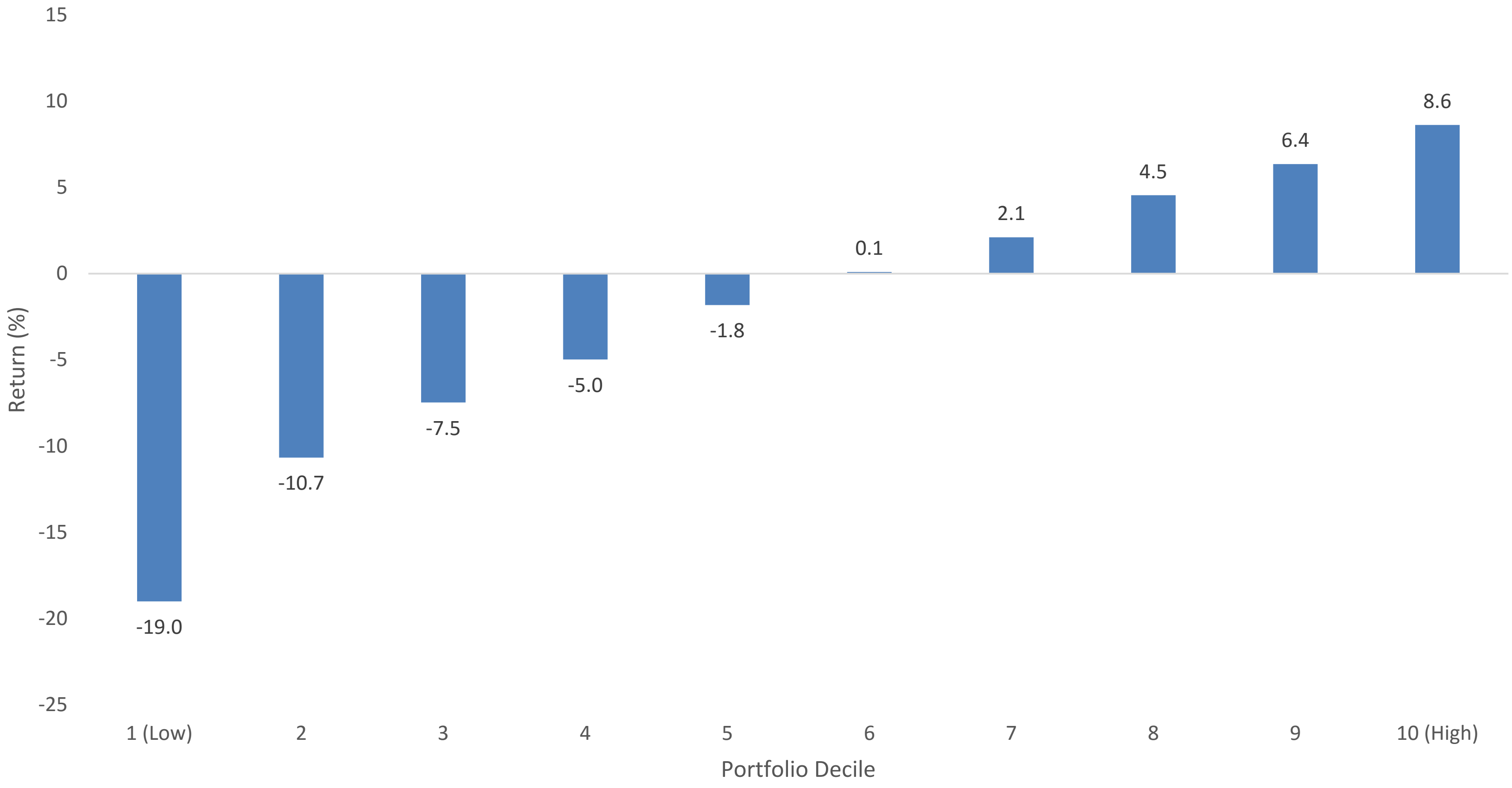


Figure 4. Histogram of Five-year Market-adjusted Returns with Missing EPS Five-year Growth Rates from 1982 to 2009. This figure reports the percentage of firm-years with missing realized earnings (REAL EPS) information, by market-adjusted return decile. There are 21,885 firm-years with future stock returns that have missing five-year EPS growth rates that were assigned EPS growth rates using our matching technique.

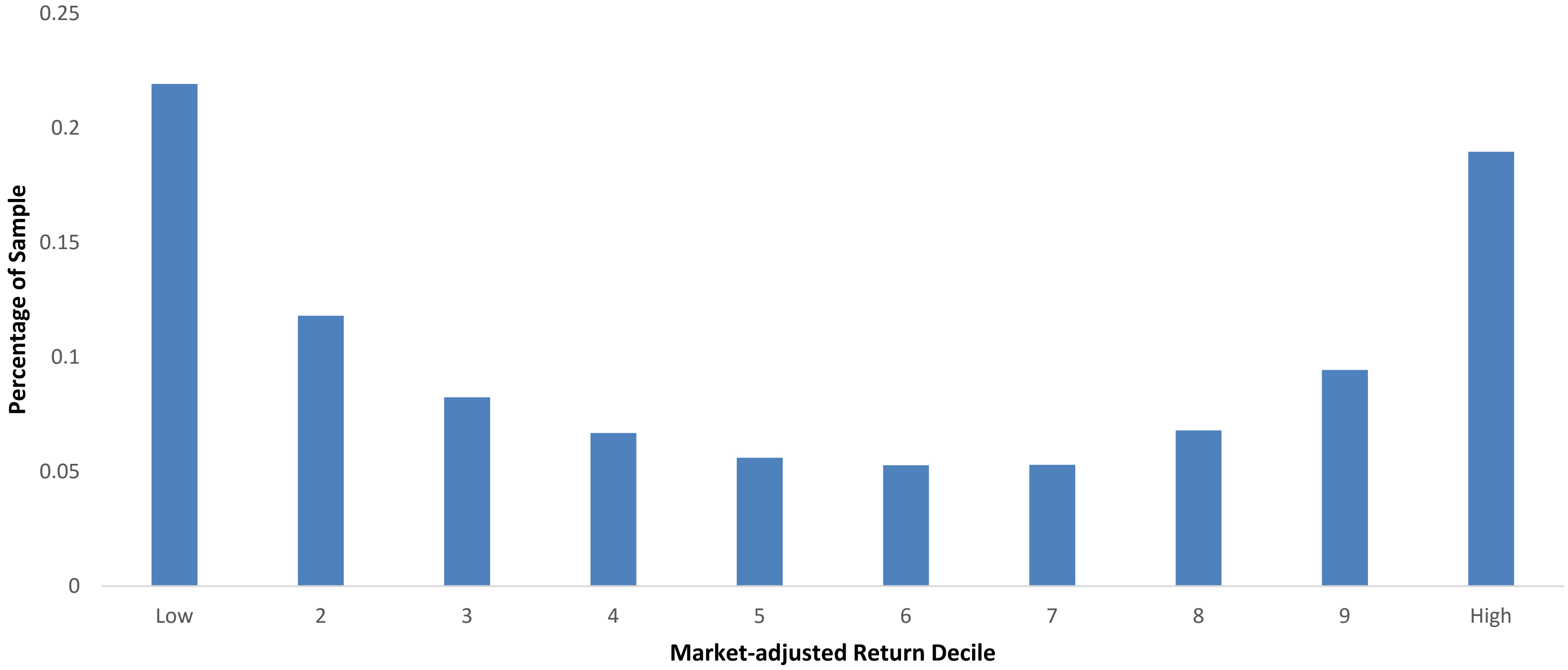


Table 4. Panel Regression Explaining Realized Earnings Growth from 1982 to 2014. The dependent variable for the regression is realized earnings growth (REAL EPS), which is the five-year annualized EPS growth rate. EQDIL is equity dilution measured as the percentage change in adjusted shares outstanding over the previous year. ΔSALES is the percentage change in split-adjusted revenues over the previous year. ΔASSETS is the percentage change in split-adjusted assets over the previous year. ROA is profitability, measured as operating income before depreciation divided by assets. LTG is measured as of the 3rd week in June of year t, while the independent variables are constructed using financial statement data from the fiscal period ending in year t-1. T-statistics, reported in parentheses, are based on robust standard errors that are clustered by firm and industry. For brevity, the intercept is not reported.

	LTG	EQDIL	ΔSALES	ΔASSETS	ROA	Hard Growth	Soft Growth	LN(P/B)	R^2	Ind & Year Fixed Effect?	N
Coefficient		-0.09	-0.02	-0.03	0.05			0.00	<.01	No	2,280
t-stat		(6.33)	(1.67)	(2.44)	(1.83)			(0.79)			
Coefficient		-0.10	-0.02	-0.03	0.12			-0.01	0.05	Yes	2,280
t-stat		(7.37)	(2.19)	(2.12)	(5.13)			(2.79)			
Coefficient	0.11	-0.10	-0.02	-0.03	0.07			-0.01	0.02	No	2,280
t-stat	(2.60)	(6.78)	(2.61)	(2.62)	(3.21)			(1.91)			
Coefficient	0.03	-0.10	-0.02	-0.03	0.13			-0.02	0.05	Yes	2,280
t-stat	(0.99)	(7.40)	(2.66)	(2.12)	(5.06)			(3.11)			
Coefficient						-0.52	0.11	-0.01	<.01	No	2,280
t-stat						(4.39)	(2.58)	(1.84)			
Coefficient						-0.61	0.02	-0.01	0.05	Yes	2,280
t-stat						(6.09)	(0.63)	(2.24)			

Figure 5. Persistence of Variables that Explain Growth from 1982 to 2009. This figure plots the average time-series Spearman correlation for different variables and their 1-, 2-, 3-, 4- and 5-year lag values using annual data. LTG measures the mean estimate of all analysts' expectations of the EPS annual growth rate between year *t+2* to year *t+5* measured in the 3rd week of June of year *t*. EQDIL (equity dilution) is the percentage change in split-adjusted shares outstanding from fiscal year-end in *t-2* to *t-1*. ΔSALES (sales growth) is the percentage change in revenues per split-adjusted share from *t-2* to *t-1*. ΔASSETS (asset growth) is the percentage change in assets per split-adjusted share from *t-2* to *t-1*. ROA (profitability) is operating income in *t-1* divided by assets for *t-1*. B/M (book/market ratio) is book equity in year *t-1* divided by market equity in December of *t-1*. P/B is market capitalization in December *t-1* divided by book equity in year *t-1*. P/E_{t+1} is the price per share in June *t*, divided by analyst EPS estimate for the next year *t+1*.

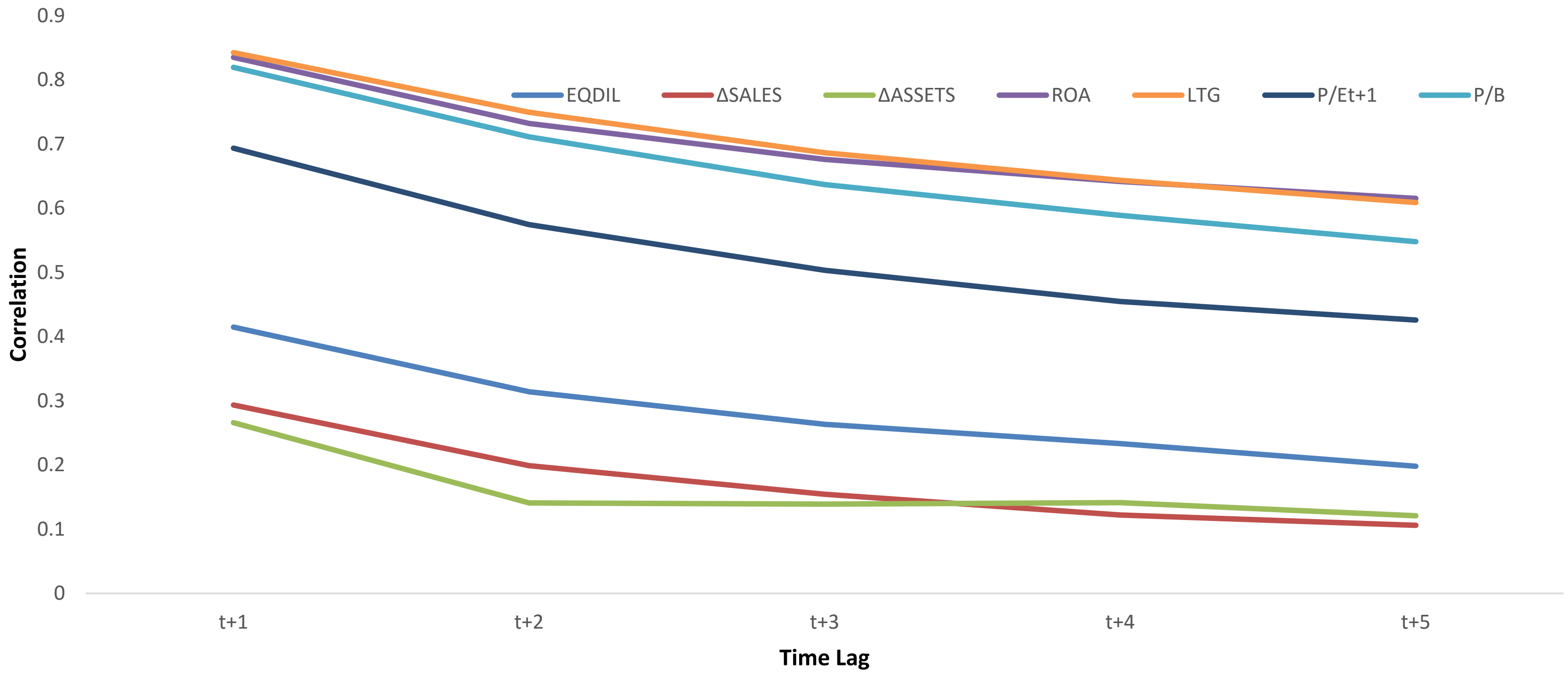


Table 5. Panel Regression Explaining Changes in Long-term Growth Estimates from 1982 to 2013. The dependent variable for the regression is the year-over-year change in analyst long-term growth forecasts ($LTG_{t+1} – LTG_t$) measured in the 3rd week of June of year *t*. EqDil (equity dilution) is the percentage change in split-adjusted shares outstanding from fiscal year-end in *t-2* to *t-1*. ΔSales (sales growth) is the percentage change in revenues per split-adjusted share from *t-2* to *t-1*. ΔAssets (asset growth) is the percentage change in assets per split-adjusted share from *t-2* to *t-1*. ROA (profitability) is operating income in *t-1* divided by assets for *t-1*, Hard Growth is the fitted value from the last regression listed in Table 2. The independent variables are constructed using financial statement data from the fiscal period ending in year t-1. N is the average of firms each year. For brevity, the intercept is not reported. Robust standard errors are clustered by firm and industry.

	EQDIL	**ΔSALES**	**ΔASSETS**	**ROA**	**Hard Growth**	**R^2**	**Industry Fixed Effect?**	**Year Fixed Effect?**	**N**
Coefficient	-0.02	-0.02	-0.01	0.00		0.03	No	No	1,929
t-stat	(7.81)	(5.91)	(8.21)	(0.31)					
Coefficient	-0.02	-0.02	-0.01	0.00		0.05	No	Yes	1,929
t-stat	(8.44)	(6.13)	(7.85)	(0.11)					
Coefficient	-0.02	-0.02	-0.01	0.00		0.03	Yes	No	1,929
t-stat	(7.62)	(5.74)	(7.82)	(0.41)					
Coefficient	-0.02	-0.02	-0.01	0.00		0.05	Yes	Yes	1,929
t-stat	(8.31)	(5.91)	(7.32)	(0.25)					
Coefficient					-0.24	0.02	No	No	1,929
t-stat					(5.40)				
Coefficient					-0.23	0.05	Yes	Yes	1,929
t-stat					(6.30)				

Table 6. Value-weighted Monthly Returns for Portfolios Formed on Long Term Growth Measures from July 1982 to December 2014. At the end of June of year *t*, stocks are allocated to ten portfolios based on the decile breakpoints for LTG (analyst long-term growth estimate), Hard Growth (fitted values from the last regression in Table 2) and Soft Growth (LTG minus Explained Growth). Panel A presents results for the original sample of firms with non-missing LTG. Panel B presents results for the bottom half of firms in the original sample based on market capitalization at the end of June of each year. Panel C reports results for all firms listed in CRSP/Compustat (including those with missing LTG data) that have valid data to construct EQDIL, ΔSALES, ΔASSETS, ROA and positive book equity. T-statistics are reported in parentheses to the right of each estimate. Monthly returns are reported in percentages.

Panel A. Original Sample

	1	2	3	4	5	6	7	8	9	10	10-1	*t-stat*	n
LTG	1.14%	1.10%	1.15%	1.12%	1.03%	1.08%	1.13%	1.25%	0.89%	1.15%	0.01%	(0.02)	2,153
Hard Growth	1.19%	1.18%	1.07%	1.22%	1.08%	1.23%	0.95%	1.05%	1.04%	0.59%	-0.60%	(2.66)	2,153
Soft Growth	0.98%	1.06%	1.15%	1.06%	1.22%	0.96%	1.06%	1.21%	1.02%	1.31%	0.33%	(0.96)	2,153

Panel B. Small Firms Only

	1	2	3	4	5	6	7	8	9	10	10-1	*t-stat*	n
LTG	1.24%	1.29%	1.23%	1.30%	1.29%	1.39%	1.28%	1.10%	1.17%	1.06%	-0.18%	(0.54)	1,077
Hard Growth	1.41%	1.44%	1.49%	1.27%	1.28%	1.37%	1.13%	1.36%	1.12%	0.55%	-0.86%	(3.88)	1,077
Soft Growth	1.18%	1.18%	1.14%	1.24%	1.25%	1.28%	1.32%	1.32%	1.23%	1.22%	0.05%	(0.15)	1,077

Panel C. All Firms (Includes Missing LTG Data Firms)

	1	2	3	4	5	6	7	8	9	10	10-1	*t-stat*	n
Hard Growth	1.16%	1.18%	1.11%	1.12%	1.11%	1.20%	1.02%	0.99%	0.98%	0.37%	-0.79%	(3.38)	4,045

Table 7. Fama-MacBeth Regressions of Monthly Returns on Growth, Size and Book/Market Measures from July 1982 to December 2014. This table reports the results of a set of Fama-MacBeth regressions of monthly returns on lagged growth measures, equity dilution, sales and asset growth, profitability, size and the book-to-market ratio. N is the average number of firms in the sample each year. LTG is the mean estimate of all analysts' expectations of the EPS annual growth rate between year *t+2* to year *t+5* measured in the 3^{rd} week of June of year *t*. EQDIL (equity dilution) is the percentage change in split-adjusted shares outstanding from fiscal year-end in *t-2* to *t-1*. ΔSALES (sales growth) is the percentage change in revenues per split-adjusted share from *t-2* to *t-1*. ΔASSETS (asset growth) is the percentage change in assets per split-adjusted share from year *t-2* to year *t-1*. ROA (profitability) is operating income in year *t-1* divided by assets in year *t-1*. LN (Size) is the natural log of the market capitalization. LN (P/B) is the natural log of the price-to-book ratio. Hard Growth is the fitted value from the last regression listed in Table 2 and Soft Growth is equal to LTG minus Hard Growth. N is the average number of stocks each year. Certain regressions use industry dummies (based on GIC's 10 sector definitions). T-statistics are reported in parentheses to the right of each estimate and are based on Newey West corrected standard errors with a lag of 12 months. Monthly returns are reported in percentages.

	1		2		3		4		5		6	
Intercept	0.016	(2.18)	0.019	(2.52)	0.015	(2.16)	0.013	(2.33)	0.019	(2.72)	0.017	(3.19)
LTG	0.002	(0.17)			0.012	(1.25)	0.007	(1.11)				
EQDIL			-0.014	(5.25)	-0.015	(5.58)	-0.013	(5.62)				
ΔSALES			-0.002	(1.86)	-0.003	(2.12)	-0.003	(3.13)				
ΔASSETS			-0.005	(4.39)	-0.005	(4.51)	-0.005	(4.55)				
ROA			0.009	(1.66)	0.010	(2.18)	0.015	(2.96)				
Hard Growth									-0.072	(4.65)	-0.079	(5.54)
Soft Growth									0.012	(1.20)	0.007	(0.97)
Ln(SIZE)	0.000	(0.43)	0.000	(0.95)	0.000	(0.59)	0.000	(0.43)	0.000	(0.60)	0.000	(0.49)
Ln(P/B)	-0.001	(1.98)	-0.001	(1.01)	-0.002	(2.39)	-0.001	(1.98)	-0.002	(2.26)	-0.002	(2.81)
Ind Fixed Effect?	No		No		No		Yes		No		Yes	
R^2	0.03		0.03		0.04		0.08		0.03		0.08	
N	2,154		2,154		2,154		2,154		2,154		2,154	

Table 8. Pre- and Post-Global Settlement (August 2002) Split-Sample Regressions and Value-weighted Portfolio Returns from July 1982 to December 2014. This table replicates key results in earlier tables for different sample periods. Pre-GS refers to the period from July 1982 to August 2002, and post-GS refers to the period from September 2002 to December 2014. Panel A displays panel regression results similar to Tables 3 and 4; Panels B and C display average value-weighted returns for portfolios formed on various growth forecasts similar to analysis presented in Table 5. LTG is the mean estimate of all analysts' expectations of the EPS annual growth rate between year *t+2* to year *t+5* measured in the 3rd week of June of year *t*. EQDIL (equity dilution) is the percentage change in split-adjusted shares outstanding from fiscal year-end in *t-2* to *t-1*. ΔASSETS (asset growth) is the percentage change in assets per split-adjusted share from year *t-2* to year *t-1*. LN (Size) is the natural log of the market capitalization. LN (P/B) is the natural log of the price-to-book ratio. Hard Growth is the fitted value from the last regression listed in Table 2 and Soft Growth is equal to LTG minus Hard Growth. N is the average number of stocks each year. The regressions in Panel A include year and industry fixed effects (based on GIC's 10 sector definitions). T-statistics reported are double-clustered by firm and industry. Monthly returns shown in Panels B and C are reported in percentages.

Panel A. Panel Regression Split-Sample Results

	Dependent Variable	EQDIL	ΔASSETS	Hard Growth	Soft Growth	LN (P/B)	R^2	Time Period	N	Table Reference
Coefficient	LN (P/B)	0.09	0.42				0.23	Pre-GS	2,250	3A
t-stat		(2.75)	(12.79)							
Coefficient	LN (P/B)	-0.37	0.62				0.20	Post-GS	2,140	3A
t-stat		(6.54)	(7.67)							
Coefficient	LN (P/B)			1.60	3.38		0.30	Pre-GS	2,250	3A
t-stat				(5.04)	(12.08)					
Coefficient	LN (P/B)			0.66	2.27		0.21	Post-GS	2,140	3A
t-stat				(0.49)	(8.18)					
Coefficient	LN (P/E_{t+1})	0.19	0.12				0.24	Pre-GS	2,078	3B
t-stat		(3.06)	(2.94)							
Coefficient	LN (P/E_{t+1})	0.36	-0.13				0.11	Post-GS	1,923	3B
t-stat		(3.85)	(2.57)							
Coefficient	LN (P/E_{t+1})			2.09	2.37		0.32	Pre-GS	2,078	3B
t-stat				(4.66)	(12.28)					
Coefficient	LN (P/E_{t+1})			2.36	3.18		0.18	Post-GS	1,923	3B
t-stat				(2.21)	(4.85)					
Coefficient	REALEPS	-0.10	-0.03			-0.01	0.05	Pre-GS	2,255	4

t-stat		(6.39)	(2.14)			(2.66)				
Coefficient	REALEPS	-0.13	-0.01			0.01	0.08	Post-GS	2,357	4
t-stat		(5.18)	(0.50)			(0.64)				
Coefficient	REALEPS			-0.57	0.04	-0.02	0.05	Pre-GS	2,255	4
t-stat				(4.77)	(0.90)	(3.70)				
Coefficient	REALEPS			-0.75	0.04	0.01	0.08	Post-GS	2,357	4
t-stat				(4.40)	(0.62)	(0.70)				
Coefficient	ΔLTG	-0.02	-0.02				0.04	Pre-GS	1,962	5
t-stat		(7.59)	(11.16)							
Coefficient	ΔLTG	-0.01	-0.02				0.03	Post-GS	1,842	5
t-stat		(3.54)	(11.54)							
Coefficient	ΔLTG			-0.24			0.05	Pre-GS	1,962	5
t-stat				(6.03)						
Coefficient	ΔLTG			-0.20			0.03	Post-GS	1,842	5
t-stat				(6.29)						

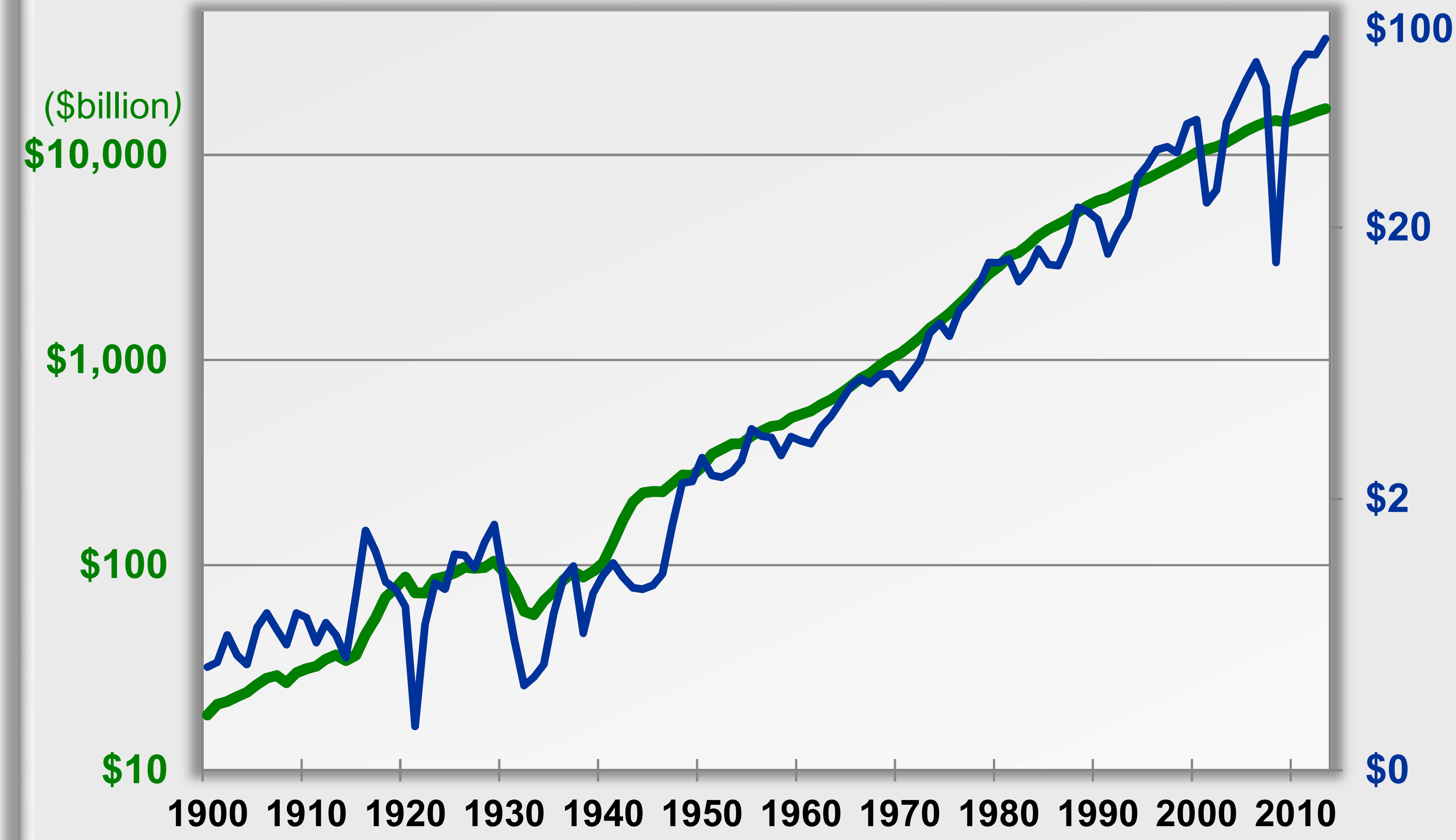
Panel B. Table 6 Pre-GS (July 1982 - August 2002)

	1	2	3	4	5	6	7	8	9	10	10-1	*t-stat*	N
LTG	1.30%	1.25%	1.37%	1.30%	1.23%	1.19%	1.35%	1.20%	0.84%	1.15%	-0.15%	(0.28)	2,173
Hard Growth	1.37%	1.31%	1.21%	1.37%	1.17%	1.46%	1.09%	1.22%	1.06%	0.63%	-0.74%	(2.25)	2,173
Soft Growth	1.15%	1.24%	1.36%	1.23%	1.37%	1.12%	1.12%	1.14%	1.11%	1.37%	0.23%	(0.48)	2,173
EQDIL	1.65%	1.40%	1.31%	1.21%	1.24%	1.43%	1.33%	1.05%	0.81%	0.75%	-0.90%	(4.47)	2,173
ΔASSETS	1.33%	1.21%	1.10%	1.48%	1.23%	1.22%	1.44%	1.29%	1.08%	0.81%	-0.53%	(1.78)	2,173

Panel C. Table 6 Post-GS (September 2002 – December 2014)

	1	2	3	4	5	6	7	8	9	10	10-1	*t-stat*	N
LTG	0.88%	0.85%	0.78%	0.83%	0.72%	0.91%	0.78%	1.35%	0.98%	1.15%	0.27%	(0.70)	2,122
Hard Growth	0.89%	0.98%	0.85%	0.98%	0.95%	0.87%	0.72%	0.76%	0.99%	0.53%	-0.36%	(1.49)	2,122
Soft Growth	0.72%	0.72%	0.80%	0.73%	0.92%	0.79%	1.02%	1.19%	0.98%	1.20%	0.48%	(1.20)	2,122
EQDIL	0.94%	0.68%	0.86%	0.92%	0.85%	1.10%	1.17%	0.80%	0.95%	0.51%	-0.43%	(1.81)	2,122
ΔASSETS	1.13%	1.26%	1.36%	1.26%	1.40%	1.07%	1.09%	1.22%	1.05%	1.38%	0.24%	(0.48)	2,122

GDP-N (left–green) & EPS (right–blue)



	SFF		CBO	
	2015-2025	2015	0.042	
Real GDP	2.51	2016	0.046	Real GDP
CPI Inlfatio	2.14	2017	0.045	CPI Inlfation
	4.65	2018	0.042	
		2019	0.042	
		2020	0.042	
		2021	0.042	
		2022	0.042	
		2023	0.042	
		2024	0.042	
		2025	0.042	
			0.042636	

EIA		SSA	
2012-2040		2014-2090	
2.40%	2014		17557
2.10%	2090		499900
4.50%	76		
			4.5%

The real cost of equity

The inflation-adjusted cost of equity has been remarkably stable for 40 years, implying a current equity risk premium of 3.5 to 4 percent

Marc H. Goedhart, Timothy M. Koller, and Zane D. Williams

As central as it is to every decision at the heart of corporate finance, there has never been a consensus on how to estimate the cost of equity and the equity risk premium.[1]

Conflicting approaches to calculating risk have led to varying estimates of the equity risk premium from 0 percent to 8 percent—although most practitioners use a narrower range of 3.5 percent to 6 percent. With expected returns from long-term government bonds currently about 5 percent in the US and UK capital markets, the narrower range implies a cost of equity for the typical company of between 8.5 and 11.0 percent. This can change the estimated value of a company by more than 40 percent and have profound implications for financial decision making.

Discussions about the cost of equity are often intertwined with debates about where the stock market is heading and whether it is over- or undervalued. For example, the run-up in stock prices in the late 1990s prompted two contradictory points of view. On the one hand, as prices soared ever higher, some investors expected a new era of higher equity returns driven by increased future productivity and economic growth. On the other hand, some analysts and academics suggested that the rising stock prices meant that the risk premium was declining. Pushed to the extreme, a few analysts even argued that the premium would fall to zero, that the Dow Jones industrial average would reach 36,000 and that stocks would earn the same returns as government bonds. While these views were at the extreme end of the spectrum, it is still easy to get seduced by complex logic and data.

We examined many published analyses and developed a relatively simple methodology that is both stable over time and overcomes the shortcomings of other models. We estimate that the real, inflation-adjusted cost of equity has been remarkably stable at about 7 percent in the US and 6 percent in the UK since the 1960s. Given current, real long-term bond yields of 3 percent in the US and 2.5 percent in the UK, the implied equity risk premium is around 3.5 percent to 4 percent for both markets.

The debate

There are two broad approaches to estimating the cost of equity and market risk premium. The first is historical, based on what equity investors have earned in the past. The second is forward-looking, based on projections implied by current stock prices relative to earnings, cash flows, and expected future growth.

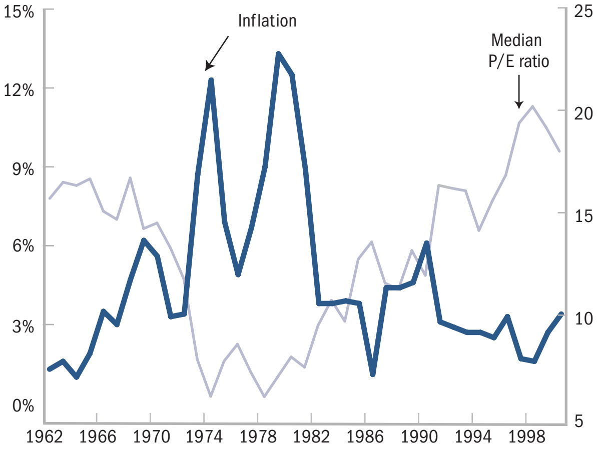
The latter is conceptually preferable. After all, the cost of equity should reflect the return expected (required) by investors. But forward-looking estimates are fraught with problems, the most intractable of which is the difficulty of estimating future dividends or earnings growth. Some theorists have attempted to meet that challenge by surveying equity analysts, but since we know that analyst projections almost always overstate the long-term growth of earnings or dividends,[2] analyst objectivity is hardly beyond question. Others have built elaborate models of forward-looking returns, but such models are typically so complex that it is hard to draw conclusions or generate anything but highly unstable results. Depending on the modeling assumptions, recently published research suggests market risk premiums between 0 and 4 percent.[3]

Unfortunately, the historical approach is just as tricky because of the subjectivity of its assumptions. For example, over what time period should returns be measured—the previous 5, 10, 20, or 80 years or more? Should average returns be reported as arithmetic or geometric means? How frequently should average returns be sampled? Depending on the answers, the market risk premium based on historical returns can be estimated to be as high as 8 percent.[4] It is clear that both historical and forward-looking approaches, as practiced, have been inconclusive.

Overcoming the typical failings of economic models

In modeling the behavior of the stock market over the last 40 years,[5] we observed that many real economic variables were surprisingly stable over time (including long-term growth in corporate profits and returns on capital) and that much of the variability in stock prices related to interest rates and inflation (Exhibit 1). Building on these findings, we developed a simple, objective, forward-looking model that, when applied retrospectively to the cost of equity over the past 40 years, yielded surprisingly stable estimates.

Exhibit 1. US median P/E vs. inflation

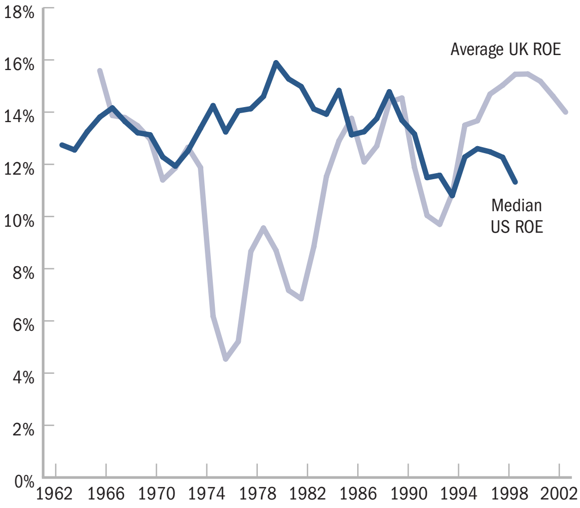


Source: McKinsey analysis

Forward-looking models typically link current stock prices to expected cash flows by discounting the cash flows at the cost of equity. The implied cost of equity thus becomes a function of known current share values and estimated future cash flows (see sidebar, “Estimating the cost of equity”). Using this standard model as the starting point, we then added three unique characteristics that we believe overcome the shortcomings of many other approaches:

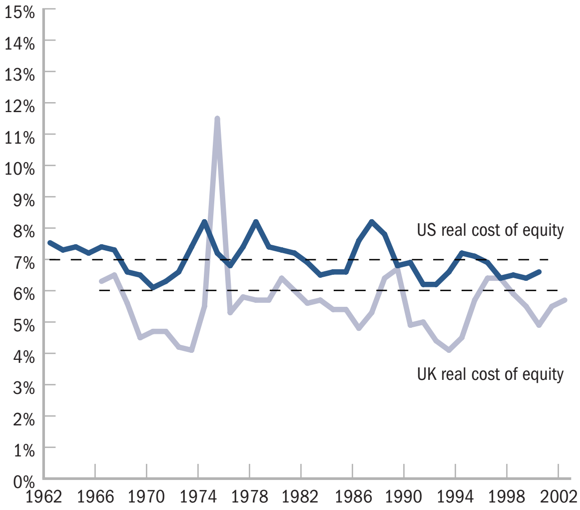
1. *Median stock price valuation.* For the US, we used the value of the median company in the S&P 500 measured by P/E ratio as an estimate of the market’s overall valuation at any point in time. Most researchers have used the S&P 500 itself, but we argue that the S&P 500 is a value-weighted index that has been distorted at times by a few highly valued companies, and therefore does not properly

Exhibit 2. Return on book equity (ROE)



Source: McKinsey analysis

Exhibit 3. Annual estimates of the real cost of equity



Source: McKinsey analysis

reflect the market value of typical companies in the US economy. During the 1990s, the median and aggregate P/E levels diverged sharply. Indeed by the end of 1999, nearly 70 percent of the companies in the S&P 500 had P/E ratios below that of the index as a whole. By using the median P/E ratio, we believe we generate estimates that are more representative for the economy as a whole. Since UK indices have not been similarly distorted, our estimates for the UK market are based instead on aggregate UK market P/E levels.

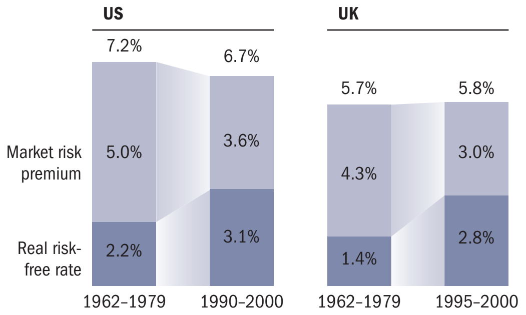
2. *Dividendable cash flows*. Most models use the current level of dividends as a starting point for projecting cash flows to equity. However, many corporations have moved from paying cash dividends to buying back shares and finding other ways to return cash to shareholders, so estimates based on ordinary dividends will miss a substantial portion of what is paid out. We avoid this by discounting not the dividends paid but the cash flows available to shareholders after new investments have been funded. These are what we term "dividendable" cash flows to investors that might be paid out through share repurchases as ordinary dividends, or temporarily held as cash at the corporate level.

We estimate dividendable cash flows by subtracting the investment required to sustain the long-term growth rate from current year profits. This investment can be shown to equal the projected long-term profit growth (See sidebar, "Estimating the cost of equity") divided by the expected return on book equity. To estimate the return on equity (ROE), we were able to take advantage of the fact that US and UK companies have had fairly stable returns over time. As Exhibit 2 shows, the ROE for both US and UK companies has been consistently about 13 percent per year,[6] the only significant exception being found in UK returns of the late 1970s.

3. *Real earnings growth based on long-term trends*. The expected growth rate in cash flow

> **The stability of the implied inflation-adjusted cost of equity is striking. Despite a handful of recessions and financial crises over the past 40 years . . . equity investors have continued to demand about the same cost of equity in inflation-adjusted terms.**

Exhibit 4. Decomposition of the inflation-adjusted cost of equity



Source: McKinsey analysis

and earnings was estimated as the sum of long-term real GDP growth plus expected inflation. Corporate profits have remained a relatively consistent 5.5 percent of US GDP over the past 50 years. Thus, GDP growth rates are a good proxy for long-term corporate profit growth. Real GDP growth has averaged about 3.5 percent per year over the last 80 years for the US and about 2.5 percent over the past 35 years for the UK. Using GDP growth as a proxy for expected earnings growth allows us to avoid using analysts' expected growth rates.

We estimated the expected inflation rate in each year as the average inflation rate experienced over the previous five years.[7] The nominal growth rates used in the model for each year were the real GDP growth combined with the contemporary level of expected inflation for that year.

Results

We used the above model to estimate the inflation-adjusted cost of equity implied by stock market valuations each year from 1963 to 2001 in the US and from 1965 to 2001 for the UK (Exhibit 3). In the US, it consistently remains between 6 and 8 percent with an average of 7 percent. For the UK market, the inflation-adjusted cost of equity has been, with two exceptions, between 4 percent and 7 percent and on average 6 percent.

The stability of the implied inflation-adjusted cost of equity is striking. Despite a handful of recessions and financial crises over the past 40 years including most recently the dot.com bubble, equity investors have continued to demand about the same cost of equity in inflation-adjusted terms. Of course, there are deviations from the long-term averages but they aren't very large and they don't last very long. We interpret this to mean that stock markets ultimately understand that despite ups and downs in the broad economy, corporate earnings and economic growth eventually revert to their long-term trend.

We also dissected the inflation-adjusted cost of equity over time into two components: the inflation-adjusted return on government bonds and the market risk premium. As Exhibit 4 demonstrates, from 1962 to 1979 the expected

Estimating the cost of equity

To estimate the cost of equity, we began with a standard perpetuity model:

$$P_t = \frac{CF_{t+1}}{k_e - g} \qquad (1)$$

where P_t is the price of a share at time t, CF_{t+1} is the expected cash flow per share at time $t + 1$, k_e is the cost of equity, and g is the expected growth rate of the cash flows. The cash flows, in turn, can be expressed as earnings, E, multiplied by the payout ratio:

$$CF = \mathrm{E}(\mathit{payout\ ratio})$$

Since the payout ratio is the share of earnings left after reinvestment, replacing the payout ratio with the reinvestment rate gives:

$$CF = \mathrm{E}(1 - \mathit{reinvestment\ rate})$$

The reinvestment rate, in turn, can be expressed as the ratio of the growth rate, g, to the expected return on equity:

$$\mathit{reinvestment\ rate} = \frac{g}{ROE}$$

And thus the cash flows can be expressed as:

$$CF = E\left(1 - \frac{g}{ROE}\right) \qquad (2)$$

We then combined formulas (1) and (2) to get the following:

$$\frac{P_t}{E_{t+1}} = \frac{1 - \frac{g}{ROE}}{k_e - g} \Rightarrow k_e = \frac{E_{t+1}}{P_t}\left(1 - \frac{g}{ROE}\right) + g \qquad (3)$$

If the inflation embedded in k_e and g is the same, we can then express equation 3 as:

$$k_{er} = \frac{E_{t+1}}{P_t}\left(1 - \frac{g}{ROE}\right) + g_r \qquad (4)$$

Where k_{er} and g_r are the inflation-adjusted cost of equity and real growth rate, respectively. We then solved for k_{er} for each year from 1963 through 2001, using the assumptions described in the text of the article.

inflation-adjusted return on government bonds appears to have fluctuated around 2 percent in the US and around 1.5 percent in the UK. The implied equity risk premium was about 5 percent in both markets.[8] But in the 1990s, it appears that the inflation-adjusted return on both US and UK government bonds may have risen to 3 percent, with the implied equity risk premium falling to 3 percent and 3.6 percent in the UK and US respectively.

We attribute this decline not to equities becoming less risky (the inflation-adjusted cost of equity has not changed) but to investors demanding higher returns in real terms on government bonds after the inflation shocks of the late 1970s and early 1980s. We believe that using an equity risk premium of 3.5 to 4 percent in the current environment better reflects the true long-term opportunity cost for equity capital and hence will yield more accurate valuations for companies. **MoF**

Marc H. Goedhart (Marc_Goedhart@McKinsey.com) *is associate principal in McKinsey's Amsterdam office,* ***Timothy M. Koller*** (Tim_Koller@McKinsey.com) *is a principal in McKinsey's New York office, and* ***Zane D. Williams*** (Zane_Williams @McKinsey.com) *is a consultant in McKinsey's Washington, D.C., office,*

[1] Defined as the difference between the cost of equity and the returns investors can expect from supposedly risk-free government bonds.

[2] *See* Marc H. Goedhart, Brendan Russel, and Zane D. Williams, "Prophets and profits?" *McKinsey on Finance*, Number 2, Autumn 2001.

[3] *See,* for example, Eugene Fama and Kenneth French, "The Equity Premium," *Journal of Finance*, Volume LVII, Number 2, 2002; and Robert Arnott and Peter Bernstein, "What Risk Premium is 'Normal'," *Financial Analysts Journal*, March/April, 2002; James Claus and Jacob Thomas, "Equity premia as low as three percent?" *Journal of Finance*, Volume LVI, Number 5, 2001.

[4] *See,* for example, *Ibbotson and Associates,* Stock, Bonds, Bills and Inflation: 1997 Yearbook.

[5] *See* Timothy Koller and Zane Williams, "What happened to the bull market?" *McKinsey on Finance*, Number 1, Summer 2001.

[6] One consequence of combining a volatile nominal growth rate (due to changing inflationary expectations) with a stable ROE is that the estimated reinvestment rate varies tremendously over time. In the late 1970s, in fact, our estimates are near 100 percent. This is unlikely to be a true representation of actual investor expectations at the time. Instead, we believe it likely that investors viewed the high inflation of those years as temporary. As a result, in all of our estimates, we capped the reinvestment rate at 70 percent.

[7] This assumption is the one that we are least comfortable with, but our analysis seems to suggest that markets build in an expectation that inflation from the recent past will continue (witness the high long-term government bond yields of the late 1970s).

[8] There is some evidence that the market risk premium is higher in periods of high inflation and high interest rates, as was experienced in the late 1970s and early 1980s.

McKinsey on Finance is a quarterly publication written by experts and practitioners in McKinsey & Company's Corporate Finance & Strategy Practice. It offers readers insights into value-creating strategies and the translation of those strategies into stock market performance. This and archive issues of *McKinsey on Finance* are available on line at http://www.corporatefinance.mckinsey.com

McKinsey & Company is an international management consulting firm serving corporate and government institutions from 85 offices in 44 countries.

Editorial Contact: McKinsey_on_Finance@McKinsey.com
Editor: Dennis Swinford
Managing Editor: Michelle Soudier
External Relations: Joan Horrvich
Editorial Consultant: Janet Bush
Design and Layout: Kim Bartko

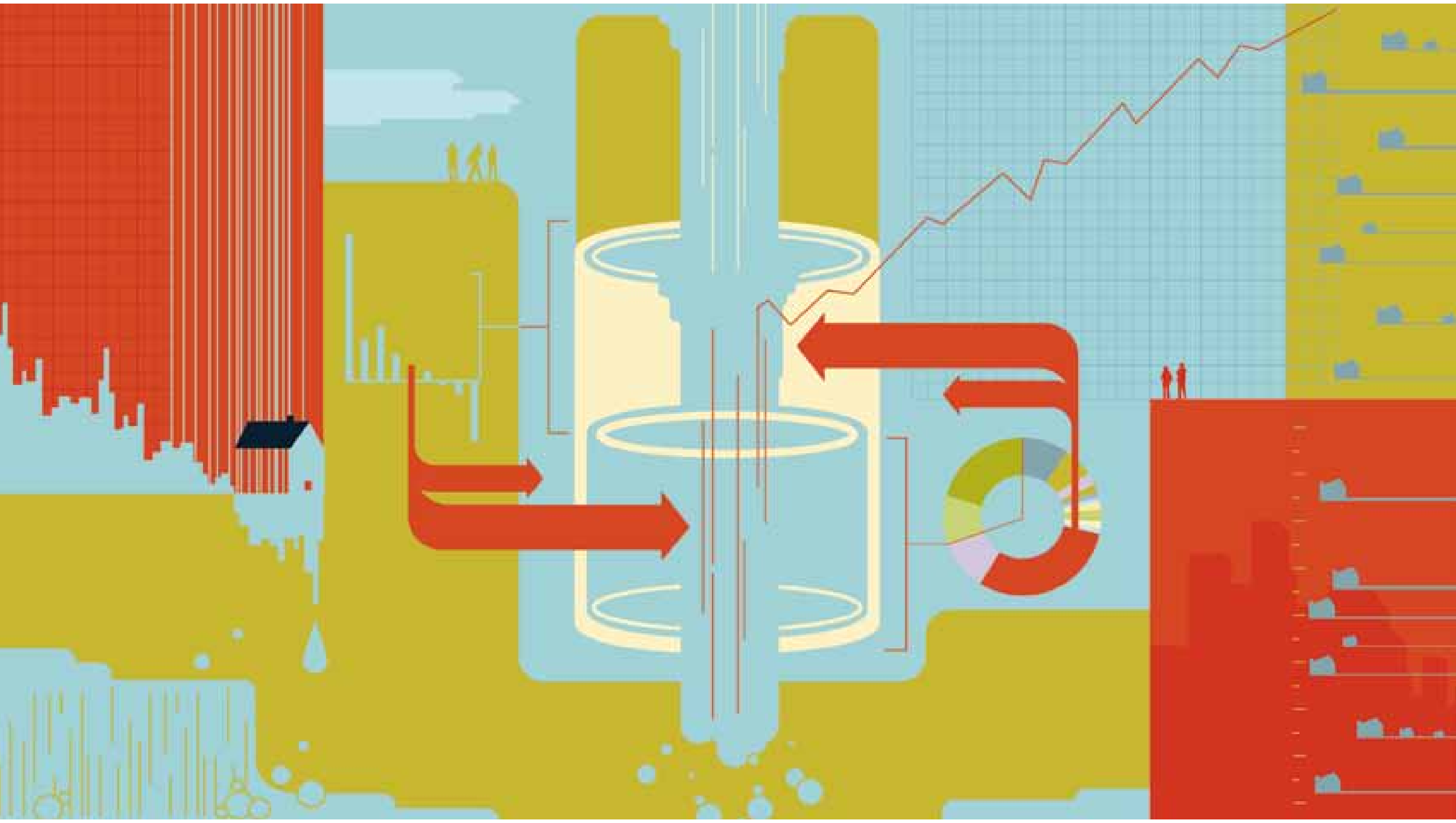
Cover images, left to right: ©Rob Colvin/Artville; © Garrian Manning/Artville; © Stephanie Carter/Artville; © Todd Davidson/The Image Bank, © Jack Star/PhotoLink.

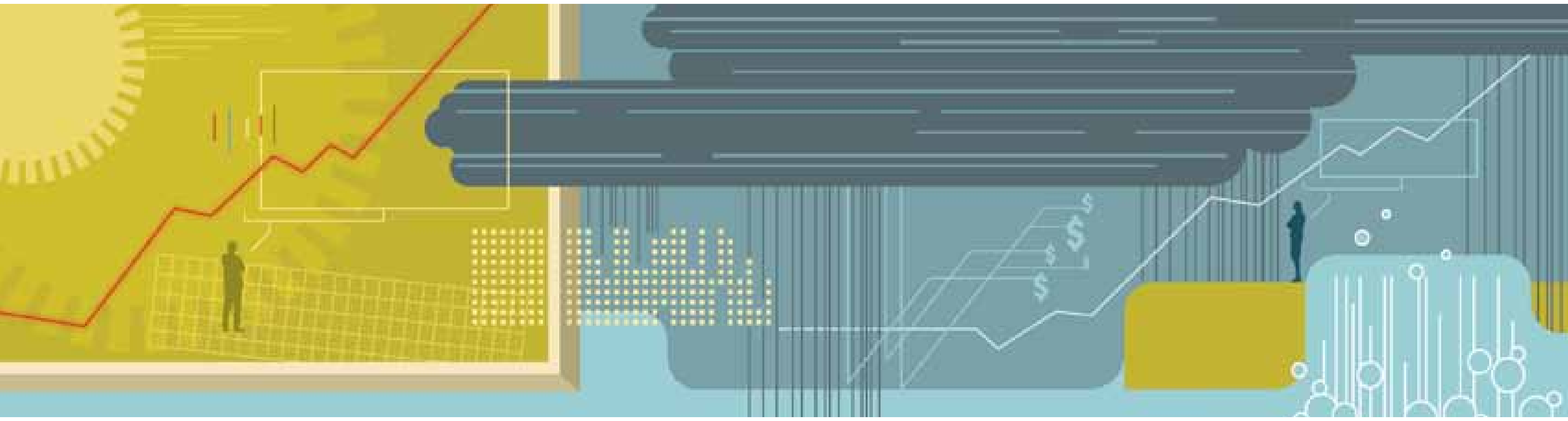
McKinsey&Company

McKinsey on Finance

Number 35,
Spring 2010

Perspectives on
Corporate Finance
and Strategy





Equity analysts: Still too bullish

After almost a decade of stricter regulation, analysts' earnings forecasts continue to be excessively optimistic.

Marc H. Goedhart, Rishi Raj, and Abhishek Saxena

No executive would dispute that analysts' forecasts serve as an important benchmark of the current and future health of companies. To better understand their accuracy, we undertook research nearly a decade ago that produced sobering results. Analysts, we found, were typically overoptimistic, slow to revise their forecasts to reflect new economic conditions, and prone to making increasingly inaccurate forecasts when economic growth declined.[1]

Alas, a recently completed update of our work only reinforces this view—despite a series of rules and regulations, dating to the last decade, that were intended to improve the quality of the analysts' long-term earnings forecasts, restore investor confidence in them, and prevent conflicts of interest.[2] For executives, many of whom go to great lengths to satisfy Wall Street's expectations in their financial reporting and long-term strategic moves, this is a cautionary tale worth remembering.

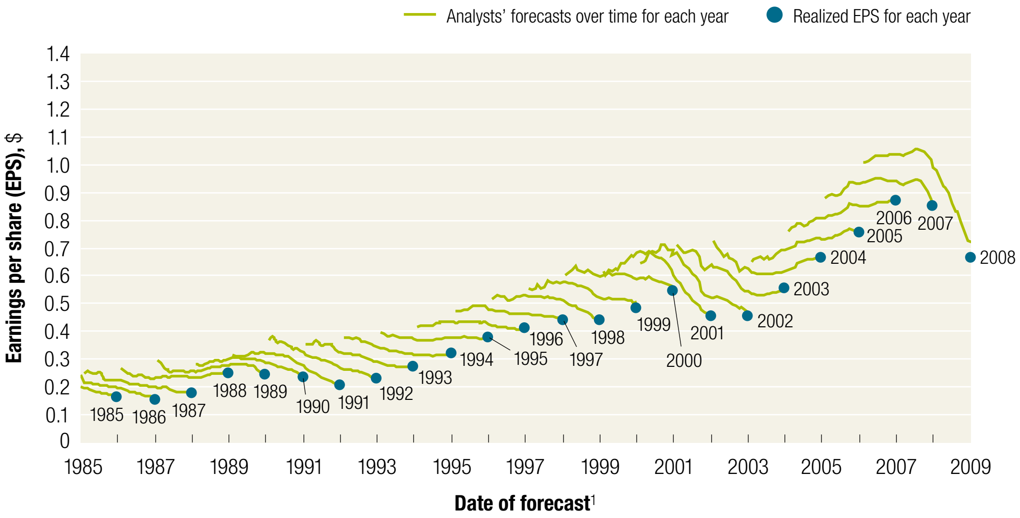
Exceptions to the long pattern of excessively optimistic forecasts are rare, as a progression of consensus earnings estimates for the S&P 500 shows (Exhibit 1). Only in years such as 2003 to 2006, when strong economic growth generated actual earnings that caught up with earlier predictions, do forecasts actually hit the mark.

Exhibit 1

Off the mark

With few exceptions, aggregate earnings forecasts exceed realized earnings per share.

S&P 500 companies



[1] Monthly forecasts.

Source: Thomson Reuters I/B/E/S Global Aggregates; McKinsey analysis

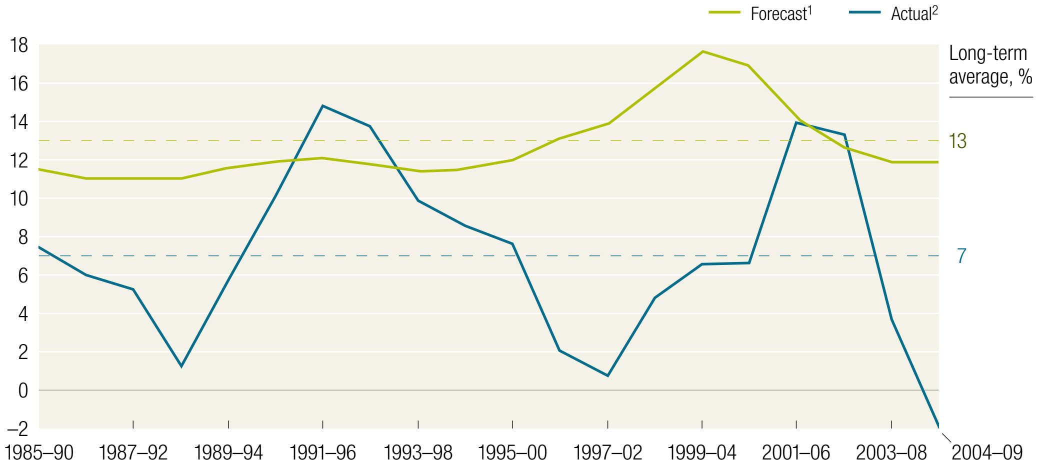
---

Exhibit 2

Overoptimistic

Actual growth surpassed forecasts only twice in 25 years—both times during the recovery following a recession.

Earnings growth for S&P 500 companies, 5-year rolling average, %



[1] Analysts' 5-year forecasts for long-term consensus earnings-per-share (EPS) growth rate. Our conclusions are same for growth based on year-over-year earnings estimates for 3 years.

[2] Actual compound annual growth rate (CAGR) of EPS; 2009 data are not yet available, figures represent consensus estimate as of Nov 2009.

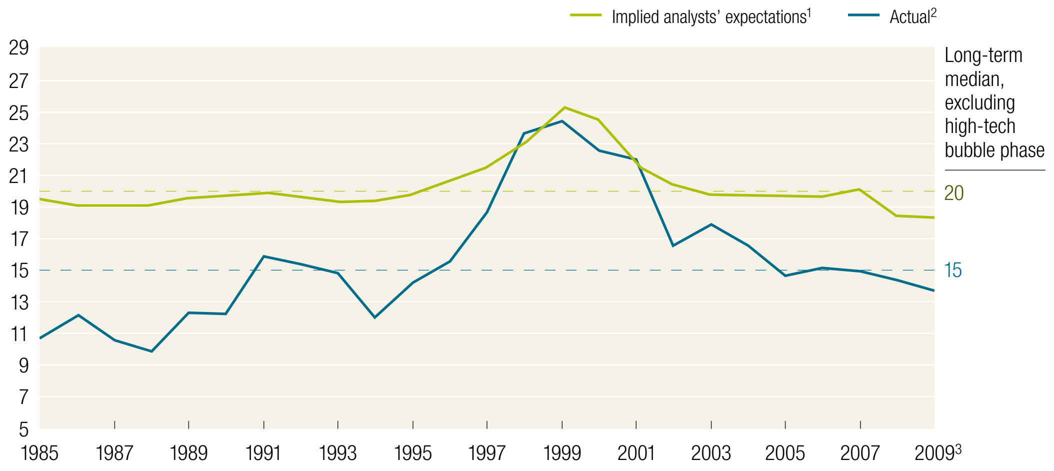
Source: Thomson Reuters I/B/E/S Global Aggregates; McKinsey analysis

Exhibit 3

Less giddy

Capital market expectations are more reasonable.

Actual P/E ratio vs P/E ratio implied by analysts' forecasts, S&P 500 composite index



[1] P/E ratio based on 1-year-forward earnings-per-share (EPS) estimate and estimated value of S&P 500. Estimated value assumes: for first 5 years, EPS growth rate matches analysts' estimates then drops smoothly over next 10 years to long-term continuing-value growth rate; continuing value based on growth rate of 6%; return on equity is 13.5% (long-term historical median for S&P 500), and cost of equity is 9.5% in all periods.

[2] Observed P/E ratio based on S&P 500 value and 1-year-forward EPS estimate.

[3] Based on data as of Nov 2009.

Source: Thomson Reuters I/B/E/S Global Aggregates; McKinsey analysis

This pattern confirms our earlier findings that analysts typically lag behind events in revising their forecasts to reflect new economic conditions. When economic growth accelerates, the size of the forecast error declines; when economic growth slows, it increases.[3] So as economic growth cycles up and down, the actual earnings S&P 500 companies report occasionally coincide with the analysts' forecasts, as they did, for example, in 1988, from 1994 to 1997, and from 2003 to 2006.

Moreover, analysts have been persistently overoptimistic for the past 25 years, with estimates ranging from 10 to 12 percent a year,[4] compared with actual earnings growth of 6 percent.[5] Over this time frame, actual earnings growth surpassed forecasts in only two instances, both during the earnings recovery following a recession (Exhibit 2). On average, analysts' forecasts have been almost 100 percent too high.[6]

Capital markets, on the other hand, are notably less giddy in their predictions. Except during the market bubble of 1999–2001, actual price-to-earnings ratios have been 25 percent lower than implied P/E ratios based on analyst forecasts (Exhibit 3). What's more, an actual forward P/E ratio[7] of the S&P 500 as of November 11, 2009—14—is consistent with long-term earnings growth of 5 percent.[8] This assessment is more reasonable, considering that long-term earnings growth for the market as a whole is unlikely to differ significantly from growth in GDP,[9] as prior McKinsey research has shown.[10] Executives, as the evidence indicates, ought to base their strategic decisions on what they see happening in their industries rather than respond to the pressures of forecasts, since even the market doesn't expect them to do so. ○

---

[1] Marc H. Goedhart, Brendan Russell, and Zane D. Williams, "Prophets and profits," mckinseyquarterly.com, October 2001.

[2] US Securities and Exchange Commission (SEC) Regulation Fair Disclosure (FD), passed in 2000, prohibits the selective disclosure of material information to some people but not others. The Sarbanes–Oxley Act of 2002 includes provisions specifically intended to help restore investor confidence in the reporting of securities' analysts, including a code of conduct for them and a requirement to disclose knowable conflicts of interest. The Global Settlement of 2003 between regulators and ten of the largest US investment firms aimed to prevent conflicts of interest between their analyst and investment businesses.

[3] The correlation between the absolute size of the error in forecast earnings growth (S&P 500) and GDP growth is –0.55.

[4] Our analysis of the distribution of five-year earnings growth (as of March 2005) suggests that analysts forecast growth of more than 10 percent for 70 percent of S&P 500 companies.

[5] Except 1998–2001, when the growth outlook became excessively optimistic.

[6] We also analyzed trends for three-year earnings-growth estimates based on year-on-year earnings estimates provided by the analysts, where the sample size of analysts' coverage is bigger. Our conclusions on the trend and the gap vis-à-vis actual earnings growth does not change.

[7] Market-weighted and forward-looking earnings-per-share (EPS) estimate for 2010.

[8] Assuming a return on equity (ROE) of 13.5 percent (the long-term historical average) and a cost of equity of 9.5 percent—the long-term real cost of equity (7 percent) and inflation (2.5 percent).

[9] Real GDP has averaged 3 to 4 percent over past seven or eight decades, which would indeed be consistent with nominal growth of 5 to 7 percent given current inflation of 2 to 3 percent.

[10] Timothy Koller and Zane D. Williams, "What happened to the bull market?" mckinseyquarterly.com, November 2001.

Marc Goedhart (Marc_Goedhart@McKinsey.com) is a consultant in McKinsey's Amsterdam office; **Rishi Raj** (Rishi_Raj@McKinsey.com) and **Abhishek Saxena** (Abhishek_Saxena@McKinsey.com) are consultants in the Delhi office.

BUSINESS
INSIDER

BEFORE THE FEDERAL COMMUNICATIONS COMMISSION

IN THE MATTER OF)
)
AMERICAN TELEPHONE AND TELEGRAPH COMPANY) CC DOCKET NO. 79-63
)
PETITION FOR MODIFICATION OF)
PRESCRIBED RATE OF RETURN)

PREPARED JOINT TESTIMONY

OF

DR. MYRON J. GORDON

AND

DR. LAWRENCE I. GOULD

APRIL, 1980

III. COST OF EQUITY CAPITAL

It is widely accepted that a public utility should earn a return on capital that allows it to raise the capital necessary to meet the demand for its services without an adverse effect on current shareholder stock. Such a rate of return is called the utility's cost of capital. A return in excess of that rate burdens the consumer with prices which are excessive and causes an unjustified transfer of income from the consuming public to the shareholders of the utility. It also encourages the utility to increase costs and prices further by overinvesting in plant facilities. On the other hand, a return on capital below the required return may discourage the utility from raising sufficient capital to meet demands for service, causing consumers to suffer an impairment in the quantity and quality of service. Therefore, if the return allowed by the Commission is either too high or too low, the result is less than satisfactory to the consumer. The testimony which follows is offered with a view to estimating as closely as possible the actual required return on capital (also called the cost of capital) and, with some care, to avoiding any bias in either direction.

In measuring the cost of capital from each source, the cost of debt and the cost of preferred capital pose few problems. It is clear that the utility must pay the embedded interest on its outstanding debt and the prescribed dividend on the preferred stock. Both of these measurements involve perfectly straightforward calculations. Somewhat more controversial is the problem of determining the cost of common equity capital.

A. General Principles

A utility's cost of common equity capital is the return or yield that investors on average require on its common stock as implied in the price that they are willing to pay to hold the stock. This implied yield is the cost of common equity capital, because the existing shareholders neither gain nor lose as a consequence of additional investment and financing, regardless of the method of financing, as long as the return the company earns on its common equity is equal to the return investors require on the stock. By contrast, when the allowed return on common is above the return investors require, each dollar of additional financing raises the value of the existing shares. Conversely, when the utility's operating income less interest on debt, income taxes, and preferred dividends does not leave a return on common equity equal to the return investors require on the stock, we not only have a depressed stock price because of the low return, but, in addition, each dollar of additional investment and financing further depresses the price.

The theoretical basis for the conclusion just stated has been fully developed,[1] but a simple analogy goes a long way in demonstrating the point. Ignoring operating costs, a bank that borrows at 8% and lends at 10% adds 2% of the amount borrowed and loaned to the earnings of the bank's shareholders. The more the bank borrows and lends with this 2% spread, the more it increases future earnings on and the current value of its common stock. The return that investors require on a utility's common stock is, in one form or another, what must be paid for additional equity funds, and if the company earns more on the money than it must pay to get the funds, the excess adds to the earnings on and value of the existing shares. Conversely, if the company earns a lower rate of return than it pays on additional funds, the difference comes out of the pockets of the existing shareholders.

While the management of a utility may not be able to prevent a regulatory agency from allowing it a rate of return on capital below its costs of capital, it will, quite understandably, be reluctant to compound the mis-

---

[1] For an extensive discussion, see M.J. Gordon, <u>The Cost of Capital to a Public Utility</u>, Michigan State University, East Lansing, Michigan, 1974.

fortunes of its shareholders by further depressing the stock price through undertaking further investment in the face of an inadequate return on capital. A difference between the return on capital and its cost is fully reflected in the return on common equity, since the bondholders and preferred shareholders are assured of receiving their prescribed returns on capital regardless of the allowed rate on total capital. However, the long-run dependence of the value of a public utility's stock on the service provided to its customers could make it advisable for the company to undertake essential capital expenditures in the face of a small and hopefully temporary unfavorable difference between the allowed rate of return and the cost of capital.

Management's own commitment to continued growth or its reluctance to face the problems of a sharp curtailment in growth may persuade it to continue a high rate of investment in the face of an unsatisfactory rate of return. However, this amounts to an appropriation of shareholder wealth in pursuit of managerial objectives, and sooner or later the shareholders may turn to a new management that is more solicitous of stockholder welfare.

B. Measurement of DCF Cost of Equity Capital

The principles used to measure the cost of common equity are the same as those used in measuring the yield which investors require on debt or the yield required on outstanding preferred stock. However, in the case of debt and preferred stock, the payments to investors are relatively certain and, thus, amenable to objective calculation. However, the future dividend payments on a share of stock are uncertain, and determination of the expected yield required by investors requires the use of a more complex, yet still relatively simple and very reliable, method for dealing with the problem at hand.

This method is called the DCF (Discounted Cash Flow) Method for computing the cost of equity capital.[1] It represents the valuation of a share of stock by the expression:

$$P_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_t}{(1+k)^t} + \ldots + \frac{D_\infty}{(1+k)^\infty} \quad . \qquad (1)$$

In this expression:

P_0 = the current price per share;

D_t = the expected value of the dividend the share will pay at the end of period t; and

k = the yield or return investors require on the share.

---

[1] This method was developed by Myron J. Gordon in an article in <u>Management Science</u> in 1956 and was first introduced in testimony in the American Telephone and Telegraph Co. Case, F.C.C. Docket 16258, 1966.

If the future dividends are expected to grow at the rate of g each period, Equation (1) reduces to:

$$P_0 = \frac{D_1}{k-g} \qquad (2)$$

Solving Equation (2) for k results in an expression for the yield that investors require:

$$k = \frac{D_1}{P_0} + g. \qquad (3)$$

In other words, to measure the expected return that investors require we may take the sume of the dividend yield and the expected rate of growth in the dividend.

An alternate approach to Equation (1) for the price of a share is:

$$P_0 = \frac{D_1 + P_1}{1 + k} . \qquad (4)$$

Here, we take as the future payments the next period's dividend and the end-of-period price. However, $P_1 = P_0(1+g)$, and this substitution plus a little algebra results in Equation (2). Hence, the two approaches to share valuation result in the same measurement equation for share yield.

In order to use Equation (3), we need to measure both the dividend yield and the expected rate of growth in the dividend.

1. Measurement of Dividend Yield

The term for dividend yield in the Eq. (3) expression for a share's yield is the forecast dividend for the coming period, D_1, divided by the current price, P_0. The value assigned to P_0 should be the price of the share at the time the share yield is being estimated. The rationale for using the current price is that at each point in time it reflects all the information available to a company's investors regarding future dividends. Hence, the yield investors require on any date is the discount rate that equates on that date the current price and the expected stream of future dividends. To use an average of share prices over some prior time period for P_0 would result in a value for k without meaning, that is, it would not provide the average value for k over the prior time period. Furthermore, to obtain an average value for k over some prior time period, one must average the values of share yield -- not of share price.

D_1 is the forecast dividend for the coming year if dividends are paid annually. Common practice, however, is to pay dividends quarterly, in which case D_t in Eq. (1), the fundamental expression for share price, is a quarterly dividend. The value of k that satisfies Eq. (1) is the quarterly yield on the share, and the g in Eqs. (2) and (3) is the quarterly rate at which the dividend is expected to grow.

Because it is customary and convenient to think in terms of annual and not quarterly figures for rate of return and growth statistics, annualized figures will be used here. Annualized figures are simply four times quarterly figures. That is, if the current price of a share is $P_0=\$50{,}000$, and if its forecast dividend for the coming quarter is $D_1=\$1.25$, the quarterly dividend yield is \$1.25/\$50.00=2.5%, and the annualized dividend yield is 10%.

We all know from bank advertisements that when interest is compounded more frequently than once a year, two annual interest rates may be computed. To illustrate, an interest rate of 15% per year with the interest compounded quarterly means that a dollar left on deposit for a year will have 3.75% added to the balance at the end of each quarter, and the balance in the account at the end of the year will be \$1.1587. In other words, a 15% interest rate compounded quarterly will earn interest equal to 15.87% of the balance at the start of the year.

What does this imply for arriving at a rate of return equal to the cost of equity capital? If the quarterly yield at which a public utility share sells is 3.75%, should the utility be allowed to earn for the year a rate of return on common equity of 15% or something more? The answer is: (1) more than 15%, if the rate of return the company earns is calculated on the basis of the common equity at the start of the year; and (2) only 15%, if the rate of return on common equity is calculated by averaging its values at the start and at the end of the year. This statement is proved in Schedule 27. The latter method represents common practice and the practice followed here. Hence, in arriving at the cost of equity capital, the correct figure for the dividend-yield term in Eq. (3) is the annualized value of the forecast dividend for the coming quarter divided by the current price.

2. Measurement of Expected Growth

A difficult problem is the determination of the long-run dividend growth expectations of investors. In other words, what is the expected rate of growth in future dividends per share, g, in which investors on average believe?

To solve the problem, it is essential to understand the determinants of long-run expected dividend growth. If a company is expected to earn a rate of return of r on its common equity, and if it retains the fraction b of its earnings, then each year its earnings per share can be expected to increase by the fraction br of its earnings per share in the previous year. Thus, br is an excellent measure of the expected rate of growth in future earnings per share. If the company is expected to have a stable retention ratio and, therefore, a stable dividend payout ratio, it follows that br is also an excellent measure of the expected rate of growth in future dividends per share. That is:

$$g = br. \tag{5}$$

This relationship is illustrated in Schedule 18. There the hypothetical initial common equity or book value per share = \$10.00, r = .10 and b = .4. The first period earnings are expected to be \$1.00 per share and the expected dividend is \$.60. The retained earnings raise the book value of equity to \$10.40 at the start of the second year, and r times that is \$1.04, which is equal to the earnings per share the second year. The dividend in the second year is expected to be \$.624, and so on through time. The earnings, dividends, and stock price are expected to grow at the rate br = (.4) (.10) = .04 in every future year.

If investors require an 8% return on the stock, the initial price is:

$$P_0 = \frac{D_1}{k-g} = \frac{\$.60}{.08-.04} = \$15.00. \tag{6}$$

Similarly, the expected share price after one year is:

$$P_1 = \frac{D_2}{k-g} = \frac{\$.624}{.08-.04} = \$15.60 \qquad (7)$$

The price in subsequent periods rises by 4% as long as the yield investors require on the share remains equal to 8%.

In fact, a company's return and retention rates do not remain constant over time. However, if investors expect that a company will on average earn a return of r and retain the fraction b of its earnings, they will expect the dividends, earnings, and price to grow at a rate br due to retention of earnings.

Stock financing will be a further cause of expected growth if the company is expected to issue new shares and if the stock's market price is greater than book value. Conversely, when a company is expected to engage in stock financing through the sale of stock at share prices below book value, ignoring the stock financing results in an overestimate of growth and share yield. If the company is expected to engage in little or no stock financing, or if stock financing is expected to occur only when the market value is close to book value, the expected rate of growth in the earnings, dividends, and price per share is g = br. As will be shown later, we may ignore stock financing and only consider growth due to retention of earnings.

If two conditions are satisfied, the best estimate of g is obtained either from the company's current values of b and r or from weighted averages of their recent values. These two conditions are: stock financing may be ignored for either of the reasons stated above, and there is no information other than the past values of b and r which can be used to forecast their future values.

The sharp rise in energy prices and other costs over the past decade have had a disruptive influence on the electric utility industry, and they have created situations in which there are obvious reasons why past values of b and r should not be projected into the future. In two recent cases, the DCF formula was adapted to deal with the peculiar circumstances of each case.[1] Similarly, as will be shown below, the recent dramatic change in anticipated inflation provides information which should be used to modify the past values of b and r in order to obtain a more accurate forecast of expected growth.

3. Alternative Measures of Expected Growth

It might be thought that past rates of growth in

---

[1] Testimony of Myron J. Gordon, Boston Edison Company Case No. DPU 19300, Commonwealth of Massachusetts, Department of Public Utilities, 1977; and Testimony of Myron J. Gordon, Public Service Company of New Mexico Case No. 1419, New Mexico Public Service Commission, 1979.

either earnings, dividends, or price could be used as estimates of g, the forecast rate of future growth in dividends. However, these past rates of growth are most unreliable due to extraneous influences on them, such as changes in the rate of return on common equity, changes in the retention rate, or changes in the yield required by investors in the case of price changes. The potential error in using past growth in earnings to estimate g is illustrated in Schedule 19, where the hypothetical company's return on common equity is 10% in the first three periods and 15% in the last three periods. With a retention rate of 40% and a return rate of 15% the growth rate is 6% in the last three years. This is a reasonable estimate of the expected future growth rate as of the end of the 6th year. However, with the 56% growth rate due to the rise in the return rate in the fourth year, a simple average of the five annual past growth rates in earnings is in excess of 15%. Clearly, this type of estimate of future growth rates cannot be used with any reliability at all, especially now when public utilities have received frequent upward adjustments in their allowed rates of return over the past five years. To do so would be to expect the company's rate of return on common equity to increase by 50% about every five years. This would be a ridiculous forecast, which the use of b and r would make readily apparent.

It can also be demonstrated that a change in the dividend payout rate makes the past rate of growth in dividends an incorrect basis for predicting g. Assume that a company has been earning a rate of return on its common stock of r = .10, that it has been retaining the fraction b = .60 of its earnings, and that, as a consequence, its dividend has been growing at the rate br = (.60)(.10) = .06. If the company were to raise the fraction of earnings it pays in dividends so that b falls to .25, the rate of growth in the dividend would then fall to br = (.25) (.10) = .025. However, over the period that spans the rise in the dividend payout rate, the dividend would have grown at an even higher rate than the prior 6%. It would only be correct to project the past rate of growth in the dividend into the future on the highly implausible assumption that the company is expected periodically to raise its payout rate. Therefore, unless there is convincing evidence to the contrary, <u>current expectations of b and r provide the best basis for forecasting future growth.</u>

C. Cost of Equity Capital for AT&T

Under the method we have advocated for estimating future growth, the DCF formula for a company's cost of equity capital is:

$$k = \frac{D_1}{P_0} + br. \tag{8}$$

To arrive at a company's current value of k, the current value of each of the quantities on the right-hand side of Equation (8) must be determined. This is done below for AT&T. As we will see, obtaining estimates of these values is extremely difficult in the turbulence of today's capital markets.

1. Dividend Yield

We argued above that the projected dividend yield is appropriate for setting the allowed rate of return on equity. The current quarterly dividend payable on April 1, 1980, is $1.25. The Value Line forecast for dividends over the next 12 months has been reduced from $5.20 in June, 1979, to a current forecast of $5.00.[1] Value Line reduced its forecast dividend even though it was aware of AT&T's stated intent to maintain shareholders real dividend income against inflation.[2] For the last few years AT&T has followed a policy of raising its dividend in the first quarter. With the recent declaration of the dividend to be paid on April 1, 1980 maintained at $1.25,

---

[1] Value Line, March 13, 1980.

[2] Value Line, February 1, 1980.

the Value Line estimate appears reasonable, and we will use a dividend of $5.00, equal to the annualized value of the current quarterly dividend of $1.25.[1]

We have also argued that we should use the share price on the date for which the estimate was made. Since this testimony was finalized on March 29, 1980, we will use the company's closing price on the previous day, that is, P_o = $48.50, which results in a dividend yield of $5.00/ $48.50 = 10.31%.

Ordinarily, for periods of up to a few months, the price of a public utility share only fluctuates in a narrow range, and the choice among the prevailing prices is usually of no particular significance. However, the impact of inflation during the second half of 1979 and the actions and statements of the Federal Reserve Board and other government officials (beginning in October and culminating in President Carter's recent anti-inflation program) have had a striking impact on the capital markets. Short-term interest rates have risen sharply, and the yields and prices on long-term securities have fluctuated dramatically. In particular, as can be seen in Schedule 20, AT&T's stock fell from $57.83 on June 30, 1979, to $55 on September 30, 1979. Since then it has decreased steadily to a low of $45 on March 7, 1980, before rising to the current price of $48.50 on March 28, 1980. During the same period its dividend

---

[1] Projection of a higher dividend in the current economic environment would require a downward revision in the growth rate forecasts below.

yield rose steadily from 8.99% on June 30, 1979, to the current projected yield of 10.31%. This was due mainly to the effects of its dropping share price, but also to the reduction in its projected dividend from $5.20 to $5.00.

Through their impact on the dividend yield, the date and the share price used to arrive at AT&T's cost of equity capital have a material impact on the value obtained for k. In other words, in a period over which interest rates fluctuate widely, share prices and the cost of equity capital also fluctuate widely. At the time this testimony was prepared, the reaction to President Carter's anti-inflation program was unknown. Although our estimated dividend yield of 10.31% represents our best estimate at this time, the unfolding reaction to the President's program may cause AT&T's dividend yield to vary considerably over the next few months.

2. Growth Rate - Past Financial Data

In order to arrive at AT&T's growth rate, we require the retention rate, b, and the rate of return on common equity, r, that investors may reasonably expect.

As a first step, let us estimate b and r using only historical data. Schedule 21 shows the underlying data for the years 1975 to 1979 that is needed to calculate b and r.

For the rate of return on common equity that investors expect, we first not that a simple average of the five values of r_t (row 5) from 1975 to 1979 is 11.81%. However, inspection of the annual values reveal that although r was abnormally depressed in 1975, its values for the next three years exhibited a definite upward trend, and then only declined slightly in 1979. Investors now might well believe that the material rise in the cost of capital between 1975 and 1979 justifies the rates of return the company realized in the more recent years, in which case they would rely primarily on the 1978 and 1979 figures in forecasting the company's future rate of return. A simple average of these figures is 13.05% and it seems reasonable that investors might conclude that 13% represents the best estimate of the long-term return AT&T is expected to earn on common equity.

For the retention rate that investors expect, we first note that a simple average of the five values of b_t (row 9) from 1975 to 1979 is 37.23%. However, this average is affected by the low retention rate in 1975, and in recent years, 1977-1979, the retention rate has averaged 38.93%. It seems reasonable that on the basis of this data, investors might use these recent years, and arrive at 39% as the best estimate of AT&T's retention ratio.

Combining the above values (obtained by using historical values in Equation (8) for P_0, D_1, b, and r) provides an estimate of AT&T's cost of equity capital as of March 28, 1980, of:

$$k = \frac{D_1}{P_o} + br$$

$$= \frac{\$\ 5.00}{\$48.50} + (.39)(.13)$$

$$= .1031 + .0507 = 15.38\% .$$

However, before accepting this result it may be instructive to pose the following question: What would have been the estimate for k as of June 30, 1979?

3. Growth Rate - Recent Developments

On June 30, 1979, Value Line estimated that AT&T's 1979 earnings would be $8.00 per share. The actual value of earnings per share for 1979 was $8.04. Since we would have been reluctant to estimate k at that time without 1979 data, we would have relied on the Value Line forecast to complete the 1979 annual data, a procedure we have used in the past. Since the Value Line estimates were extremely close to the actual 1979 results, using these estimates and the historical data would have produced the same estimates of b and r obtained previously. It is obvious that if the data and analysis do not change materially, we would obtain the same measurement of the growth rate at any point between June 30, 1979, and March 28, 1980.

The estimates which would have been obtained on two previous dates are provided below:

Date	D_1/P_0	+	br	=	k
June 30, 1979	8.99%		5.07%		14.06%
November 19, 1979	9.39%		5.07%		14.46%

An estimate is provided for November 19, 1979, for comparative purposes, since an estimate of k was obtained for Rochester Telephone Co. on that date of 14.85%.[1] The difference in k between Rochester Telephone and AT&T may be attributed to AT&T's slightly lower business risk due to its greater diversification.

The problem can now be easily seen. The estimate of 15.38% obtained for AT&T is correct only if we assume that the large increase in the expected rate of inflation (which raised the dividend yield on AT&T from 8.99% on June 30, 1979, to 10.31% on March 28, 1980) had no effect on the anticipated growth in the dividend.

It is extremely unlikely that investors believe that to be true. The rise in the expected rate of inflation has not only increased interest rates, but also the expected rate at which AT&T's other costs of production, such as materials and labor, will grow. A continued expectation that the company will earn a return on common of 13% and retain 39% of earnings would require the belief that the rate of growth in its revenues will rise to match

---

[1] Myron J. Gordon, Direct Testimony, Before tHe State of New York Public Utility Commission, In the Matter of Rochester Telephone Co., November 20, 1979.

the rise in the rate of growth of its costs. However, if investors fear that the regulatory process will not be fully responsive to the increase in the rate at which the company's costs are rising, they will revise their growth estimate downward. That is, with any regulatory lag in the pass through of higher costs, a rise in the expected inflation rate would reduce investor estimates of long-run return on common equity, and would, therefore, result in a downward revision of expected growth. In that event, simply raising the estimate of AT&T's cost of equity capital by the increase in the dividend yield would result in an overstatement of the required return.

It is our judgment that the response of investors to the rise in the expected rate of inflation has been a downward revision in expectations regarding AT&T's rate of return on common equity, implying a downward revision in its retention rate also. In support of this position, we note that Value Line lowered its prediction of 1980 earnings per share for AT&T to $7.50, and lowered its predicted 1980 dividend per share to $5.00.[1] This implies for 1980 an estimate for r of 11.60% and an estimate for b of 33.33%.

Under the present turbulent economic conditions it is extremely difficult to estimate with precision the extent

---

[1] Value Line, February 1, 1980.

to which these rates have been revised downward. If the revised figures are a 12.50% return on common equity and a 37% retention rate, then the estimated growth rate must be reduced from 5.07% to 4.63%.[1] Adding the latter figure to the current dividend yield of 10.31% results in a cost of equity capital of 14.94%. On the other hand, the rise in interest rates over the past six months may be taken as evidence that the cost of equity capital has gone up over the same time period. Hence, in some measure, this rise in interest [illegible] will lead to an upward revision in the rates of return allowed by the numerous regulatory commissions that set rates for AT&T. A generous allowance for the favorable impact of increases in the allowed rates of return on investment [illegible] forecasts of the AT&T growth rate is a rise in its value from the above 4.63% to 5.25%. This latter growth rate combined with the 10.31% dividend yield re- [illegible] equity capital of 15.56%. In our judgment the AT&T cost of equity capital may well be as low as 15.0%, [illegible] unlikely to be above 15.5%, and 15.25% represents our base estimate as of March 28, 1980.

---

[1] Using this reasoning, the growth rate was adjusted downward by 69 basis points for Rochester Telephone. *Ibid.*, Supplemental Prepared Direct Testimony, March 24, 1980.

A Comprehensive Look at The Empirical Performance of Equity Premium Prediction[*]

Amit Goyal
Emory University
Goizueta Business School[†]

Ivo Welch
Brown University
Department of Economics
NBER[‡]

January 3, 2007

Abstract

Our paper comprehensively reexamines the performance of variables that have been suggested by the academic literature to be good predictors of the equity premium. We find that by and large, these models have predicted poorly both in-sample and out-of-sample for thirty years now; these models seem unstable, as diagnosed by their out-of-sample predictions and other statistics; and these models would not have helped an investor with access only to available information to profitably time the market.

---

[*] Thanks to Malcolm Baker, Ray Ball, John Campbell, John Cochrane, Francis Diebold, Ravi Jagannathan, Owen Lamont, Sydney Ludvigson, Rajnish Mehra, Michael Roberts, Jay Shanken, Samuel Thompson, Jeff Wurgler, and Yihong Xia for comments, and Todd Clark for providing us with some critical McCracken values. We especially appreciate John Campbell and Sam Thompson for challenging our earlier drafts, and iterating mutually over working papers with opposite perspectives.

[†] http://www.goizueta.emory.edu/agoyal. E-mail: amit_goyal@bus.emory.edu.

[‡] http://welch.econ.brown.edu. E-mail: ivo_welch@brown.edu.

JEL Classification: G12, G14.

1 Introduction

Attempts to predict stock market returns or the equity premium have a long tradition in finance. As early as 1920, Dow (1920) explored the role of dividend ratios. A typical specification regresses an independent lagged predictor on the stock market rate of return or, as we shall do, on the equity premium,

$$\text{Equity Premium}(t) \;=\; \gamma_0 \;+\; \gamma_1 \cdot x(t-1) + \epsilon(t) \quad . \tag{1}$$

γ_1 is interpreted as a measure of how significant x is in predicting the equity premium. The most prominent x variables explored in the literature are the dividend price ratio and dividend yield, the earnings price ratio and dividend-earnings (payout) ratio, various interest rates and spreads, the inflation rates, the book-to-market ratio, volatility, the investment-capital ratio, the consumption, wealth, and income ratio (CAY), and aggregate net or equity issuing activity.

The literature is difficult to absorb. Different papers use different techniques, variables, and time periods. Results from papers that were written years ago may change when more recent data is used. Some papers contradict the findings of others. Still, most readers are left with the impression that “prediction works”—though it is unclear exactly what works. The prevailing tone in the literature is perhaps best summarized by Lettau and Ludvigson (2001, p.842)

> It is now widely accepted that excess returns are predictable by variables such as dividend-price ratios, earnings-price ratios, dividend-earnings ratios, and an assortment of other financial indicators.

There are also a healthy number of current papers which further cement this perspective; and a large theoretical and normative literature has developed that stipulates how investors should allocate their wealth as a function of the aforementioned variables.

The goal of our own paper is to comprehensively reexamine the empirical evidence as of early 2006, evaluating each variable using the same methods (mostly, but not only, in linear models), time-periods, and estimation frequencies. The evidence suggests that most models are unstable or even spurious. Most models are no longer significant even in-sample (IS), and the few models that still are usually fail simple regression diagnostics. Most models have performed poorly for over thirty years IS. For many models, any earlier apparent statistical significance was often based exclusively on years up to *and especially on* the years of the Oil Shock of 1973-5. Most models have poor out-of-sample (OOS) performance, but not in a way that merely suggests lower power than IS tests. They predict poorly late in the sample, not early in the sample. (For many variables, we have difficulty finding robust statistical significance even when they are examined only during their most favorable contiguous OOS sub-period.) Finally, the OOS performance is not only a useful model diagnostic for the IS regressions, but also interesting in itself for an investor who had sought to use these models for market-timing. Our evidence suggests that the models would not have helped such an investor.

Therefore, although it is possible to search for, to occasionally stumble upon and then to defend some seemingly statistically significant models, we interpret our results to suggest that a healthy skepticism is appropriate when it comes to predicting the equity premium, at least as of early 2006. The models seem not robust.

Our paper now proceeds as follows. We describe our data—available at the RFS website—in Section 2 and our tests in Section 3. Section 4 explores our base case—predicting equity premia annually using OLS forecasts. In Sections 5 and 6, we predict equity premia on five-year and monthly horizons, the latter with special emphasis on the suggestions in Campbell and Thompson (2005). Section 7 tries earnings and dividend ratios with longer memory as independent variables, corrections for persistence in regressors, and encompassing model forecasts. Section 8 reviews earlier literature. Section 9 concludes.

2 Data Sources and Data Construction

Our dependent variable is always the equity premium, i.e., the total rate of return on the stock market minus the prevailing short-term interest rate.

Stock Returns: We use S&P 500 index returns from 1926 to 2005 from CRSP's month-end values. Stock returns are the continuously compounded returns on the S&P 500 index, including dividends. For yearly and longer data frequencies, we can go back as far as 1871, using data from Robert Shiller's website. For monthly frequency, we can only begin in the CRSP period, i.e., 1927.

Risk-free Rate: The risk-free rate from 1920 to 2005 is the T-bill rate. Because there was no risk-free short-term debt prior to the 1920's, we had to estimate it. Commercial paper rates for New York City are from the NBER's Macrohistory data base. These are available from 1871 to 1970. We estimated a regression from 1920 to 1971, which yielded

$$\text{T-bill Rate} = -0.004 + 0.886 \cdot \text{Commercial Paper Rate} , \tag{2}$$

with an R^2 of 95.7%. Therefore, we instrumented the risk-free rate from 1871 to 1919 with the predicted regression equation. The correlation for the period 1920 to 1971 between the equity premium computed using the actual T-bill rate and that computed using the predicted T-bill rate (using the commercial paper rate) is 99.8%.

The equity premium had a mean (standard deviation) of 4.85% (17.79%) over the entire sample from 1872 to 2005; 6.04% (19.17%) from 1927 to 2005; and 4.03% (15.70%) from 1965 to 2005.

Our first set of independent variables are primarily stock characteristics:

Dividends: Dividends are twelve-month moving sums of dividends paid on the S&P 500 index. The data are from Robert Shiller's website from 1871 to 1970.

Dividends from 1971 to 2005 are from the S&P Corporation. The **Dividend Price Ratio** (**d/p**) is the difference between the log of dividends and the log of prices. The **Dividend Yield** (**d/y**) is the difference between the log of dividends and the log of *lagged* prices. (See, e.g., Ball (1978), Campbell (1987), Campbell and Shiller (1988a, 1988b), Campbell and Viceira (2002), Campbell and Yogo (2006), the survey in Cochrane (1997), Fama and French (1988), Hodrick (1992), Lewellen (2004), Menzly, Santos, and Veronesi (2004), Rozeff (1984), and Shiller (1984).)

Earnings: Earnings are twelve-month moving sums of earnings on the S&P 500 index. The data are again from Robert Shiller's website from 1871 to June 2003. Earnings from June 2003 to December 2005 are our own estimates based on interpolation of quarterly earnings provided by the S&P Corporation. The **Earnings Price Ratio** (**e/p**) is the difference between the log of earnings and the log of prices. (We also consider variations, in which we explore multi-year moving averages of numerator or denominator, e.g., as in $\mathbf{e}^{10}/\mathbf{p}$, which is the moving ten-year average of earnings divided by price.) The **Dividend Payout Ratio** (**d/e**) is the difference between the log of dividends and the log of earnings. (See, e.g., Campbell and Shiller (1988a, 1998) and Lamont (1998).)

Stock Variance (**svar**): Stock Variance is computed as sum of squared daily returns on the S&P 500. G. William Schwert provided daily returns from 1871 to 1926; data from 1926 to 2005 are from CRSP. (See Guo (2006).)

Cross-Sectional Premium (**csp**): The cross-sectional beta premium measures the relative valuations of high- and low-beta stocks and is proposed in Polk, Thompson, and Vuolteenaho (2006). The **csp** data are from Samuel Thompson from May 1937 to December 2002.

Book Value: Book values from 1920 to 2005 are from Value Line's website, specifically their *Long-Term Perspective Chart* of the Dow Jones Industrial Average. The **Book to Market Ratio** (**b/m**) is the ratio of book value to market value for the Dow Jones Industrial Average. For the months from March to December, this is computed by dividing book value at the end of the previous year by the price at the end of the current month. For the months of January and February, this is computed by dividing book value at the end of two years ago by the price at the end of the current month. (See, e.g, Kothari and Shanken (1997) and Pontiff and Schall (1998).)

Corporate Issuing Activity: We entertain two measures of corporate issuing activity. **Net Equity Expansion** (**ntis**) is the ratio of twelve-month moving sums of net issues by NYSE listed stocks divided by the total end-of-year market capitalization of NYSE stocks. This dollar amount of net equity issuing activity (IPOs, SEOs, stock repurchases, less dividends) for NYSE listed stocks is computed from CRSP data as

$$\text{Net Issue}_t \;=\; \text{Mcap}_t - \text{Mcap}_{t-1} \cdot (1 + \text{vwretx}_t)\;, \tag{3}$$

where Mcap is the total market capitalization, and vwretx is the value weighted return (excluding dividends) on the NYSE index.[1] These data are available from 1926 to 2005. **ntis** is closely related, but not identical, to a variable proposed in Boudoukh, Michaely, Richardson, and Roberts (2005). The second measure, **Percent Equity Issuing** (**eqis**), is the ratio of equity issuing activity as a fraction of total issuing activity. This is the variable proposed in Baker and Wurgler (2000). The authors provided us with the data, except for 2005, which we added ourselves. The first equity issuing measure is relative to aggregate market cap, while the second is relative to aggregate corporate issuing.

Our next set of independent variables is interest-rate related:

Treasury Bills (**tbl**): T-bill rates from 1920 to 1933 are the *U.S. Yields On Short-Term United States Securities, Three-Six Month Treasury Notes and Certificates, Three Month Treasury* series in the NBER Macrohistory data base. T-bill rates from 1934 to 2005 are the *3-Month Treasury Bill: Secondary Market Rate* from the

---

[1] This calculation implicitly assumes that the delisting return is –100 percent. Using the actual delisting return, where available, or ignoring delistings altogether, has no impact on our results.

economic research data base at the Federal Reserve Bank at St. Louis (FRED). (See, e.g., Campbell (1987) and Hodrick (1992).)

Long Term Yield (lty): Our long-term government bond yield data from 1919 to 1925 is the *U.S. Yield On Long-Term United States Bonds* series in the NBER's Macrohistory data base. Yields from 1926 to 2005 are from Ibbotson's *Stocks, Bonds, Bills and Inflation Yearbook*, the same source that provided the **Long Term Rate of Returns (ltr)**. The **Term Spread (tms)** is the difference between the long term yield on government bonds and the T-bill. (See, e.g., Campbell (1987) and Fama and French (1989).)

Corporate Bond Returns: Long-term corporate bond returns from 1926 to 2005 are again from Ibbotson's *Stocks, Bonds, Bills and Inflation Yearbook*. **Corporate Bond Yields** on AAA and BAA-rated bonds from 1919 to 2005 are from FRED. The **Default Yield Spread (dfy)** is the difference between BAA and AAA-rated corporate bond *yields*. The **Default Return Spread (dfr)** is the difference between long-term corporate bond and long-term government bond *returns*. (See, e.g., Fama and French (1989) and Keim and Stambaugh (1986).)

Inflation (infl): Inflation is the *Consumer Price Index (All Urban Consumers)* from 1919 to 2005 from the Bureau of Labor Statistics. Because inflation information is released only in the following month, we wait for one month before using it in our monthly regressions. (See, e.g., Campbell and Vuolteenaho (2004), Fama (1981), Fama and Schwert (1977), and Lintner (1975).)

Like inflation, our next variable is also a common broad macroeconomic indicator.

Investment to Capital Ratio (i/k): The investment to capital ratio is the ratio of aggregate (private nonresidential fixed) investment to aggregate capital for the whole economy. This is the variable proposed in Cochrane (1991). John Cochrane kindly provided us with updated data.

Of course, many papers explore multiple variables. For example, Ang and Bekaert (2003) explore both interest rate and dividend related variables. In addition to simple univariate prediction models, we also entertain two methods that rely on multiple variables (**all** and **ms**), and two models that are rolling in their independent variable construction (**cay** and **ms**).

A "Kitchen Sink" Regression (**all**): This includes all the aforementioned variables. (It does not include **cay**, described below, partly due to limited data availability of **cay**.)

Consumption, wealth, income ratio (**cay**): Lettau and Ludvigson (2001) estimate the following equation:

$$c_t = \alpha + \beta_a \cdot a_t + \beta_y \cdot y_t + \sum_{i=-k}^{k} b_{a,i} \cdot \Delta a_{t-i} + \sum_{i=-k}^{k} b_{y,i} \cdot \Delta y_{t-i} + \epsilon_t, \quad t = k+1, \ldots, T-k, \tag{4}$$

where c is the aggregate consumption, a is the aggregate wealth, and y is the aggregate income. Using estimated coefficients from the above equation provides **cay** $\equiv \widehat{\text{cay}}_t = c_t - \hat{\beta}_a \cdot a_t - \hat{\beta}_y \cdot y_t, \quad t = 1, \ldots, T$. Note that, unlike the estimation equation, the fitting equation does not use look-ahead data. Eight leads/lags are used in quarterly estimation ($k = 8$) while two lags are used in annual estimation ($k = 2$). (For further details, see Lettau and Ludvigson (2001).) Data for **cay**'s construction are available from Martin Lettau's website at quarterly frequency from the second quarter of 1952 to the fourth quarter of 2005. Although annual data from 1948 to 2001 is also available from Martin Lettau's website, we reconstruct the data following their procedure as this allows us to expand the time-series from 1945 to 2005 (an addition of 7 observations).

Because the Lettau-Ludvigson measure of **cay** is constructed using look-ahead (in-sample) estimation regression coefficients, we also created an equivalent measure that excludes advance knowledge from the estimation equation and thus uses only prevailing data. In other words, if the current time period is 's', then we estimated equation (4) using only the data up to 's' through

$$c_t = \alpha + \beta_a^s \cdot a_t + \beta_y^s \cdot y_t + \sum_{i=-k}^{k} b_{a,i}^s \cdot \Delta a_{t-i} + \sum_{i=-k}^{k} b_{y,i}^s \cdot \Delta y_{t-i} + \epsilon_t, t = k+1, \ldots, s-k, \quad (5)$$

This measure is called **caya** ("ante") to distinguish it from the traditional variable **cayp** constructed with look-ahead bias ("post"). The superscript on the betas indicates that these are rolling estimates, i.e., a set of coefficients used in the construction of one **caya**$_S$ measure in one period.

A **model selection** approach, named "**ms**." If there are K variables, we consider 2^K models essentially consisting of all possible combinations of variables. (As with the kitchen sink model, **cay** is not a part of the **ms** selection.) Every period, we select one of these models that gives the minimum cumulative prediction errors up to time t. This method is based on Rissanen (1986) and is recommended by Bossaerts and Hillion (1999). Essentially, this method uses our criterion of minimum OOS prediction errors to choose amongst competing models *in each time period* t. This is also similar in spirit to the use of a more conventional criterion (like R^2) in Pesaran and Timmerman (1995) (who do not entertain our NULL hypothesis). This selection model also shares a certain flavor with our encompassing tests in Section 7, where we seek to find an optimal rolling combination between each model and an unconditional historical equity premium average, and with the Bayesian model selection approach in Avramov (2002).

The latter two models, **cay** and **ms**, are revised every period, which render in-sample regressions problematic. This is also why we did not include **caya** in the kitchen sink specification.

3 Empirical Procedure

Our base regression coefficients are estimated using OLS, although statistical significance is always computed from bootstrapped F-statistics (taking correlation of independent variables into account).

OOS statistics: The OOS forecast uses only the data available up to the time at which the forecast is made. Let e_{N} denote the vector of rolling OOS errors from the historical mean model and e_{A} denote the vector of rolling OOS errors from the OLS model. Our OOS statistics are computed as

$$\begin{aligned} R^2 &= 1 - \frac{\text{MSE}_{\mathsf{A}}}{\text{MSE}_{\mathsf{N}}} \quad , \quad \overline{R}^2 = R^2 - (1 - R^2) \cdot \left(\frac{T-k}{T-1} \right) \qquad , \\ \Delta\text{RMSE} &= \sqrt{\text{MSE}_{\mathsf{N}}} - \sqrt{\text{MSE}_{\mathsf{A}}} \qquad , \\ \text{MSE-F} &= (T - h + 1) \cdot \left(\frac{\text{MSE}_{\mathsf{N}} - \text{MSE}_{\mathsf{A}}}{\text{MSE}_{\mathsf{A}}} \right) \qquad , \end{aligned} \tag{6}$$

where h is the degree of overlap ($h = 1$ for no overlap). MSE-F is McCracken's (2004) F-statistic. It tests for equal MSE of the unconditional forecast and the conditional forecast (i.e., ΔMSE = 0).[2] We generally do not report MSE-F statistics, but instead use their bootstrapped critical levels to provide statistical significance levels via stars in the tables.

For our encompassing tests in Section 7, we compute

$$\text{ENC} = \frac{T - h + 1}{T} \cdot \frac{\sum_{t=1}^{T} \left(e_{\mathsf{N}t}^2 - e_{\mathsf{N}t} \cdot e_{\mathsf{A}t} \right)}{\text{MSE}_{\mathsf{A}}} \qquad , \tag{7}$$

which is proposed by Clark and McCracken (2001). They also show that the MSE-F and ENC statistics follow non-standard distributions when testing nested models, because the asymptotic difference in squared forecast errors is exactly 0 with 0 variance under the NULL, rendering the standard distributions asymptotically invalid. Because our models are nested, we could use asymptotic critical values for MSE tests provided by McCracken, and asymptotic critical values for ENC tests provided by

---

[2] Our earlier drafts also entertained another performance metric, the mean absolute error difference ΔMAE. The results were similar. These drafts also described another OOS-statistic, MSE-T $= \sqrt{T + 1 - 2 \cdot h + h \cdot (h-1)/T} \cdot \left[\overline{d} / \widehat{se}\left(\overline{d} \right) \right]$, where $d_t = e_{\mathsf{N}t} - e_{\mathsf{A}t}$, and $\overline{d} = T^{-1} \cdot \sum_t^T d_t =$ MSE$_{\mathsf{N}}$ − MSE$_{\mathsf{A}}$ over the entire OOS period, and T is the total number of forecast observations. This is the Diebold and Mariano (1995) t-statistic modified by Harvey, Leybourne, and Newbold (1997). (We still use the latter as bounds in our plots, because we know the full distribution.) Again, the results were similar. We chose to use the MSE-F in this paper because Clark and McCracken (2001) find that MSE-F has higher power than MSE-T.

Clark and McCracken. However, because we use relatively small samples, because our independent variables are often highly serially correlated, and especially because we need critical values for our five-year *overlapping* observations (for which asymptotic critical values are not available), we obtain critical values from the bootstrap procedure described below. (The exceptions are that critical values for **caya**, **cayp**, and **all** models are not calculated using a bootstrap, and critical values for **ms** model are not calculated at all.) The NULL hypothesis is that the unconditional forecast is not inferior to the conditional forecast, so our critical values for OOS test are for a one-sided test (critical values of IS tests are, as usual, based on two-sided tests).[3]

Bootstrap: Our bootstrap follows Mark (1995) and Kilian (1999) and imposes the NULL of no predictability for calculating the critical values. In other words, the data generating process is assumed to be

$$\begin{aligned} y_{t+1} &= \alpha \qquad\qquad + u_{1t+1} \\ x_{t+1} &= \mu + \rho \cdot x_t + u_{2t+1} \qquad . \end{aligned}$$

The bootstrap for calculating power assumes the data generating process is

$$\begin{aligned} y_{t+1} &= \alpha + \beta \cdot x_t + u_{1t+1} \\ x_{t+1} &= \mu + \rho \cdot x_t + u_{2t+1} \qquad , \end{aligned}$$

where both β and ρ are estimated by OLS using the full sample of observations, with the residuals stored for sampling. We then generate 10,000 bootstrapped time series by drawing with replacement from the residuals. The initial observation—preceding the sample of data used to estimate the models—is selected by picking one date from the actual data at random. This bootstrap procedure not only preserves the autocorrelation structure of the predictor variable, thereby being valid under the

---

[3] If the regression coefficient β is small (so that explanatory power is low or the in-sample R^2 is low), it may happen that our unconditional model outperforms on OOS because of estimation error in the rolling estimates of β. In this case, ΔRMSE might be negative but still significant *because these tests are ultimately tests of whether β is equal to zero.*

Stambaugh (1999) specification, but also preserves the cross-correlation structure of the two residuals.[4]

Statistical Power: Our paper entertains both IS and OOS tests. Inoue and Kilian (2004) show that the OOS tests used in this paper are less powerful than IS tests, even though their size properties are roughly the same. Similar critiques of the OOS tests in our paper have been noted by Cochrane (2005) and Campbell and Thompson (2005). We believe this is the wrong way to look at the issue of power for two reasons:

1. It is true that under a well-specified stable underlying model, an IS OLS estimator is more efficient. Therefore, a researcher who has complete confidence in her underlying model specification (but not the underlying model parameters) should indeed rely on IS tests to establish significance—the alternative of OOS tests does have lower power. However, the point of any regression diagnostics, such as those for heteroskedasticity and autocorrelation, is always to subject otherwise seemingly successful regression models to a number of reasonable diagnostics when there is some model uncertainty. Relative to not running the diagnostic, by definition, any diagnostic that can reject the model at this stage sacrifices power *if* the specified underlying model is correct. In our forecasting regression context, OOS performance just happens to be one natural and especially useful diagnostic statistic. It can help determine whether a model is stable and well-specified, or changing over time, either suddenly or gradually.

   This also suggests why the simple power experiment performed in some of the aforementioned critiques of our own paper is wrong. It is unreasonable to propose a model if the IS performance is insignificant, regardless of its OOS performance. Reasonable (though not necessarily statistically significant) OOS performance is not a substitute, but a necessary complement for IS performance in order to establish the quality of the underlying model specification. The thought experiments and analyses in the critiques, which simply compare the power of

---

[4] We do not bootstrap for **cayp** because it is calculated using ex-post data; for **caya** and **ms** because these variables change each period; and for **all** because of computational burden.

OOS tests to that of IS tests, especially under their assumption of a correctly specified stable model, is therefore incorrect. The correct power experiment instead should explore whether *conditional on observed IS significance*, OOS diagnostics are reasonably powerful. We later show that they are.

Not reported in the tables, we also used the CUSUMQ test to test for model stability. Although this is a weak test, we can reject stability for all monthly models; and for all annual models except for **ntis**, **i/k**, and **cayp**, when we use data beginning in 1927. Thus, the CUSUMQ test sends the same message about the models as the findings that we shall report.

2. All of the OOS tests in our paper do not fail in the way the critics suggest. Low power OOS tests would produce relatively poor predictions early and relatively good predictions late in the sample. Instead, all of our models show the opposite behavior—good OOS performance early, bad OOS performance late.

   A simple alternative OOS estimator, which downweights early OOS predictions relative to late OOS predictions, would have more power than our unweighted OOS prediction test. Such a modified estimator would both be more powerful *and* it would show that all models explored in our paper perform even worse. (We do not use it only to keep it simple and to avoid a "cherry-picking-the-test" critique.)

Estimation Period: It is not clear how to choose the periods over which a regression model is estimated and subsequently evaluated. This is even more important for OOS tests. Although any choice is necessarily ad-hoc in the end, the criteria are clear. It is important to have enough initial data to get a reliable regression estimate at the start of evaluation period, and it is important to have an evaluation period that is long enough to be representative. We explore three time period specifications: the first begins OOS forecasts twenty years after data are available; the second begins OOS forecast in 1965 (or twenty years after data are available, whichever comes later); the third ignores all data prior to 1927 even in the estimation.[5] If a

---

[5] We also tried estimating our models only with data after World-War II, as recommended by

variable does not have complete data, some of these time-specifications can overlap. Using three different periods reflects different tradeoffs between the desire to obtain statistical power and the desire to obtain results that remain relevant today. In our graphical analysis later, we also evaluate the rolling predictive performance of variables. This analysis helps us identify periods of superior or inferior performance and can be seen as invariance to the choice of the OOS evaluation period (though not the estimation period).

4 Annual Prediction

Table 1: Annual Performance

Figure 1

Figure 2

Table 1 shows the predictive performance of the forecasting models on annual forecasting horizons. Figures 1 and 2 graph the IS and OOS performance of variables in Table 1. For the IS regressions, the performance is the cumulative squared demeaned equity premium minus the cumulative squared regression residual. For the OOS regressions, this is the cumulative squared prediction errors of the prevailing mean minus the cumulative squared prediction error of the predictive variable from the linear historical regression. Whenever a line increases, the ALTERNATIVE predicted better; whenever it decreases, the NULL predicted better. The units in the graphs are not intuitive, but the time-series pattern allows diagnosis of years with good or bad performance. Indeed, the final ΔSSE statistic in the OOS plot is sign-identical with the ΔRMSE statistic in our tables. The standard error of all the observations in the graphs is based on translating MSE-T statistic into symmetric 95% confidence intervals based on the McCracken (2004) critical values; the tables differ in using the MSE-F statistic instead.

The reader can easily adjust perspective to see how variations in starting or ending date would impact the conclusion—by shifting the graph up or down (redrawing the y=0 horizontal zero line). Indeed, a horizontal line and the right-side scale

---

Lewellen (2004). Some properties in some models change, especially when it comes to statistical significance and the importance of the Oil Shock for one variable, **d/p**. However, the overall conclusions of our paper remain.

indicate the equivalent zero-point for the second time period specification, in which we begin forecasts in 1965 (this is marked "Spec B Zero Val" line). The plots have also vertically shifted the IS errors, so that the IS line begins at zero on the date of our first OOS prediction. The Oil Shock recession of 1973 to 1975, as identified by the NBER, is marked by a vertical (red) bar in the figures.[6]

In addition to the figures and tables, we also summarize models' performances in small in-text summary tables, which give the IS-$\overline{R}^2$ and OOS-$\overline{R}^2$ for two time periods: the most recent 30 years and the entire sample period. The $\overline{R}^2$ for the subperiod is not the $\overline{R}^2$ for a different model estimated only over the most recent three decades, but the residual fit for the overall model over the subset of data points (e.g., computed simply as 1-SSE/SST for the last 360 residuals). The most recent three decades after the Oil Shock can help shed light on whether a model is likely to still perform well nowadays. Generally, it is easiest to understand the data by looking first at the figures, then at the in-text table, and finally at the full table.

A well-specified signal would inspire confidence in a potential investor if it had

1. both significant IS and reasonably good OOS performance over the entire sample period;
2. a generally upward drift (of course, an irregular one);
3. an upward drift which occurs not just in one short or unusual sample period—say just the two years around the Oil Shock;
4. an upward drift that remains positive over the most recent several decades—otherwise, even a reader taking the long view would have to be concerned with the possibility that the underlying model has drifted.

There are also other diagnostics that stable models should pass (heteroskedasticity, residual autocorrelation, etc.), but we do not explore them in our paper.

---

[6] The actual recession period was from November 1973 to March 1975. We treat both 1973 and 1975 as years of Oil Shock recession in annual prediction.

4.1 In-Sample Insignificant Models

As already mentioned, if a model has no IS performance, its OOS performance is not interesting. However, because some of the IS insignificant models are so prominent, and because it helps to understand why they may have been considered successful forecasters in past papers, we still provide some basic statistics and graph their OOS performance. The most prominent such models are the following:

Dividend Price Ratio: Figure 1 shows that there were four distinct periods for the **d/p** model, and this applies both to IS and OOS performance. **d/p** had mild underperformance from 1905 to WW-II, good performance from WW-II to 1975, neither good nor bad performance until the mid-1990s, and poor performance thereafter. The best sample period for **d/p** was from the mid 1930s to the mid 1980s. For the OOS, it was 1937 to 1984, although over half of the OOS performance was due to the Oil Shock. Moreover, the plot shows that the OOS performance of the **d/p** regression was consistently worse than the performance of its IS counterpart. The distance between the IS and OOS performance increased steadily until the Oil Shock.

Over the most recent 30 years (1976 to 2005), **d/p**'s performance is negative both IS and OOS. Over the entire period, **d/p** underperformed the prevailing mean OOS, too:

d/p	Recent 30 Years	All Years
IS $\overline{R}^2$	−4.80%	0.49%
OOS $\overline{R}^2$	−15.14%	−2.06%

Dividend Yield: Figure 1 shows that the **d/y** model's IS patterns look broadly like those of **d/p**. However, its OOS pattern was much more volatile: **d/y** predicted equity premia well during the Great Depression (1930 to 1933), the period from World War II to 1958, the Oil Shock of 1973-1975, and the market decline of 2000-2002. It had large prediction errors from 1958 to 1965 and from 1995 to 2000, and it had unremarkable performance in other years. The best OOS sample period started around 1925 and ended either in 1957 or 1975. The Oil Shock did not play an important role for **d/y**. Over the most recent 30 years, **d/y**'s performance is again negative IS and OOS. The full-sample OOS performance is also again negative:

d/y	Recent 30 Years	All Years
IS $\overline{R}^2$	-5.52%	0.91%
OOS $\overline{R}^2$	-20.79%	-1.93%

Earnings Price Ratio: Figure 1 shows that **e/p** had inferior performance until WW-II, and superior performance from WW-II to the late 1970s. After the Oil Shock, it had generally non-descript performance (with the exception of the late 1990s and early 2000s). Its best sample period was 1943 to 2002. 2003 and 2004 were bad years for this model. Over the most recent 30 years, **e/p**'s performance is again negative IS and OOS. The full-sample OOS performance is negative too.

e/p	Recent 30 Years	All Years
IS $\overline{R}^2$	-2.08%	1.08%
OOS $\overline{R}^2$	-5.98%	-1.78%

Table 1 shows that these three price ratios are not statistically significant IS at the 90% level. However, some disagreement in the literature can be explained by differences in the estimation period.[7]

---

[7] For example, the final lines in Table 1 show that **d/y** and **e/p** had positive and statistically significant IS performance at the 90% level if all data prior to 1927 is ignored. Nevertheless, Table 1 also shows that the OOS-$\overline{R}^2$ performance remains negative for both of these. Moreover, when the data begins in 1927 and the forecast begins in 1947 (another popular period choice), we find

(Data Begins in 1927)	**e/p**		**d/y**	
(Forecast Begins in 1947)	Recent 30 Years	All Years	Recent 30 Years	All Years
IS $\overline{R}^2$	-3.83%	3.20%	-5.20%	2.71%
OOS $\overline{R}^2$	-13.58%	3.41%	-28.05%	-16.65%

Finally, and again not reported in the table, another choice of estimation period can also make a difference. The three price models lost statistical significance over the full sample only in the 1990s. This is not because the IS-ΔRMSE has decreased further in the 1990's, but because the 1991–2005 prediction errors were more volatile, which raised the standard errors of point estimates.

Other Variables: The remaining plots in Figure 1 and the remaining IS insignificant models in Table 1 show that **d/e**, **dfy**, and **infl** essentially never had significantly positive OOS periods, and that **svar** had a huge drop in OOS performance from 1930 to 1933. Other variables (that are IS insignificant) often had good sample performance early on, ending somewhere between the Oil Shock and the mid-1980s, followed by poor performance over the most recent three decades. The plots also show that it was generally not just the late 1990s that invalidated them, unlike the case with the aforementioned price ratio models.

In sum, twelve models had insignificant in-sample full-period performance and, not surprisingly, these models generally did not offer good OOS performance.

4.2 In-Sample Significant Models

Five models were significant IS (**b/m**, **i/k**, **ntis**, **eqis**, and **all**) at least at the 10% two-sided level. Table 1 contains more details for these variables, such as the IS performance during the OOS period, and a power statistic. Together with the plots in Figure 2, this information helps the reader to judge the stability of the models—whether poor OOS performance is driven by less accurately estimated parameters (pointing to lower power), and/or by the fact that the model fails IS and/or OOS during the OOS sample period (pointing to a spurious model).

Book-market ratio: **b/m** is statistically significant at the 6% level IS. Figure 2 shows that it had excellent IS and OOS predictive performance right until the Oil Shock. Both its IS and OOS performance were poor from 1975 to 2000, and the recovery in 2000-2002 was not enough to gain back the 1997-2000 performance. Thus, the **b/m** model has negative performance over the most recent three decades, both IS and OOS.

b/m	Recent 30 Years	All Years
IS $\overline{R}^2$	–12.37%	3.20%
OOS $\overline{R}^2$	–29.31%	–1.72%

Over the entire sample period, the OOS performance is negative, too. The “IS for OOS” $\overline{R}^2$ in Table 1 shows how dependent **b/m**’s performance is on the first 20 years of the sample. The IS $\overline{R}^2$ is -7.29% for the 1965-2005 period. The comparable OOS $\overline{R}^2$ even reaches -12.71%.

As with other models, **b/m**’s lack of OOS significance is not just a matter of low test power. Table 1 shows that in the OOS prediction beginning in 1941, under the simulation of a stable model, the OOS statistic came out *statistically significantly* positive in 67%[8] of our (stable-model) simulations in which the IS regression was significant. Not reported in the table, positive performance (significant or insignificant) occurred in 78% of our simulations. A performance as negative as the observed ΔRMSE of -0.01 occurred in *none* of the simulations.

Investment-capital ratio: **i/k** is statistically significant IS at the 5% level. Figure 2 shows that, like **b/m**, it performed well only in the first half of its sample, both IS and OOS. About half of its performance, both IS and OOS, occurs during the Oil Shock. Over the most recent 30 years, **i/k** has underperformed:

i/k	Recent 30 Years	All Years
IS $\overline{R}^2$	-8.09%	6.63%
OOS $\overline{R}^2$	-18.02%	-1.77%

Corporate Issuing Activity: Recall that **ntis** measures equity issuing and repurchasing (plus dividends) relative to the price level; **eqis** measures equity issuing relative to debt issuing. Figure 2 shows that both variables had superior IS performance in the early 1930’s, a part of the sample that is not part of the OOS period. **eqis** continues good performance into the late 1930’s but gives back the extra gains immediately thereafter. In the OOS period, there is one stark difference between the two variables: **eqis** had superior performance during the Oil Shock, both IS and

---

[8] The 42% applies to draws that were not statistically significant in-sample at the 90% level. It is the equivalent of the experiment conducted in some other papers. However, because OOS performance is relevant only when the IS performance is significant, this is the wrong measure of power.

OOS. It is this performance that makes **eqis** the only variable that had statistically significant OOS performance in the annual data. In other periods, neither variable had superior performance during the OOS period.

Both variables underperformed over the most recent 30 years

	ntis		**eqis**	
	Recent 30 Years	All Years	Recent 30 Years	All Years
IS $\overline{R}^2$	−5.14%	8.15%	−10.36%	9.15%
OOS $\overline{R}^2$	−8.63%	−5.07%	−15.33%	2.04%

The plot can also help explain dueling perspectives about **eqis** between Butler, Grullon, and Weston (2005) and Baker, Taliaferro, and Wurgler (2004). One part of their disagreement is whether **eqis**'s performance is just random underperformance in sampled observations. Of course, some good years are expected to occur in any regression. Yet **eqis**'s superior performance may not have been so random, because it [a] occurred in consecutive years, and [b] in response to the Oil Shock events that are often considered to have been exogenous, unforecastable, and unusual. Butler, Grullon, and Weston also end their data in 2002, while Baker, Taliaferro, and Wurgler refer to our earlier draft and to Rapach and Wohar (2006), which end in 2003 and 1999, respectively. Our figure shows that small variations in the final year choice can make a difference in whether **eqis** turns out significant or not. In any case, both papers have good points. We agree with Butler, Grullon, and Weston that **eqis** would not have been a profitable and reliable predictor for an external investor, especially over the most recent 30 years. But we also agree with Baker, Taliaferro, and Wurgler that conceptually, it is not the OOS performance, but the IS performance that matters in the sense in which Baker and Wurgler (2000) were proposing **eqis**—not as a third-party predictor, but as documentary evidence of the fund-raising behavior of corporations. Corporations did repurchase profitably in the Great Depression and the Oil Shock era (though not in the "bubble period" collapse of 2001-2002).

all The final model with IS significance is the kitchen sink regression. It had high IS significance, but exceptionally poor OOS performance.

4.3 Time-Changing Models

caya and **ms** have no in-sample analogs, because the models themselves are constantly changing.

Consumption-Wealth-Income: Lettau and Ludvigson (2001) construct their **cay** proxy assuming that agents have some ex-post information. The experiment their study calls OOS is unusual: their representative agent still retains knowledge of the model's full-sample CAY-*construction* coefficients. It is OOS only in that the agent does not have knowledge of the *predictive* coefficient and thus has to update it on a running basis. We call the Lettau and Ludvigson (2001) variable **cayp**. We also construct **caya**, which represents a more genuine OOS experiment, in which investors are not assumed to have advance knowledge of the **cay** construction estimation coefficients.

Figure 2 shows that **cayp** had superior performance until the Oil Shock, and nondescript performance thereafter. It also benefited greatly from its performance during the Oil Shock itself.

cay	Recent 30 Years	All Years
some ex-post knowledge, **cayp** IS $\overline{R}^2$	10.52%	15.72%
some ex-post knowledge, **cayp** OOS $\overline{R}^2$	7.60%	16.78%
no advance knowledge, **caya** OOS $\overline{R}^2$	–12.39%	–4.33%

The full-sample **cayp** result confirms the findings in Lettau and Ludvigson (2001). **cayp** outperforms the benchmark OOS RMSE by 1.61% per annum. It is stable and its OOS performance is almost identical to its IS performance. In contrast to **cayp**, **caya** has had no superior OOS performance, either over the entire sample period or the most recent years. In fact, without advance knowledge, **caya** had the worst OOS $\overline{R}^2$ performance among our single variable models.

Model Selection Finally, **ms** fails with a pattern similar to earlier variables—good performance until 1976, bad performance thereafter.

ms	Recent 30 Years	All Years
IS $\overline{R}^2$	–	–
OOS $\overline{R}^2$	–43.40%	–22.50%

Conclusion: There were a number of periods with sharp stock market changes, such as the Great Depression of 1929–1933 (in which the S&P500 dropped from 24.35 at the end of 1928 to 6.89 at the end of 1932) and the "bubble period" from 1999–2001 (with its subsequent collapse). However, it is the Oil Shock recession of 1973–1975, in which the S&P500 dropped from 108.29 in October 1973 to 63.54 in September 1974—and its recovery back to 95.19 in June 1975—that stands out. Many models depend on it for their apparent forecasting ability, often both IS and OOS. (And none performs well thereafter.) Still, we caution against overreading or underreading this evidence. In favor of discounting this period, the observed source of significance seems unusual, because the important years are consecutive observations during an unusual period. (They do not appear to be merely independent draws.) In favor of not discounting this period, we do not know how one would identify these special multi-year periods ahead of time, except through a model. Thus, good prediction during such a large shock should not be automatically discounted. More importantly and less ambiguously, no model seems to have performed well since—that is, over the last thirty years.

In sum, on an annual prediction basis, there is no single variable that meets all of our four suggested investment criteria from Page 14 (IS significance, OOS performance, reliance not just on some outliers, and good positive performance over the last three decades.) Most models fail on all four criteria.

5 Five-Yearly Prediction

Table 2:
Five-Yearly
Frequency

Some models may predict long-term returns better than short-term returns. Unfortunately, we do not have many years to explore 5-year predictions thoroughly, and there are difficult econometric issues arising from data overlap. Therefore, we only briefly describe some preliminary and perhaps naive findings. (See, e.g., Boudoukh, Richardson, and Whitelaw (2005) and Lamoureux and Zhou (1996) for more detailed treatments.) Table 2 repeats Table 1 with 5-year returns. As before, we bootstrap all critical significance levels. This is especially important here, because the observations are overlapping and the asymptotic critical values are not available.

Table 2 shows that there are four models that are significant IS over the entire sample period: **ntis**, **d/p**, **i/k**, and **all**. **ntis** and **i/k** were also significant in the annual data (Table 1). Two more variables, **d/y** and **tms**, are IS significant if no data prior to 1927 is used.

Dividend Price Ratio: **d/p** had negative performance OOS regardless of period.

Term Spread: **tms** is significant IS only if the data begins in 1927 rather than 1921. An unreported plot shows that **tms** performed well from 1968–1979, poorly from 1979–1986, and then well again from 1986–2005. Indeed, its better years occur in the OOS period, with an IS $\overline{R}^2$ of 23.54% from 1965-2005. This was sufficient to permit it to turn in a superior OOS ΔRMSE performance of 2.77% per five-years—a meaningful difference. On the negative side, **tms** has positive OOS performance *only* if forecasting begins in 1965. Using 1927–2005 data and starting forecasts in 1947, the OOS ΔRMSE and $\overline{R}^2$ are negative.

The Kitchen Sink: **all** again turned in exceptionally poor OOS performance.

Model selection (**ms**) and **caya** again have no in-sample analogs. **ms** had the worst predictive performance observed in this paper. **caya** had good OOS performance of 2.50% per five-year period. Similarly, the investment-capital ratio, **i/k**, had both positive IS and OOS performance, and both over the most recent three decades as well as over the full sample (where it was also statistically significant).

i/k	Recent 30 Years	All Years
IS $\overline{R}^2$	30.60%	33.99%
OOS $\overline{R}^2$	28.00%	12.99%

i/k's performance is driven by its ability to predict the 2000 crash. In 1997, it had already turned negative on its 1998-2002 equity premium prediction, thus predicting the 2000 collapse, while the unconditional benchmark prediction continued with its 30% plus predictions:

Forecast made in	for years	Actual EqPm	Forecast Unc.	**i/k**	Forecast made in	for years	Actual EqPm	Forecast Unc.	**i/k**
1995	1996-2000	0.58	0.30	0.22	1998	1999-2003	−0.19	0.33	−0.09
1996	1997-2001	0.27	0.31	0.09	1999	2000-2004	−0.25	0.34	−0.07
1997	1998-2002	−0.23	0.31	−0.01	2000	2001-2005	−0.08	0.34	−0.06

This model (and perhaps **caya**) seem promising. We hesitate to endorse them further only because our inference is based on a small number of observations, and because statistical significance with overlapping multi-year returns raises a set of issues that we can only tangentially address. We hope more data will allow researchers to explore these models in more detail.

6 Monthly Prediction and Campbell-Thompson

Table 3 describes the performance of models predicting monthly equity premia. It also addresses a number of points brought up by Campbell and Thompson (2005), henceforth CT. We do not have dividend data prior to 1927, and thus no reliable equity premium data before then. This is why even our the estimation period begins only in 1927.

Table 3: Monthly and Campbell and Thompson Analysis

6.1 In-Sample Performance

Table 3 presents the performance of monthly predictions both IS and OOS. The first data column shows the IS performance when the predicted variable is logged (as in the rest of the paper). Eight out of eighteen models are in-sample significant at the 90% level, seven at the 95% level. Because CT use simple rather than log equity premia, the remaining data columns follow their convention. This generally improves the predictive power of most models, and the fourth column (by which rows are sorted) shows that three more models turn in statistically significant IS.[9]

CT argue that a reasonable investor would not have used a models to forecast a negative equity premium. Therefore, they suggest truncation of such predictions at zero. In a sense, this injects caution into the models themselves, a point we agree with. Because there were high equity premium realizations especially in the 1980s and 1990s, a time when many models were bearish, this constraint can improve performance. Of course, it also transforms formerly linear models into non-linear models, which are generally not the subject of our paper. CT do *not* truncate predictions in their in-sample regressions, but there is no reason not to do so. Therefore, the fifth column shows a revised IS $\overline{R}^2$ statistic. Some models now perform better, some perform worse.

6.2 Out-of-Sample Prediction Performance

The remaining columns explore the OOS performance. The sixth column shows that without further manipulation, **eqis** is the only model with both superior IS ($\overline{R}^2$=0.82% and 0.80%) and OOS ($\overline{R}^2$ = 0.14%) untruncated performance. The term-spread, **tms**, has OOS performance that is even better ($\overline{R}^2$ = 0.22%), but it just misses statistical

---

[9] Geert Bekaert pointed out to us that if returns are truly log-normal, part of their increased explanatory power could be due to the ability of these variables to forecast volatility.

significance IS at the 90% level. **infl** has marginally good OOS performance, but poor IS performance. All other models have negative IS or OOS untruncated $\overline{R}^2$.

The remaining columns show model performance when we implement the Campbell and Thompson (2005) suggestions. The seventh column describes the frequency of truncation of negative equity premium predictions. For example, **d/y**'s equity premium predictions are truncated to zero in 54.2% of all months; **csp**'s predictions are truncated in 44.7% of all months. Truncation is a very effective constraint.

CT also suggest using the unconditional model if the theory offers one coefficient sign and the estimation comes up with the opposite sign. For some variables, such as the dividend ratios, this is easy. For other models, it is not clear what the appropriate sign of the coefficient would be. In any case, this matters little in our data set. The eighth column shows that the coefficient sign constraint matters only for **dfr**, and **ltr** (and mildly for **d/e**). None of these three models has IS performance high enough to make this worthwhile to explore further.

The ninth and tenth columns, $\overline{R}^2{}_{\mathrm{TU}}$ and $\Delta\mathrm{RMSE}_{\mathrm{TU}}$, show the effect of the CT truncations on OOS prediction. For many models, the performance improves. Nevertheless, the OOS $\overline{R}^2$'s remain generally much lower than their IS equivalents. Some models have positive ΔRMSE but negative OOS $\overline{R}^2$. This reflects the number of degrees of freedom: even though we have between 400 and 800 data months, the plain ΔRMSE and R^2 are often so small that the $\overline{R}^2$ turns negative. For example, even with over 400 months of data, the loss of three degrees of freedom is enough for **cay3** to render a positive ΔRMSE of 0.0088 (equivalent to an unreported unadjusted-R^2 of 0.0040) into a negative adjusted-R^2 of −0.0034.

Even after these truncations, ten of the models that had negative plain OOS $\overline{R}^2$'s still have negative CT OOS $\overline{R}^2$'s. Among the eleven IS significant models, seven (**cay3**, **ntis**, **e^{10}/p**, **b/m**, **e/p**, **d/y**, and **dfy**) have negative OOS $\overline{R}^2$ performance even after the truncation. Three of the models (**lty**, **ltr**, and **infl**) that benefit from the OOS truncation are not close to statistical significance IS, and thus can be ignored. All in all, this leaves four models that are both OOS and IS positive and significant:

csp, **eqis**, **d/p**, **tbl**, plus possibly **tms** (which is just barely not IS significant). We investigate these models further below.

6.3 OOS Utility Performance of a Trading Strategy

Like Brennan and Xia (2004), CT also propose to evaluate the OOS usefulness of models based on the certainty equivalence (CEV) measure of a trading strategy. Specifically, they posit a power-utility investor with an assumed risk-aversion parameter, γ, of three. This allows a conditional model to contribute to an investment strategy not just by increasing the mean trading performance, but also by reducing the variance. (Breen, Glosten, and Jagannathan (1989) have shown this to be a potentially important factor.)

Although the focus of our paper is on mean prediction, we know of no better procedure to judge the economic significance of forecasting models, and therefore follow their suggestion here. To prevent extreme investments, there is a 150% maximum equity investment. A positive investment weight is guaranteed by the truncation of equity premium predictions at zero.

CT show that even a small improvement in ΔRMSE by a model over the unconditional benchmark can translate into CEV gains that are ten times as large.[10] We can confirm this—and almost to a fault. **cay3** offers 6.1bp/month performance, even though it had a negative $\overline{R}^2$. Column 12 also shows that even models that have a negative OOS ΔRMSE (not just a negative $\overline{R}^2$), like **dfr**, can produce positive gains in CEV. This is because the risk-aversion parameter gamma of 3 is low enough to favor equity-tilted strategies. Put differently, some strategy CEV gains are due to the fact that the risky equity investment was a better choice than the risk-free rate in our

---

[10] CT show in equation (8) of their paper that the utility gain is roughly equal to OOS-R^2/γ. This magnification effect occurs only on the monthly horizon, because the difference between OOS-R^2 and the ΔRMSE scales with the square root of the forecasting horizon (for small ΔRMSE, OOS-$R^2 \approx 2\cdot$ΔRMSE/StdDev(R)). That is, at a monthly frequency, the OOS-R^2 is about 43 times as large as ΔRMSE. On an annual prediction basis, this number drops from 43 to 12. An investor with a risk aversion of 10 would therefore consider the economic significance on annual investment horizon to be roughly the same as the ΔRMSE we consider. (We repeated the CT CEV equivalent at annual frequency to confirm this analysis.)

data. (This applies not only to strategies based on the conditional models, but also to the strategy based on the unconditional mean.) An alternative utility specification that raises the risk-aversion coefficient to 7.48 would have left an investor indifferent between the risk-free and the equity investments. Briefly considering this parameter can help judge the role of equity bias in a strategy; it does seem to matter for the **eqis** and **tms** models, as explained below.

In order, among the IS reasonably significant models, those providing positive CEV gains were **tms** (14bp/month), **eqis** (14bp/month), **tbl** (10bp/month), **csp** (6bp/month), **cay3**(6bp/month), and **ntis** (2bp/month).

6.4 Details

We now look more closely at the set of variables with potentially appealing forecasting characteristics. **csp**, **eqis**, **tbl**, and **tms** have positive IS performance (either statistically significant or close to it), positive OOS $\overline{R}^2$ (truncated), and positive CEV gains. **cay3** and **ntis** have negative OOS $\overline{R}^2$, but very good IS performance and positive CEV gains. **d/p** has a negative CEV gain, but is positive IS and OOS $\overline{R}^2$. Thus, we describe these seven models in more detail (and with equivalent graphs):

Figure 3

1. **cay3:** The best CT performer is an alternative **cay** model that also appears in Lettau and Ludvigson (2005). It predicts the equity premium not with the linear **cay**, but with all three of its highly cointegrated ingredients up to date. We name this model **cay3**. In unreported analysis, we found that the **cay** model and **cay3** models are quite different. For most of the sample period, the unrestricted predictive regression coefficients of the **cay3** model wander far off their cointegration-restricted **cay** equivalents. The model may not be as well-founded theoretically as the Lettau and Ludvigson (2001) **cay**, but if its components are known ex-ante, then **cay3** is fair game for prediction.

   Table 3 shows that **cay3** has good performance IS, but only marginal performance OOS (a positive ΔRMSE, but a negative $\overline{R}^2$). It offers good CEV gains among the models considered, an extra 6.10 bp/month. The *h* superscript indicates that its trading strategy requires an extra 10% more trading turnover than the unconditional model. It also reaches the maximum permitted 150% equity investment in 13.2% of all months.

A first drawback is that the **cay3** model relies on data that may not be immediately available. Its components are publicly released by the BEA about 1-2 months after the fact. Adding just one month delay to trading turns **cay3**'s performance negative:

	ΔRMSE	$\Delta\text{RMSE}_{\text{TU}}$	ΔCEV
Immediate Availability (CT)	−2.88 bp	+0.88 bp	+6.10 bp
One Month Delayed	−5.10 bp	−1.62 bp	−11.82 bp
Two Months Delayed	−5.38 bp	−1.11 bp	−9.80 bp

A second drawback is visible in Figure 3. Like **caya** and **cayp**, much of **cay3**'s performance occurs around the Oil Shock (most of its OOS performance and between one-half and one-third of its IS performance). Even IS, **cay3** has not performed well for over 30 years now:

cay3 (CT)	Recent 30 Years	All Years
IS $\overline{R}^2$	−0.30%	1.87%
OOS $\overline{R}^2$	−1.60%	−0.34%

Finally, the figure shows that many of **cay3**'s recent equity premium forecasts have been negative and therefore truncated. And, therefore, the information in its current forecasts is limited.

2. **csp:** Table 3 shows that the relative valuations of high- over low-beta stocks had good IS and truncated OOS performance, and offered a market timer 6.12 bp/month superior CEV-equivalent performance. The plot in Figure 3 shows that **csp** had good performance from September 1965 to March 1980. It underperformed by just as much from about April 1980 to October 2000. In fact, from its first OOS prediction in April 1957 to August 2001, **csp**'s total net performance

was zero even after the CT truncations, and both IS and OOS. All of **csp**'s superior OOS performance has occurred since mid-2001. Although it is commendable that it has performed well late rather than early, better performance over its first 45 years would have made us deem this variable more reliable.

The plot raises one other puzzle. The CT truncated version performs better than the plain OLS version because it truncated the **csp** predictions from July 1957 through January 1963. These CT truncations are critically responsible for its superior OOS performance, but make no difference thereafter. It is the truncation treatment of these specific 66 months that would make an investor either believe in superior positive or inferior outright negative performance for **csp** (from August 2001 to December 2005). We do not understand why the particular 66 month period from 1957 to 1963 is so crucial.

Finally, the performance during the Oil Shock recession is not important for IS performance, but it is for the OOS performance. It can practically account for its entire out-of-sample performance. Since the Oil Shock, **csp** has outperformed IS, but not OOS:

csp (CT)	Recent 30 Years	All Years
IS $\overline{R}^2$	0.33%	0.99%
OOS $\overline{R}^2$	-0.41%	0.15%

3. **ntis:** Net issuing activity had good IS performance, but a negative OOS $\overline{R}^2$. Its CEV gain is a tiny 1.53 bp/month. These 1.53 bp are likely to be offset by trading costs to turn over an additional 4.6% of the portfolio every month.[11] The strategy was very optimistic, reaching the maximum 150% investment constraint in 57.4% of all months. We do not report it in the table, but an investor with a higher 7.48 risk-aversion parameter, who would not have been so eager to highly lever herself

---

[11] Keim and Madhavan (1997) show that one typical roundtrip trade in large stocks for institutional investors would have conservatively cost around 38 bp from 1991–1993. Costs for other investors and earlier time-periods were higher. Futures trading costs are not easy to gauge, but a typical contract for a notional amount of $250,000 costs around $10-$30. A 20% movement in the underlying index—about the annual volatility—would correspond to $50,000, which would come to around 5 bp.

into the market, would have experienced a negative CEV with an **ntis** optimized trading strategy. Finally, the plot shows that almost all of the **csp** model's IS power derives from its performance during the Great Depression. There was really only a very short window from 1982 to 1987 when **csp** could still perform well.

4. **eqis:** Equity Issuing Activity had good IS performance, good OOS performance, and improved the CEV for an investor by a meaningful 13.67 bp/month. It, too, was an optimistic equity-aggressive strategy. With a $\gamma = 3$, trading based on this variable leads to the maximum permitted equity investment of 150% in 56% of all months. Not reported, with the higher risk-aversion coefficient of 7.48, that would leave an investor indifferent between bonds and stocks, the 13.67bp/month gain would shrink to 8.74bp/month.

   As in the annual data, Figure 3 shows that **eqis**'s performance relies heavily on the good Oil Shock years. It has not performed well in the last thirty years.

eqis (CT)	Recent 30 Years	All Years
IS $\overline{R}^2$	–0.88%	0.80%
OOS $\overline{R}^2$	–1.00%	0.30%

5. **d/p:** The dividend price ratio has good IS and OOS $\overline{R}^2$. (The OOS $\overline{R}^2$ is zero when predicting log premia.) An investor trading on **d/p** would have lost the CEV of 10bp/month. (Not reported, a more risk-averse investor might have broken even.) The plot shows that **d/p** has not performed well over the last 30 years; **d/p** has predicted negative equity premia since January 1992.

d/p (CT)	Recent 30 Years	All Years
IS $\overline{R}^2$	–0.39%	0.33%
OOS $\overline{R}^2$	–1.09%	0.17%

6. **tbl:** The short rate is insignificant IS if we forecast log premia. If we forecast unlogged premia, it is statistically significant IS at the 9% level, although this declines further if we apply the CT truncation. In its favor, **tbl**'s full-sample CT-truncated performance is statistically significant OOS, and it offers a respectable 9.53 bp/month market timing advantage. The plot shows that this is again largely Oil Shock dependent. **tbl** has offered no advantage over the last thirty years.

tbl (CT)	Recent 30 Years	All Years
IS $\overline{R}^2$	−0.41%	0.20%
OOS $\overline{R}^2$	−1.06%	0.25%

7. **tms:** The term-spread has IS significance only at the 10.1% level. (With logged returns, this drops to the 14.5% level.) Nevertheless, **tms** had solid OOS performance, either with or without the CT truncation. As a consequence, its CEV gain was a respectable 14.40 bp/month. Not reported in the table, when compared to the CEV gain of an investor with a risk-aversion coefficient of 7.48, we learn that about half of this gain comes from the fact that the term-spread was equity heavy. (It reaches its maximum of 150% equity investment in 59.3% of all months.) The figure shows that TMS performed well in the period from 1970 to the mid-1980s, that TMS has underperformed since then, and that the Oil Shock gain was greater than the overall OOS sample performance of **tms**. Thus,

tms (CT)	Recent 30 Years	All Years
IS $\overline{R}^2$	-0.19%	0.18%
OOS $\overline{R}^2$	-0.81%	0.21%

b/m, **e/p**, **e^{10}/p**, **d/y**, and **dfy** have negative OOS $\overline{R}^2$ and/or CT CEV gains, and so are not further considered. The remaining models have low or negative IS $\overline{R}^2$, and therefore should not be considered, either. Not reported, among the models that are IS insignificant, but OOS significant, none had positive performance from 1975 to today.

6.5 Comparing Findings and Perspectives

The numbers we report are slightly different from those in Campbell and Thompson (2005). In particular, they report **cay3** to have a ΔRMSE of 0.0356, more than the 0.0088 we report. This can be traced back to three equally important factors: they end their data 34 months earlier (in 2/2003), they begin their estimation one month later (1/1952), and they use an earlier version of the **cay** data from Martin Lettau's website. Differences in other variables are sometimes due to use of pre-1927 data (relying on price changes because returns are not available) for estimation though not prediction, while we exclude all pre-1927 data.

More importantly, our perspective is different from CT's. We believe that the data suggests not only that these models are not good enough for actual investing, but also that the models are not stable. Therefore, by and large, we consider even their IS significance to be dubious. Because they fail stability diagnostics, we would recommend against their continued use. Still, we can agree with some points CT raise:

1. One can reasonably truncate the models' predictions.
2. On shorter horizons, even a small predictive ΔRMSE difference can gain a risk-averse investor good CEV gains.
3. OOS performance should not be used for primary analysis.

We draw different conclusions from this last point. We view OOS performance not as a substitute but as a necessary complement to IS performance. We consider it to be an important regression *diagnostic*, and *if and only if* the model is significant IS. Consequently, we disagree with the CT analysis of the statistical power of OOS tests. In our view, because the OOS power matters only if the IS regression is statistically significant, the power of the OOS tests is conditional and thus much higher than suggested in CT, Cochrane (2005), and elsewhere. Of course, any additional diagnostic test can only reject a model—if an author is sure that the linear specification is correct, then not running the OOS test surely remains more powerful.

In judging the usefulness of these models, our paper attaches more importance than CT to the following facts:

1. Most models are not IS significant. That is, many variables in the academic literature no longer have IS significance (even at the 90% level). It is our perspective that this disqualifies them as forecasters for researchers without strong priors.
2. After three decades of poor performance, often even IS, one should further doubt the stability of most prediction models.
3. Even after the CT truncation, many models earn negative CEV gains.
4. What we call OOS performance is not truly OOS, because it still relies on the same data that was used to establish the models. (This is especially applicable to **eqis** and **csp**, which were only recently proposed.)
5. For practical use, an investor would have had to have known *ex-ante* which of the models would have held up, and that none of the models had superior performance over the last three decades—in our opinion because the models are unstable.

We believe it is now best left to the reader to concur either with our or CT's perspective. (The data is posted on the website.)

7 Alternative Specifications

We now explore some other models and specifications which have been proposed as improvements over the simple regression specifications.

7.1 Longer-Memory Dividend and Earnings Ratios

Table 4 considers dividend-price ratios, earnings-price ratios, and dividend-earnings ratios with memory (which simply means that we consider sums of multiple year dividends or earnings in these ratios). The table is an excerpt from a complete set of 1-year, 5-year, and 10-year dividend-price ratios, earnings-price ratios, and dividend-earnings ratios. (That is, we tried all 90 possible model combinations.) The table contains *all* 27 IS significant specifications from our monthly regressions that begin forecasting in 1965, and from our annual and five-yearly forecasts that begin forecasting either in 1902 or 1965.

Table 4: Long-Memory Ratios

Even though there were more combinations of dividend-earnings ratios than either dividend-price or earnings-price ratios, not a single dividend-earnings ratio turned out IS statistically significant. The reader can also see that out of our 27 IS significant models, only 5 had OOS positive and statistically significant performance. (For 2 of these models, the OOS significance is modest, not even reaching the 95% significance level.) Unreported graphs show that none of these performed well over the last 3 decades. (We also leave it to the readers to decide whether they believe that real-world investors would have been able to choose the right five models for prediction, and to get out right after the Oil Shock.)

7.2 Different Estimation Methods To Improve Power For Nonstationary Independent Variables

Stambaugh (1999) shows that predictive coefficients in small samples are biased if the independent variable is close to a random walk. Many of our variables have autoregressive coefficients above 0.5 on monthly frequency. Goyal and Welch (2003) show that **d/p** and **d/y**'s auto-correlations are not stable but themselves increase over the sample period, and similar patterns occur with other variables in our study. (The exceptions are **ntis**, **ltr**, and **dfy**.) Our previously reported statistics took stable positive autoregressive coefficients into account, because we bootstrapped for significance levels mimicking the IS autocorrelation of each independent variable.

However, one can use this information itself to also design more powerful tests. Compared to the plain OLS techniques in our preceding tables, the Stambaugh coefficient correction is a more powerful test in non-asymptotic samples. There is also information that the autocorrelation is not constant for the dividend ratios, which we are ignoring in our current paper. Goyal and Welch (2003) use rolling dividend-price ratio and dividend-growth autocorrelation estimates as instruments in their return predictions. This is model specific, and thus can only apply to one model, the dividend price ratio (**d/p**). In contrast, Lewellen (2004) and Campbell and Yogo (2006) introduce two further statistical corrections, extending Stambaugh (1999) and assuming different boundary behavior. This subsection, therefore, explores equity premium forecasts using these corrected coefficients.

Table 5: Stambaugh and Lewellen Estimation Corrections for Non-stationary Independent Variables

In Table 5, we predict with Stambaugh and Lewellen corrected coefficients. Both methods break the link between $\overline{R}^2$ (which is maximized by OLS) and statistical significance. The Lewellen coefficient is often dramatically different from the OLS coefficients, resulting in negative $\overline{R}^2$, even among its IS significant variable estimations. However, it is also tremendously powerful. Given our bootstrapped critical rejection levels under the NULL hypothesis, this technique is able to identify eight (rather than just three) ALTERNATIVE models as different from the NULL. In six of them, it even imputes significance in each and every one of our 10,000 bootstraps!

Unfortunately, neither the Stambaugh nor the Lewellen technique manages to improve OOS prediction. Of all models, only the **e/p** ratio in the Lewellen specification seems to perform better with a positive ΔRMSE. However, like other variables, it has not performed particularly well over the most recent 30 years—even though it has non-negative OOS ΔRMSE (but not $\overline{R}^2$) performance over the last three decades.

e/p (Lewellen)	Recent 30 Years	All Years
IS $\overline{R}^2$	-0.16%	0.02%
OOS $\overline{R}^2$	-0.08%	-0.01%

7.3 Encompassing Tests

Our next tests use encompassing predictions. A standard encompassing test is a hybrid of ex-ante OOS predictions and an ex-post optimal convex combination of unconditional forecast and conditional forecast. A parameter λ gives the ex-post weight on the conditional forecast for the optimal forecast that minimizes the ex-post MSE. The ENC statistic in equation (7) can be regarded as a test statistic for λ. If λ is between 0 and 1, we can think of the combination model as a "shrinkage" estimator. It produces an optimal combination OOS forecast error, which we denote ΔRMSE*. However, investors would not have known the optimal *ex-post* λ. This means that they would have computed λ based on the best predictive up-to-date combination of the two OOS model (NULL and ALTERNATIVE), and then would have used this λ to forecast one month ahead. We denote the relative OOS forecast error of this rolling λ procedure as ΔRMSE$^{\star r}$.[12]

Table 6: Encompassing Tests

Table 6 shows the results of encompassing forecast estimates. Panel A predicts annual equity premia. Necessarily, all ex-post λ combinations have positive ΔRMSE*— but almost all rolling λ combinations have negative ΔRMSE$^{\star r}$. The exceptions are **d/e** and **cayp** (with OOS knowledge). In some but not all specifications, this also applies to **dfy**, **all**, and **caya**. **d/e**, **dfy**, and **all** can immediately be excluded, because their optimal λ is negative. This leaves **caya**. Again, not reported, **caya** could not outperform over the most recent three decades. In the monthly rolling encompassing tests (not reported), only **svar** and **d/e** (in one specification) are positive, neither with a positive λ.

In sum, "learned shrinking" does not improve any of our models to the point where we would expect them to outperform.

---

[12] For the first three observations, we presume perfect optimal foresight, resulting in the minimum ΔRMSE. This tilts the rolling statistic slightly in favor of superior performance. The results remain the same if we use reasonable variations.

8 Other Literature

Our paper is not the first to explore or to be critical of equity premium predictions. Many bits and pieces of evidence we report have surfaced elsewhere, and some authors working with the data may already know which models work, and when and why—but this is not easy to systematically determine for a reader of this literature. There is also a publication bias in favor of significant results—non-findings are often deemed less interesting. Thus, the general literature tenet has remained that the empirical evidence and professional consensus is generally supportive of predictability. This is why we believe that it is important for us to review models in a comprehensive fashion—variable-wise, horizon-wise, and time-wise—and to bring all variables up-to-date. The updating is necessary to shed light on post-Oil Shock behavior and explain some otherwise startling disagreements in the literature.

There are many other papers that have critiqued predictive regressions. In the context of dividend ratios, see, e.g., Goetzmann and Jorion (1993) and Ang and Bekaert (2003). A number of papers have also documented low in-sample power (e.g., see Goetzmann and Jorion (1993), Nelson and Kim (1993), and Valkanov (2003)). We must apologize to everyone whose paper we omit to cite here—the literature is simply too voluminous to cover fully.

The papers that explore model instability and/or OOS tests have the closest kinship to our own. The possibility that the underlying model has changed (often through regime shifts) has also been explored in such papers as Heaton and Lucas (2000), Jagannathan, McGrattan, and Scherbina (2000), Bansal, Tauchen, and Zhou (2004), and Kim, Morley, and Nelson (2005), and Lettau and Van Nieuwerburgh (2005). Interestingly, Kim, Morley, and Nelson (2005) cannot find any structural univariate break post WW-II. Bossaerts and Hillion (1999) suggest one particular kind of change in the underlying model—a disconnect between IS and OOS predictability because investors themselves are learning about the economy.

Again, many of the earlier OOS tests have focused on the dividend ratios.

- Fama and French (1988) interpret the OOS performance of dividend ratios to have been a success. Our paper comes to the opposite conclusion primarily because we have access to a longer sample period.
- Bossaerts and Hillion (1999) interpret the OOS performance of the dividend yield (not dividend price ratio) to be a failure, too. However, they rely on a larger cross-section of 14 (correlated) countries and not on a long OOS time period (1990–1995). Because this was a period when the dividend-yield was known to have performed poorly, the findings were difficult to generalize.
- Ang and Bekaert (2003) similarly explore the dividend yield in a more rigorous structural model. They, too, find poor OOS predictability for the dividend yield.
- Goyal and Welch (2003) explore the OOS performance of the dividend ratios in greater detail on annual horizons. (Our current paper has much overlap in perspective, but little overlap in implementation.)

Lettau and Ludvigson (2001) run rolling OOS regressions—but not in the same spirit as our paper: the construction of their CAY variable itself relies on ex-post coefficient knowledge. This thought experiment applies to a representative investor, who knows the full-sample estimation coefficients for CAY, but does not know the full-sample predictive coefficients. This is *not* the experiment our own paper pursues. (Lettau and Ludvigson also do not explore their model's stability, or note its performance since 1975.) Some tests are hybrids between IS and OOS tests (as are our encompassing tests). For example, Fisher and Statman (2005) explore mechanical rules based on P/E and dividend-yield ratios, which are based on pre-specified numerical cutoff values. None works robustly across countries.

Most of the above papers have focused on a relatively small number of models. There are at least three studies in which authors seek to explore more comprehensive sets of variables:

- Pesaran and Timmerman (1995) (and others) have pointed out that our profession has snooped data (and methods) in search of models that seem to predict the equity premium in the same single U.S. or OECD data history. They explore model selection in great detail, exploring dividend-yield, earnings-price ratios, interest rates, and money in $2^9 = 512$ model variations. Their data series is monthly, begins in 1954 and ends (by necessity) twelve years ago in 1992. They conclude that investors could have succeeded, especially in the volatile periods of the 1970s (i.e., the Oil Shock). But they do not entertain the historical equity premium mean as a NULL hypothesis, which makes it difficult to compare their results to our own. Our paper shows that the Oil Shock experience generally is almost unique in making many predictive variables seem to outperform. Still, even including the two-year Oil Shock period in the sample, the overall OOS performance of our ALTERNATIVE models is typically poor.

- Ferson, Sarkissian, and Simin (2003) explore spurious regressions and data mining in the presence of serially correlated independent variables. They suggest increasing the critical t-value of the in-sample regression. The paper concludes that "many of the regressions in the literature, based on individual predictor variables, may be spurious." Torous and Valkanov (2000) disagree with Ferson, Sarkissian, and Simin. They find that a low signal-noise ratio of many predictive variables makes a spurious relation between returns and persistent predictive variables unlikely and, at the same time, would lead to no out-of-sample forecasting power.
- An independent study, Rapach and Wohar (2006), is perhaps closest to our paper. It is also fairly recent, fairly comprehensive, and explores out-of-sample performance for a number of variables. We come to many similar conclusions. Their study ends in 1999, while our data end in 2005—a fairly dramatic five years. Moreover, our study focuses more on diagnosis of weaknesses, rather than just on detection.[13]

---

[13] Another study by Guo (2006) finds that **svar** has OOS predictive power. However, Guo uses post WW-II sample period and downweights the fourth quarter of 1987 in calculating stock variance. We check that this is why he can find significance where we find none. In the pre-WW2 period, there are many more quarters that have even higher stock variance than the fourth quarter of 1987. If we use a longer sample period, Guo's results also disappear regardless of whether we downweight the highest observation or not.

9 Conclusion

Findings: Our paper systematically investigates the IS and OOS performance of (mostly) linear regressions that predict the equity premium with prominent variables from earlier academic research. Our analysis can be regarded as conservative because we do not even conduct a true OOS test—we select variables from previously published papers and include the very same data that were used to establish the models in the first place. We also ignore the question of how a researcher or investor would have known which among the many models we considered would ultimately have worked.

There is one model for which we feel judgment should be reserved (**eqis**), and some models that deserve more investigation on very-long term frequencies (5 years). None of the remaining models seems to have worked well. To draw this conclusion, our paper relies not only on the printed tables in this final version, but on a much larger set of tables that explored combinations of modified data definitions, data frequencies, time periods, econometric specifications, etc).[14] Our findings are not driven by a few outlier years. Our findings do not disappear if we use different definitions and corrections for the time-series properties of the independent variable. Our findings do not arise because our tests have weak power (which would have manifested itself mostly in poor early predictions). Our findings hold up if we apply statistical corrections, data driven model selection, and encompassing tests.

Instead, our view based on this evidence is now that most models seem unstable or even spurious. Our plots help diagnose when they performed well or poorly, both in-sample and out-of-sample. They shine light on the two most interesting subperiods, the 1973-75 Oil Shock, and the most recent thiry years, 1975 to today. (And we strongly suggest that future papers proposing equity premium predictive models include similar plots.) If we exclude the Oil Shock, most models perform even worse—many were statistically significant in the past only because of the stellar

---

[14] The tables in this paper have been distilled from a larger set of tables, which are available from our website—and on which we sometimes draw in our text description of results.

model performance during these contiguous unusual years. One can only imagine whether our profession would have been equally comfortable rationalizing away these years "as unusual" if they had been the main negative and not the main positive influence.

As of the end of 2005, most models have lost statistical significance, both in-sample and out-of-sample. Out-of-sample, most models not only fail to beat the unconditional benchmark (the prevailing mean) in a statistically or economically significant manner, but underperform it outright. If we focus on the most recent decades, i.e., the period after 1975, we find that no model had superior performance OOS and few had acceptable performance IS. With 30 years of poor performance, believing in a model today would require strong priors that the model is well specified and that the underlying model has not changed.

Of course, even today, researchers can cherry-pick models—intentionally or unintentionally. Still, this does not seem to be an easy task. It is rare that a choice of sample start, data frequency, and method leads to robust superior statistical performance in-sample. Again, to ignore OOS tests even as a diagnostic, a researcher would have to have supreme confidence that the underlying model is stable. Despite extensive search, we were unsuccessful in identifying any models on annual or shorter frequency that systematically had both good in-sample and out-of-sample performance, at least in the period from 1975 to 2005—although more search might eventually produce one. To place faith in a model, we would want to see genuine superior and stable IS and OOS performance in years after the model identification. Switching perspective from a researcher to an investor, we believe the evidence suggests that none of the academic models we reexamine warrants a strong investment endorsement today. By assuming that the equity premium was "like it always has been," an investor would have done just as well.

Directions: An academic researcher could explore more variables and/or more sophisticated models (e.g., through structural shifts or Kalman filters). Alternatively, one could predict disaggregated returns, for example, the returns on value-stocks and the returns on growth stocks. The former could respond more strongly to dividends, while the latter could respond more strongly to book-market factors. However, such explorations aggravate the problems arising from (collective) specification search. Some of these models are bound to work both IS or OOS by pure chance. At the very least, researchers should wait for more new OOS data to become available in order to accumulate faith in such new variables or more sophisticated models.

Having stated the obvious, there are promising directions. We are looking forward to accumulating more data. Lettau and Van Nieuwerburgh (2005) model structural change not based on the forecasting regression, but based on mean shifts in the dependent variables. This reduces (but does not eliminate) snooping bias. Another promising method relies on theory—an argument along the line of Cochrane's (2005) observation that the dividend yield must predict future returns eventually if it fails to predict dividend growth.[15]

Broader Implications: Our paper is simple, but we believe its implications are not. The belief that the state variables which we explored in our paper can predict stock returns and/or equity premia is not only widely held, but the basis for two entire literatures: one literature on how these state variables predict the equity premium and one literature on how smart investors should use these state variables in better portfolio allocations. This is not to argue that an investor would not update his estimate of the equity premium as more equity premium realizations come in. Updating will necessarily induce time-varying opportunity sets (see Xia

---

[15] We do not agree with all of Cochrane's (2005) conclusions. He has strong priors, placing full faith in a stationary specification of the underlying model—even though Goyal and Welch (2003) have documented dramatic increases in the autocorrelation of dividend growth. Therefore, he does not consider whether changes in the model over the last 30 years could lead one to the conclusion that dividend ratios do not predict *as of 2006*. He also draws a stark dichotomy between a NULL (no return prediction, but dividend growth prediction) and an ALTERNATIVE (no dividend growth prediction, but return prediction). He evaluates both hypotheses separately for dividend growth and return predictability. He then proceeds under unconditional confidence in the ALTERNATIVE to show that if dividend growth rates are truly unpredictable, then dividend ratios increase in significance to conventional levels. With residual doubts about the ALTERNATIVE, this conclusion could change.

(2001) and Lewellen and Shanken (2002)). Instead, our paper suggests only that the profession has yet to find some variable that has meaningful and robust empirical equity premium forecasting power, both IS and OOS. We hope that the simplicity of our approach strengthens the credibility of our evidence.

Website Data Sources

Robert Shiller's Website: `http://aida.econ.yale.edu/~shiller/data.htm`.

NBER Macrohistory Data Base:
`http://www.nber.org/databases/macrohistory/contents/chapter13.html`.

FRED: `http://research.stlouisfed.org/fred2/categories/22`.

Value-Line: `http://www.valueline.com/pdf/valueline_2005.pdf`.

Bureau of Labor Statistics Webpage: `http://www.bls.gov/cpi/`

Martin Lettau's Webpage: (**cay**), `http://pages.stern.nyu.edu/~mlettau/`.

William Schwert's Webpage: (**svar**), `http://schwert.ssb.rochester.edu/`.

Jeff Wurgler's Webpage: (**eqis**), `http://pages.stern.nyu.edu/~jwurgler/`

Figure 1: Annual Performance of In-Sample Insignificant Predictors

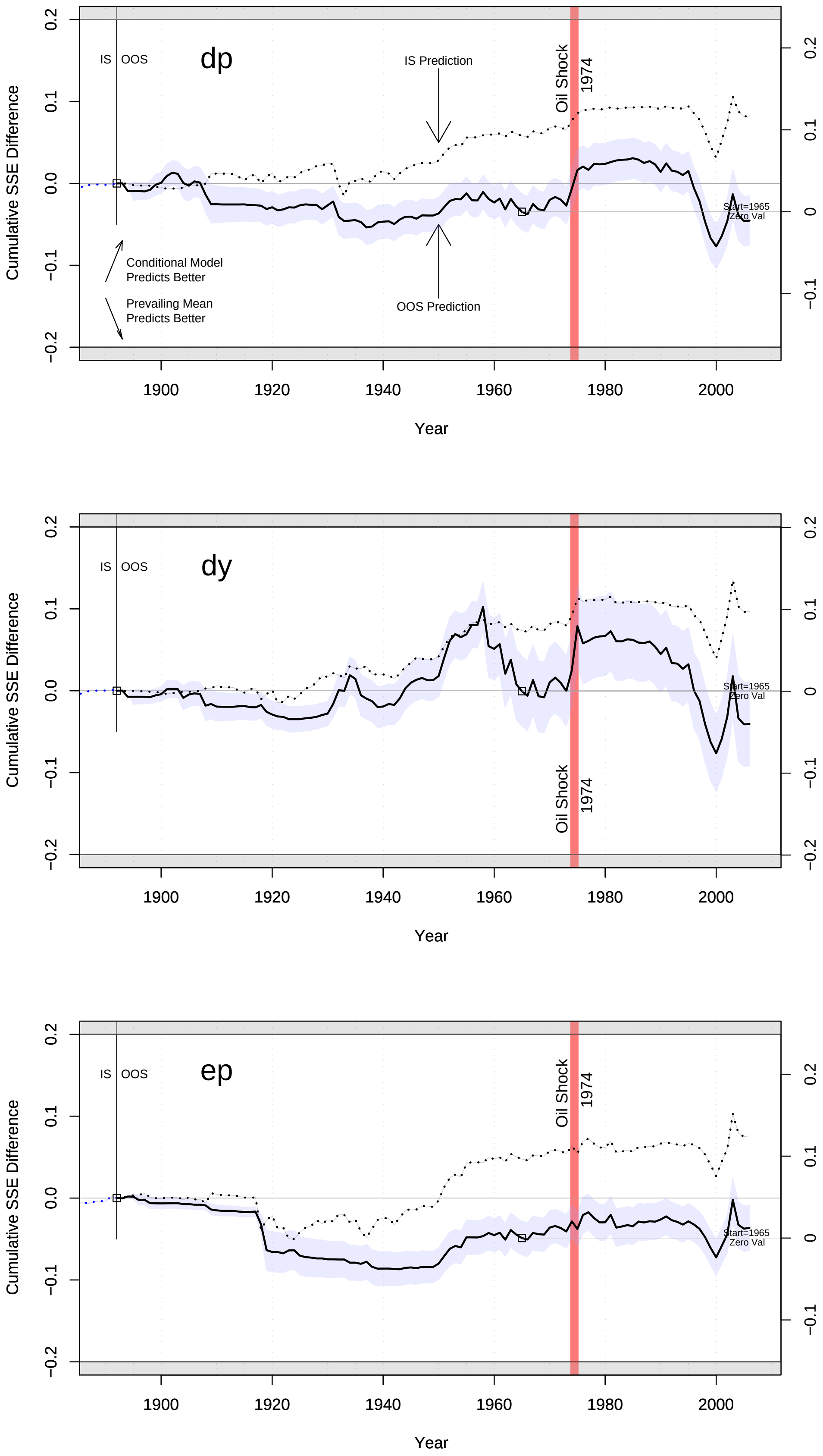


Figure 1: continued

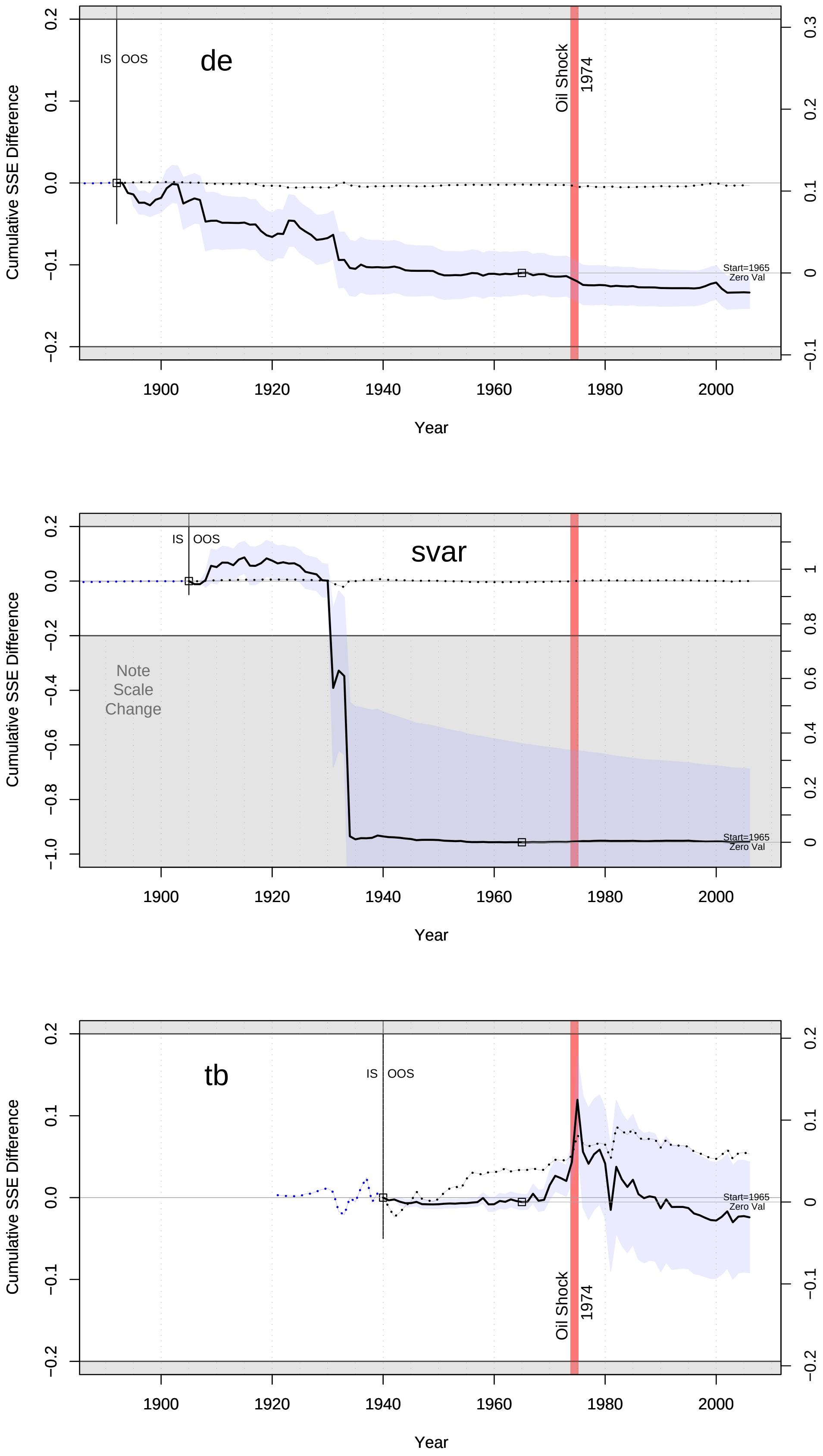
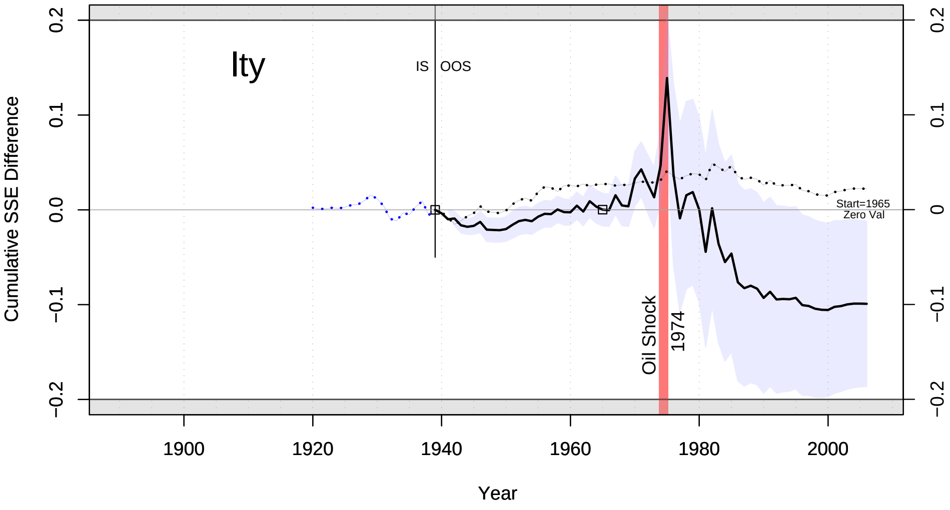
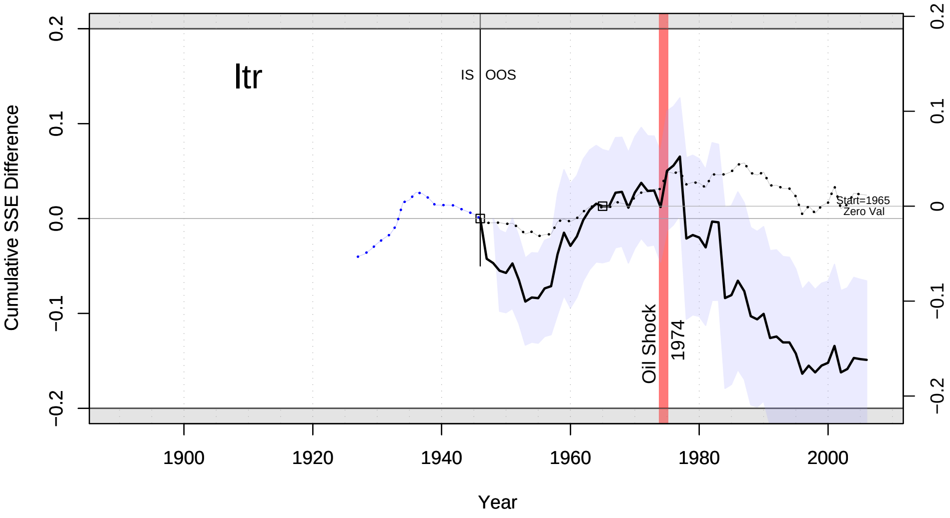


Figure 1: continued





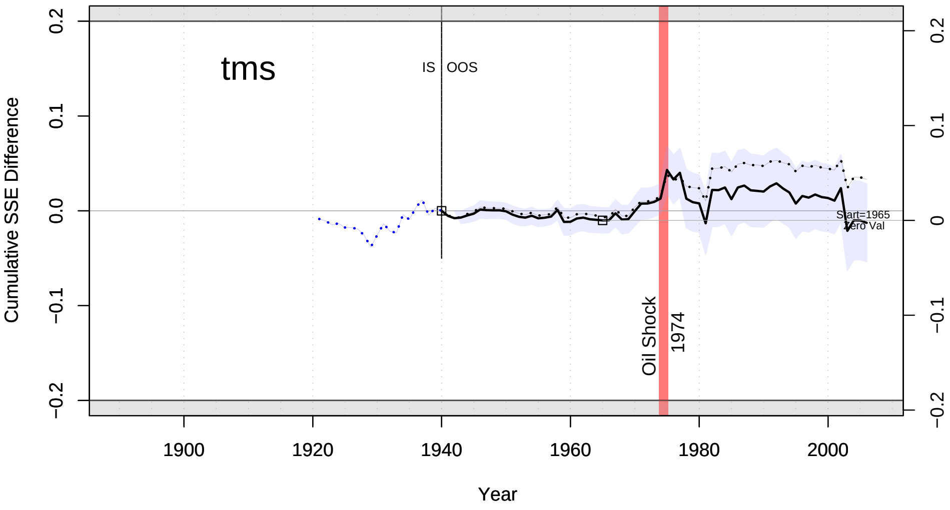
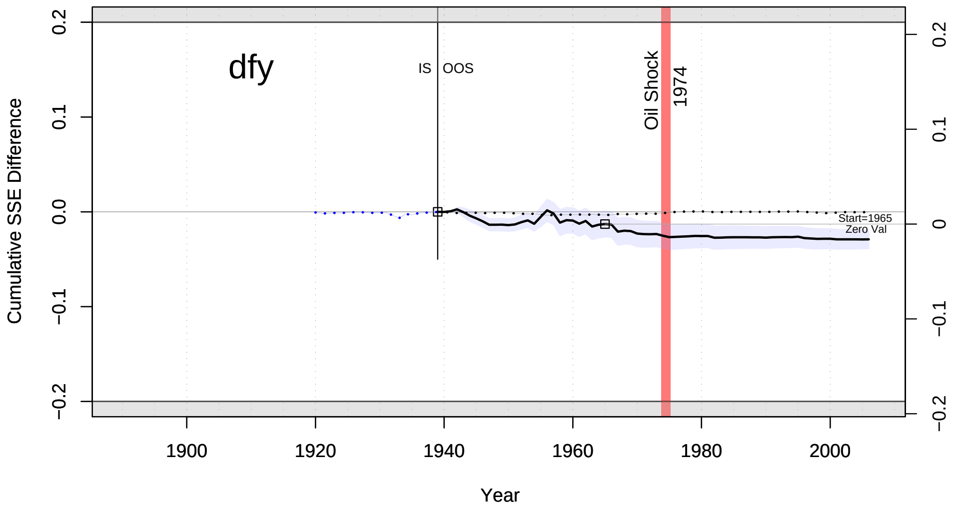
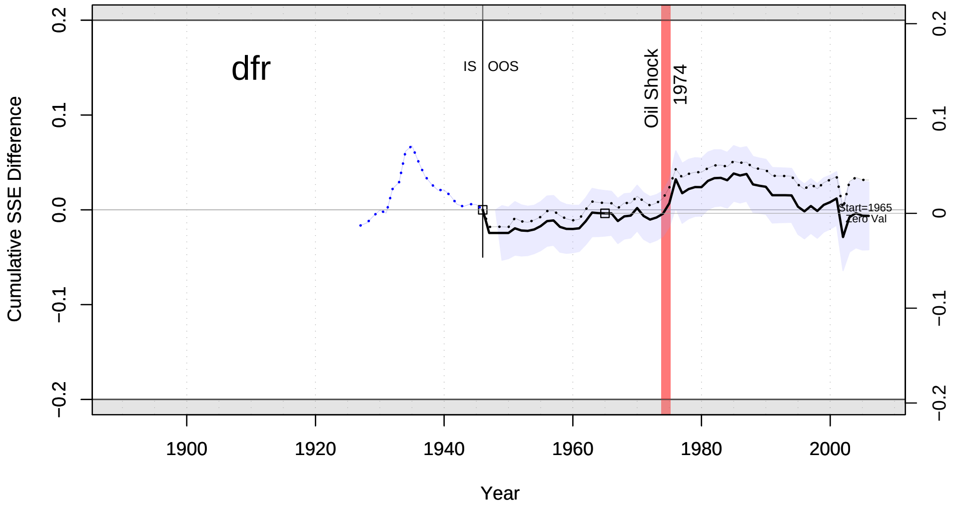
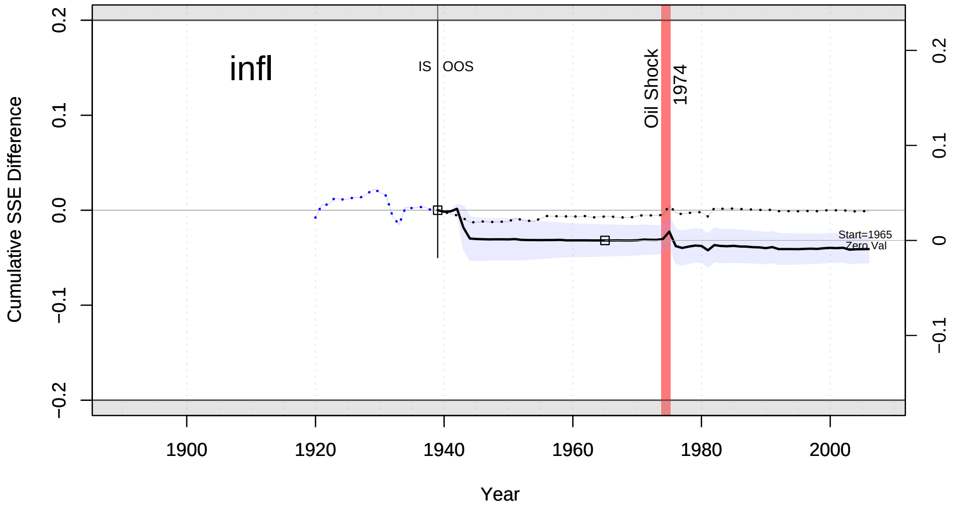


Figure 1: continued

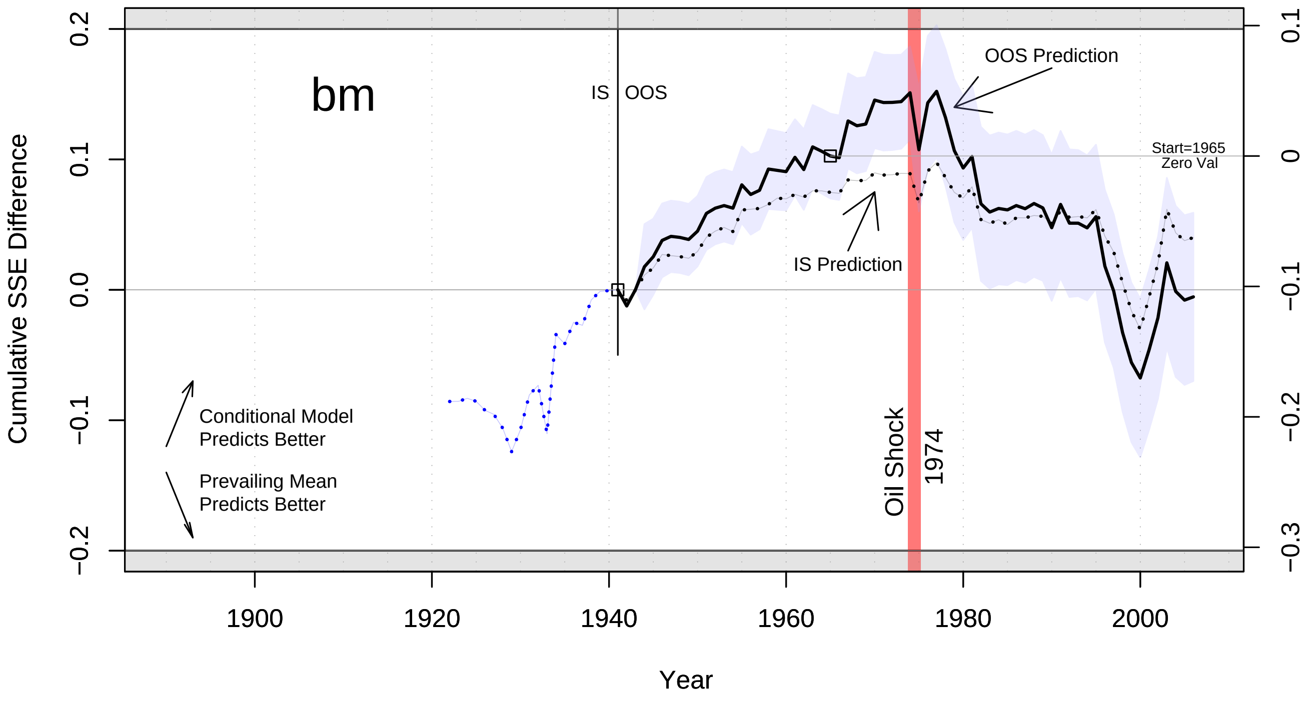






Explanation: These figures plot the IS and OOS performance of annual predictive regressions. Specifically, these are the cumulative squared prediction errors of the NULL minus the cumulative squared prediction error of the ALTERNATIVE. The ALTERNATIVE is a model that relies on predictive variables noted in each graph. The NULL is the prevailing equity premium mean for the OOS graph, and the full-period equity premium mean for the IS graph. The IS prediction relative performance is dotted (and usually above), the OOS prediction relative perfomance is solid. An increase in a line indicates better performance of the named model; a decrease in a line indicates better performance of the NULL. The blue band is the equivalent of 95% two-sided levels, based on MSE-T critical values from McCracken (2004). (MSE-T is the Diebold and Mariano (1995) *t*-statistic modified by Harvey, Leybourne, and Newbold (1998)). The right axis shifts the zero point to 1965. The Oil Shock is marked by a red vertical line.

Figure 2: Annual Performance of Predictors That Are Not In-Sample Significant



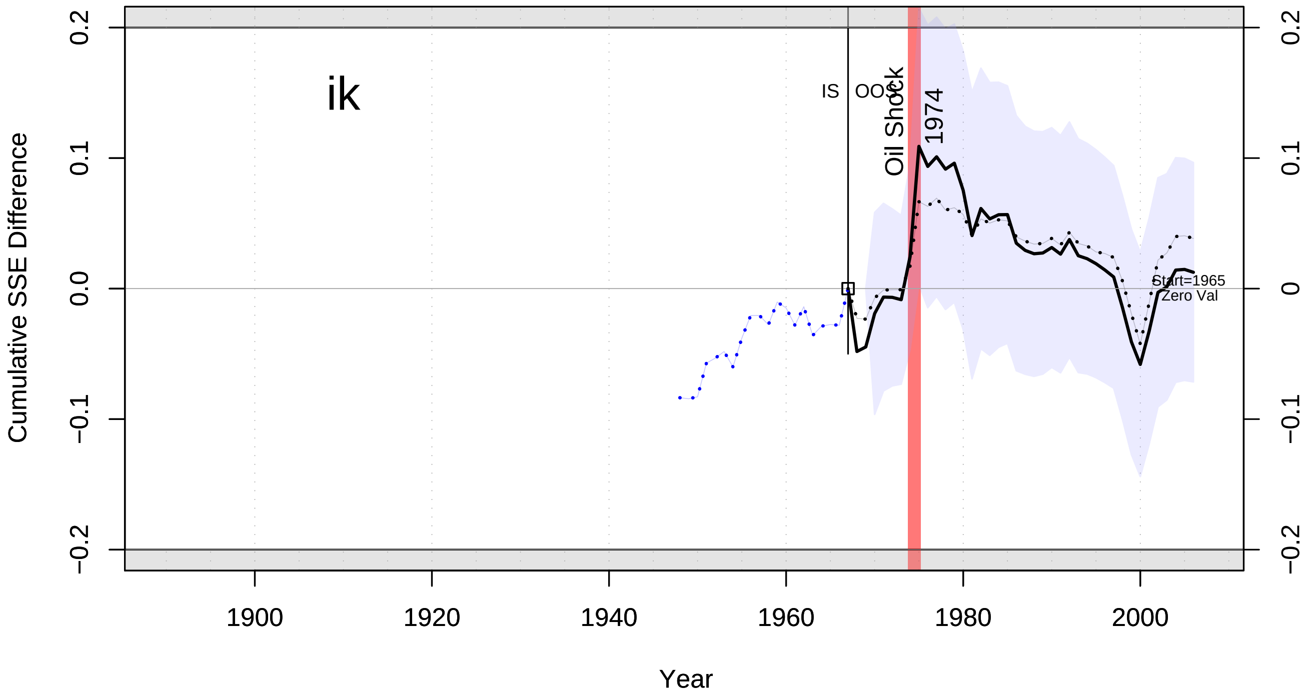
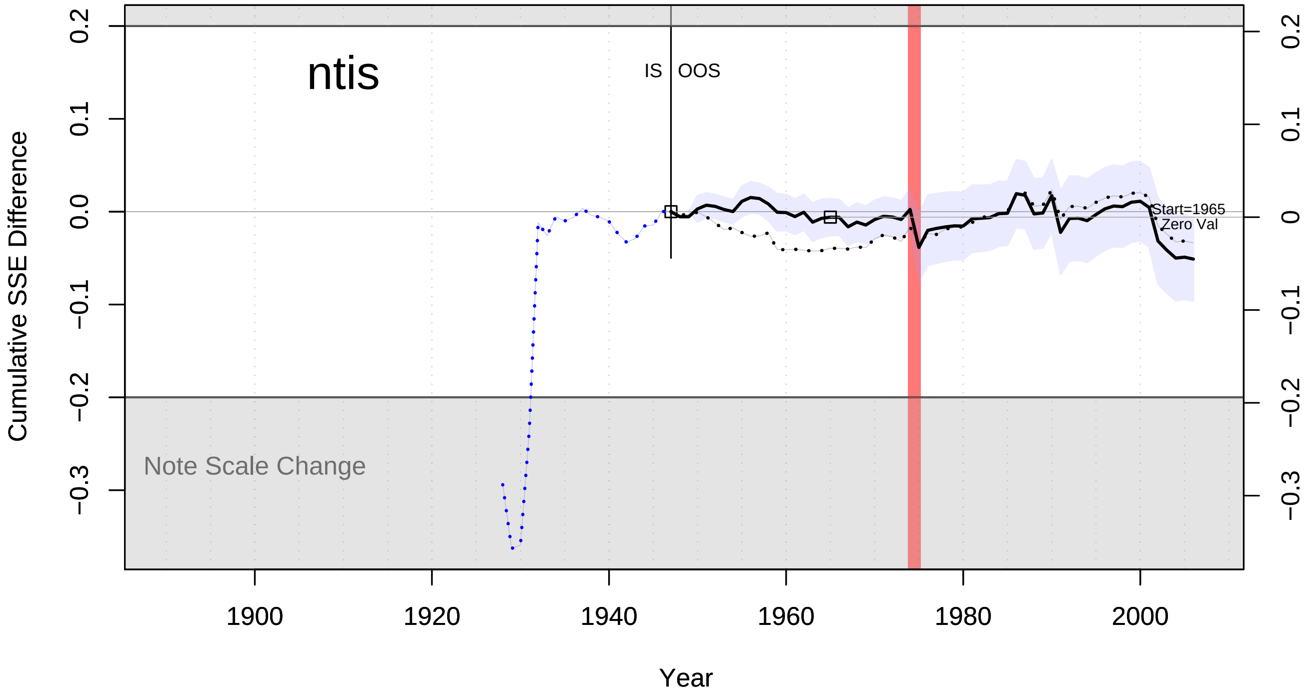


Figure 2: continued



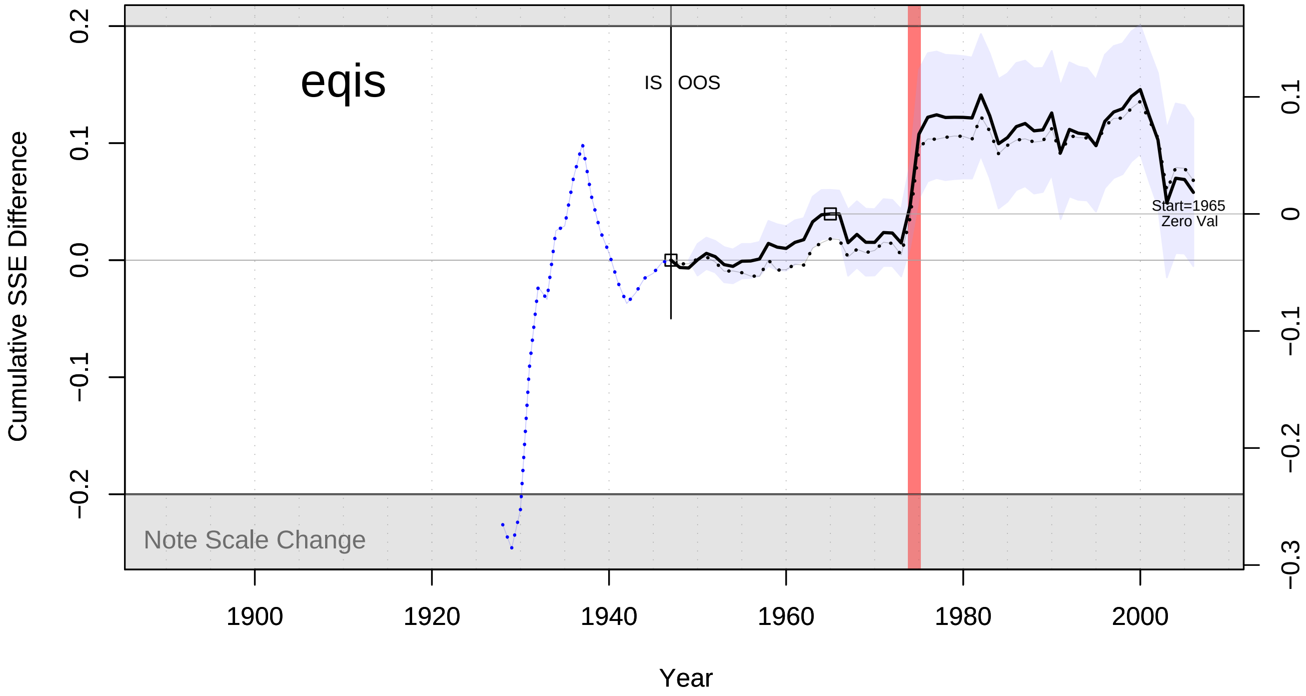
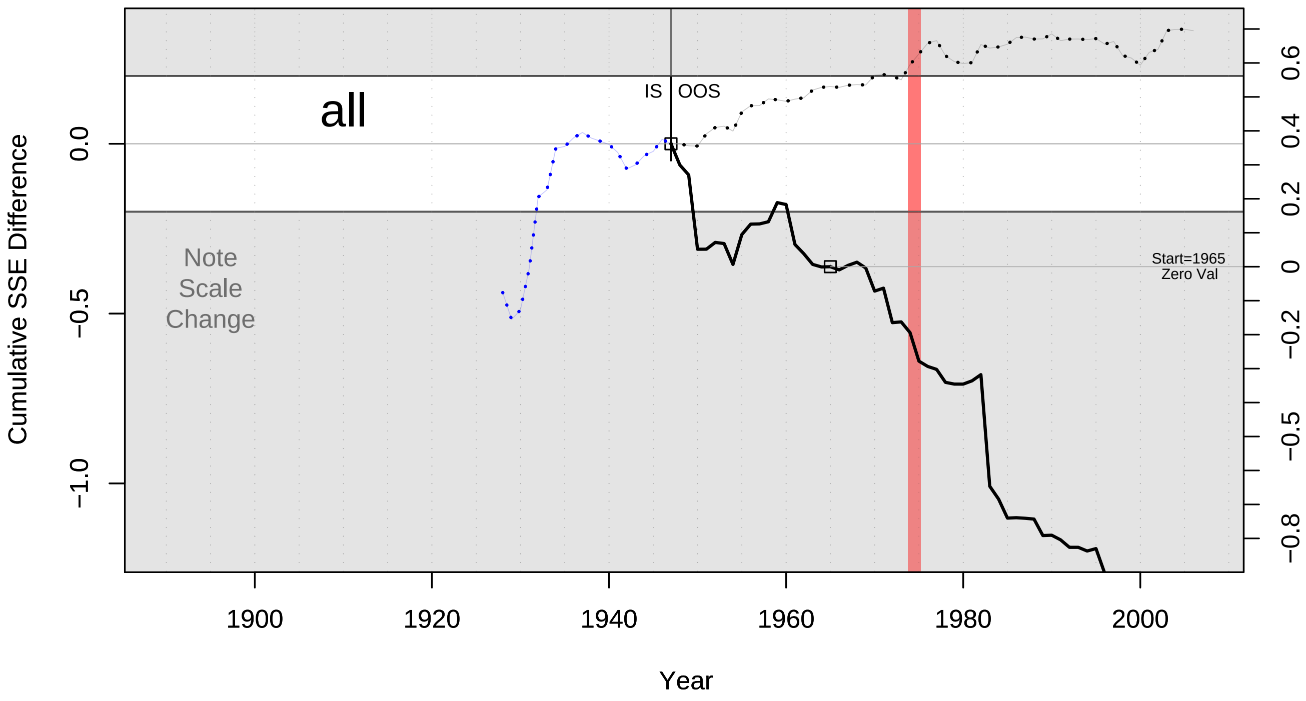


Figure 2: continued



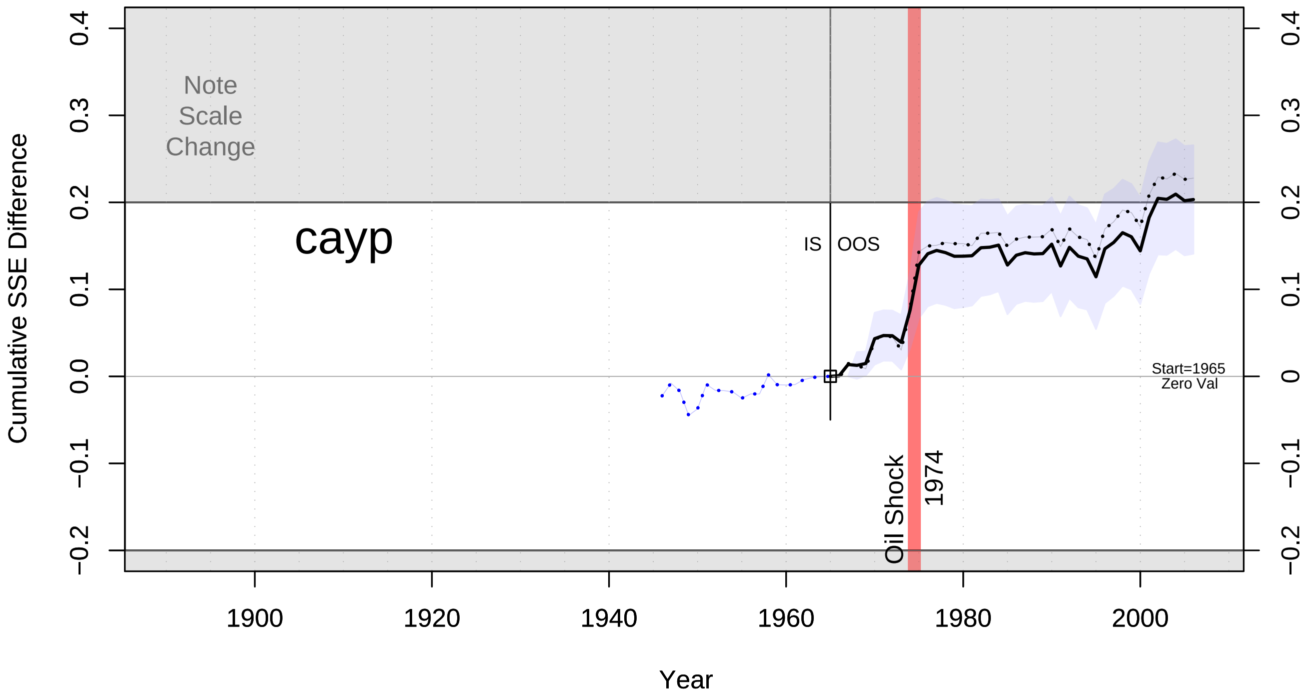
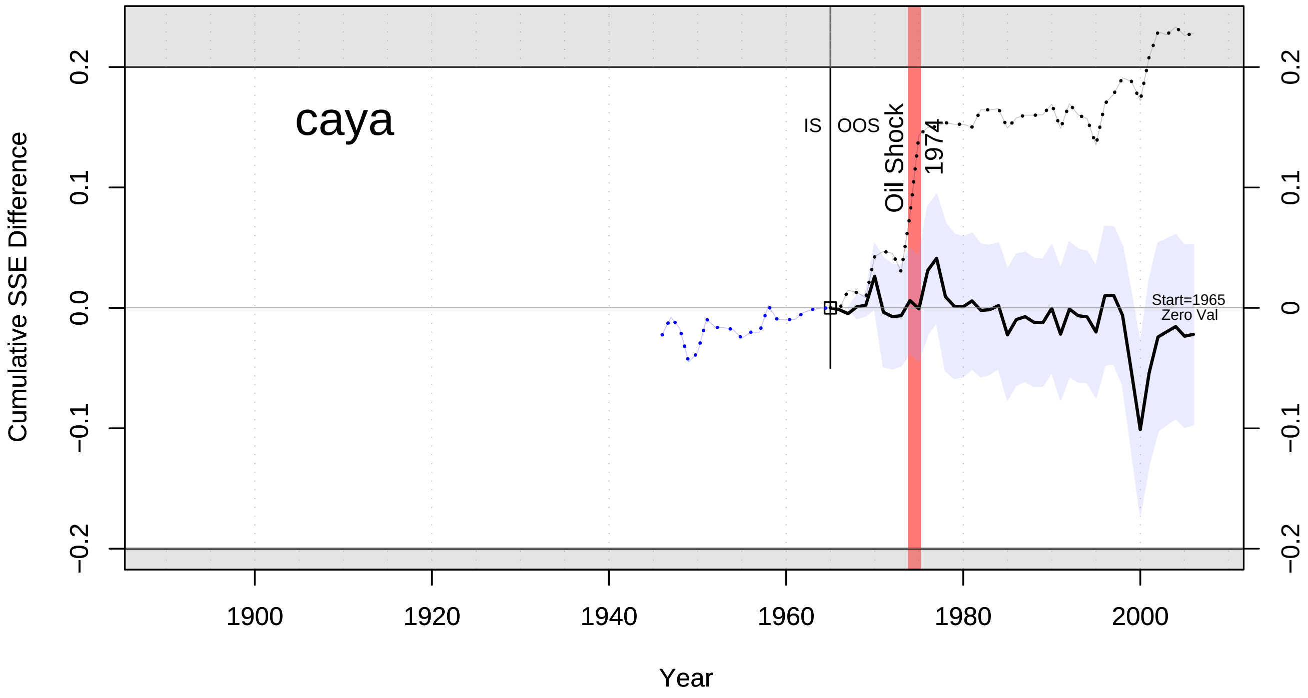
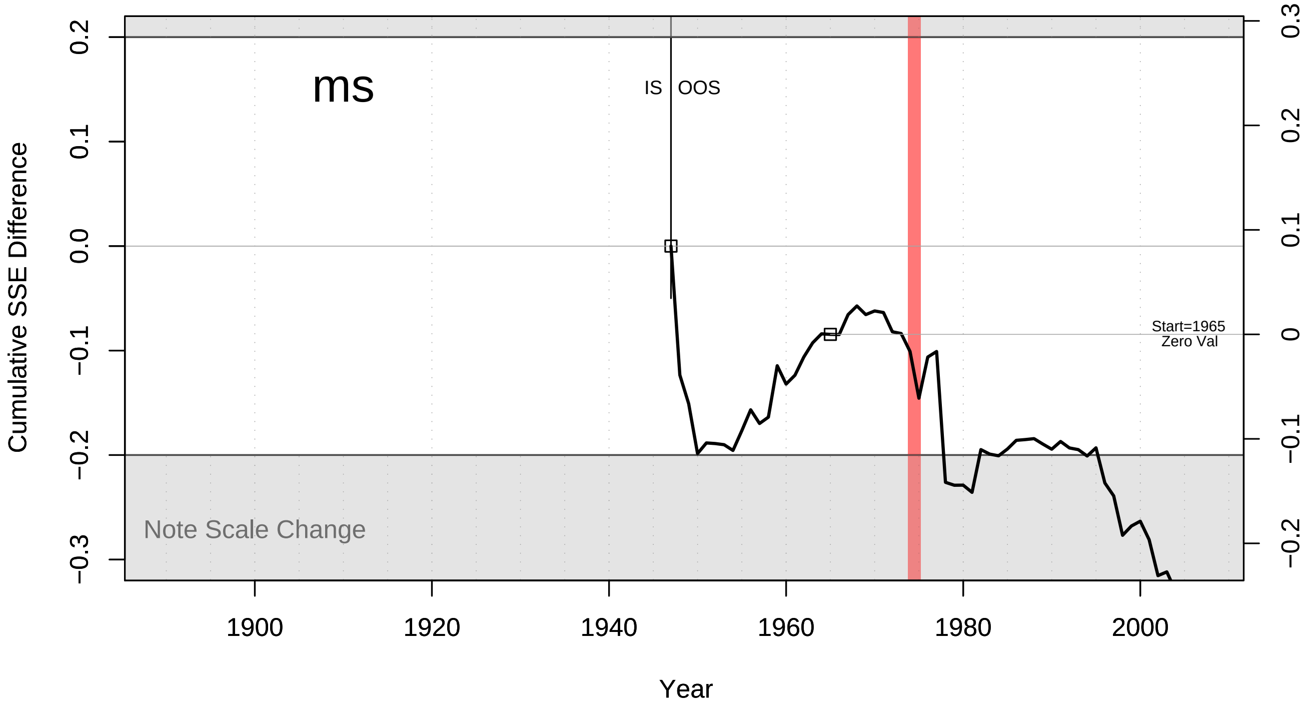


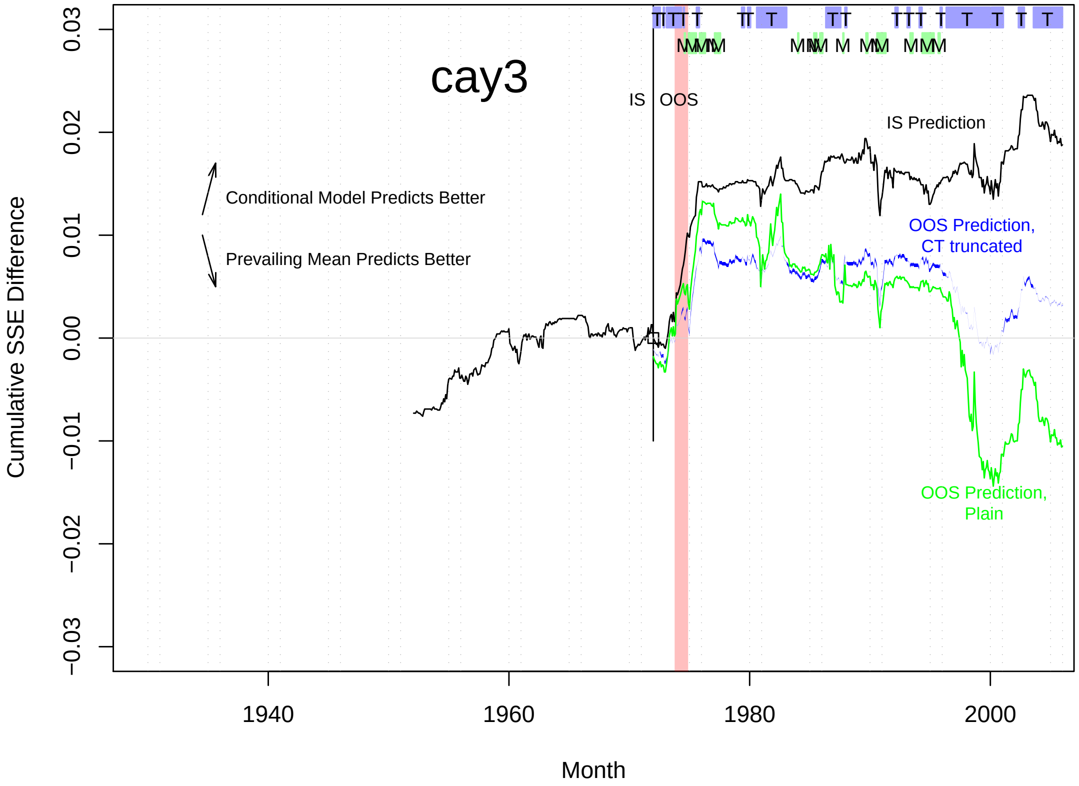
Figure 2: continued





Explanation: See Figure 1.

Figure 3: Monthly Performance of In-Sample Significant Predictors



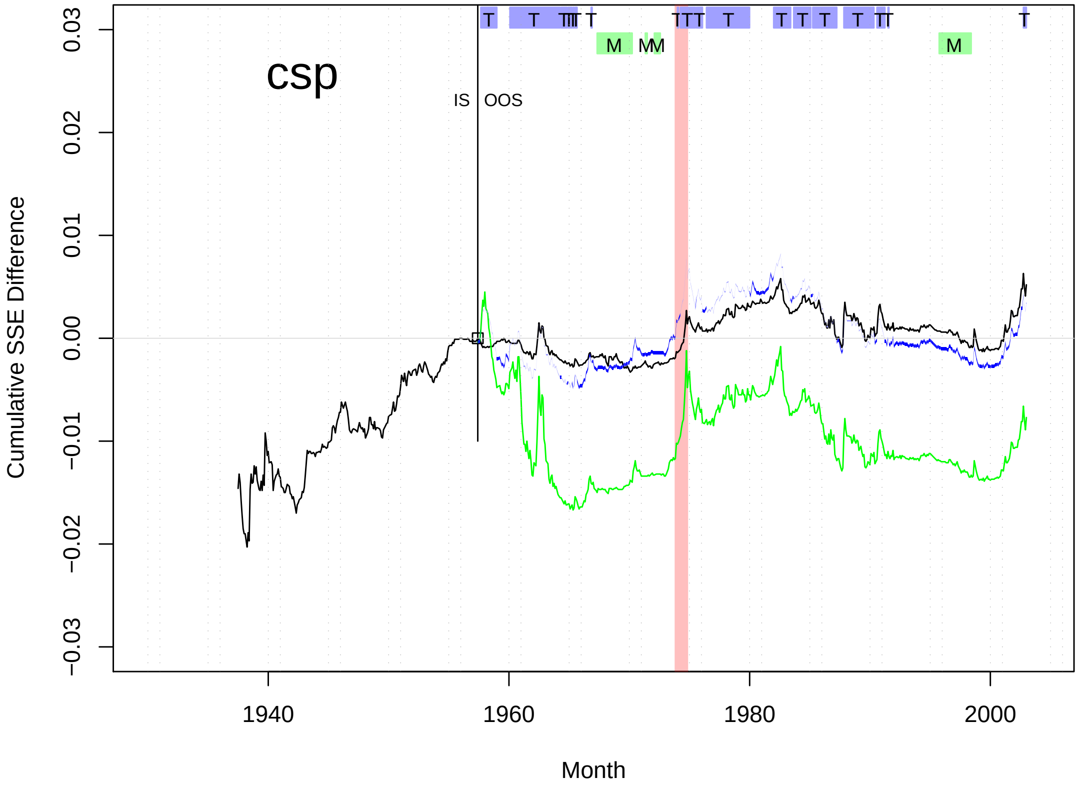
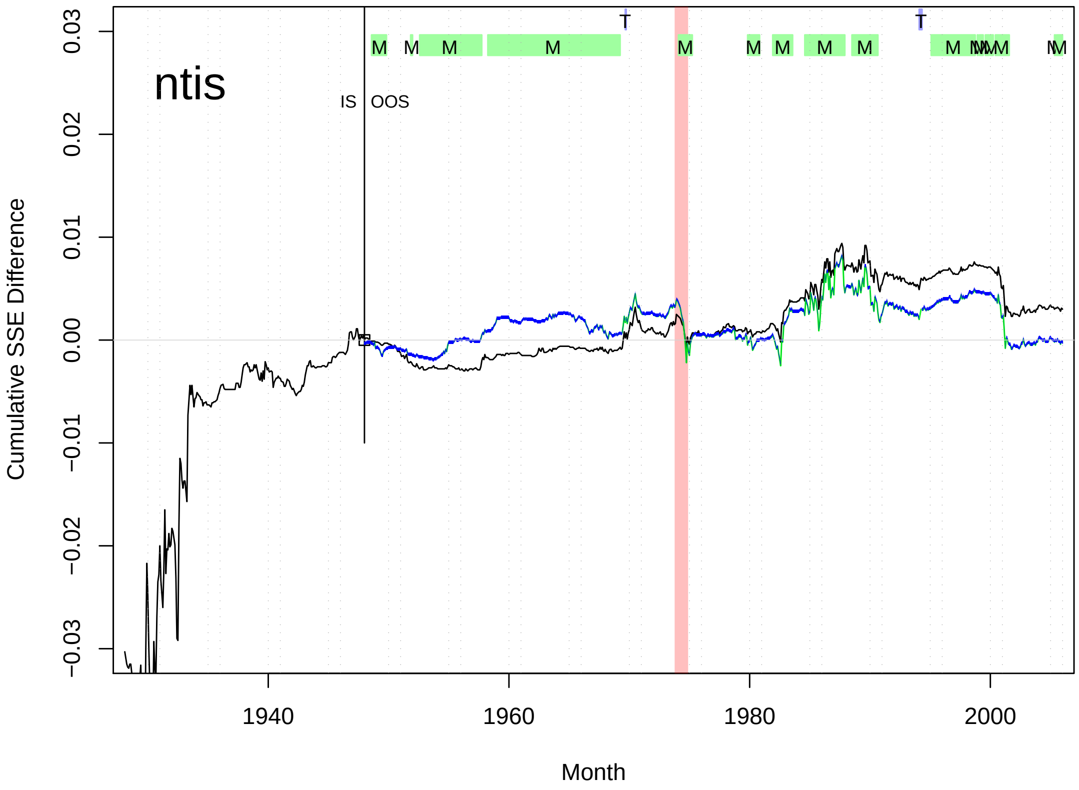


Figure 3: continued



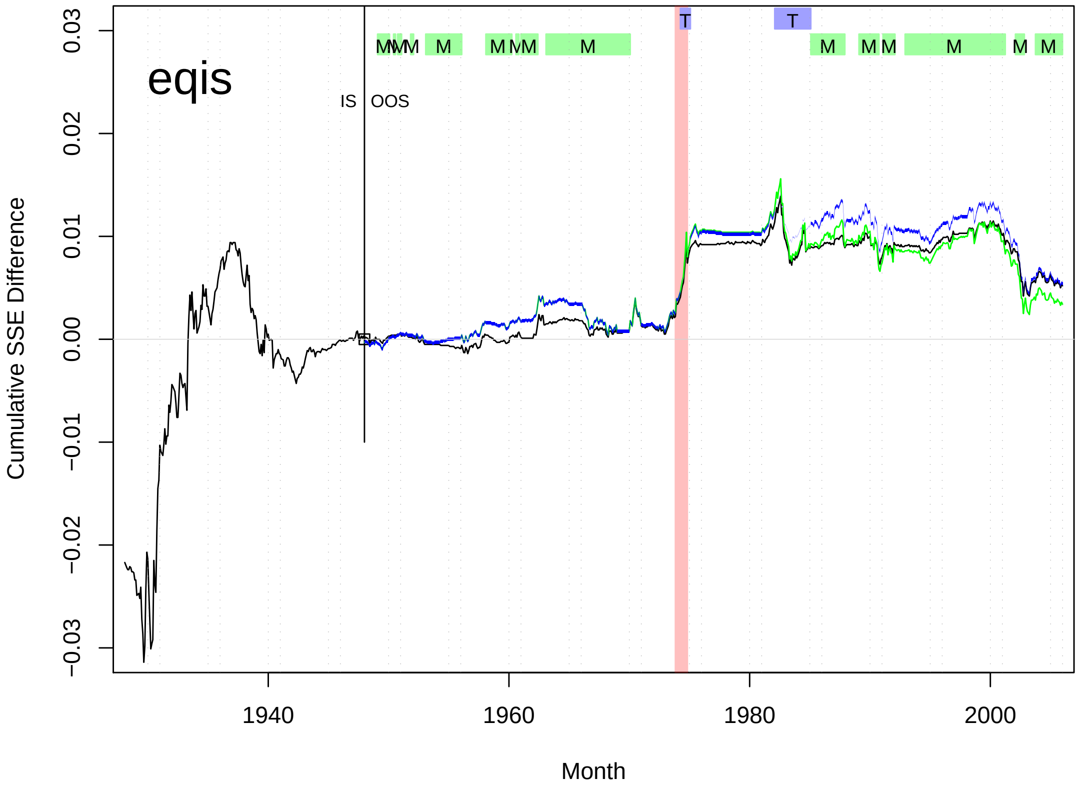
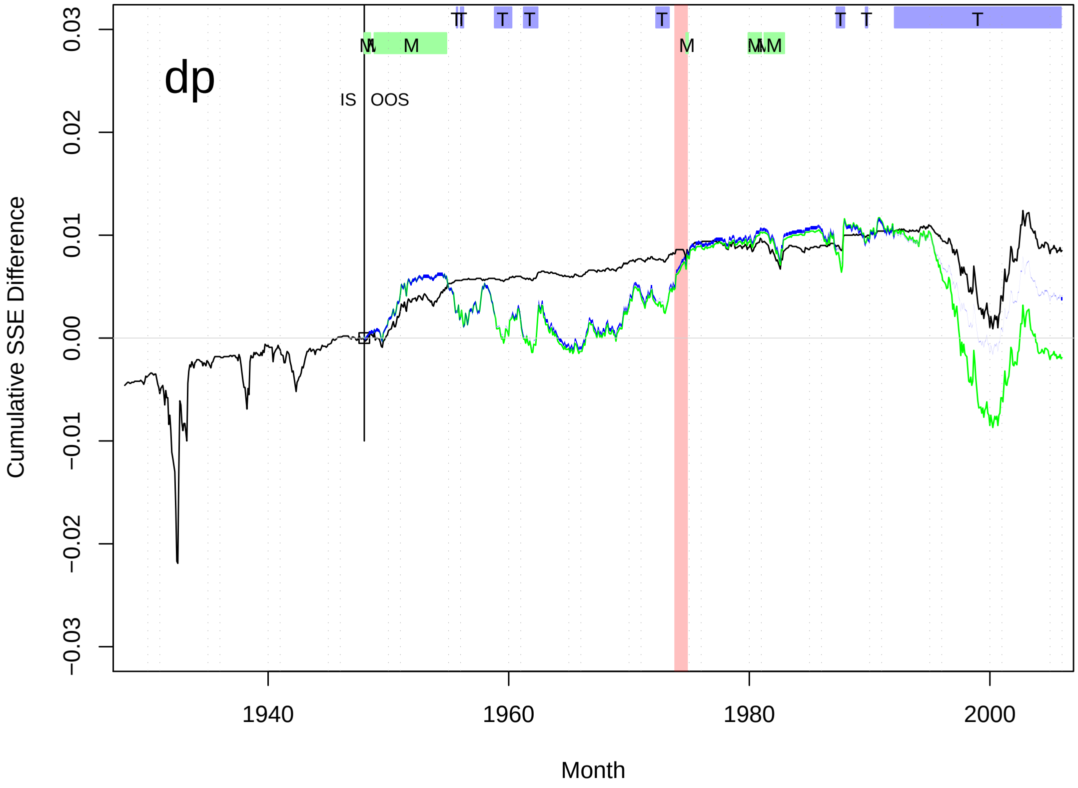


Figure 3: continued



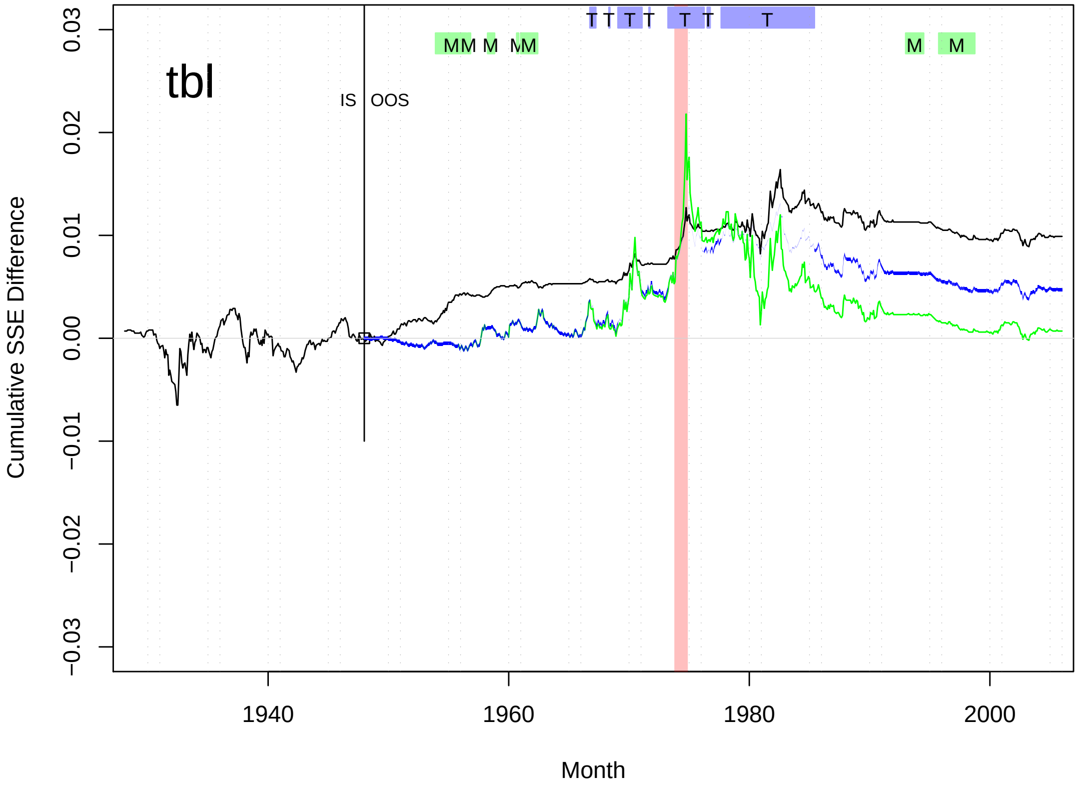
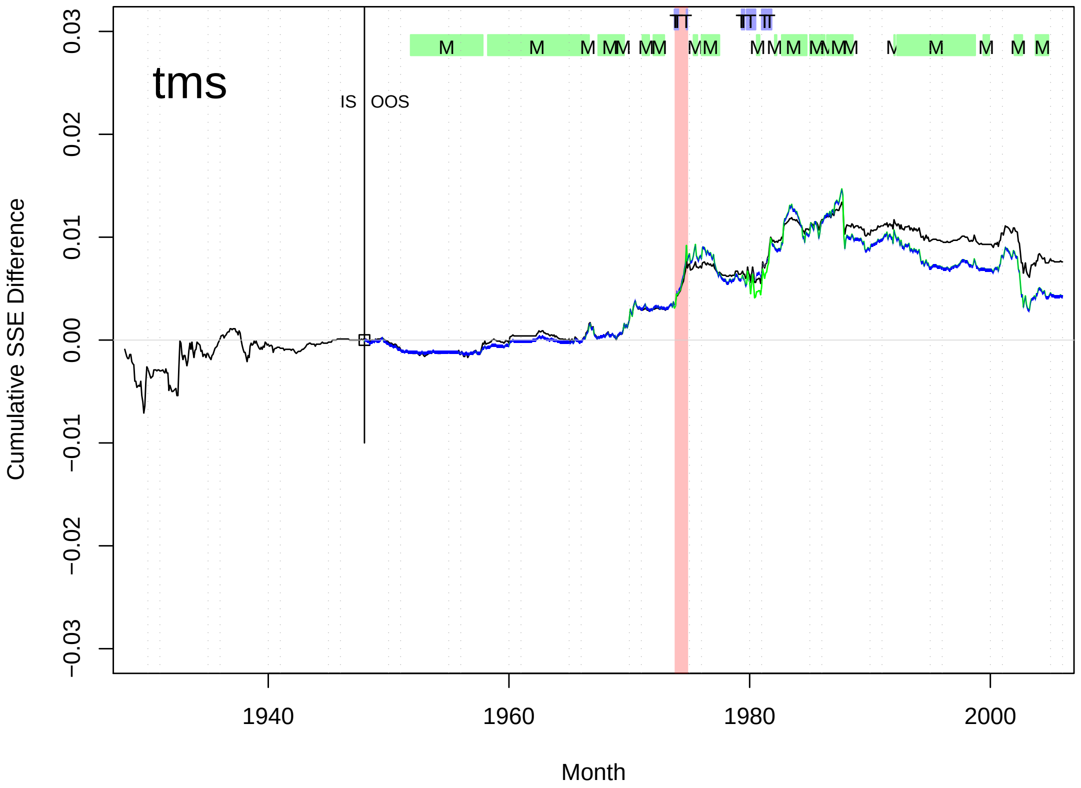


Figure 3: continued



Explanation: These figures are the analogs of Figures 1 and 2, plotting the IS and OOS performance of the named model. However, they use monthly data. The IS performance is in black. The Campbell-Thompson (2005) (CT) OOS model performance is plotted in blue, the plain OOS model performance is plotted in green. The top bars ("T") indicate truncation of the equity prediction at 0, inducing the CT investor to hold the risk-free security. (This also lightens the shade of blue in the CT line.) The lower bars ("M") indicate when the CT risk-averse investor would purchase equities worth 150% of his wealth, the maximum permitted. The Oil Shock (Nov 1973 to Mar 1975) is marked by a red vertical line.

Table 1: Forecasts at Annual Frequency

This table presents statistics on forecast errors in-sample (IS) and out-of-sample (OOS) for log equity premium forecasts at annual frequency (both in the forecasting equation and forecast). Variables are explained in Section 2. Stock returns are price changes, including dividends, of the S&P500. All numbers are in percent per year, except except $\overline{R}^2$ and power which are simple percentages. A star next to IS-$\overline{R}^2$ denotes significance of the in-sample regression as measured by F-statistics (critical values of which are obtained empirically from bootstrapped distributions). The column 'IS for OOS' gives the IS-$\overline{R}^2$ for the OOS period. ΔRMSE is the RMSE (root mean square error) difference between the unconditional forecast and the conditional forecast for the same sample/forecast period. Positive numbers signify superior out-of-sample conditional forecast. The OOS-$\overline{R}^2$ is defined in equation (6). A star next to OOS-$\overline{R}^2$ is based on significance of MSE-F statistic by McCracken (2004), which tests for equal MSE of the unconditional forecast and the conditional forecast. One-sided critical values of MSE statistics are obtained empirically from bootstrapped distributions, except for **caya** and **all** models where they are obtained from McCracken (2004). Critical values for the **ms** model are not calculated. Power is calculated as the fraction of draws where the simulated ΔRMSE is greater than the empirically calculated 95% critical value. The two numbers under the power column are for all simulations and for those simulations in which the in-sample estimate was significant at the 95% level. Significance levels at 90%, 95%, and 99% are denoted by one, two, and three stars, respectively.

			Full Sample									1927–2005 Sample
				Forecasts begin 20 years after sample				Forecasts begin 1965				
			IS	IS for	OOS			IS for	OOS			IS
	Variable	Data	$\overline{R}^2$	OOS $\overline{R}^2$	$\overline{R}^2$	ΔRMSE	Power	OOS $\overline{R}^2$	$\overline{R}^2$	ΔRMSE	Power	$\overline{R}^2$
Full Sample, Not Significant IS												
dfy	Default Yield Spread	1919–2005	−1.18		−3.29	−0.14			−4.15	−0.12		−1.31
infl	Inflation	1919–2005	−1.00		−4.07	−0.20			−3.56	−0.08		−0.99
svar	Stock Variance	1885–2005	−0.76		−27.14	−2.33			−2.44	+0.01		−1.32
d/e	Dividend Payout Ratio	1872–2005	−0.75		−4.33	−0.31			−4.99	−0.18		−1.24
lty	Long Term Yield	1919–2005	−0.63		−7.72	−0.47			−12.57	−0.76		−0.94
tms	Term Spread	1920–2005	0.16		−2.42	−0.07			−2.96	−0.03		0.89
tbl	T-Bill Rate	1920–2005	0.34		−3.37	−0.14			−4.90	−0.18		0.15
dfr	Default Return Spread	1926–2005	0.40		−2.16	−0.03			−2.82	−0.02		0.32
d/p	Dividend Price Ratio	1872–2005	0.49		−2.06	−0.11			−3.69	−0.09		1.67
d/y	Dividend Yield	1872–2005	0.91		−1.93	−0.10			−6.68	−0.31		**2.71***
ltr	Long Term Return	1926–2005	0.99		−11.79	−0.76			−18.38	−1.18		0.92
e/p	Earning Price Ratio	1872–2005	1.08		−1.78	−0.08			−1.10	+0.11		**3.20***
Full Sample, Significant IS												
b/m	Book to Market	1921–2005	**3.20***	1.13	−1.72	−0.01	42 (67)	−7.29	−12.71	−0.77	40 (61)	**4.14***
i/k	Invstmnt Capital Ratio	1947–2005	**6.63****	−0.25	−1.77	+0.07	47 (77)		same			same
ntis	Net Equity Expansion	1927–2005	**8.15*****	−4.21	−5.07	−0.26	57 (78)	0.96	−6.79	−0.32	53 (72)	same
eqis	Pct Equity Issuing	1927–2005	**9.15*****	2.81	**2.04****	+0.30	72 (85)	3.64	−1.00	+0.12	66 (77)	same
all	Kitchen Sink	1927–2005	**13.81****	2.62	−139.03	−5.97	- (-)	−20.91	−176.18	−6.19	- (-)	same
Full Sample, No IS Equivalent (caya, ms) or Ex-Post Information (cayp)												
cayp	Cnsmptn, Wlth, Incme	1945–2005	**15.72*****	20.70	**16.78*****	+1.61	- (-)		same			same
caya	Cnsmptn, Wlth, Incme	1945–2005	-	-	−4.33	−0.14	- (-)		same			same
ms	Model Selection	1927–2005	-	-	−22.50	−1.69	- (-)	-	−23.71	−1.79	- (-)	same
1927-2005 Sample, Significant IS												Full Sample
d/y	Dividend Yield	1927–2005	**2.71***					−0.35	−6.44	−0.30	30 (71)	0.91
e/p	Earning Price Ratio	1927–2005	**3.20***					−0.94	−3.15	−0.05	39 (64)	1.08
b/m	Book to Market	1927–2005	**4.14***					−8.65	−19.46	−1.26	45 (64)	**3.20***

Table 2: Forecasts at 5-year Frequency

This table is identical to Table 1, except that we predict overlapping 5-yearly equity premia, rather than annual equity premia.

			Full Sample									1927–2005 Sample
				Forecasts begin 20 years after sample				Forecasts begin 1965				
			IS	IS for	OOS			IS for	OOS			IS
	Variable	Data	$\overline{R}^2$	OOS $\overline{R}^2$	$\overline{R}^2$	ΔRMSE	Power	OOS $\overline{R}^2$	$\overline{R}^2$	ΔRMSE	Power	$\overline{R}^2$
Full Sample, Not Significant IS												
ltr	Long Term Return	1926–2005	−1.36		−7.40	−1.10			−18.92	−2.72		−1.39
dfr	Default Return Spread	1926–2005	−1.36		−5.71	−0.77			−4.01	−0.25		−1.36
infl	Inflation	1919–2005	−1.21		−11.25	−1.70			−7.34	−0.85		−1.21
lty	Long Term Yield	1919–2005	−0.15		−122.13	−17.41			−72.47	−10.96		−0.30
svar	Stock Variance	1885–2005	0.33		−79.33	−13.31			−2.37	+0.03		−0.84
d/e	Dividend Payout Ratio	1872–2005	0.66		−4.87	−0.76			−0.64	+0.31		1.64
dfy	Default Yield Spread	1919–2005	3.54		−59.33	−9.18			**4.97***	+1.38		0.94
tbl	T-Bill Rate	1920–2005	3.83		−17.66	−2.78			−30.19	−4.70		4.91
d/y	Dividend Yield	1872–2005	6.04		−4.45	−0.68			−16.84	−2.19		**14.99***
e/p	Earning Price Ratio	1872–2005	6.24		−1.04	−0.03			−3.03	−0.07		**14.96***
tms	Term Spread	1920–2005	7.84		−26.52	−4.24			**10.46****	+2.44		**12.47***
eqis	Pct Equity Issuing	1927–2005	9.50		−2.35	−0.11			−5.75	−0.56		same
b/m	Book to Market	1921–2005	10.78		−13.06	−2.03			−46.34	−7.17		13.93
Full Sample, Significant IS												
ntis	Net Equity Expansion	1927–2005	**6.59***	−8.28	−3.46	−0.32	21 **(70)**	1.49	−13.77	−1.92	21 **(67)**	same
d/p	Dividend Price Ratio	1872–2005	**10.24***	14.35	−1.19*	−0.06	21 **(69)**	8.30	−26.09	−3.54	20 **(51)**	**21.24****
i/k	Invstmnt Capital Ratio	1947–2005	**33.99*****	27.42	**12.99****	+3.39	22 **(78)**	same				same
all	Kitchen Sink	1927–2005	**41.48*****	43.29	−499.83	−45.47	- (-)	19.75	−442.08	−34.19	- (-)	same
Full Sample, No IS Equivalent (caya, ms) or Ex-Post Information (cayp)												
cayp	Cnsmptn, Wlth, Incme	1945–2005	**36.05*****	63.11	**30.35*****	+7.50	- (-)	same				same
caya	Cnsmptn, Wlth, Incme	1945–2005	-	-	**9.10*****	+2.50	- (-)	same				same
ms	Model Selection	1927–2005	-	-	−14465.67	−408.06	- (-)	-	−122.89	−18.03	- (-)	same
1927-2005 Sample, Significant IS												Full Sample
tms	Term Spread	1927–2005	**12.47***					23.24	**12.59****	+2.77	11 **(65)**	7.84
e/p	Earning Price Ratio	1927–2005	**14.96***					−4.04	−15.33	−2.18	28 **(65)**	6.24
d/y	Dividend Yield	1927–2005	**14.99***					6.16	−9.47	−1.19	22 **(72)**	6.04
d/p	Dividend Price Ratio	1927–2005	**21.24****					4.28	−12.69	−1.74	29 **(61)**	**10.24***

Table 3: Forecasts at Monthly Frequency using Campbell and Thompson (2005) procedure

Refer to Table 1 for basic explanations. This table presents statistics on forecast errors in-sample (IS) and out-of-sample (OOS) for equity premium forecasts at the monthly frequency (both in the forecasting equation and forecast). Variables are explained in Section 2. The data period is December 1927 to December 2004, except for **csp** (May 1937 to December 2002) and **cay**3 (December 1951 to December 2004). Critical values of all statistics are obtained empirically from bootstrapped distributions, except for **cay**3 model where they are obtained from McCracken (2004). The resulting significance levels at 90%, 95%, and 99% are denoted by one, two, and three stars, respectively. They are two-sided for IS model significance, and one-sided for OOS superior model performance. The first data column is the IS $\overline{R}^2$ when returns are logged, as they are in our other tables. The remaining columns are based on predicting simple returns for correspondence with Campbell and Thompson (2005). Certainty Equivalence (CEV) gains are based on the utility of an optimizer with a risk-aversion coefficient of $\gamma = 3$ who trades based on unconditional forecast and conditional forecast. Equity positions are winsorized at 150% ($w = w_{\max}$). At this risk-aversion, the base CEV are 82bp for a market-timer based on the unconditional forecast, 79bp for the market, and 40bp for the risk-free rate. "T" means "truncated" to avoid a negative equity premium prediction. "U" means unconditional, that is, to avoid a forecast that is based on a coefficient that is inverse to what the theory predicts. A superscript h denotes high trading turnover of about 10%/month more than the trading strategy based on unconditional forecasts.

		Log Returns	Simple Returns									
			IS		OOS	Campbell and Thompson (2005) OOS						
	Variable	IS $\overline{R}^2$	$\overline{R}^2$	$\overline{R}^2$ T	$\overline{R}^2$	Frcst= T	Frcst= U	$\overline{R}^2$ TU	ΔRMSE TU	w = $w_{\max}$	ΔCEV	Fig
d/e	Dividend Payout Ratio	0.02	−0.10	−0.10	−0.70	0.0	7.9	−0.69	−0.0114	57.7	-0.01	
svar	Stock Variance	−0.09	−0.07	−0.07	−0.79	0.0	0.0	−0.79	−0.0134	35.4	-0.04	
dfr	Default Return Spread	−0.02	−0.07	−0.08	−0.37	0.0	20.9	−0.29	−0.0030	44.9	0.01	
lty	Long Term Yield	−0.03	0.02	0.02	−0.80	34.1	0.0	**0.26****	+0.0085	19.5	0.06	
ltr	Long Term Return	0.04	0.07	0.08	−0.63	3.0	38.2	**0.11****	+0.0053	51.2^{h}	0.06	
infl	Inflation	−0.01	0.14	−0.05	**0.01***	1.3	0.0	**0.07****	+0.0045	43.5^{h}	0.04	
tms	Term Spread	0.12	0.18	0.20	**0.22****	3.7	0.0	**0.21****	+0.0073	59.3	0.14	F3.G
tbl	T-Bill Rate	0.10	**0.20***	0.15	−0.08*	23.1	0.0	**0.25****	+0.0081	16.4	0.10	F3.F
dfy	Default Yield Spread	−0.06	**0.28***	0.28	−0.56	4.0	0.0	−0.49	−0.0071	27.3	-0.08	
d/p	Dividend Price Ratio	0.12	**0.33***	0.29	−0.30	32.3	0.0	**0.17***	+0.0066	16.1	-0.10	F3.E
d/y	Dividend Yield	**0.22***	**0.47****	0.45	−1.12	54.2	0.0	−0.04*	+0.0023	16.4	-0.14	
e/p	Earning Price Ratio	**0.51****	**0.54****	0.45	−1.04	18.1	0.0	−1.03	−0.0183	34.4	-0.04	
eqis	Pct Equity Issuing	**0.82*****	**0.80*****	0.59	**0.14****	6.7	0.0	**0.30*****	+0.0093	55.8	0.14	F3.D
b/m	Book to Market	**0.45****	**0.81*****	0.88	−3.28	44.3	0.0	−2.23	−0.0432	31.3	-0.22	
e^{10}**/p**	Earning(10Y) Price Ratio	**0.46****	**0.86*****	0.96	−2.21	52.4	0.0	−0.48	−0.0071	15.4	-0.13	
csp	Cross-Sectional Prem	**0.92*****	**0.99*****	0.93	−0.94	44.7	0.0	**0.15****	+0.0072	13.5	0.06	F3.B
ntis	Net Equity Expansion	**0.94*****	**1.02*****	0.88	−0.16	0.4	0.0	−0.16	−0.0003	57.4	0.02	F3.C
cay3	Cnsmptn, Wlth, Incme	**1.88*****	**1.87*****	1.57	−2.05	44.7	0.0	−0.34*	+0.0088	13.2	0.06	F3.A

Table 4: Significant Forecasts Using Various d/p, e/p, and d/e Ratios

Refer to Table 1 for basic explanations. The table reports only those combinations of **d/p e/p** and **d/e** that were found to predict equity premia significantly in-sample. This table presents statistics on forecast errors in-sample (IS) and out-of-sample (OOS) for excess stock return forecasts at various frequencies. Variables are explained in Section 2. All ΔRMSE numbers are in percent per frequency corresponding to the column entitled 'Freq'. The 'Freq' column also gives the first year of forecast. A star next to OOS-$\overline{R}^2$ is based on the MSE-*F*-statistic by McCracken (2004), which tests for equal MSE of the unconditional forecast and the conditional forecast. One-sided critical values of MSE statistics are obtained empirically from bootstrapped distributions. Significance levels at 90%, 95%, and 99% are denoted by one, two, and three stars, respectively.

				IS	OOS	
	Variable	Data	Freq	$\overline{R}^2$	$\overline{R}^2$	ΔRMSE
e/p	Earning(1Y) Price Ratio	1927–2005	M 1965–	**0.54****	−1.20	−0.02
e^5/p	Earning(5Y) Price Ratio	1927–2005	M 1965–	**0.32***	−0.60	−0.01
e^{10}/p	Earning(10Y) Price Ratio	1927–2005	M 1965–	**0.49****	−0.83	−0.01
e^3/p	Earning(3Y) Price Ratio	1882–2005	A 1902–	**2.53****	−1.05*	−0.01
e^5/p	Earning(5Y) Price Ratio	1882–2005	A 1902–	**2.88****	−0.52*	+0.04
e^{10}/p	Earning(10Y) Price Ratio	1882–2005	A 1902–	**4.89****	**2.12****	+0.30
d^3/p	Dividend(3Y) Price Ratio	1882–2005	A 1902–	**1.85***	−1.53	−0.05
d^5/p	Dividend(5Y) Price Ratio	1882–2005	A 1902–	**2.48***	−0.54*	+0.04
d^{10}/p	Dividend(10Y) Price Ratio	1882–2005	A 1902–	**2.11***	−1.07*	−0.01
e^3/p	Earning(3Y) Price Ratio	1882–2005	A 1965–	**2.53****	−3.41	−0.06
e^5/p	Earning(5Y) Price Ratio	1882–2005	A 1965–	**2.88****	−5.01	−0.19
e^{10}/p	Earning(10Y) Price Ratio	1882–2005	A 1965–	**4.89****	−11.45	−0.66
d^3/p	Dividend(3Y) Price Ratio	1882–2005	A 1965–	**1.85***	−6.55	−0.30
d^5/p	Dividend(5Y) Price Ratio	1882–2005	A 1965–	**2.48***	−8.79	−0.47
d^{10}/p	Dividend(10Y) Price Ratio	1882–2005	A 1965–	**2.11***	−8.32	−0.43
e^3/p	Earning(3Y) Price Ratio	1882–2005	5Y 1902–	**11.35***	**3.46****	+0.89
e^5/p	Earning(5Y) Price Ratio	1882–2005	5Y 1902–	**16.16****	**4.76****	+1.16
e^{10}/p	Earning(10Y) Price Ratio	1882–2005	5Y 1902–	**16.47****	−2.85*	−0.37
d/p	Dividend(1Y) Price Ratio	1882–2005	5Y 1902–	**12.30***	−0.66*	+0.06
d^3/p	Dividend(3Y) Price Ratio	1882–2005	5Y 1902–	**13.11***	−2.02*	−0.21
d^5/p	Dividend(5Y) Price Ratio	1882–2005	5Y 1902–	**13.75***	−3.85*	−0.57
e^3/p	Earning(3Y) Price Ratio	1882–2005	5Y 1965–	**11.35***	−12.55	−1.56
e^5/p	Earning(5Y) Price Ratio	1882–2005	5Y 1965–	**16.16****	−21.16	−2.85
e^{10}/p	Earning(10Y) Price Ratio	1882–2005	5Y 1965–	**16.47****	−25.65	−3.51
d/p	Dividend(1Y) Price Ratio	1882–2005	5Y 1965–	**12.30***	−29.33	−4.03
d^3/p	Dividend(3Y) Price Ratio	1882–2005	5Y 1965–	**13.11***	−28.11	−3.86
d^5/p	Dividend(5Y) Price Ratio	1882–2005	5Y 1965–	**13.75***	−30.71	−4.23

Table 5: Forecasts at Monthly Frequency with Alternative Procedures and Total Returns

Refer to Table 1 for basic explanations.Columns under the heading 'OLS' are unadjusted betas, columns under the heading 'Stambaugh' correct for betas following Stambaugh (1999), and columns under the heading 'Lewellen' correct for betas following Lewellen (2004). ρ under the column OLS gives the autoregressive coefficient of the variable over the entire sample period (the variables are sorted in descending order of ρ).

			OLS				Stambaugh			Lewellen		
			IS		OOS		IS	OOS		IS	OOS	
	Variable	Data	ρ	$\overline{R}^2$	$\overline{R}^2$	Power	$\overline{R}^2$	$\overline{R}^2$	Power	$\overline{R}^2$	$\overline{R}^2$	Power
d/e	Dividend Payout Ratio	192701–200512	0.9989	0.01	−2.02	15 **(70)**	0.01	−2.11	15 **(69)**	0.01	−2.05	15 **(69)**
lty	Long Term Yield	192701–200512	0.9963	−0.01	−1.15	9 **(68)**	−0.01	−1.71	9 **(68)**	−0.01	−1.05	10 **(67)**
d/y	Dividend Yield	192701–200512	0.9929	**0.25***	−0.40	33 **(71)**	**0.25***	−0.36	33 **(71)**	**0.25***	−0.26	32 **(72)**
d/p	Dividend Price Ratio	192701–200512	0.9927	0.15	−0.15	29 **(56)**	0.05	−0.31	26 **(69)**	−0.15**	−1.03	3 **(3)**
tbl	T-Bill Rate	192701–200512	0.9922	0.11	−0.18	19 **(69)**	0.11	−0.33	20 **(69)**	0.11	−0.27	20 **(68)**
e/p	Earning Price Ratio	192701–200512	0.9879	**0.54****	−1.21	56 **(64)**	**0.48****	−0.54	59 **(73)**	**0.02*****	−0.01**	41 **(41)**
b/m	Book to Market	192701–200512	0.9843	**0.40****	−2.45	48 **(65)**	**0.36****	−1.61	48 **(71)**	−0.14**	−0.31	19 **(19)**
csp	Cross-Sectional Prem	193705–200212	0.9788	**0.92*****	**0.70*****	65 **(80)**	**0.92*****	**0.70*****	65 **(80)**	**0.91*****	**0.71*****	65 **(81)**
dfy	Default Yield Spread	192701–200512	0.9763	−0.07	−0.14	9 **(59)**	−0.07	−0.33	8 **(59)**	−0.15	−0.71	5 **(43)**
ntis	Net Equity Expansion	192701–200512	0.9680	**0.75*****	−0.28	59 **(76)**	**0.75*****	−0.29	59 **(76)**	**0.74*****	−0.38	58 **(74)**
tms	Term Spread	192701–200512	0.9566	0.07	**0.09***	21 **(66)**	0.07	**0.07***	20 **(65)**	0.07	**0.06***	20 **(65)**
svar	Stock Variance	192701–200512	0.6008	−0.08	−0.34	7 **(53)**	−0.08	−0.34	7 **(53)**	−1.66**	−0.63	7 **(7)**
infl	Inflation	192701–200512	0.5513	−0.00	−0.07	14 **(62)**	−0.00	−0.07	14 **(62)**	−0.03	−0.13	15 **(56)**
ltr	Long Term Return	192701–200512	0.0532	0.04	−0.49	18 **(62)**	0.04	−0.48	18 **(62)**	−1.55***	−6.41	12 **(12)**
dfr	Default Return Spread	192701–200512	-0.1996	−0.02	−0.30	12 **(61)**	−0.02	−0.30	12 **(61)**	−1.32*	−2.64	10 **(38)**

Table 6: Encompassing Tests

This table presents statistics on encompassing tests for excess stock return forecasts at various frequencies. Variables are explained in Section 2. All numbers are in percent per frequency corresponding to the panel. λ gives the ex-post weight on the conditional forecast for the optimal forecast that minimizes the MSE. ENC is the test statistic proposed by Clark and McCracken (2001) for a test of forecast encompassing. One-sided critical values of ENC statistic are obtained empirically from bootstrapped distributions, except for **caya**, **cayp**, and **all** models where they are obtained from Clark and McCracken (2001). Critical values for **ms** model are not calculated. **cayp** uses ex-post information. ΔRMSE* is the RMSE difference between the unconditional forecast and the optimal forecast for the same sample/forecast period. ΔRMSE^{*r} is the RMSE difference between the unconditional forecast and the optimal forecast for the same sample/forecast period using rolling estimates of λ. Significance levels at 90%, 95%, and 99% are denoted by one, two, and three stars, respectively.

Panel A: Annual Data

		Estimation:	All Data					All Data				After 1927				
		OOS Forecast:	After 20 years					After 1965				After 1965				
		Data	$\overline{R}^2$	λ	ENC	ΔRMSE*	ΔRMSE^{*r}	λ	ENC	ΔRMSE*	ΔRMSE^{*r}	$\overline{R}^2$	λ	ENC	ΔRMSE*	ΔRMSE^{*r}
d/p	Dividend Price Ratio	1872–2005	0.49	0.21	0.48	+0.0084	−0.2583	0.40	**0.87***	+0.0664	−0.4989	1.67	0.54	**2.19****	+0.2297	−0.3539
d/y	Dividend Yield	1872–2005	0.91	0.38	1.94	+0.0614	−0.5713	0.30	**1.24***	+0.0749	−0.5389	**2.71***	0.41	**3.24****	+0.2662	−0.2858
e/p	Earning Price Ratio	1872–2005	1.08	0.22	0.40	+0.0074	−0.2266	0.66	**1.21****	+0.1508	−0.4845	**3.20***	0.48	**2.51****	+0.2346	−0.4049
d/e	Dividend Payout Ratio	1872–2005	−0.75	-1.73	−1.46	+0.2135	+0.0960	-8.46	−0.45	+0.7545	+0.2858	−1.24	-4.57	−1.25	+1.2308	+0.7796
svar	Stock Variance	1885–2005	−0.76	-0.42	−4.74	+0.2387	−0.6475	2.07	0.03	+0.0134	−0.5937	−1.32	-16.73	−0.18	+0.5906	+0.4490
b/m	Book to Market	1921–2005	**3.20***	0.49	**4.16****	+0.2532	−0.0575	0.20	**1.27***	+0.0559	−0.7885	**4.14***	0.18	**1.67***	+0.0689	−0.4821
ntis	Net Equity Expansion	1927–2005	**8.15*****	0.31	1.46	+0.0619	−0.2708	0.31	**1.30***	+0.0805	−0.9310	**8.15*****	0.31	**1.30***	+0.0805	−0.9310
eqis	Pct Equity Issuing	1927–2005	**9.15*****	0.67	**4.45****	+0.3917	−0.0564	0.56	**3.12****	+0.3342	−0.7106	**9.15*****	0.56	**3.12****	+0.3342	−0.7106
tbl	T-Bill Rate	1920–2005	0.34	0.39	**2.14***	+0.1031	−1.2425	0.41	**2.16****	+0.1790	−1.3058	0.15	0.33	**2.72****	+0.1863	−0.5619
lty	Long Term Yield	1919–2005	−0.63	0.29	**2.67***	+0.0971	−0.7012	0.28	**2.39****	+0.1447	−0.9358	−0.94	0.25	**2.39****	+0.1317	−0.5682
ltr	Long Term Return	1926–2005	0.99	0.31	**4.55****	+0.2077	−0.1412	0.24	**2.45****	+0.1300	−8.4290	0.92	0.25	**2.44****	+0.1348	−8.7284
tms	Term Spread	1920–2005	0.16	0.38	0.93	+0.0433	−1.0292	0.47	**1.07***	+0.0977	−0.8750	0.89	0.50	**1.95****	+0.1880	−0.5375
dfy	Default Yield Spread	1919–2005	−1.18	-2.62	−0.48	+0.1503	−0.9718	-10.65	−0.30	+0.6395	+0.4999	−1.31	-11.91	−0.24	+0.5677	+0.4496
dfr	Default Return Spread	1926–2005	0.40	0.44	0.87	+0.0501	−0.3698	0.47	0.78	+0.0710	−0.3808	0.32	0.48	0.74	+0.0692	−0.3877
infl	Inflation	1919–2005	−1.00	-2.46	−0.68	+0.2019	−0.4520	-1.48	−0.15	+0.0429	−15.1368	−0.99	-3.12	−0.86	+0.5541	−0.4697
i/k	Invstmnt Capital Ratio	1947–2005	**6.63****	0.53	**3.01****	+0.3330	−0.1950	0.53	**3.01****	+0.3330	−0.1950	**6.63****	0.53	**3.01****	+0.3330	−0.1950
cayp	Cnsmptn, Wlth, Incme	1945–2005	**15.72*****	1.34	**7.62*****	+1.7225	+0.3315	1.34	**7.62*****	+1.7225	+0.3315	**15.72*****	1.34	**7.62*****	+1.7225	+0.3315
all	Kitchen Sink	1927–2005	**13.81****	0.13	4.86	+0.1607	+0.0160	-0.07	−1.26	+0.0342	−0.4666	**13.81****	-0.07	−1.26	+0.0342	−0.4666
caya	Cnsmptn, Wlth, Incme	1945–2005	-	0.45	**3.39****	+0.3117	−0.3185	0.45	**3.39****	+0.3117	−0.3185	-	0.45	**3.39****	+0.3117	−0.3185
ms	Model Selection	1927–2005	-	0.24	4.82	+0.1870	+0.0739	0.07	0.59	+0.0094	−1.1268	-	0.07	0.59	+0.0094	−1.1268

Panel B: Monthly Data

		OOS Forecast:	After 194701					After 196501			
		Data	$\overline{R}^2$	λ	ENC	ΔRMSE*	ΔRMSE*^{r}	λ	ENC	ΔRMSE*	ΔRMSE*^{r}
d/p	Dividend Price Ratio	192701–200512	0.15	0.53	**4.14****	+0.0065	−0.0134	0.53	**2.67****	+0.0063	−0.0109
d/y	Dividend Yield	192701–200512	**0.25***	0.43	**6.53*****	+0.0083	−0.0115	0.45	**3.90****	+0.0078	−0.0084
e/p	Earning Price Ratio	192701–200512	**0.54****	0.35	**9.27*****	+0.0097	−0.0135	0.28	**3.08****	+0.0039	−0.0172
d/e	Dividend Payout Ratio	192701–200512	0.01	-0.02	−0.22	+0.0000	−0.0146	-1.12	−3.01	+0.0152	+0.0003
svar	Stock Variance	192701–200512	−0.08	-12.30	−0.47	+0.0172	+0.0046	-12.93	−0.32	+0.0184	+0.0060
csp	Cross-Sectional Prem	193705–200212	**0.92*****	0.38	**6.21*****	+0.0093	−0.0138	0.82	**5.50*****	+0.0219	−0.0007
b/m	Book to Market	192701–200512	**0.40****	0.18	**3.04****	+0.0016	−0.0416	0.07	0.89	+0.0003	−0.0260
ntis	Net Equity Expansion	192701–200512	**0.75*****	0.60	**4.28****	+0.0075	−0.0055	0.47	**2.77****	+0.0058	−0.0180
tbl	T-Bill Rate	192701–200512	0.11	0.50	**5.47****	+0.0081	−0.0222	0.51	**4.86*****	+0.0110	−0.0218
lty	Long Term Yield	192701–200512	−0.01	0.35	**7.57*****	+0.0079	−0.0084	0.35	**5.47*****	+0.0086	−0.0161
ltr	Long Term Return	192701–200512	0.04	-0.15	−0.77	+0.0003	−0.0129	0.30	**1.02***	+0.0014	−0.0234
tms	Term Spread	192701–200512	0.07	0.68	**2.51****	+0.0050	−0.0311	0.73	**2.37****	+0.0076	−0.0538
dfy	Default Yield Spread	192701–200512	−0.07	-1.04	−0.27	+0.0008	−0.0070	2.15	0.20	+0.0019	−0.0197
dfr	Default Return Spread	192701–200512	−0.02	-0.85	−0.72	+0.0018	−0.0134	-0.03	−0.01	+0.0000	−0.0221
infl	Inflation	192701–200512	−0.00	1.01	0.69	+0.0021	−0.0114	1.19	0.58	+0.0030	−0.0541
all	Kitchen Sink	192701–200512	**1.98*****	0.05	4.39	+0.0008	−0.0150	0.14	**5.88****	+0.0040	−0.0366
ms	Model Selection	192701–200512	–	0.09	1.51	+0.0004	−0.0232	0.14	1.39	+0.0009	−0.0245

References

Ang, A., and G. Bekaert, 2003, "Stock Return Predictability: Is it There?," Working Paper, Columbia University.

Avramov, D., 2002, "Stock Return Predictability and Model Uncertainty," *Journal of Financial Economics*, 64(3), 423–458.

Baker, M., R. Taliaferro, and J. Wurgler, 2004, "Pseudo Market Timing and Predictive Regressions," NBER Working paper No. 10823.

Baker, M., and J. Wurgler, 2000, "The Equity Share in New Issues and Aggregate Stock Returns," *Journal of Finance*, 55(5), 2219–2257.

Ball, R., 1978, "Anomalies in Relationship Between Securities' Yields and Yield-Surrogates," *Journal of Financial Economics*, 6(2/3), 103–126.

Bansal, R., G. Tauchen, and H. Zhou, 2004, "Regime-Shifts, Risk Premiums in the Term Structure, and the Business Cycle," *Journal of Business and Economic Statistics*, 22(4), 396–409.

Bossaerts, P., and P. Hillion, 1999, "Implementing Statistical Criteria to Select Return Forecasting Models: What Do We Learn?," *Review of Financial Studies*, 12(2), 405–428.

Boudoukh, J., R. Michaely, M. P. Richardson, and M. R. Roberts, 2005, "On the Importance of Measuring Payout Yield: Implications for Empirical Asset Pricing," Working Paper, forthcoming in *Journal of Finance*.

Boudoukh, J., M. Richardson, and R. F. Whitelaw, 2005, "The Myth of Long-Horizon Predictability," NBER Working Paper No. 11841.

Breen, W., L. R. Glosten, and R. Jagannathan, 1989, "Economic Significance of Predictable Variations in Stock Index Returns," *Journal of Finance*, 64(5), 1177–1189.

Brennan, M. J., and Y. Xia, 2004, "Persistence, Predictability, and Portfolio Planning," Working Paper, UCLA and Wharton.

Butler, A. W., G. Grullon, and J. Weston, 2005, "Can Managers Forecast Aggregate Market Returns?," *Journal of Finance*, 60(2), 963–986.

Campbell, J. Y., 1987, "Stock returns and the Term Structure," *Journal of Financial Economics*, 18(2), 373–399.

Campbell, J. Y., and R. J. Shiller, 1988a, "Stock Prices, Earnings, and Expected Dividends," *Journal of Finance*, 43(3), 661–676.

——— , 1988b, "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors," *Review of Financial Studies*, 1(3), 195–227.

——— , 1998, “Valuation Ratios and the Long-Run Stock Market Outlook,” *Journal of Portfolio Management*, 24(2), 11–26.

Campbell, J. Y., and S. B. Thompson, 2005, “Predicting the Equity Premium Out of Sample: Can Anything Beat the Historical Average?,” Working Paper, Harvard University.

Campbell, J. Y., and L. M. Viceira, 2002, *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors.* Oxford University Press, Oxford, UK.

Campbell, J. Y., and T. Vuolteenaho, 2004, “Inflation Illusion and Stock Prices,” *American Economic Review*, 94(2), 19–23.

Campbell, J. Y., and M. Yogo, 2006, “Efficient Tests of Stock Return Predictability,” Working Paper, forthcoming in *Journal of Financial Economics.*

Clark, T. E., and M. W. McCracken, 2001, “Tests of Forecast Accuracy and Encompassing for Nested Models,” *Journal of Econometrics*, 105, 85–110.

Cochrane, J. H., 1991, “Production-Based Asset Pricing and the Link Between Stock Returns and Economic Fluctuations,” *Journal of Finance*, 46(1), 209–237.

——— , 1997, “Where is the Market Going? Uncertain Facts and Novel Theories,” *Federal Reserve Bank of Chicago - Economic Perspectives*, 21(6), 3–37.

——— , 2005, “The Dog That Did Not Bark: A Defense of Return Predictability,” Working Paper, University of Chicago.

Diebold, F. X., and R. S. Mariano, 1995, “Comparing Predictive Accuracy,” *Journal of Business & Economic Statistics*, 13(3), 253–263.

Dow, C. H., 1920, “Scientific Stock Speculation,” The Magazine of Wall Street.

Fama, E. F., 1981, “Stock Returns, Real Activity, Inflation, and Money,” *American Economic Review*, 71(4), 545–565.

Fama, E. F., and K. R. French, 1988, “Dividend Yields and Expected Stock Returns,” *Journal of Financial Economics*, 22(1), 3–25.

——— , 1989, “Business Conditions and Expected Returns on Stocks and Bonds,” *Journal of Financial Economics*, 25(1), 23–49.

Fama, E. F., and G. W. Schwert, 1977, “Asset Returns and Inflation,” *Journal of Financial Economics*, 5(2), 115–146.

Ferson, W. E., S. Sarkissian, and T. T. S. Simin, 2003, “Spurious Regressions in Financial Economics,” *Journal of Finance*, 58(4), 1393–1413.

Fisher, K. L., and M. Statman, 2005, “Market Timing at Home and Abroad,” Working Paper, Santa Clara University.

Goetzmann, W. N., and P. Jorion, 1993, “Testing the Predictive Power of Dividend Yields,” *Journal of Finance*, 48(2), 663–679.

Goyal, A., and I. Welch, 2003, “Predicting the Equity Premium with Dividend Ratios,” *Management Science*, 49(5), 639–654.

Guo, H., 2006, “On the Out-of-Sample Predictability of Stock Market Returns,” *Journal of Business*, 79(2), 645–670.

Harvey, D. I., S. J. Leybourne, and P. Newbold, 1997, “Testing the Equality of Prediction Mean Squared Errors,” *International Journal of Forecasting*, 13(2), 281–291.

Heaton, J., and D. J. Lucas, 2000, “Stock Prices and Fundamentals,” in *NBER Macroeconomics Annual 1999*, ed. by B. S. Bernanke, and J. Rotemberg. MIT Press/NBER, Cambridge, MA, vol. 14, pp. 213–242.

Hodrick, R. J., 1992, “Dividend Yields and Expected Stock Returns: Alternative Procedures for Inference and Measurement,” *Review of Financial Studies*, 5(3), 257–286.

Inoue, A., and L. Kilian, 2004, “In-Sample or Out-of-Sample Tests of Predictability: Which One Should We Use?,” *Econometric Reviews*, 23(4), 371–402.

Jagannathan, R., E. R. McGrattan, and A. Scherbina, 2000, “The Declining U.S. Equity Premium,” *Federal Reserve Bank of Minneapolis Quarterly Review*, 24(4), 3–19.

Keim, D., and A. Madhavan, 1997, “Transaction Costs and Investment Style: An Inter-Exchange Analysis of Institutional Equity Trades,” *Journal of Financial Economics*, 46(3), 265–292.

Keim, D. B., and R. F. Stambaugh, 1986, “Predicting Returns in the Stock and Bond Markets,” *Journal of Financial Economics*, 17(2), 357–390.

Kilian, L., 1999, “Exchange Rates and Monetary Fundamentals: What Do We Learn From Long–Horizon Regressions?,” *Journal of Applied Econometrics*, 14(5), 491–510.

Kim, C.-J., J. C. Morley, and C. R. Nelson, 2005, “The Structural Break in the Equity Premium,” *Journal of Business and Economic Statistics*, 23(2), 181–191.

Kothari, S., and J. Shanken, 1997, “Book-to-market, Dividend Yield, and Expected Market Returns: A Time-Series Analysis,” *Journal of Financial Economics*, 44(2), 169–203.

Lamont, O., 1998, “Earnings and Expected Returns,” *Journal of Finance*, 53(5), 1563–1587.

Lamoureux, C. G., and G. Zhou, 1996, “Temporary Components of Stock Returns: What Do the Data Tell Us?,” *Review of Financial Studies*, 9(4), 1033–1059.

Lettau, M., and S. Ludvigson, 2001, "Consumption, Aggregate Wealth, and Expected Stock Returns," *Journal of Finance*, 56(3), 815–849.

———, 2005, "Expected Returns and Expected Dividend Growth," *Journal of Financial Economics*, 76(3), 583–626.

Lettau, M., and S. Van Nieuwerburgh, 2005, "Reconciling the Return Predictability Evidence," Working Paper, NYU.

Lewellen, J., 2004, "Predicting Returns with Financial Ratios," *Journal of Financial Economics*, 74(2), 209–235.

Lewellen, J., and J. Shanken, 2002, "Learning, Asset-Pricing Tests, and Market Efficiency," *Journal of Finance*, 57(3), 1113–1145.

Lintner, J., 1975, "Inflation and Security Returns," *Journal of Finance*, 30(2), 259–280.

Mark, N. C., 1995, "Exchange Rates and Fundamentals: Evidence on Long–Horizon Predictability," *American Economic Review*, 85(1), 201–218.

McCracken, M. W., 2004, "Asymptotics for Out-of-Sample Tests of Causality," Working Paper, University of Missouri-Columbia.

Menzly, L., T. Santos, and P. Veronesi, 2004, "Understanding Predictability," *Journal of Political Economy*, 112(1), 1–47.

Nelson, C. R., and M. J. Kim, 1993, "Predictable Stock Returns: The Role of Small Sample Bias," *Journal of Finance*, 48(2), 641–661.

Pesaran, H. M., and A. Timmerman, 1995, "Predictability of Stock Returns: Robustness and Economic Significance," *Journal of Finance*, 50(4), 1201–1228.

Polk, C., S. Thompson, and T. Vuolteenaho, 2006, "Cross-Sectional Forecasts of the Equity Premium," Working Paper, forthcoming in *Journal of Financial Economics*.

Pontiff, J., and L. D. Schall, 1998, "Book-to-Market Ratios as Predictors of Market Returns," *Journal of Financial Economics*, 49(2), 141–160.

Rapach, D. E., and M. E. Wohar, 2006, "In-Sample vs. Out-of-Sample Tests of Stock Return Predictability in the Context of Data Mining," *Journal of Empirical Finance*, 13(2), 231–247.

Rissanen, J., 1986, "Order Estimation by Accumulated Prediction Errors," *Journal of Applied Probability*, 23A, 55–61.

Rozeff, M. S., 1984, "Dividend Yields Are Equity Risk Premiums," *Journal of Portfolio Management*, 11(1), 68–75.

Shiller, R. J., 1984, "Stock Prices and Social Dynamics," *Brookings Papers on Economic Activity*, 2, 457–498.

Stambaugh, R. F., 1999, “Predictive Regressions,” *Journal of Financial Economics*, 54(3), 375–421.

Torous, W., and R. Valkanov, 2000, “Boundaries of Predictability: Noisy Predictive Regressions,” Working Paper, UCLA.

Valkanov, R., 2003, “Long-Horizon Regressions: Theoretical Results and Applications,” *Journal of Financial Economics*, 68(2), 201–232.

Xia, Y., 2001, “Learning about Predictability: The Effects of Parameter Uncertainty on Dynamic Asset Allocation,” *Journal of Finance*, 56(1), 205–246.

Equity Risk Premium: 2006 Update

by Roger J. Grabowski, ASA

Are you aware of recent research questioning the use of those realized equity premiums as an estimate of the equity risk premium (ERP)? [1,2] Or do you simply choose to ignore the research?

ERP is a forward-looking concept. ERP is an expectation as of the valuation date for which no "market quotes" are observable. While you can observe premiums realized over time by referring to historical data, such calculated premiums serve only as estimates for the *expected* ERP. If we are to truly mimic the market, then our goal should be to estimate the true expected ERP as of the valuation date. To do that you need to look beyond the realized premiums.

While there is no one universally accepted standard for estimating ERP, you need to be aware of recent research and not blindly continue using the historical realized equity premiums reported in the *SBBI Yearbook*. The methods used can be broadly categorized into one of two approaches: the Realized Return or *ex post* approach and the Forward-looking or *ex ante* approach.

Ex Post Approach

The realized return approach employs the premium that investors have, on the average, realized over some historical holding period (historical realized premium). The underlying theory is that the past provides an indicator of how the market will behave in the future, and investors' expectations are influenced by the historical performance of the market. If periodic (say, monthly) returns are serially independent (i.e., not correlated) and if expected returns are stable through time, the arithmetic average of historical returns provides an unbiased estimate of expected future returns. A more indirect justification for use of the historical approach is the contention that, for whatever reason, securities in the past have been priced in such a way as to earn the returns observed. By using the historical realized premium in applying the income approach to valuation (i.e., in the discounted cash flow valuation method), one may, to some extent, replicate this level of pricing.

Academics often formulate their research in terms of the equity risk premium relative to Treasury bills. But the variability of Treasury bill returns is such that one can hardly consider them riskless. Further we are generally valuing closely held businesses. Those investments are generally thought of as long-term and long-term government bonds are the benchmark security we use in developing discount rates. Therefore, in this article we have reported the research results in terms of the premium over long-term government bonds in calculating the historical realized premium.[3]

In applying the realized return method, the analyst selects the number of years of historical return data to include in the average. One school of thought holds that the future is best estimated using a very long horizon of past returns. Another school of thought holds that the future is best measured by the (relatively) recent past. These differences in opinion result in disagreement as to the number of years to include in the average.

While the *SBBI Yearbook*[4] contains summaries of returns on U.S. stocks and bonds derived from data accumulated by the Center for Research in Security Prices (CRSP) at the University of Chicago since 1926, good stock market data is available back to 1871, and less reliable data is available from various sources back to the end of the eighteenth century. Data for yields on government bonds is also available for these periods.[5] Exhibit 1 displays realized average annual premiums of

---

[1] Readers interested in more detailed information on the ERP issue are invited to attend the American Society of Appraisers' Center for Advanced Business Valuation Studies Cost of Capital course and to read Grabowski and King, Chapter 1, "Equity Risk Premium" in *The Handbook of Business Valuation and Intellectual Property Analysis*, (McGraw-Hill, 2004);"Equity Risk Premium: What Valuation Consultants Need to Know About Current Research" *Valuation Strategies* (Sept/Oct 2003); "Equity Risk Premium: What Valuation Consultants Need to Know About Current Research – 2005 Update" *Valuation Strategies* (Sept/Oct 2005); "Equity Risk Premium – What is the Current Evidence", *Business Valuation Review* (Fall 2005)

[2] The equity risk premium (ERP) (sometimes referred to as the market risk premium) is defined as the extra return (over the expected yield on government securities) that investors expect to receive from an investment in a diversified portfolio of common stocks. ERP = Rm - Rf where Rm is the expected return on a fully diversified portfolio of equity securities and Rf is the rate of return expected on an investment free of default risk.

[3] In applying the ERP in, say, the CAPM, one must use the return on a risk-free security with a term (maturity) consistent with the benchmark security used in developing the ERP. For example, this article measures ERP in terms of the premium over that of long-term government bonds. In CAPM, $ke = Rf + (Beta \times ERP)$. The Rf used as of the valuation date should be the yield on a long-term government bond because the data cited herein has been developed comparing equity returns to the income return (i.e., the yield promised at issue date) of long-term government bonds.

[4] *Stocks, Bonds, Bills and Inflation Valuation Edition 2006 Yearbook* (Ibbotson Associates, 2006)

[5] See Fisher and Lorie, "Rates of Return on Investments in Common Stocks," 37–1 *Journal of Business* (1964); Wilson and Jones, "A Comparison of Annual Stock Market Returns: 1871–1925 with 1926–1985," 60–2 *Journal of Business* 1 (1987); Schwert, "Indexes of Common Stock Returns from 1802 to 1987," 60–3 Journal of Business 239 (1990); Ibbotson and Brinson, *Global Investing* (McGraw-Hill, 1993); Wilson and Jones, "An Analysis of the S&P 500 Index and Cowles's Extensions: Price Indexes and Stock Returns, 1870–1999," 75–3 *Journal of Business* 505 (2002); Wright, "Measures of Stock Market Value and Returns for the US Nonfinancial Corporate Sector, 1900–2000," working paper, 2/1/02.; Goetzmann, Ibbotson and Peng, "A new historical database for the NYSE 1815 to 1925: Performance and Predictability", *Journal of Financial Markets* 4 (2001) 1–32; Dimson, Marsh and Staunton, *Triumph of the Optimists: 101Years of Global Investment Returns* (Princeton University Press, 2002) with annual updates of their Global Returns database for seventeen countries including the U.S. available at www.ibbotson.com.

Exhibit 1
Historical Realized Equity Risk Premiums: Stock Market Returns vs. Treasury Bonds (Income Returns)

Period	Arithmetic (%)	Geometric (%)
20 years (since 1986)	6.4	5.1
30 years (since 1976)	6.0	4.9
40 years (since 1966)	4.2	2.9
50 years (since 1956)	5.0	3.8
80 years (since 1926)	7.1	5.2
106 years (since 1900)	6.7	4.9
134 years (since 1872)	5.9	4.3
208 years (since 1798)	5.1	3.6

stock market returns (relative to the income return on long-term government bonds) for alternative periods through 2005.

The historical realized premium is measured by comparing the stock market returns realized during the period to the income return on bonds. While the stock market return is not known when investing at the beginning of the period, the rate of interest promised on a long-term government bond is known in terms of the yield to maturity. Therefore, analysts measure the stock market returns realized over the expected returns on bonds. An investor makes a decision to invest in the stock market today by comparing the expected return from that investment to the return on a benchmark security (in this case the long-term government bond) given the rate of return today on that benchmark security. The realized return approach is based on the expectation that history will repeat itself and such a premium return will again be realized (on the average) in the future.

Selection of the Observation Period

The historical realized premium derived from realized returns is sensitive to the period chosen for the average. For example, if one includes in the average only observed premiums in the immediate past period, that *ex post* premium may be the inverse of the *ex ante* estimate analysts are looking to develop. Almost all practitioners who use historical data focus on a longer-run view of historical returns. But selection of the period over which to measure those returns is key.

The selection of 1926 as a starting point is a happenstance of the arbitrary selection of that date by the founders of the CRSP database. The average calculated using 1926 return data as a beginning point may be too heavily influenced by the unusually low interest rates during the 1930s to mid-1950s. Some observers have suggested that the period, which includes the 1930s, 1940s, and the immediate post-World War II boom period may have exhibited an unusually high average realized return premium. If we disaggregate the 80 years reported in the *SBBI Yearbook* into two sub-periods, the first covering the periods before and after the mid-1950s, we get the following comparative figures for stock and bond returns as shown in Exhibit 2.

Exhibit 2
Historical Realized Returns: Relative Volatility of Stock Returns to Bond Returns

	Realized Equity Risk premiums over Treasury Bond Income Returns Nominal (i.e., without inflation removed)	
	1926–1957	1958–2005
Arithmetic averages (%)	9.5	5.4
Geometric average (%)	6.6	4.2
Standard Deviations		
Stock Market annual returns (%)	24.8	16.7
Long-term Treasury Bond		
Income Returns (%)	0.5	2.4
Total Returns (%)	4.9	11.0
Ratio of Equity to Bond		
Total Return Volatility	5.1	1.5

Source: Ibbotson Associates' data; calculations by author.

The period since the mid-1950s has been characterized by a more stable stock market and a more volatile bond market compared to the earlier period. Interest rates have become more volatile in the later period.[6] The effect is amplified in the volatility of bond total returns.[7] This data indicates that the *relative* risk of stocks versus bonds is lower today which indicates that the equity risk premium is likely lower today. Thus, the historical arithmetic average realized premium reported in the *SBBI Yearbook* as measured from 1926 likely overstates expected returns as of 2006.

If the average expected return on stocks has changed through time, averages of realized returns using the longest available data become questionable. A short-run horizon may give a better estimate if changes in economic conditions have created a different expected return environment than that of more remote past periods. For example, why not use the average realized return over the past 20-year period? A drawback of using averages over shorter periods is that they are susceptible to large errors in measuring the true ERP due to high volatility of annual stock returns. Also, the average of the realized

---

[6] As reflected in Ibbotson Associates' Long-term Treasure Bond Income Return statistics.

[7] As reflected in Ibbotson Associates' Long-term Treasure Bond Total Returns which include the capital gains and losses associated with interest rate fluctuations.

premiums over the past 20 years may overstate today's expected returns due to the general downward movement of interest rates since 1981.

Even using long-term observations, the volatility of annual stock returns is high. For example, the standard deviation of the realized average return for the entire 80-year period 1926–2005 is approximately 20%. Even assuming that the 80-year average gives an unbiased estimate, a 95% confidence interval for the unobserved true ERP still spans a range of approximately 2.7% to 11.5%.

Which Average—Arithmetic or Geometric?

Realized return premiums measured using geometric (compound) averages are always less than those using the arithmetic average. The choice between which average to use remains a matter of disagreement among practitioners. The arithmetic average receives the most support in the literature,[8] other authors recommend a geometric average,[9] and still others support something in between.[10] The use of the arithmetic average relies on the assumption that (1) market returns are serially independent (not correlated) and (2) the distribution of market returns is stable (not time-varying). Under these assumptions, an arithmetic average gives an unbiased estimate of expected future returns. Empirical studies generally indicate a fairly low degree of serial correlation, supporting use of the arithmetic average. Moreover, the more observations, the more accurate the estimate will be.

But even if one agrees that stock returns are serially independent, the arithmetic average of one-year realized premiums may not be the best estimate of future premiums. Textbook models of stock returns (e.g., CAPM) are generally single period models that estimate returns over unspecified investment horizons. As the investment horizon increases, the arithmetic average of realized premiums decreases asymptotically to the geometric average of the entire realized premium series. As a result, some recommend using the mid-point of the arithmetic average of one-year realized premiums and the geometric average of the entire realized premium series as the best estimate of the future premiums when one is using historical realized premiums as the basis for their future ERP estimate.[11]

Expected ERP versus Realized Equity Premiums

Much has recently been written comparing the realized returns as reported in sources such as the *SBBI Yearbook* with the ERP that must have been expected by investors given the underlying economics of publicly traded companies (i.e., expected growth in earnings or expected growth in dividends) and the underlying economics of the economy (i.e., expected growth in Gross Domestic Product). Such studies conclude that investors could not have expected as large an ERP as the equity premiums actually realized.

Roger Ibbotson and Peng Chen report on their study of estimated forward looking long-term sustainable equity returns and expected ERPs.[12] They first analyzed historical equity returns by decomposing returns into factors including inflation, earnings, dividends, price-to-earnings ratio, dividend-payout ratio, book value, return on equity, and gross domestic product per capita. They forecast what could have been expected as an ERP through "supply side" models built from historical data. In the most recent update to this study reported in the *SBBI Yearbook*, Ibbotson Associates determined that the long-term ERP that could have been expected given the underlying economics was approximately 6.3% on an arithmetic basis (4.2% on a geometric basis) compared to the historical realized risk premium of 7.1% on an arithmetic basis (5.2% on a geometric basis). The greater-than-expected historical realized equity returns were caused by an unexpected increase in market multiples relative to economic fundamentals (i.e., decline in the discount rates).

What caused the decline in discount rates that led to the unexpected capital gain? The marginal income tax rate declined (the marginal tax rate on corporate distributions averaged 43% in the 1955–1962 period and averaged only 17% in the 1987–2000 period), and equity investments could not be held "tax free" in 1962. By 2000 however, equity investment could be held "tax deferred" in defined benefit and contribution pension plans and in individual retirement accounts. The decrease in income tax rates on corporate distributions and the inflow of retirement plan investment capital into equity

---

[8] E.g., Kaplan, "Why the Expected Rate of Return is an Arithmetic Average," 14–3 Business Valuation Review 126, (September 1995); *Stocks, Bonds, Bills and Inflation Valuation Edition 2005 Yearbook*, (Ibbotson Associates, 2005) pp 75–77; Kritzman, "What Practitioners Need to Know About Future Value," 50–3 *Financial Analysts Journal* 12 (May/June 1994); Bodie, Kane, and Marcus, *Investments* (Richard D. Irwin, Inc.,1989) p. 720.

[9] E.g., Damodaran, *Investment Valuation, 2nd ed.* (John Wiley & Sons, Inc., 2002) p. 161.

[10] Copeland, Koller and Murrin, *Valuation: Measuring and Managing the Value of Companies*, *3rd ed.* (John Wiley & Sons, Inc., 2000) p. 218; Koller, Goedhart and Wessels, *Valuation: Measuring and Managing the Value of Companies, 4th ed.* (John Wiley & Sons, Inc., 2005), p. 299–302; Cornell, *The Equity Risk Premium* (John Wiley & Sons, Inc.,1999) p. 36; Julius, "Market Returns in Rolling Multi-Year Holding Periods: An Alternative Interpretation to Ibbotson Data," 15–2 *Business Valuation Review* 57 (June 1996).

[11] Note 10, *supra*.

[12] Ibbotson and Chen, "Long-Run Stock Returns, Participating in the Real Economy," 591 *Financial Analysts Journal* 88 (January/February 2003) updated in *Stocks, Bonds, Bills and Inflation, Valuation Edition 2006 Yearbook* (Ibbotson Associates, 2006) p 98.

investments combined to lower discount rates and increase market multiples relative to economic fundamentals.[13]

Assuming that investors did not expect such changes, the true ERP during this period has been less than the historical realized premium calculated as the arithmetic average of excess returns realized since 1926. Further, assuming that the likelihood of changes in such factors being repeated are remote and investors do not expect another such decline in discount rates, the true ERP as of today can also be expected to be less than the historical realized premium.

Ex Ante Approaches

Merrill Lynch publishes "bottom-up" expected return estimates for the S&P 500 stock index derived from averaging return estimates for stocks in the S&P 500. While Merrill Lynch does not cover every company in the S&P 500 index, it does cover a high percentage of the companies as measured in market value terms. Merrill Lynch uses a multi-stage dividend discount model (DDM) to calculate expected returns for several hundred companies using projections from its own securities analysts. The resulting data is published monthly in the Merrill Lynch publication *Quantitative Profiles.* The Merrill Lynch expected return estimates have indicated an implied ERP ranging from 3% to 7% in recent years (approximately 6.6% at the end of 2005), with an average over the last 15 years of approximately 4.6%.[14]

Graham and Harvey report the results from a series of surveys of chief financial officers of U.S. corporations conducted from mid-2000 to the end of 2005. They report that the range of ERP given a ten-year investment horizon was 3.6% to 4.7% (premium over ten-year Treasury bonds). The most recent survey reports an ERP given a ten-year investment horizon was 4.7% on an arithmetic average basis (2.4% on a geometric average basis).[15]

Elroy Dimson, Paul Marsh and Mike Staunton studied the realized equity returns and historical equity premiums for 17 countries (including the U.S.) from 1900 to the end of 2005.[16]

These authors report that the historical equity premiums have been 6.5% on an arithmetic basis (4.6% on a geometric basis) for the U.S. (in excess of the total return on bonds) and 5.2% on an arithmetic basis (4.0% on a geometric basis) for the total of the 17 countries.

They observe larger equity returns earned in the second half of the 20th century compared to the first half due to (1) corporate cash flows growing faster than investors anticipated fueled by rapid technological change and unprecedented growth in productivity and efficiency, (2) transaction and monitoring costs falling over the course of the century, (3) inflation rates generally declining over the final two decades of the century and the resulting increase in real interest rates, and (4) required rates of return on equity declining due to diminished business and investment risks. They conclude that the observed increase in the overall price-to-dividend ratio during the century is attributable to the long-term decrease in the required risk premium and that the decrease will not continue into the future. The authors note that:

> Further adjustments should almost certainly be made to historical risk premiums to reflect long-term changes in capital market conditions. Since, in most countries corporate cash flows historically exceeded investors' expectations, a further downward adjustment is in order.

They conclude that a downward adjustment in the expected ERP compared to the historical equity premiums due to the increase in price/dividend ratio is reasonable. Further, they conclude that a further downward adjustment in the expected ERP of approximately 50 to 100 basis points is plausible if one assumes that the current level of dividend yield will continue (versus the greater historical average yield).

Removing the historical increase in the price/dividend ratio and adjusting the historical average dividend yield to today's dividend yield results in an expected equity premium (relative to bonds) of approximately 4.8% - 5.3% on an arithmetic basis (2.8% - 3.3% on a geometric basis) for the U.S. and 3.5% - 4.0% on an arithmetic

---

[13] McGrattan and Prescott, "Is the Market Overvalued?" *Federal Reserve Bank of Minneapolis Quarterly Review* (24,2000) and "Taxes, Regulations and Asset Prices," Federal Reserve Bank of Minneapolis working paper 610 (July, 2001).

[14] Use of analyst projections leads one to the literature on analyst projection bias (i.e., are analyst forecasts overly optimistic?). For example, see Ramnath, Rock and Stone, "*Value Line* and *I/B/E/S* earnings forecasts", working paper (Nov 2001). Those authors reports the results of projected earnings amounts, rather than growth rates (they use the *I/B/E/S* longterm growth rate to project the EPS four years into the future, and compares this with the actual EPS four years in the future. The results indicate that *I/B/E/S* mean forecast error in year 4 EPS is negative. This can be translated into a preliminary typical growth rate adjustment for say a projected 15% growth rate follows: ((1.15ˆ4)(1-.0545))ˆ.25 −1 = 13.4%, implying a ratio of actual to forecast of .134/.15 = .89. This would imply that equity risk premium forecasts using analyst forecasts are biased high. See also, Bonini, Zanetti and Bianchini, "Target Price Accuracy in Equity Research", working paper (Jan 2006).

[15] Graham and Harvey, "Expectations of Equity Risk Premia, Volatility and Asymmetry from a Corporate Finance Perspective," National Bureau of Economic Research working paper, December 2001, updated quarterly by *Duke CFO Outlook Survey* (www.cfosurvey.org); "The Equity Risk Premium in January 2006: Evidence from the Global CFO Outlook Survey", Dec 19, 2005.

[16] Dimson, Marsh and Staunton, "Global Evidence on the Equity Premium," 15–4 The *Journal of Applied Corporate Finance* (Summer 2003); "The Worldwide Equity Premium: A Smaller Puzzle", April 7, 2006; *The Global Investment Returns Yearbook 2006* (ABN-AMRO/ London Business School, 2006)

basis (2.4% - 2.9% on a geometric basis) for a world index (denominated in U.S. dollars for 17 countries).[17]

The *SBBI Yearbook* reports on an update to the work authored by Roger Ibbotson and Peng Chen, forecasting ERP based on the contribution of earnings growth to price to earnings ratio growth and on growth in per capital gross domestic product (a "supply side" approach).[18] They remove the increase in historical returns due to the overall increase in price-to-earnings ratio from 1926 to 2005 resulting in an estimate of ERP at the end of 2005 of approximately 6.3% on an arithmetic basis (4.2% on a geometric basis).

William Goetzmann and Roger Ibbotson commenting on the supply side approach of estimating expected risk premiums note:

> These forecasts tend to give somewhat lower forecasts than historical risk premiums, primarily because part of the total returns of the stock market have come from price-earnings ratio expansion. This expansion is not predicted to continue indefinitely,and should logically be removed from the expected risk premium.[19]

Tim Koller, Marc Goedhart, and David Wessels conclude on their assessment of the research and evidence:

> Although many in the finance profession disagree about how to measure the (ERP), we believe 4.5 to 5.5 percent is the appropriate range.[20]

Conclusion

Estimating the ERP is one of the most important issues when you estimate the cost of capital of the subject business. One needs to consider a variety of alternative sources including examining realized returns over various periods and employing forward-looking estimates such as those implied from projections of future prices, dividends, and earnings.

What is a reasonable estimate of ERP in 2006? While giving consideration to long-run historical arithmetic averages realized returns, this author concludes that the post-1925 historical arithmetic average of one-year realized premiums as reported in the *SBBI Yearbook* results in an expected ERP estimate that is too high. I come to that conclusion based on the works of various researchers (e.g., Dimson, Marsh and Staunton, Goetzmann and Ibbotson) and current market expectations (e.g., survey of chief financial officers).

Some appraisers express dismay over the necessity of considering a forward ERP since that would require changing their current "cookbook" practice of relying exclusively on the post-1925 historical arithmetic average of one-year realized premiums reported in the *SBBI Yearbook* as their estimate of the ERP. My reply – valuation is a forward-looking concept, not an exercise in mechanical application of formulas. Correct valuation requires applying value drivers reflected in today's market pricing. Our role is to mimic the market. In the experience of this author, one often cannot match current market pricing for equities using the post-1925 historical arithmetic average of one-year realized premiums as the basis for developing discount rates. The entire appraisal process is based on applying reasoned judgment to the evidence derived from economic, financial and other information and arriving at a well reasoned opinion of value. Estimating the ERP is no different. I challenge all appraisers to look at the evidence.

After considering the evidence, any reasonable long-term estimate of the *normal* ERP as of 2006 should be in the range of 3.5% to 6%.[21]

Roger Grabowski is a Managing Director of Duff & Phelps LLC in Chicago, Il. This author wants to thank Ryan Brown and David Turney of Duff and Phelps and my former colleague, David King, for their assistance. But I accept full responsibility for the final form of the paper. Moreover, this work should not be construed as representing the official organization position of any organization.

---

[17] Based on this author's converting premium over total returns on bonds as reported by Dimson, Marsh and Staunton, removing the impact of the growth in price-dividend ratios from the geometric average historical premium, reducing the historical average dividend yield to a current dividend yield and converting to an approximate arithmetic average.

One method of converting the geometric average into an arithmetic average is to assume the returns are independently log-normally distributed over time. Then the arithmetic and geometric averages approximately follow the relationship: Arithmetic average of returns for the period = Geometric average of returns for the period + (variance of returns for the period/2).

[18] Note 12, *supra*; Ibbotson, "Equity Risk Premium Forum," AIMR, 11/8/01, pp. 100–104, 108.

[19] Goetzmann and Ibbotson, "History and the Equity Risk Premium", Yale ICF Working Paper No. 05–04 (April 2005), p 8.

[20] Note 10, *supra*: Koller et al., p 306.

[21] Where in this range is the current ERP? Research has shown that ERP is cyclical during the business cycle. When the economy is near or in recession (and reflected in relatively recent low returns on stocks), the *conditional* ERP is more likely at the higher end of the range. When the economy improves (with expectations of improvements reflected in higher stock returns), the *conditional* ERP moves toward the mid-point of the range. When the economy is near its peak (and reflected in relatively recent high stock returns), the *conditional* ERP is more likely at the lower end of the range. This author will let the reader decide where his valuation date lies in the business cycle.

The Equity Risk Premium in 2015

John R. Graham
Fuqua School of Business, Duke University, Durham, NC 27708, USA
National Bureau of Economic Research, Cambridge, MA 02912, USA

Campbell R. Harvey*
Fuqua School of Business, Duke University, Durham, NC 27708, USA
National Bureau of Economic Research, Cambridge, MA 02912, USA

ABSTRACT

We analyze the history of the equity risk premium from surveys of U.S. Chief Financial Officers (CFOs) conducted every quarter from June 2000 to March 2015. The risk premium is the expected 10-year S&P 500 return relative to a 10-year U.S. Treasury bond yield. We show that the equity risk premium has increased more than 50 basis points from the levels observed in 2014. The current 10-year risk premium is 4.51%. Similarly, measures of risk such as investor disagreement and perceptions of volatility have increased. Interestingly, the increased premium and risk are not reflected in market-based measures of risk, such as the VIX and credit spreads. We also link our survey results to measures survey-based measures of the weighted average cost of capital and investment hurdle rates. The hurdle rates are significantly higher than the cost of capital implied by the market risk premium.

JEL Classification: *G11, G31, G12, G14*

Keywords: *Cost of capital, financial crisis, equity premium, WACC, hurdle rate, long-term market returns, stock return forecasts, long-term equity returns, expected excess returns, disagreement, individual uncertainty, skewness, asymmetry, survey methods, TIPs, VIX, credit spreads*

---

*Corresponding author, Telephone: +1 919.660.7768, E-mail: cam.harvey@duke.edu. We appreciate the research assistance of Sergio Correia. Version: May 29, 2015

Introduction

We analyze the results of the most recent survey of Chief Financial Officers (CFOs) conducted by Duke University and *CFO* Magazine. The survey closed on March 3, 2015 and measures expectations beginning in the first quarter of 2015. In particular, we poll CFOs about their long-term expected return on the S&P 500. Given the current U.S. 10-year Treasury bond yield, we provide estimates of the equity risk premium and show how the premium changes through time. We also provide information on the disagreement over the risk premium as well as average confidence intervals. Finally, we link the equity risk premium to measures used to evaluate firm's investments: the weighted average cost of capital (WACC) and the investment hurdle rate.

1. Method

2.1 Design

The quarterly survey of CFOs was initiated in the third quarter of 1996.[1] Every quarter, Duke University polls financial officers with a short survey on important topical issues (Graham and Harvey, 2009). The usual response rate for the quarterly survey is 5%-8%. Starting in June of 2000, a question on expected stock market returns was added to the survey. Fig. 1 summarizes the results from the risk premium question. While the survey asks for both the one-year and ten-year expected returns, we focus on the ten-year expected returns herein, as a proxy for the market risk premium.

The executives have the job title of CFO, Chief Accounting Officer, Treasurer, Assistant Treasurer, Controller, Assistant Controller, or Vice President (VP), Senior VP or Executive VP of Finance. Given that the overwhelming majority of survey respondents hold the CFO title, for simplicity we refer to the entire group as CFOs.

---

[1] The surveys from 1996Q3-2004Q2 were partnered with a national organization of financial executives. The 2004Q3 and 2004Q4 surveys were solely Duke University surveys, which used Duke mailing lists (previous survey respondents who volunteered their email addresses) and purchased email lists. The surveys from 2005Q1 to present are partnered with *CFO Magazine*. The sample includes both the Duke mailing lists and the *CFO* subscribers that meet the criteria for policy-making positions.

2.2 Delivery and response

In the early years of the survey, the surveys were faxed to executives. The delivery mechanism was changed to the Internet starting with the December 4, 2001 survey. Respondents are given four business days to fill out the survey, and then a reminder is sent allowing another four days. Usually, two-thirds of the surveys are returned within two business days.

The response rate of 5-8% could potentially lead to a non-response bias. There are five reasons why we are not overly concerned with the response rate. First, we do not manage our email list. If we deleted the email addresses that had not responded to the survey in the past 12 quarters, our response rate would be in the 15-20% range – which is a good response rate. Second, Graham and Harvey (2001) conduct a standard test for non-response biases (which involves comparing the results of those that fill out the survey early to the ones that fill it out late) and find no evidence of bias. Third, Brav, Graham, Harvey and Michaely (2005) conduct a captured sample survey at a national conference in addition to an Internet survey. The captured survey responses (to which over two-thirds participated) are qualitatively identical to those for the Internet survey (to which 8% responded), indicating that non-response bias does not significantly affect their results. Fourth, Brav et al. contrast survey responses to archival data from Compustat and find archival evidence for the universe of Compustat firms that is consistent with the responses from the survey sample. Fifth, Campello, Graham, and Harvey (2011) show that the December 2008 response sample is fairly representative of the firms included in the commonly used Compustat database.

2.3 Data integrity

In each quarter, implement a series of rules to ensure the integrity of the data. We have, on average, 350 responses each quarter. There are a total of 21,016 survey observations. There are six key pieces of data: 1) the 10-year forecast (LT); 2) lower 10% of 10-year forecast (LLT); and 3) upper 10% of the 10-year forecast (ULT). We collect the analogous information for the one-year S&P 500 forecasts too (ST). This paper focuses on the 10-year forecasts but the short-term forecasts factor into our data filters.

Our exclusion rules are the following:

1. Delete all missing forecasts, LT, ST
2. Delete all negative LT forecasts (not ST forecasts)
3. Delete all observations that failed to use percentages (forecasts<1.0 for both ST and LT)
4. Delete observations where they failed to annualize, i.e. delete if LT>30% (does not apply to ST)
5. Delete is ST>100%.
6. Delete if lower intervals inconsistent, i.e. LST>=ST or LLT>=LT.
7. Delete if upper intervals inconsistent, i.e. UST<=ST or ULT<=LT.
8. Delete if ST-LST and UST-ST both equal 1 (we call this lazy answer)
9. Delete if LT-LLT and ULT-LT both equal 1 (again, lazy answer)

2.4 The 2015 results

The expected market return questions are a subset of a larger set of questions in the quarterly survey of CFOs. The survey usually contains between eight and ten questions. Some of the questions are repeated every quarter and some change through time depending on economic conditions. The historical surveys can be accessed at http://www.cfosurvey.org. Appendix 1 shows the risk premium question in the most recent survey.

While the survey is anonymous, we collect demographic information on seven firm characteristics, including industry, sales revenue, number of employees, headquarters location, ownership (public or private), and proportion of foreign sales.

During the past 15 years, we have collected over 21,000 responses to the survey. Panel A of Table 1 presents the date that the survey window opened, the number of responses for each survey, the 10-year Treasury bond rate, as well as the average and median expected excess returns. There is relatively little time variation in the risk premium. This is confirmed in Fig. 1a, which displays the historical risk premiums contained in Table 1. The current premium, 4.51%, is close to the historical average. The March 2015 survey shows that the expected annual S&P 500 return is 6.63% (=4.51%+2.12%) which is somewhat below the overall average. The total return forecasts are presented in Fig. 1b.[2]

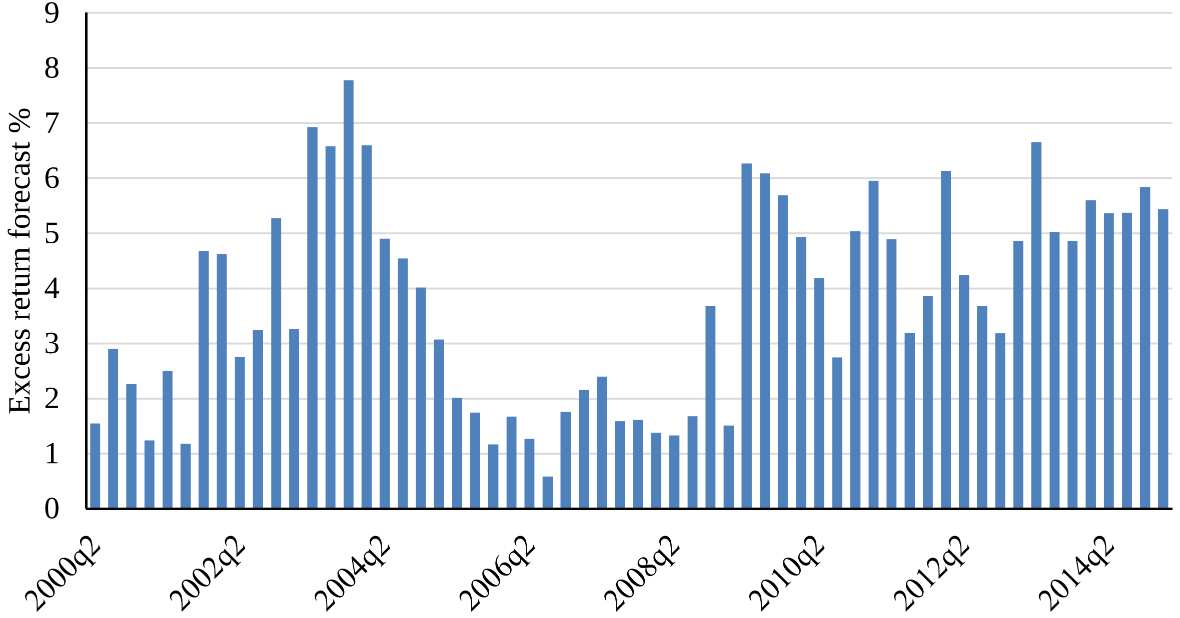
---

[2] See, for example, Ghysels (1998), Welch (2000, 2001, 2009), Ghysels (1998), Fraser (2001), Harris and Marston (2001), Pástor and Stambaugh (2001), Fama and French (2002), Goyal and Welch (2003), Graham and Harvey (2003), Ang and Bekaert (2005), Fernandez (2004, 2006, 2009) for studies of the risk premium.

Panel B of Table 1 presents some summary statistics that pool all responses through the history of the survey. The overall average ten-year risk premium return is 4.51%.[3] The standard deviation is 2.89% based on the individual responses (not reported in the Table) and 0.60% (see Panel B) based on the quarterly averages.

Figure 1a

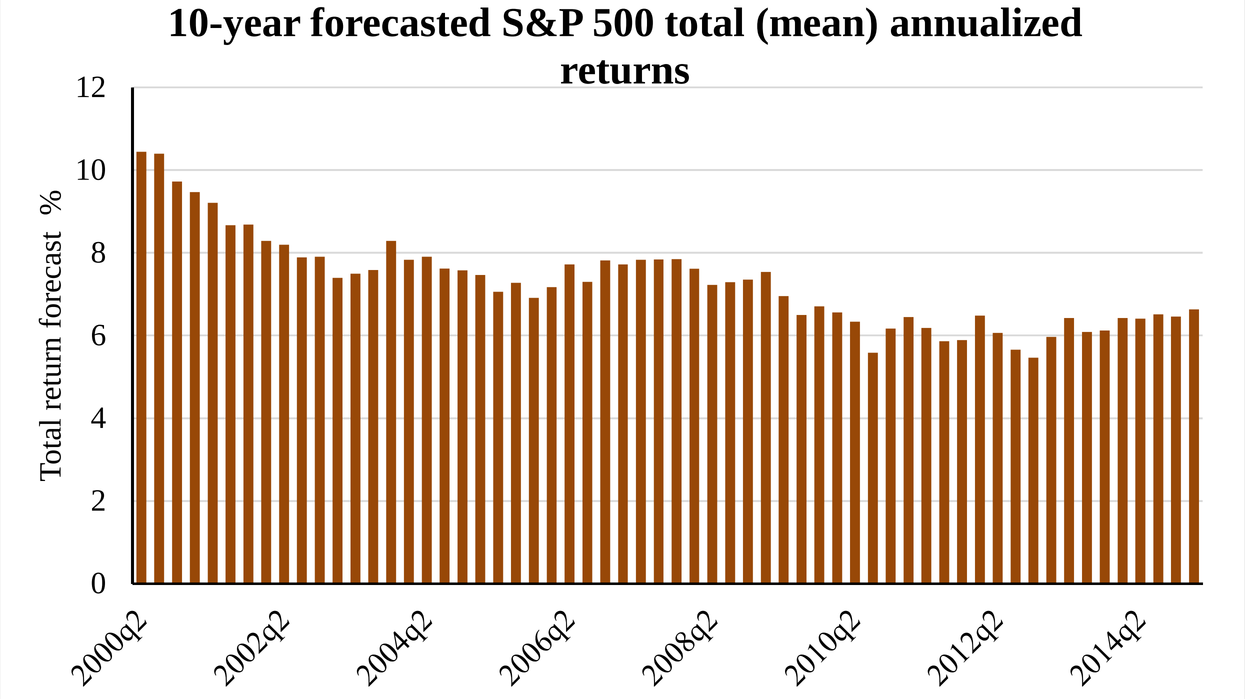
10-year forecasted S&P 500 (mean) annual returns over and above the 10-year Treasury bond yield



---

[3] Using the Ibbotson Associates data from January 1926 through July 2010, the arithmetic (geometric) average return on the S&P 500 over and above the 30-day U.S. Treasury bill is 7.75% (5.80%). Using data from April 1953-July 2010, the arithmetic (geometric) risk premium is 6.27% (5.12%). The risk premium over the 10 year bond should be reduced by 212 basis points for the arithmetic premium and 174 basis points for the geometric premium. Fama and French (2002) study the risk premium on the S&P 500 from 1872-2000 using fundamental data. They argue that the ex ante risk premia is between 2.55% and 4.32% for 1951-2000 period. Ibbotson and Chen (2001) estimate a long-term risk premium between 4 and 6%. Also see Siegel (1999), Asness (2000), Heaton and Lucas (2000) and Jagannathan, McGratten and Scherbina (2001). A recent treatment is Sharpe and Suarez (2013).

Figure 1b



The cross-sectional standard deviation across the individual CFO forecasts in a quarter is a measure of the disagreement or dispersion of the participants in each survey. Dispersion sharply increased during the global financial crisis. The average disagreement in 2005 was 2.39%. Disagreement increased in 2006 to 2.64%. As the crisis began in 2007, disagreement increased to 2.98 by March 2008. The peak disagreement was recorded in February 2009 (4.13%). The most recent observation is 3.50% which represents a sizeable jump from the previous quarter.

We also report information on the average of the CFOs' assessments of the one in ten chance that the market will exceed or fall below a certain level. In the most recent survey, the worst case total return is +0.81% which is lower than the average of 1.62%. The best-case return is 10.68% which is also slightly lower than the average of 11.08%.

With information on the 10% tails, we construct a probability distribution for each respondent. We use Davidson and Cooper's (1976) method to recover each respondent's probability distribution:

$$\text{Variance} = ([x(0.90)\text{-}x(0.10)]/2.65)^2$$

where *x*(0.90) and *x*(0.10) represent the 90th and 10th percentiles of the respondent's distribution, ULT and LLT. Keefer and Bodily (1983) show that this simple approximation is the preferred method of estimating the variance of a probability distribution of random variables, given information about the 10th and 90th percentiles. Like disagreement, the average of individual volatilities peaked in February 2009 at 4.29%. The current level, 3.72%, is higher than the overall average.

There is also a natural measure of asymmetry in each respondent's response. We look at the difference between each individual's 90% tail and the mean forecast and the mean minus the 10% tail. Hence, if the respondent's forecast of the excess return is 6% and the tails are -8% and +11%, then the distribution is negatively skewed with a value of -9% (=5%-14%). As with the usual measure of skewness, we cube this quantity and standardize by dividing by the cube of the individual standard deviation. In every quarter's survey, there is on average negative skewness in the individual forecasts. The average asymmetry -0.55 which is slightly lower than the average of -0.46.

Overall, the survey points to a recent increase in the risk premium and heightened uncertainty.

Table 1

Summary statistics based on the responses from the 60 CFO Outlook Surveys from June 2000 to March 2015

A. By quarter

#	Survey date	Survey quarter	Number of survey responses	10-year bond yield	Total market return forecast	Average risk premium	Median risk premium	Disagreement (standard deviation of risk premium estimates)	Average of individual standard deviations	Average of individuals' worst 10% market return scenario	Average of individuals' best 10% market return scenario	Skewness of risk premium estimates	Average of individuals' asymmetry	% who forecast negative excess return
1	6/6/2000	2000Q2	209	**6.14**	**10.45**	4.31	3.86	3.22				0.95		9.09
2	9/7/2000	2000Q3	188	5.76	10.40	**4.64**	4.24	3.03				0.83		4.79
3	12/4/2000	2000Q4	243	5.53	9.72	4.19	4.47	2.52				0.53		4.12
4	3/12/2001	2001Q1	140	4.92	9.47	4.55	4.58	2.91				0.78		3.57
5	6/7/2001	2001Q2	208	5.33	9.21	3.88	3.67	2.64				0.58		5.77
6	9/10/2001	2001Q3	199	4.84	8.67	3.83	3.16	2.53				**0.13**		3.52
7	12/4/2001	2001Q4	279	4.70	8.68	3.98	3.30	2.43				0.61		2.15
8	3/11/2002	2002Q1	233	5.33	8.29	2.96	2.67	2.43	3.28	**3.68**	12.42	1.06	-0.28	11.16
9	6/4/2002	2002Q2	316	5.04	8.20	3.16	2.96	2.61	3.50	3.00	12.28	1.86	-0.39	10.44
10	9/16/2002	2002Q3	361	3.90	7.89	3.99	4.10	2.31	3.39	3.05	12.03	0.86	-0.25	2.77
11	12/2/2002	2002Q4	285	4.22	7.91	3.69	3.78	2.56	3.23	3.32	11.87	1.24	-0.28	4.91
12	3/19/2003	2003Q1	184	3.98	7.40	3.42	3.02	2.37	3.59	1.95	11.47	0.83	-0.62	4.35
13	6/16/2003	2003Q2	366	3.18	7.50	4.32	**4.82**	2.34	3.74	2.16	12.07	0.90	-0.33	3.28
14	9/18/2003	2003Q3	167	4.19	7.58	3.39	3.81	**2.07**	**2.83**	3.31	10.83	0.35	-0.43	6.59
15	12/10/2003	2003Q4	220	4.30	8.29	3.98	3.70	2.66	3.29	3.40	12.10	1.74	-0.45	2.27
16	3/24/2004	2004Q1	206	3.73	7.83	4.10	4.27	2.37	3.46	2.85	12.02	0.50	-0.29	3.88
17	6/16/2004	2004Q2	177	4.74	7.90	3.16	3.26	2.61	3.10	3.14	11.34	2.14	-0.40	6.21
18	9/10/2004	2004Q3	179	4.19	7.62	3.43	3.31	2.92	3.27	2.61	11.29	2.02	-0.52	8.94
19	12/3/2004	2004Q4	287	4.27	7.57	3.30	3.23	2.66	3.05	3.10	11.17	1.89	-0.37	5.92
20	2/28/2005	2005Q1	272	4.36	7.46	3.10	3.39	2.52	3.06	3.13	11.23	1.29	-0.33	6.62
21	5/31/2005	2005Q2	316	4.00	7.06	3.06	3.00	2.22	3.22	2.39	10.93	0.46	-0.26	6.65
22	8/29/2005	2005Q3	321	4.20	7.28	3.08	2.80	2.61	3.36	2.15	11.06	2.42	-0.52	7.48
23	11/21/2005	2005Q4	338	4.46	6.91	2.45	2.54	2.20	3.48	2.23	11.44	0.41	**-0.23**	9.76
24	3/6/2006	2006Q1	276	4.74	7.17	**2.43**	2.26	2.40	3.44	2.07	11.18	1.02	-0.37	8.70
25	6/1/2006	2006Q2	494	5.11	7.72	2.61	2.89	2.74	3.29	3.00	11.70	1.84	-0.24	**18.02**
26	9/11/2006	2006Q3	460	4.80	7.30	2.50	2.20	2.49	3.32	2.53	11.33	1.32	-0.33	7.83
27	11/21/2006	2006Q4	386	4.58	7.82	3.24	3.42	2.93	3.36	2.94	11.82	1.91	-0.30	6.99
28	3/1/2007	2007Q1	380	4.56	7.72	3.16	3.44	2.39	3.38	2.73	11.67	1.80	-0.39	5.53
29	6/1/2007	2007Q2	419	4.95	7.83	2.88	3.05	2.14	3.21	3.08	11.58	0.56	-0.37	3.58
30	9/7/2007	2007Q3	479	4.38	7.84	3.46	3.62	2.82	3.12	3.33	11.59	1.80	-0.34	5.22
31	11/30/2007	2007Q4	458	3.97	7.85	3.88	4.03	2.75	3.31	2.93	11.70	1.38	-0.32	3.28
32	3/7/2008	2008Q1	381	3.56	7.61	4.05	4.44	2.99	3.21	3.08	11.58	2.23	-0.30	3.94
33	6/13/2008	2008Q2	384	4.27	7.23	2.96	2.73	2.60	3.32	2.44	11.24	1.50	-0.41	9.38
34	9/5/2008	2008Q3	432	3.66	7.29	3.63	3.34	2.79	3.31	2.30	11.06	1.71	-0.42	4.63
35	11/28/2008	2008Q4	534	2.93	7.35	4.42	4.07	3.19	3.73	1.77	11.64	1.94	-0.37	2.81
36	2/26/2009	2009Q1	443	2.98	7.54	4.56	4.02	**4.13**	**4.29**	1.18	**12.54**	1.80	-0.47	5.87
37	5/29/2009	2009Q2	427	3.47	6.96	3.49	3.53	3.12	3.73	1.37	11.26	1.79	-0.42	6.56
38	9/11/2009	2009Q3	536	3.34	6.50	3.16	2.66	2.88	3.87	0.62	10.86	1.82	-0.46	10.82
39	12/11/2009	2009Q4	457	3.55	6.71	3.16	2.45	3.56	3.86	0.64	10.88	2.38	-0.52	9.85
40	2/26/2010	2010Q1	478	3.61	6.56	2.95	2.39	3.28	3.96	0.39	10.86	2.31	-0.68	9.41
41	6/4/2010	2010Q2	444	3.20	6.33	3.13	2.80	3.08	3.90	0.33	10.64	**2.61**	-0.64	9.91
42	9/10/2010	2010Q3	451	2.81	5.59	2.78	**2.19**	2.53	4.21	**-1.16**	9.99	0.77	-0.67	8.65
43	12/10/2010	2010Q4	402	3.32	6.17	2.85	2.68	2.62	3.91	0.26	10.63	1.89	-0.55	10.70
44	3/4/2011	2011Q1	429	3.49	6.45	2.96	2.51	2.92	4.16	-0.27	10.76	2.44	**-0.70**	8.16
45	6/3/2011	2011Q2	406	2.99	6.18	3.19	3.01	2.90	3.90	0.12	10.45	2.09	-0.68	5.17
46	9/9/2011	2011Q3	397	1.93	5.86	3.93	3.07	3.11	3.79	0.04	10.09	2.41	-0.54	**2.02**
47	12/16/2011	2011Q4	439	1.86	5.89	4.03	3.14	2.98	4.07	-0.11	10.68	1.91	-0.36	3.42
48	3/1/2012	2012Q1	406	2.03	6.48	4.45	3.97	2.97	4.07	0.30	11.08	2.25	-0.59	2.71
49	5/30/2012	2012Q2	338	1.63	6.06	4.43	4.37	2.96	3.94	0.00	10.42	1.96	-0.59	2.37
50	9/7/2012	2012Q3	675	1.67	5.66	3.99	3.33	3.00	3.66	-0.01	9.67	2.04	-0.58	2.37
51	12/6/2012	2012Q4	325	**1.59**	**5.46**	3.87	3.41	2.59	3.69	-0.49	**9.25**	1.42	-0.62	3.08
52	3/8/2013	2013Q1	418	2.06	5.97	3.91	3.94	2.73	3.84	-0.14	10.02	2.01	-0.64	4.55
53	5/31/2013	2013Q2	300	2.16	6.43	4.27	3.84	2.91	4.02	0.10	10.76	1.63	-0.67	2.67
54	9/5/2013	2013Q3	404	2.98	6.09	3.11	3.02	2.73	3.41	0.75	9.77	1.71	-0.53	6.68
55	12/5/2013	2013Q4	320	2.88	6.13	3.25	3.12	2.95	3.81	0.18	10.26	1.69	-0.50	7.19
56	3/4/2014	2014Q1	291	2.70	6.43	3.73	3.30	2.63	3.32	1.35	10.13	0.64	-0.69	5.15
57	6/5/2014	2014Q2	325	2.59	6.41	3.82	3.41	3.23	3.76	0.50	10.46	1.89	-0.64	7.08
58	9/4/2014	2014Q3	316	2.45	6.52	4.07	3.55	3.33	3.69	0.90	10.68	2.56	-0.60	3.16
59	12/4/2014	2014Q4	398	2.25	6.46	4.21	4.50	2.51	3.79	0.46	10.51	1.22	-0.59	2.26
60	3/3/2015	2015Q1	414	2.12	6.63	4.51	3.88	3.50	3.72	0.81	10.68	1.92	-0.55	5.80
	Average of quarters		350	**3.71**	**7.29**	**3.58**	**3.39**	**2.77**	**3.57**	**1.62**	**11.08**	**1.51**	**-0.46**	**6.00**
	Standard deviation			1.14	1.12	0.60	0.65	0.38	0.34	1.34	0.73	0.66	0.14	3.08

B. By individual responses

Survey for												
All dates	21,016	**3.54**	**7.09**	**3.55**	**3.30**	**2.89**	**3.61**	**1.46**	**11.03**	**1.61**	**-0.47**	**6.10**

2.5 Risk premia, weighted average cost of capital and hurdle rates

The risk premia that we measure can be used in the calculation of the cost of capital. In a simple capital asset pricing model, the cost of equity capital would be the product of the company's beta times the risk premium plus the risk free rate. The average firm's cost of equity capital would be 6.63% (assuming a beta=1). Assuming the Baa bond yield is the borrowing rate and a 25% marginal tax rate, the weighted average cost of capital would be about 5.67%.

In some surveys we ask CFOs about their weighted average cost of capital. For example, in March of 2011, CFOS on average reported that they considered their weighted average cost of capital to be 10%. At the time, the cost of equity capital was similar to today, 6.45%. The bond yields were higher, with the Baa yielding 6.09%. Using the same parameters as above, we would estimate the WACC to be about 5.7%, which is sharply lower than the reported 10%.

Why is there such a divergence? One possible reason is that companies consider other factors in calculating the WACC – perhaps a multifactor model. However, there is little support for this hypothesis (Graham and Harvey, 2001). For example, consultants often add a premium for smaller firms based on the results in many research papers of a size premium. However, we do not document a size effect in our survey: the average WACC for firms with less than $25 million in revenue is 10.6% and the WACC for the largest firms with annual revenue greater than $10 billion is 10.5%.

This analysis was replicated in June of 2012 with similar results. Given the same assumptions, we estimate the average WACC to be 5.37%. However, the average reported WACC is 9.3%. Again, there is no evidence of a size premium. The smallest firms reported a WACC of 9.3% and the largest firms 9.7%.

The WACC should not be confused with the investment hurdle rate. The WACC is an analytical calculation that combines a model-based cost of equity (such as the CAPM) and the after-tax cost of debt (as reflected in current borrowing rates). Given constraints on funding and managerial time, firms often impose a higher hurdle rate on their investments.

The June 2012 survey also asked for the investment hurdle rates. They are much higher than the WACCs. The average hurdle rate was 13.5% (compared to the survey-reported WACC of 9.3%

and the implied WACC from the survey based risk premium of 5.7%). Similar to the WACC results, there is no evidence that the hurdle rates are higher for small firms. Our evidence shows that the reported average hurdle rate for the smallest firms is 13.1% and for the largest firms the rate is 14.2%.

Even though we know from Graham and Harvey (2001) that three quarters of companies use the capital asset pricing model to estimate the cost of equity, there is a large gap between an imputed WACC and the WACC that people use. One way to reconcile this is that companies use very long term averages of equity and bond premia in their calculations. For example, suppose the cost of capital relies on inputs based on historical data back to 1926. Ibbotson (2013) reports an arithmetic average return of 11.8% over the 1926-2012 period. The average return on corporate bonds is 6.4%. Using the same parameters, we get an imputed WACC of 9.7%. This is very close to the average reported WACC and, indeed, identical to the WACC reported by the largest firms in our survey.

To summarize: 1) CFOs perceive the equity risk premium to be much lower today than averages used over long-periods (e.g. from 1926) such as reported in Morningstar (2013) and Duff and Phelps (2015); 2) survey evidence yields estimates of WACC that are is consistent with companies routinely using long-horizon averages for inputs; and 3) in terms of making investment decisions, WACC can be thought of as a lower bound – the Hurdle Rates used for actual investment decisions are 400bp to 500bp higher than the stated WACCs.[4]

2.6 Recessions, the financial crisis and risk premia

Our survey spans two recessions: March 2001-September 2001 as well as the recession that begins in December 2007 and ends in June 2009. Financial theory would suggest that risk premia should vary with the business cycle. Premiums should be highest during recessions and lowest during recoveries. Previous research has used a variety of methods including looking at ex post realized returns to investigate whether there is business-cycle like variation in risk premia.

---

[4] Sharpe and Suarez (2013) provide detailed analyses of some of these same CFO survey data. See also Jagannathan, Matsa, Meier and Tarhan (2014).

While we only have 60 observations and this limits our statistical analysis, we do note differences. During recessions, the risk premium is 3.92% and during non-recessions, the premium falls to 3.46%.

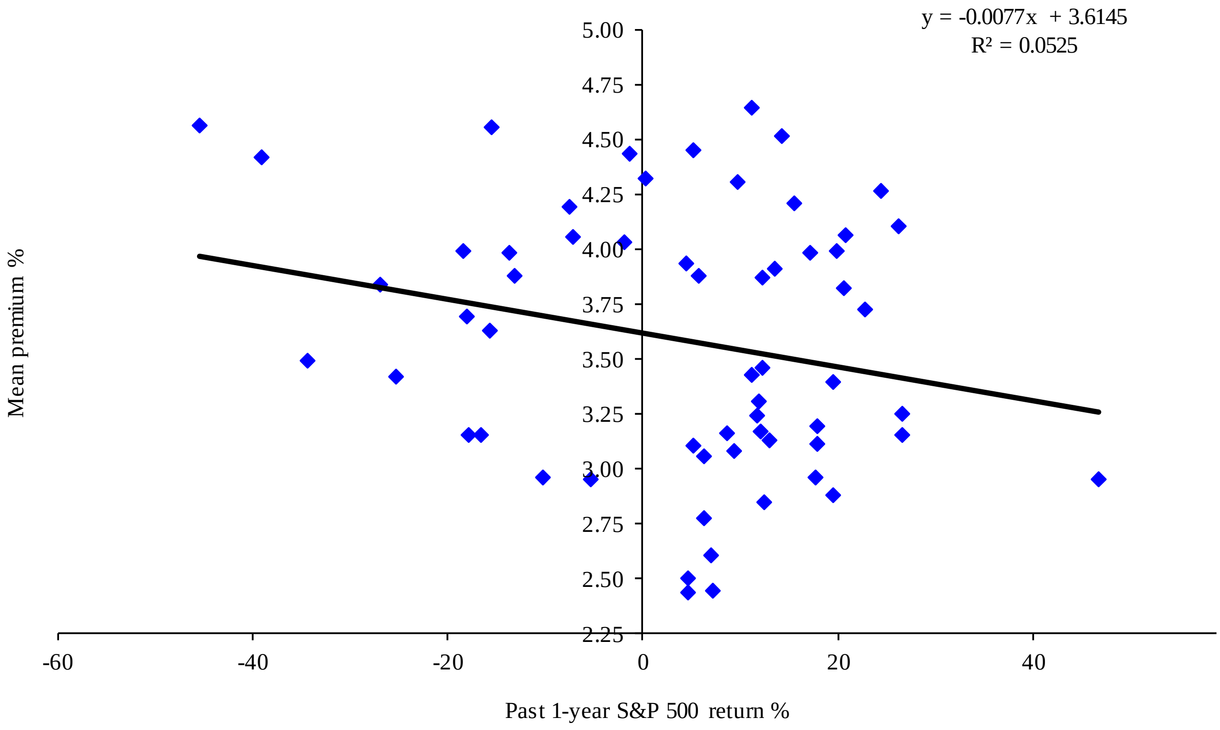
2.7 Explaining variation in the risk premium

While we document the level and a limited time-series of the long-run risk premium, statistical inference is complicated by the fact that the forecasting horizons are overlapping. First, we have no way of measuring the accuracy of the risk premiums as forecasts of equity returns. Second, any inference based on regression analysis is confounded by the fact that from one quarter to the next, there are 36 common quarters being forecasted. This naturally induces a moving-average process.

We do, however, try to characterize the time-variation in the risk premium without formal statistical tests. Figure 2 examines the relation between the mean premium and previous one-year returns on the S&P 500.

Figure 2

The ten-year equity risk premium and past 1-year returns on the S&P 500 index

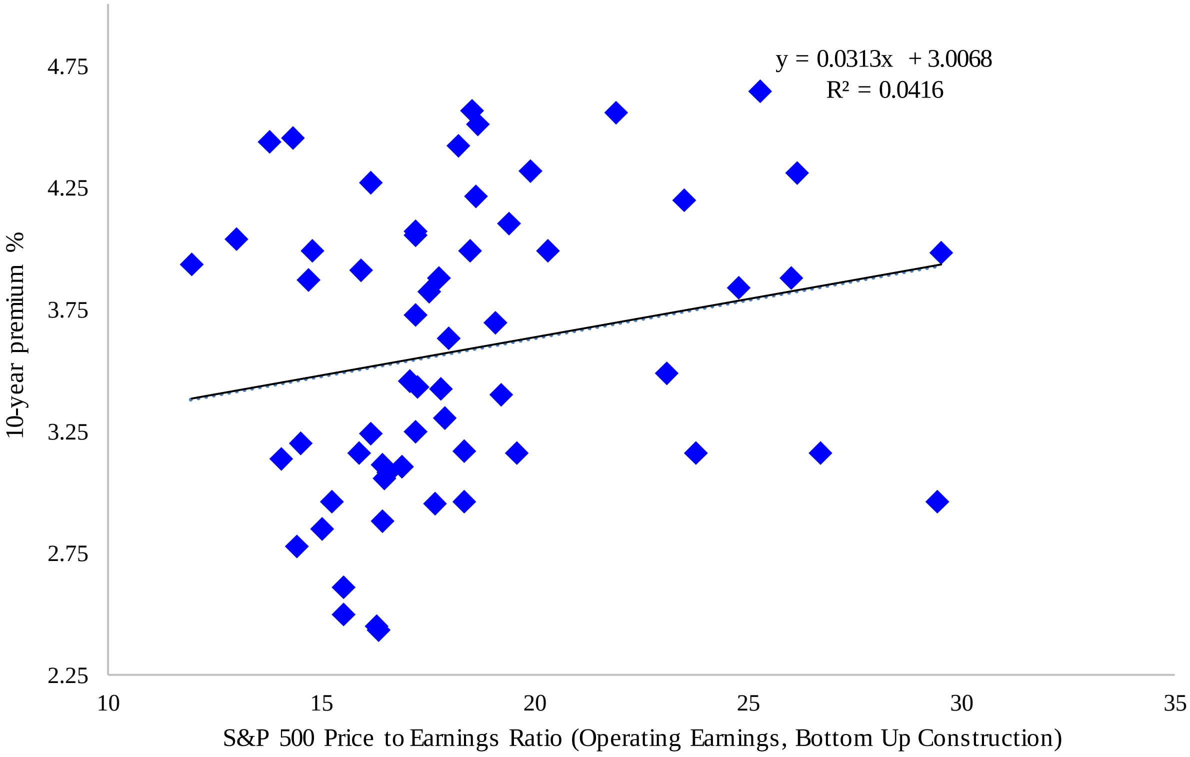


The evidence suggests that there is a weak negative correlation between past returns and the level of the long-run risk premium. This makes economic sense. When prices are low (after negative returns), expected return increase.

An alternative to using past-returns is to examine a measure of valuation. Figure 3 examines a scatter of the mean premium versus the forward price-to-earnings ratio of the S&P 500.

Figure 3

The equity risk premium and the S&P 500 forward price-to-earnings ratio

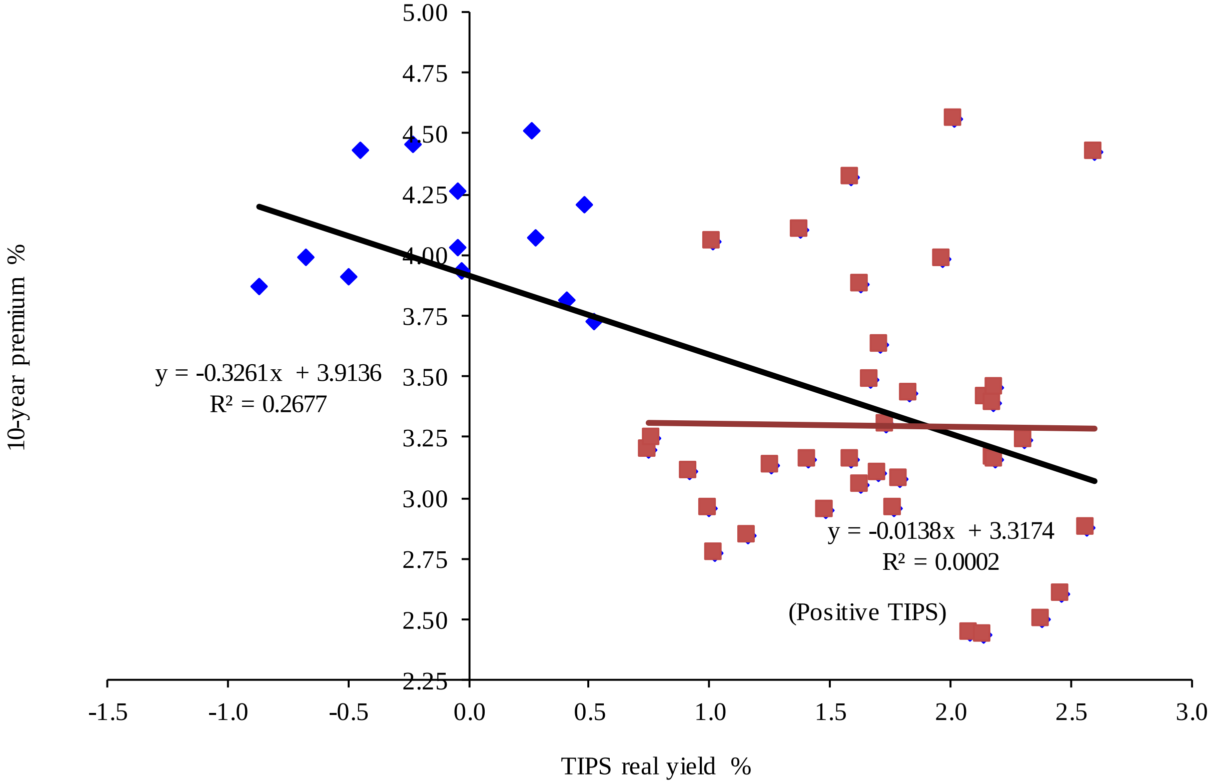


Looking at the data in Figure 3, it appears that the inference may be complicated by a non-linear relation. At very high levels of valuation, the expected return (the risk premium) was low.

We also examine the real yield on Treasury Inflation Indexed Notes. The risk premium is like an expected real return on the equity market. It seems reasonable that there could be a correlation between expected real rates of return stocks and bonds. Figure 4 examines the 10-year on the run yield on the Treasury Inflation Indexed Notes.

Figure 4

The equity risk premium and the real yield on Treasury Inflation Indexed Notes

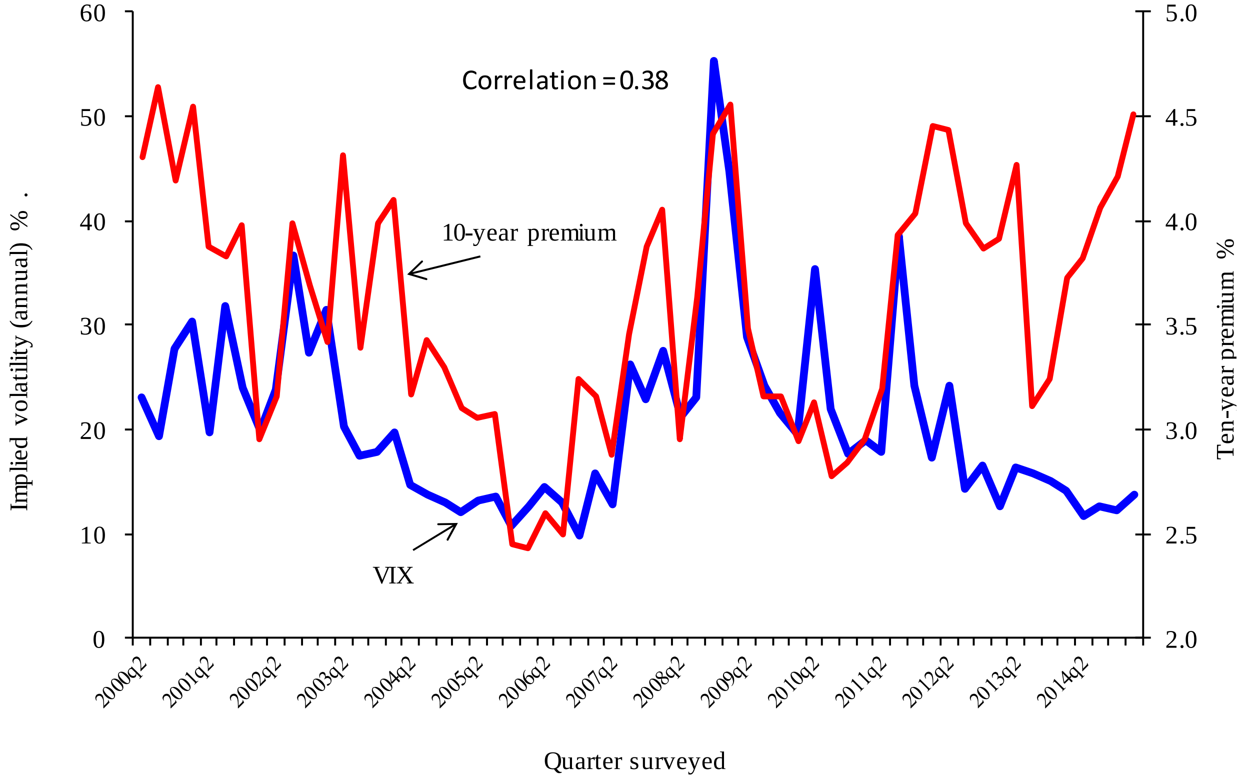


Overall, there is a negative correlation of -0.52. However, this correlation is driven by the negative TIPS yields. This is consistent with the idea that in periods of heightened uncertainty, investors engage in a flight to safety and accept low or negative TIPS yields – and at the same time demand a high risk premium for investing in the equity market.

Finally, we consider two alternative measures of risk and the risk premium. Figure 5 shows that over our sample there is evidence of a strong positive correlation between market volatility and the long-term risk premium. We use a five-day moving average of the implied volatility on the S&P index option (VIX) as our volatility proxy. The correlation between the risk premium and volatility is 0.38. If the closing day of the survey is used, the correlation is roughly the same. Asset pricing theory suggests that there is a positive relation between risk and expected return. While our volatility proxy doesn't match the horizon of the risk premium, the evidence, nevertheless, is suggestive of a positive relation. Figure 5 also highlights a strong recent divergence between the risk premium and the VIX.

Figure 5

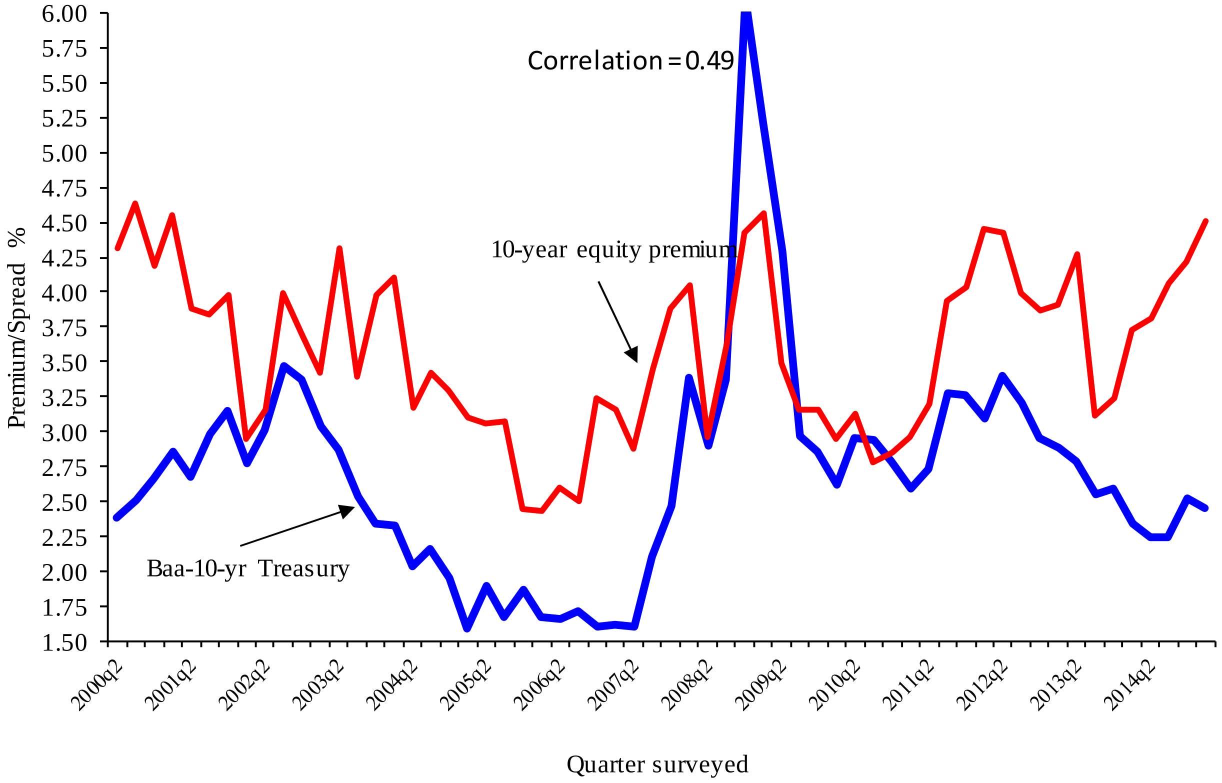
The equity risk premium and the implied volatility on the S&P 500 index option (VIX)



We also consider an alternative risk measure, the credit spread. We look at the correlation between Moody's Baa rated bond yields less the 10-year Treasury bond yield and the risk premium. Figure 6 shows a highly significant relation between the time-series with a correlation of 0.49. Similar to Figure 5, there is a strong recent divergence.

Figure 6

The equity risk premium and credit spreads



2.8 Other survey questions

The March 2015 survey contains a number of other questions. http://www.cfosurvey.org presents the full results of these questions. The site also presents results conditional on demographic firm characteristics. For example, one can examine the CFOs views of the risk premium conditional on the industry in which the CFO works.

2.9 Risk premium data and corporate policies

New research by Ben-David, Graham and Harvey (2013) uses the one-year risk premium forecasts as a measure of optimism and the 80% confidence intervals as a direct measure of overconfidence. By linking email addresses that respondents provide to archival corporate data, Ben-David et al. find that the tightness of the confidence intervals is correlated with corporate investment. Overconfident managers invest more.

Campello, Graham and Harvey (2010) use the survey during the financial crisis and the higher risk premiums to examine the implications of financial constraints on the real activities of the firm. They provide new evidence on the negative impact of financial constraints on firms' investment plans.

Campello, Giambona, Graham and Harvey (2011) use the survey during the financial crisis to study how firms managed liquidity during the financial crisis.

Graham, Harvey and Puri (2013) administer a psychometric test using the survey instrument and link CEO optimism and risk aversion to corporate financial policies.

Graham, Harvey and Puri (2015) use survey data to study how capital is allocated within the firm and the degree to which CEOs delegate decision making to CFOs.

Graham, Harvey and Rajgopal (2005) use survey data to study how managers manipulate earnings.

2.10 CFO Survey compared to other surveys

Table 2 compares the predictive ability of the Duke-CFO survey with other popular surveys. The table reports the correlations between the current quarter Duke-CFO survey of either optimism about the economy or optimism about the firm's prospects with the subsequent quarter's realization for five surveys: UBS-Gallup, CEO Survey, Conference Board Consumer Confidence, University of Michigan Consumer Confidence and ISM Purchasing Manager's Index. Both of the Duke-CFO optimism measures significantly predict all five of these popular barometers of economic confidence. Related analysis shows that our CFO survey anticipates economic activity sooner (usually one quarter sooner) than do the other surveys.

Table 2
The ability of the Duke CFO survey to predict other surveys

	Predictive correlations	
Survey	Optimism about economy	Optimism about firm's prospects
UBS-Gallup	0.289	0.380
CEO Survey	0.814	0.824
Conference Board Consumer Confidence	0.513	0.767
University of Michigan Consumer Confidence	0.341	0.253
ISM Purchasing Managers Index	0.694	0.497

3. Conclusions

We provide a direct measure of ten-year market returns based on a multi-year survey of Chief Financial Officers. Importantly, we have a 'measure' of expectations. We do not claim it is the true market expectation. Nevertheless, the CFO measure has not been studied before.

While there is relatively little time-variation in the risk premium, premia are higher during recessions and higher during periods of uncertainty. We also link our analysis to the actual investment decisions of financial managers. We are able to impute the weighted average cost of capital given the CFO estimates of equity risk premia, current corporate bond yields and marginal tax rates. This imputed measure is significantly less than the WACCs that CFOs report using in project evaluation. One way to reconcile this is that CFOs use very long-term averages of equity premia and bond rates when calculating WACCs. We provide evidence on the actual hurdle rates used by companies. These hurdle rates are, on average, 400bp higher than the reported WACCs.

While we have over 21,000 survey responses in 15 years, much of our analysis uses summary statistics for each survey. As such, with only 56 unique quarters of predictions and a variable of interest that has a 10-year horizon, it is impossible to evaluate the accuracy of the market excess return forecasts. For example, the March 6, 2006 10-year annual forecast was 7.72% and the realized annual S&P 500 return through March 3, 2015 is 4.4%. Our analysis shows some weak correlation between past returns, real interest rates and the risk premium. In contrast, there is significant evidence on the relation between two common measures of economic risk and the risk premium. We find that both the implied volatility on the S&P index as well as a commonly used measure of credit spreads are highly correlated with our measured equity risk premium.

References

Asness, C. S., 2000. Stocks vs. bonds: Explaining the equity risk premium, *Financial Analysts Journal*, May/June.

Ben-David, I., J. R. Graham, and C. R. Harvey, 2013. Managerial miscalibration. *Quarterly Journal of Economics*, 128:4, 1547-1584. Available at SSRN: http://ssrn.com/abstract=1640552

Brav, A., J. R. Graham, C. R. Harvey, and R. Michaely, 2005. Payout policy in the 21st century, *Journal of Financial Economics* 77:3, 483-529. Available at SSRN: http://ssrn.com/abstract=571046

Campello, M., J. R. Graham and C. R. Harvey, 2010. The real effects of financial constraints: Evidence from a financial crisis, *Journal of Financial Economics* 97, 470-487. Available at SSRN: http://ssrn.com/abstract=1318355

Campello, M., E. Giambona, J. R. Graham and C. R. Harvey, 2011. Liquidity management and corporate investment during a financial crisis, *Review of Financial Studies* 24:6, 1944-1979. Available at SSRN: http://ssrn.com/abstract=144400

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, 1629-1666.

Davidson, L. B., and D. O. Cooper, 1976. A simple way of developing a probability distribution of present value, *Journal of Petroleum Technology*, September, 1069-1078.

Duff and Phelps, 2015. *2015 Valuation Handbook*. John Wiley and Sons, NJ,

Fama, E. F. and French, K. R., 2002. The equity premium, *Journal of Finance* 57, 637-659.

Fernandez, P., 2004. Market risk premium: Required, historical and expected, Unpublished working paper, University of Navarra. Available at SSRN: http://ssrn.com/abstract=601761

Fernandez, P., 2006. Market risk premium in 100 textbooks, Unpublished working paper, University of Navarra. Available at SSRN: http://ssrn.com/abstract=1148373

Fernandez, P., 2009. Market risk premium used in 2008 by professors: A survey with 1,400 answers, Unpublished working paper, University of Navarra. Available at SSRN: http://ssrn.com/abstract=1344209

Gebhardt, W. R., C. M. C. Lee, and B. Swaminathan, 2001. Toward an implied cost of capital, *Journal of Accounting Research* 39, 135-176.

Goyal, A. and I. Welch, 2003. Predicting the risk premium, *Management Science* 49, 639-654.

Graham, J. R. and C. R. Harvey, 2001. Theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60, 187-243. Available at SSRN: http://ssrn.com/abstract=220251

Graham, J. R. and C. R. Harvey, 2003. Expectations of equity risk premia, volatility and asymmetry from a corporate finance perspective, Working paper, Available at SSRN: http://ssrn.com/abstract=292623

Graham, J. R., and C. R. Harvey, 2009. The CFO Global Business Outlook: 1996-2009. http://www.cfosurvey.org.

Graham, J. R., C. R. Harvey and M. Puri, 2013. Managerial attitudes and corporate actions, *Journal of Financial Economics,* 109:1, 103-121. Available at SSRN: http://ssrn.com/abstract=1432641

Graham, J. R., C. R. Harvey and M. Puri, 2015. Capital allocation and delegation of decision-making authority within firms, *Journal of Financial Economics, 115:3,* 449-470. Available at SSRN: http://ssrn.com/abstract=1527098

Graham, J. R., C. R. Harvey, and S. Rajgopal, 2005. The economic implications of corporate financial reporting, *Journal of Accounting and Economics* 40, 3-70. Available at SSRN: http://ssrn.com/abstract=491627

Harris, R. S. and F. C. Marston, 2001. The market risk premium: Expectational estimates using analysts' forecasts, *Journal of Applied Finance* 11, 6-16.

Harvey, C. R., 2001. The specification of conditional expectations, *Journal of Empirical Finance* 8, 573-638.

Jagannathan, R., D. A. Matsa, I. Meier, and V. Tarhan, 2014. Why do firms use high discount rates? Available at SSRN: http://ssrn.com/abstract=2412250.

Jagannathan, R., E. R. McGrattan and A. Scherbina, 2001. The declining U.S. equity premium, *Quarterly Review*, Federal Reserve Bank of Minneapolis.

Keefer, D. L. and S. E. Bodily, 1983. Three-point approximations for continuous random variables, *Management Science* 29, 5 595-609.

Morningstar, 2013. *Ibbotson SBBI 2013 Valuation Yearbook*. Morningstar, Chicago, IL.

Pástor, L. And R. Stambaugh, 2001. The equity premium and structural breaks, *Journal of Finance* 56, 1207-1239.

Poterba, J. M. and Summers, L. H., 1995. A CEO survey of U.S. companies' time horizons and hurdle rates, *Sloan Management Review*, Fall, 43-53.

Sharpe, S. A. and G. A. Suarez, 2013. The insensitivity of investment to interest rates: Evidence from a survey of CFOs, Working paper, Federal Reserve Bank, Washington, DC.

Siegel, J. J., 1999. The shrinking equity premium, *Journal of Portfolio Management*, 10-17.

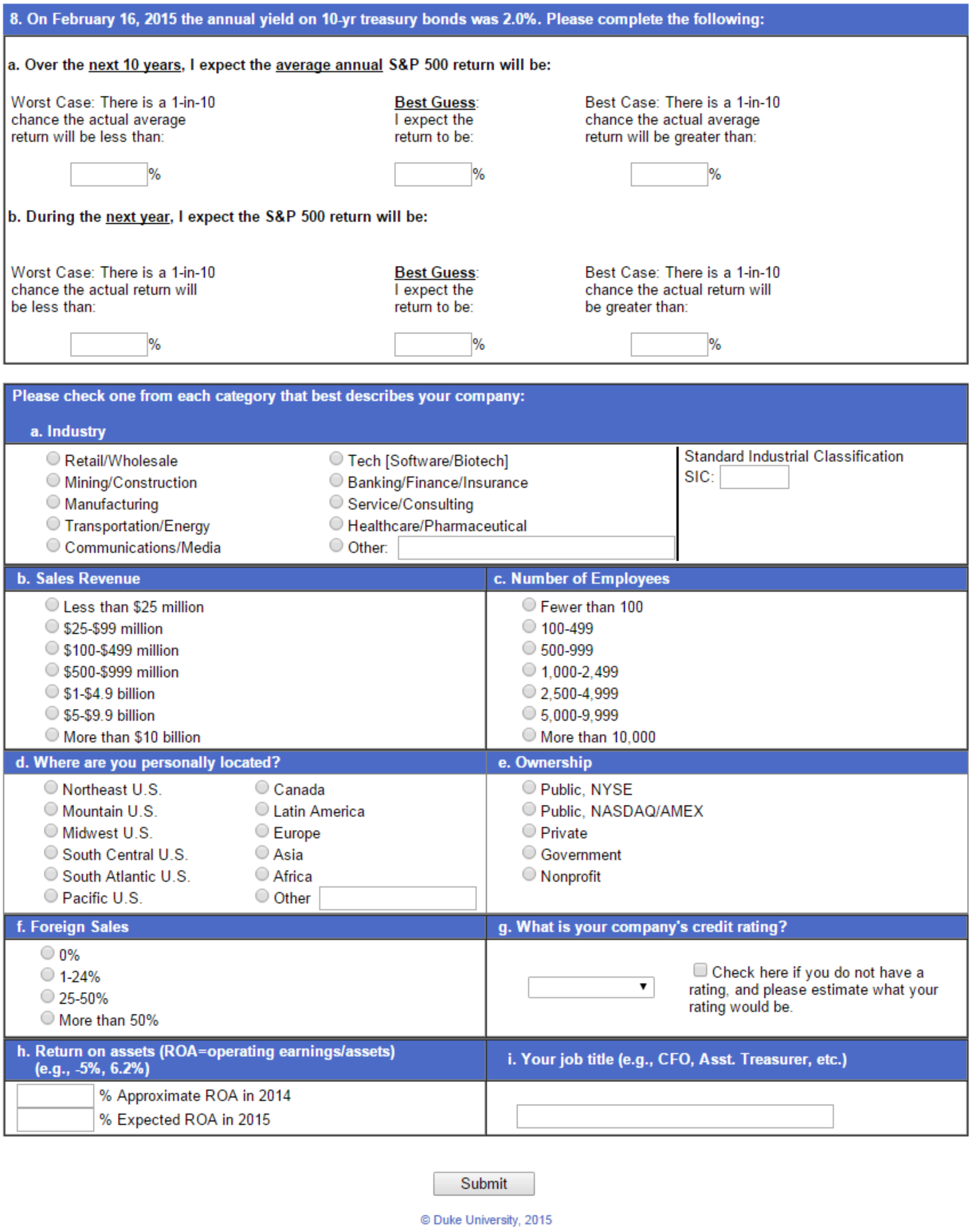
Welch, I., 2000. Views of financial economists on the equity premium and other issues, *Journal of Business* 73 (October): 501-37.

Welch, I., 2001. The equity premium consensus forecast revisited, Unpublished working paper, Cowles Foundation for Research in Economics, Yale University, New Haven, CT. Available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=285169.

Welch, I., 2009. Views of economists about the equity premium and policy, Unpublished working paper, Brown University. Available at http://welch.econ.brown.edu/academics/equpdate-results2009.html

Appendix A

Excerpt from the Survey Instrument



8. On February 16, 2015 the annual yield on 10-yr treasury bonds was 2.0%. Please complete the following:

a. Over the next 10 years, I expect the average annual S&P 500 return will be:

Worst Case: There is a 1-in-10 chance the actual average return will be less than:	**Best Guess**: I expect the return to be:	Best Case: There is a 1-in-10 chance the actual average return will be greater than:
%	%	%

b. During the next year, I expect the S&P 500 return will be:

Worst Case: There is a 1-in-10 chance the actual return will be less than:	**Best Guess**: I expect the return to be:	Best Case: There is a 1-in-10 chance the actual return will be greater than:
%	%	%

Please check one from each category that best describes your company:

a. Industry

○ Retail/Wholesale
○ Mining/Construction
○ Manufacturing
○ Transportation/Energy
○ Communications/Media
○ Tech [Software/Biotech]
○ Banking/Finance/Insurance
○ Service/Consulting
○ Healthcare/Pharmaceutical
○ Other:

Standard Industrial Classification
SIC:

b. Sales Revenue

○ Less than $25 million
○ $25-$99 million
○ $100-$499 million
○ $500-$999 million
○ $1-$4.9 billion
○ $5-$9.9 billion
○ More than $10 billion

c. Number of Employees

○ Fewer than 100
○ 100-499
○ 500-999
○ 1,000-2,499
○ 2,500-4,999
○ 5,000-9,999
○ More than 10,000

d. Where are you personally located?

○ Northeast U.S.
○ Mountain U.S.
○ Midwest U.S.
○ South Central U.S.
○ South Atlantic U.S.
○ Pacific U.S.
○ Canada
○ Latin America
○ Europe
○ Asia
○ Africa
○ Other

e. Ownership

○ Public, NYSE
○ Public, NASDAQ/AMEX
○ Private
○ Government
○ Nonprofit

f. Foreign Sales

○ 0%
○ 1-24%
○ 25-50%
○ More than 50%

g. What is your company's credit rating?

☐ Check here if you do not have a rating, and please estimate what your rating would be.

h. Return on assets (ROA=operating earnings/assets) (e.g., -5%, 6.2%)

% Approximate ROA in 2014
% Expected ROA in 2015

i. Your job title (e.g., CFO, Asst. Treasurer, etc.)

The Equity Risk Premium in 2016

John R. Graham
Fuqua School of Business, Duke University, Durham, NC 27708, USA
National Bureau of Economic Research, Cambridge, MA 02912, USA

Campbell R. Harvey*
Fuqua School of Business, Duke University, Durham, NC 27708, USA
National Bureau of Economic Research, Cambridge, MA 02912, USA

ABSTRACT

We analyze the history of the equity risk premium from surveys of U.S. Chief Financial Officers (CFOs) conducted every quarter from June 2000 to June 2016. The risk premium is the expected 10-year S&P 500 return relative to a 10-year U.S. Treasury bond yield. The average risk premium in 2016, 4.02%, is slightly higher than the average observed over the past 16 years. We also provide results on the risk premium disagreement among respondents as well as asymmetry or skewness of risk premium estimates. We also link our risk premium results to survey-based measures of the weighted average cost of capital and investment hurdle rates. The hurdle rates are significantly higher than the cost of capital implied by the market risk premium estimates.

JEL Classification: *G11, G31, G12, G14*

Keywords: *Cost of capital, financial crisis, equity premium, WACC, hurdle rate, long-term market returns, stock return forecasts, long-term equity returns, expected excess returns, disagreement, individual uncertainty, skewness, asymmetry, survey methods, TIPs, VIX, credit spreads*

---

*Corresponding author, Telephone: +1 919.660.7768, E-mail: cam.harvey@duke.edu. We appreciate the research assistance of Joy Tong. Version: August 2, 2016

Introduction

We analyze the results of the most recent survey of Chief Financial Officers (CFOs) conducted by Duke University and *CFO* Magazine. The survey closed on June 2, 2016 and measures expectations beginning in the second quarter of 2016. In particular, we poll CFOs about their long-term expected return on the S&P 500. Given the current U.S. 10-year Treasury bond yield, we provide estimates of the equity risk premium and show how the premium changes through time. We also provide information on the disagreement over the risk premium as well as average confidence intervals. Finally, we link the equity risk premium to measures used to evaluate firm's investments: the weighted average cost of capital (WACC) and the investment hurdle rate.

1. Method

2.1 Design

The quarterly survey of CFOs was initiated in the third quarter of 1996.[1] Every quarter, Duke University polls financial officers with a short survey on important topical issues (Graham and Harvey, 2009). The usual response rate for the quarterly survey is 5%-8%. Starting in June of 2000, a question on expected stock market returns was added to the survey. Fig. 1 summarizes the results from the risk premium question. While the survey asks for both the one-year and ten-year expected returns, we focus on the ten-year expected returns herein, as a proxy for the market risk premium.

The executives have the job title of CFO, Chief Accounting Officer, Treasurer, Assistant Treasurer, Controller, Assistant Controller, or Vice President (VP), Senior VP or Executive VP of Finance. Given that the majority of survey respondents hold the CFO title, for simplicity we refer to the entire group as CFOs.

---

[1] The surveys from 1996Q3-2004Q2 were partnered with a national organization of financial executives. The 2004Q3 and 2004Q4 surveys were solely Duke University surveys, which used Duke mailing lists (previous survey respondents who volunteered their email addresses) and purchased email lists. The surveys from 2005Q1 to present are partnered with *CFO magazine*. The sample includes both the Duke mailing lists and the *CFO* subscribers that meet the criteria for policy-making positions.

2.2 Delivery and response

In the early years of the survey, the surveys were faxed to executives. The delivery mechanism was changed to the Internet starting with the December 4, 2001 survey. Respondents are given four business days to fill out the survey, and then a reminder is sent allowing another four days. Usually, two-thirds of the surveys are returned within two business days.

The response rate of 5-8% could potentially lead to a non-response bias. There are six reasons why we are not overly concerned with the response rate. First, we do not manage our email list. If we deleted the email addresses that had not responded to the survey in the past 12 quarters, our response rate would be in the 15-20% range – which is a good response rate. Second, Graham and Harvey (2001) conduct a standard test for non-response biases (which involves comparing the results of those that fill out the survey early to the ones that fill it out late) and find no evidence of bias. Third, Brav, Graham, Harvey and Michaely (2005) conduct a captured sample survey at a national conference in addition to an Internet survey. The captured survey responses (to which over two-thirds participated) are qualitatively identical to those for the Internet survey (to which 8% responded), indicating that non-response bias does not significantly affect their results. Fourth, Brav et al. contrast survey responses to archival data from Compustat and find archival evidence for the universe of Compustat firms that is consistent with the responses from the survey sample. Fifth, Campello, Graham, and Harvey (2011) show that the December 2008 response sample is fairly representative of the firms included in the commonly used Compustat database. Sixth, Graham, Harvey, Popadak and Rajgopal (2016) update the non-response bias test in a survey of 1,900 CFOs and find no evidence of non-response bias.

2.3 Data integrity

In each quarter, implement a series of rules to ensure the integrity of the data. We have, on average, 355 responses each quarter. However, in recent years the average number of responses has exceeded 400. There are a total of 23,086 survey observations. There are six key pieces of data: 1) the 10-year forecast (LT); 2) lower 10% of 10-year forecast (LLT); and 3) upper 10% of the

10-year forecast (ULT). We collect the analogous information for the one-year S&P 500 forecasts too (ST). This paper focuses on the 10-year forecasts but the short-term forecasts factor into our data filters.

Our exclusion rules are the following:

1. Delete all missing forecasts, LT, ST
2. Delete all negative LT forecasts (not ST forecasts)
3. Delete all observations that failed to use percentages (forecasts<1.0 for both ST and LT)
4. Delete observations where they failed to annualize, i.e. delete if LT>30% (does not apply to ST)
5. Delete is ST>100%.
6. Delete if lower intervals inconsistent, i.e. LST>=ST or LLT>=LT.
7. Delete if upper intervals inconsistent, i.e. UST<=ST or ULT<=LT.
8. Delete if ST-LST and UST-ST both equal 1 (we call this a lazy answer)
9. Delete if LT-LLT and ULT-LT both equal 1 (again, a lazy answer)

2.4 The 2016 results

The expected market return questions are a subset of a larger set of questions in the quarterly survey of CFOs. The survey usually contains between eight and ten questions. Some of the questions are repeated every quarter and some change through time depending on economic conditions. The historical surveys can be accessed at http://www.cfosurvey.org. Appendix 1 shows the risk premium question in the most recent survey.

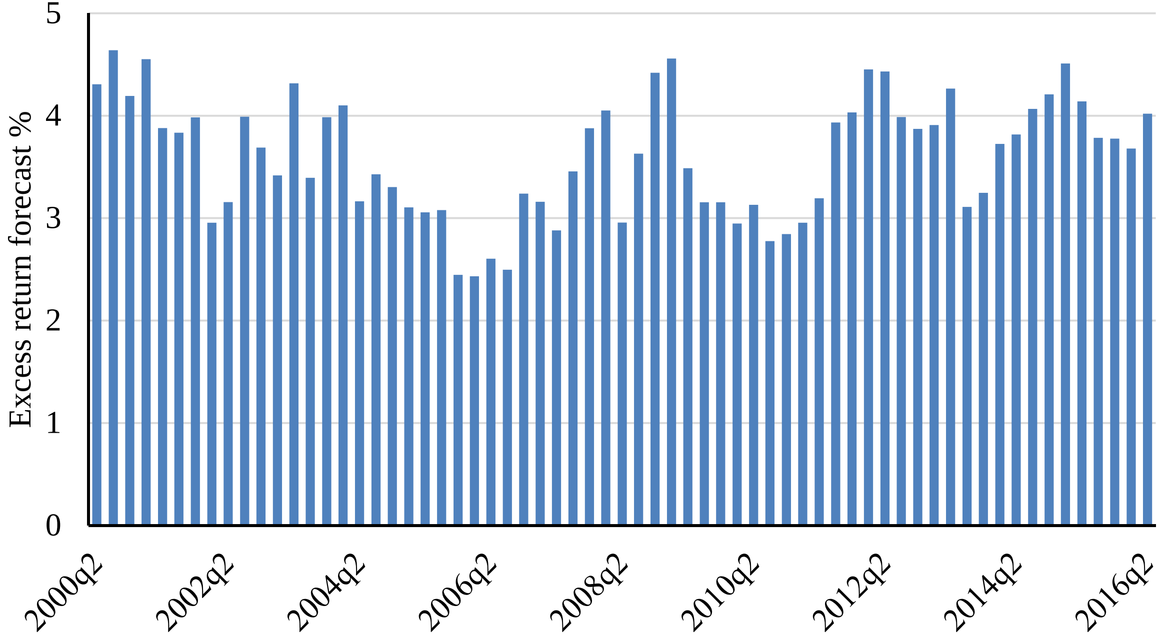
While the survey is anonymous, we collect demographic information on seven firm characteristics, including industry, sales revenue, number of employees, headquarters location, ownership (public or private), and proportion of foreign sales.

During the past 16 years, we have collected over 23,000 responses to the survey. Panel A of Table 1 presents the date that the survey window opened, the number of responses for each survey, the 10-year Treasury bond rate, as well as the average and median expected excess returns. There is relatively little time variation in the risk premium. This is confirmed in Fig. 1a, which displays the historical risk premiums contained in Table 1. The current premium, 4.02%, is close to the historical average. The June 2016 survey shows that the expected annual S&P 500 return is 5.83% (=4.02%+1.81%) which is below the overall average of 7.19%. The total return forecasts are presented in Fig. 1b.[2]

Panel B of Table 1 presents some summary statistics that pool all responses through the 16 year history of the survey. The overall average ten-year risk premium return is 3.58%.[3] The standard deviation of the individual responses is 2.91% (see Panel B). The standard deviation of the quarterly risk premium estimates is 0.58% (not reported in the Table).

Figure 1a

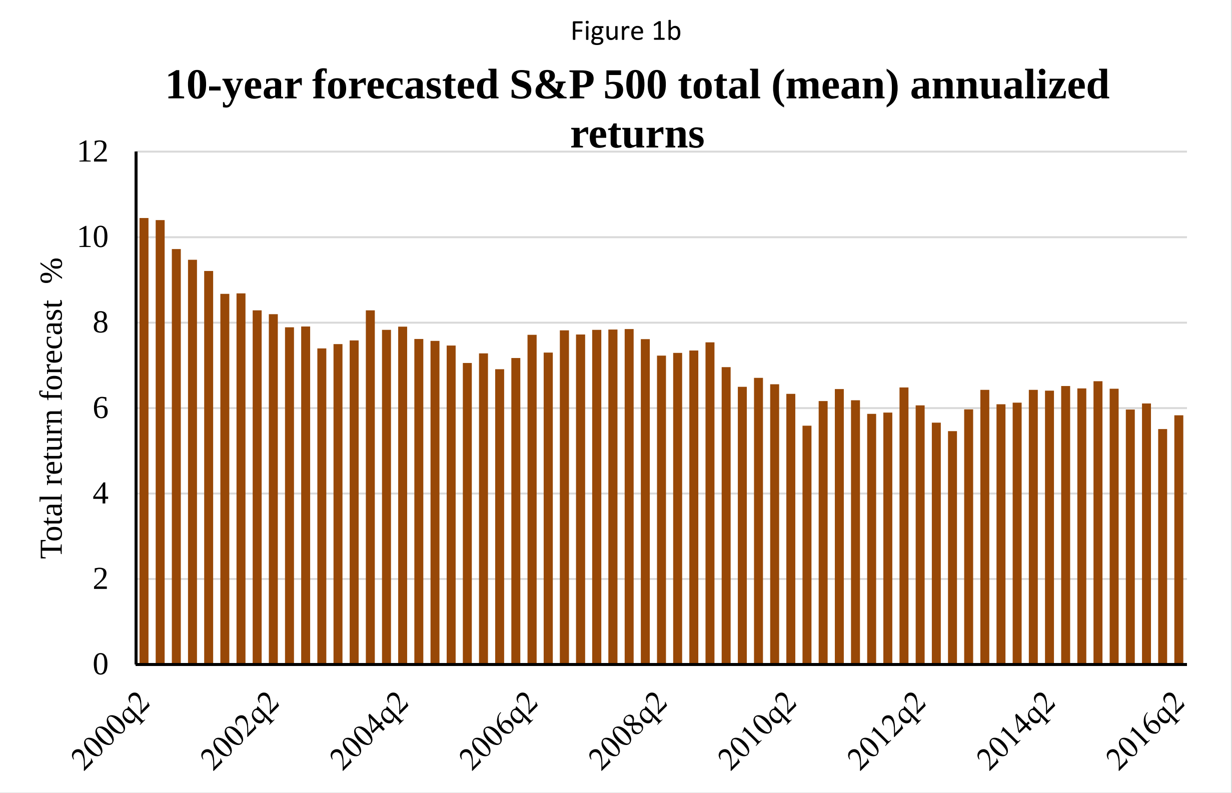
10-year forecasted S&P 500 (mean) annual returns over and above the 10-year Treasury bond yield



---

[2] See, for example, Ghysels (1998), Welch (2000, 2001, 2009), Ghysels (1998), Fraser (2001), Harris and Marston (2001), Pástor and Stambaugh (2001), Fama and French (2002), Goyal and Welch (2003), Graham and Harvey (2003), Ang and Bekaert (2005), Fernandez (2004, 2006, 2009) for studies of the risk premium.

[3] Using the Ibbotson Associates data from January 1926 through July 2010, the arithmetic (geometric) average return on the S&P 500 over and above the 30-day U.S. Treasury bill is 7.75% (5.80%). Using data from April 1953-July 2010, the arithmetic (geometric) risk premium is 6.27% (5.12%). The risk premium over the 10 year bond should be reduced by 212 basis points for the arithmetic premium and 174 basis points for the geometric premium. Fama and French (2002) study the risk premium on the S&P 500 from 1872-2000 using fundamental data. They argue that the ex ante risk premia is between 2.55% and 4.32% for 1951-2000 period. Ibbotson and Chen (2001) estimate a long-term risk premium between 4 and 6%. Also see Siegel (1999), Asness (2000), Heaton and Lucas (2000) and Jagannathan, McGratten and Scherbina (2001). A recent treatment is Sharpe and Suarez (2013).



The cross-sectional standard deviation across the individual CFO forecasts in a quarter is a measure of the disagreement or dispersion of the participants in each survey. Dispersion sharply increased during the global financial crisis. The average disagreement in 2005 was 2.39%. Disagreement increased in 2006 to 2.64%. As the crisis began in 2007, disagreement increased to 2.98 by March 2008. The peak disagreement was recorded in February 2009 (4.13%). The most recent observation is 3.24%.

We also report information on the average of the CFOs' assessments of the one in ten chance that the market will exceed or fall below a certain level. In the most recent survey, the worst case total return is +0.39% which is lower than the historic average of 1.52%. The best-case return is 9.71% which is also slightly lower than the average of 10.97%.

With information on the 10% tails, we construct a probability distribution for each respondent. We use Davidson and Cooper's (1976) method to recover each respondent's probability distribution:

$$\text{Variance} = ([x(0.90)\text{-}x(0.10)]/2.65)^2$$

where *x*(0.90) and *x*(0.10) represent the 90th and 10th percentiles of the respondent’s distribution, ULT and LLT. Keefer and Bodily (1983) show that this simple approximation is the preferred method of estimating the variance of a probability distribution of random variables, given information about the 10th and 90th percentiles. Like disagreement, the average of individual volatilities peaked in February 2009 at 4.29%. The current level, 3.52%, is very close to the overall average.

There is also a natural measure of asymmetry in each respondent’s response. We look at the difference between each individual’s 90% tail and the mean forecast and the mean minus the 10% tail. Hence, if the respondent's forecast of the excess return is 6% and the tails are -8% and +11%, then the distribution is negatively skewed with a value of -9% (=5%-14%). As with the usual measure of skewness, we cube this quantity and standardize by dividing by the cube of the individual standard deviation. In every quarter’s survey, there is on average negative skewness in the individual forecasts. The average asymmetry -0.63 which is slightly lower than the average of -0.47.

Table 1

Summary statistics based on the responses from the 65 CFO Outlook Surveys from June 2000 to June 2016 (Maximums in red, minimums in green)

A. By quarter

#	Survey date	Survey quarter	Number of survey responses	10-year bond yield	Total market return forecast	Average risk premium	Median risk premium	Disagreement (standard deviation of risk premium estimates)	Average of individual standard deviations	Average of individuals' worst 10% market return scenario	Average of individuals' best 10% market return scenario	Skewness of risk premium estimates	Average of individuals' asymmetry	% who forecast negative excess return
1	6/6/2000	2000Q2	209	**6.14**	**10.45**	4.31	3.86	3.22				0.95		9.09
2	9/7/2000	2000Q3	188	5.76	10.40	**4.64**	4.24	3.03				0.83		4.79
3	12/4/2000	2000Q4	243	5.53	9.72	4.19	4.47	2.52				0.53		4.12
4	3/12/2001	2001Q1	140	4.92	9.47	4.55	4.58	2.91				0.78		3.57
5	6/7/2001	2001Q2	208	5.33	9.21	3.88	3.67	2.64				0.58		5.77
6	9/10/2001	2001Q3	199	4.84	8.67	3.83	3.16	2.53				**0.13**		3.52
7	12/4/2001	2001Q4	279	4.70	8.68	3.98	3.30	2.43				0.61		2.15
8	3/11/2002	2002Q1	233	5.33	8.29	2.96	2.67	2.43	3.28	**3.68**	12.42	1.06	-0.28	11.16
9	6/4/2002	2002Q2	316	5.04	8.20	3.16	2.96	2.61	3.50	3.00	12.28	1.86	-0.39	10.44
10	9/16/2002	2002Q3	361	3.90	7.89	3.99	4.10	2.31	3.39	3.05	12.03	0.86	-0.25	2.77
11	12/2/2002	2002Q4	285	4.22	7.91	3.69	3.78	2.56	3.23	3.32	11.87	1.24	-0.28	4.91
12	3/19/2003	2003Q1	184	3.98	7.40	3.42	3.02	2.37	3.59	1.95	11.47	0.83	-0.62	4.35
13	6/16/2003	2003Q2	366	3.18	7.50	4.32	**4.82**	2.34	3.74	2.16	12.07	0.90	-0.33	3.28
14	9/18/2003	2003Q3	167	4.19	7.58	3.39	3.81	**2.07**	**2.83**	3.31	10.83	0.35	-0.43	6.59
15	12/10/2003	2003Q4	220	4.30	8.29	3.98	3.70	2.66	3.29	3.40	12.10	1.74	-0.45	2.27
16	3/24/2004	2004Q1	206	3.73	7.83	4.10	4.27	2.37	3.46	2.85	12.02	0.50	-0.29	3.88
17	6/16/2004	2004Q2	177	4.74	7.90	3.16	3.26	2.61	3.10	3.14	11.34	2.14	-0.40	6.21
18	9/10/2004	2004Q3	179	4.19	7.62	3.43	3.31	2.92	3.27	2.61	11.29	2.02	-0.52	8.94
19	12/3/2004	2004Q4	287	4.27	7.57	3.30	3.23	2.66	3.05	3.10	11.17	1.89	-0.37	5.92
20	2/28/2005	2005Q1	272	4.36	7.46	3.10	3.39	2.52	3.06	3.13	11.23	1.29	-0.33	6.62
21	5/31/2005	2005Q2	316	4.00	7.06	3.06	3.00	2.22	3.22	2.39	10.93	0.46	-0.26	6.65
22	8/29/2005	2005Q3	321	4.20	7.28	3.08	2.80	2.61	3.36	2.15	11.06	2.42	-0.52	7.48
23	11/21/2005	2005Q4	338	4.46	6.91	2.45	2.54	2.20	3.48	2.23	11.44	0.41	**-0.23**	9.76
24	3/6/2006	2006Q1	276	4.74	7.17	**2.43**	2.26	2.40	3.44	2.07	11.18	1.02	-0.37	8.70
25	6/1/2006	2006Q2	494	5.11	7.72	2.61	2.89	2.74	3.29	3.00	11.70	1.84	-0.24	**18.02**
26	9/11/2006	2006Q3	460	4.80	7.30	2.50	2.20	2.49	3.32	2.53	11.33	1.32	-0.33	7.83
27	11/21/2006	2006Q4	386	4.58	7.82	3.24	3.42	2.93	3.36	2.94	11.82	1.91	-0.30	6.99
28	3/1/2007	2007Q1	380	4.56	7.72	3.16	3.44	2.39	3.38	2.73	11.67	1.80	-0.39	5.53
29	6/1/2007	2007Q2	419	4.95	7.83	2.88	3.05	2.14	3.21	3.08	11.58	0.56	-0.37	3.58
30	9/7/2007	2007Q3	479	4.38	7.84	3.46	3.62	2.82	3.12	3.33	11.59	1.80	-0.34	5.22
31	11/30/2007	2007Q4	458	3.97	7.85	3.88	4.03	2.75	3.31	2.93	11.70	1.38	-0.32	3.28
32	3/7/2008	2008Q1	381	3.56	7.61	4.05	4.44	2.99	3.21	3.08	11.58	2.23	-0.30	3.94
33	6/13/2008	2008Q2	384	4.27	7.23	2.96	2.73	2.60	3.32	2.44	11.24	1.50	-0.41	9.38
34	9/5/2008	2008Q3	432	3.66	7.29	3.63	3.34	2.79	3.31	2.30	11.06	1.71	-0.42	4.63
35	11/28/2008	2008Q4	534	2.93	7.35	4.42	4.07	3.19	3.73	1.77	11.64	1.94	-0.37	2.81
36	2/26/2009	2009Q1	443	2.98	7.54	4.56	4.02	**4.13**	**4.29**	1.18	**12.54**	1.80	-0.47	5.87
37	5/29/2009	2009Q2	427	3.47	6.96	3.49	3.53	3.12	3.73	1.37	11.26	1.79	-0.42	6.56
38	9/11/2009	2009Q3	536	3.34	6.50	3.16	2.66	2.88	3.87	0.62	10.86	1.82	-0.46	10.82
39	12/11/2009	2009Q4	457	3.55	6.71	3.16	2.45	3.56	3.86	0.64	10.88	2.38	-0.52	9.85
40	2/26/2010	2010Q1	478	3.61	6.56	2.95	2.39	3.28	3.96	0.39	10.86	2.31	-0.68	9.41
41	6/4/2010	2010Q2	444	3.20	6.33	3.13	2.80	3.08	3.90	0.33	10.64	**2.61**	-0.64	9.91
42	9/10/2010	2010Q3	451	2.81	5.59	2.78	**2.19**	2.53	4.21	**-1.16**	9.99	0.77	-0.67	8.65
43	12/10/2010	2010Q4	402	3.32	6.17	2.85	2.68	2.62	3.91	0.26	10.63	1.89	-0.55	10.70
44	3/4/2011	2011Q1	429	3.49	6.45	2.96	2.51	2.92	4.16	-0.27	10.76	2.44	**-0.70**	8.16
45	6/3/2011	2011Q2	406	2.99	6.18	3.19	3.01	2.90	3.90	0.12	10.45	2.09	-0.68	5.17
46	9/9/2011	2011Q3	397	1.93	5.86	3.93	3.07	3.11	3.79	0.04	10.09	2.41	-0.54	**2.02**
47	12/16/2011	2011Q4	439	1.86	5.89	4.03	3.14	2.98	4.07	-0.11	10.68	1.91	-0.36	3.42
48	3/1/2012	2012Q1	406	2.03	6.48	4.45	3.97	2.97	4.07	0.30	11.08	2.25	-0.59	2.71
49	5/30/2012	2012Q2	338	1.63	6.06	4.43	4.37	2.96	3.94	0.00	10.42	1.96	-0.59	2.37
50	9/7/2012	2012Q3	675	1.67	5.66	3.99	3.33	3.00	3.66	-0.01	9.67	2.04	-0.58	2.37
51	12/6/2012	2012Q4	325	**1.59**	**5.46**	3.87	3.41	2.59	3.69	-0.49	**9.25**	1.42	-0.62	3.08
52	3/8/2013	2013Q1	418	2.06	5.97	3.91	3.94	2.73	3.84	-0.14	10.02	2.01	-0.64	4.55
53	5/31/2013	2013Q2	300	2.16	6.43	4.27	3.84	2.91	4.02	0.10	10.76	1.63	-0.67	2.67
54	9/5/2013	2013Q3	404	2.98	6.09	3.11	3.02	2.73	3.41	0.75	9.77	1.71	-0.53	6.68
55	12/5/2013	2013Q4	320	2.88	6.13	3.25	3.12	2.95	3.81	0.18	10.26	1.69	-0.50	7.19
56	3/4/2014	2014Q1	291	2.70	6.43	3.73	3.30	2.63	3.32	1.35	10.13	0.64	-0.69	5.15
57	6/5/2014	2014Q2	325	2.59	6.41	3.82	3.41	3.23	3.76	0.50	10.46	1.89	-0.64	7.08
58	9/4/2014	2014Q3	316	2.45	6.52	4.07	3.55	3.33	3.69	0.90	10.68	2.56	-0.60	3.16
59	12/4/2014	2014Q4	398	2.25	6.46	4.21	4.50	2.51	3.79	0.46	10.51	1.22	-0.59	2.26
60	3/3/2015	2015Q1	414	2.12	6.63	4.51	3.88	3.50	3.72	0.81	10.68	1.92	-0.55	5.80
61	6/4/2015	2015Q2	399	2.31	6.45	4.14	3.69	3.03	3.96	0.20	10.68	1.93	-0.72	4.26
62	9/3/2015	2015Q3	376	2.18	5.96	3.78	2.82	3.17	3.48	0.28	9.49	2.72	-0.72	3.99
63	12/3/2015	2015Q4	347	2.33	6.11	3.78	2.67	3.58	3.55	0.54	9.94	1.92	-0.52	9.22
64	3/3/2016	2016Q1	476	1.83	5.51	3.68	3.17	2.55	3.12	1.04	9.29	0.99	-0.34	3.15
65	6/2/2016	2016Q2	472	1.81	5.83	4.02	3.19	3.24	3.52	0.39	9.71	2.14	-0.63	2.54
	Average of quarters		355	**3.58**	**7.19**	**3.61**	**3.37**	**2.80**	**3.57**	**1.52**	**10.97**	**1.54**	**-0.47**	**5.89**
	Standard deviation			1.18	1.13	0.58	0.63	0.38	0.34	1.33	0.80	0.66	0.15	3.05

B. By individual responses

Survey for											
All dates	23,086	**3.41**	**6.99**	**3.58**	**3.30**	**2.91**	**3.60**	**1.37**	**10.91**	**1.64**	**-0.48**	**5.95**

2.5 Risk premia, weighted average cost of capital and hurdle rates

The risk premia that we measure can be used in the calculation of the cost of capital. In a simple capital asset pricing model, the cost of equity capital would be the product of the company's beta times the risk premium along with the risk free rate. The average firm's cost of equity capital would be 6.63% (assuming a beta=1). Assuming the Baa bond yield is the borrowing rate and a 25% marginal tax rate, the weighted average cost of capital would be about 5.67%.

In previous surveys, we have asked CFOs about their weighted average cost of capital. For example, in March of 2011, companies told us that their internally calculated weighted average cost of capital was 10% (averaged across respondents). At the time, the cost of equity capital was similar to today, 6.45%. The bond yields were higher, with the Baa yielding 6.09%. The average firm (assuming average beta is 1.0) without any debt would have a WACC of 6.45%. When debt is introduced, the WACC would be less than 6.45% -- which is sharply lower than the reported 10%.

Why is there such a divergence? One possible reason is that companies consider other factors in calculating the WACC – perhaps a multifactor model.[4] However, there is no evidence supporting this hypothesis. For example, consultants often add a premium for smaller firms based on the results in many research papers of a size premium. However, in our survey the average WACC for firms with less than $25 million in revenue is 10.6% and the WACC for the largest firms with annual revenue greater than $10 billion is 10.5%.

This analysis was replicated in June of 2012 with similar results. Given the same assumptions, the WACC is 5.37%. However, the average self-reported WACC is 9.3%. Again, there is no evidence of a size premium. The smallest firms reported a WACC of 9.3% and the largest firms 9.7%.

The WACC should not be confused with the investment hurdle rate. The WACC is an analytical calculation that combines a model-based cost of equity (such as the CAPM) and the after-tax cost of debt (reflected in current borrowing rates). Given capital constraints, firms often impose a higher hurdle rate on their investments. For example, to allocate capital to an investment that

---

[4] Graham and Harvey (2001) find that most companies use a 1-factor model for cost of capital calculations.

promises a projected return exactly at the firm's WACC is equivalent to accepting a zero net present value project.

The June 2012 survey also asked for the investment hurdle rates. They are much higher than the WACCs. The average rate was 13.5% (compared to the survey-reported WACC of 9.3% and the implied WACC from the survey based risk premium of 5.7%. Similar to the WACC results, there is no evidence that the hurdle rates are higher for small firms. Our evidence shows that the reported average hurdle rate for the smallest firms is 13.1% and for the largest firms the rate is 14.2%.

Even though we know from Graham and Harvey (2001) that three quarters of companies use the capital asset pricing model, there is a large gap between an imputed WACC and the WACC that people use. One way to reconcile this is that companies use very long term averages of equity and bond premia in their calculations. For example, suppose the cost of capital is being calculated with averages from 1926. Ibbotson (2013) reports an arithmetic average return of 11.8% over the 1926-2012 period. The average return on corporate bonds is 6.4%. Using the same parameters, we get an imputed WACC of 9.7%. This is very close to the average reported WACC and, indeed, identical to the WACC reported by the largest firms in our survey.

We learn the following: 1) the equity risk premium is much lower today than averages used over long-periods (e.g. from 1926) such as reported in Morningstar (2013) and Duff and Phelps (2015); 2) the survey questions asking directly about a company's WACC is consistent with companies routinely using long-horizon averages for inputs; and 3) WACCs should be thought as lower bounds – the Hurdle Rates used for actual investment decisions are 400bp higher than the stated WACCs.[5]

2.6 Recessions, the financial crisis and risk premia

Our survey spans two recessions: March 2001-September 2001 as well as the recession that begins in December 2007 and ends in June 2009. Financial theory would suggest that risk premia should vary with the business cycle. Premiums should be highest during recessions and lowest

---

[5] Also see Sharpe and Suarez (2013) and Jagannathan et al. (2016) who analyze our CFO survey data.

during recoveries. Previous research has used a variety of methods including looking at ex post realized returns to investigate whether there is business-cycle like variation in risk premia.

While we only have 60 observations and this limits our statistical analysis, we do see important differences. During recessions, the risk premium is 3.92% and during non-recessions, the premium falls to 3.46%.

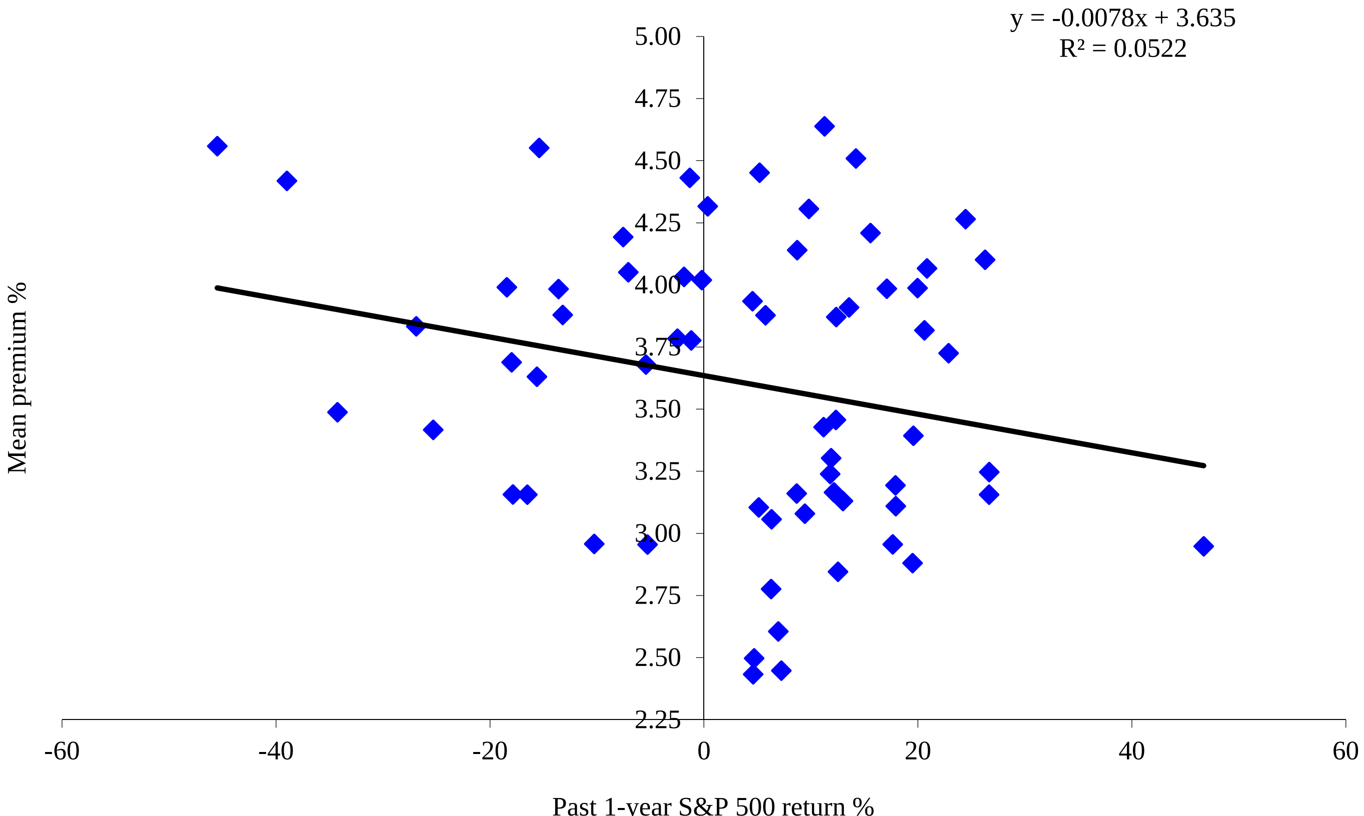
2.7 Explaining variation in the risk premium

While we document the level and a limited time-series of the long-run risk premium, statistical inference is complicated by the fact that the forecasting horizons are overlapping. First, we have no way of measuring the accuracy of the risk premiums as forecasts of equity returns. Second, any inference based on regression analysis is confounded by the fact that from one quarter to the next, there are 36 common quarters being forecasted. This naturally induces a moving-average process.

We do, however, try to characterize the time-variation in the risk premium without formal statistical tests. Figure 2 examines the relation between the mean premium and previous one-year returns on the S&P 500.

Figure 2

The ten-year equity risk premium and past 1-year returns on the S&P 500 index

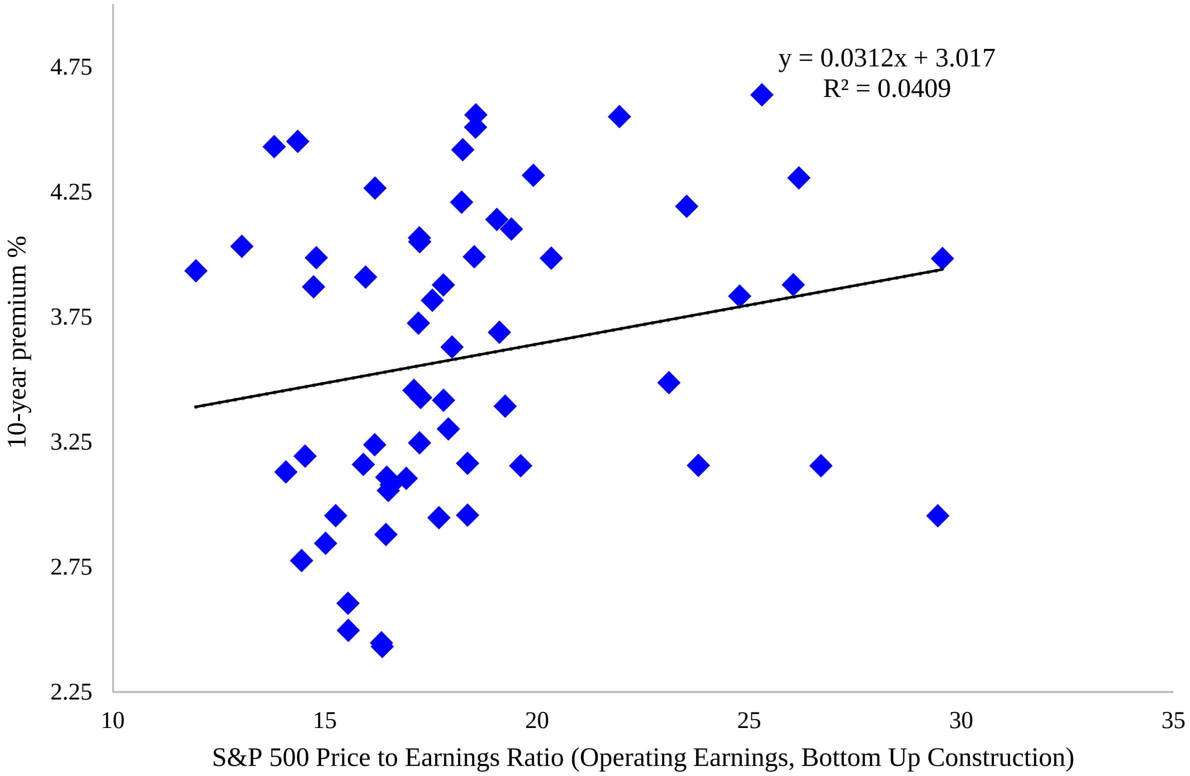


The evidence suggests that there is a weak negative correlation between past returns and the level of the long-run risk premium. This makes economic sense. When prices are low (after negative returns), expected return increase.

An alternative to using past-returns is to examine a measure of valuation. Figure 3 examines a scatter of the mean premium versus the forward price-to-earnings ratio of the S&P 500.

Figure 3

The equity risk premium and the S&P 500 forward price-to-earnings ratio

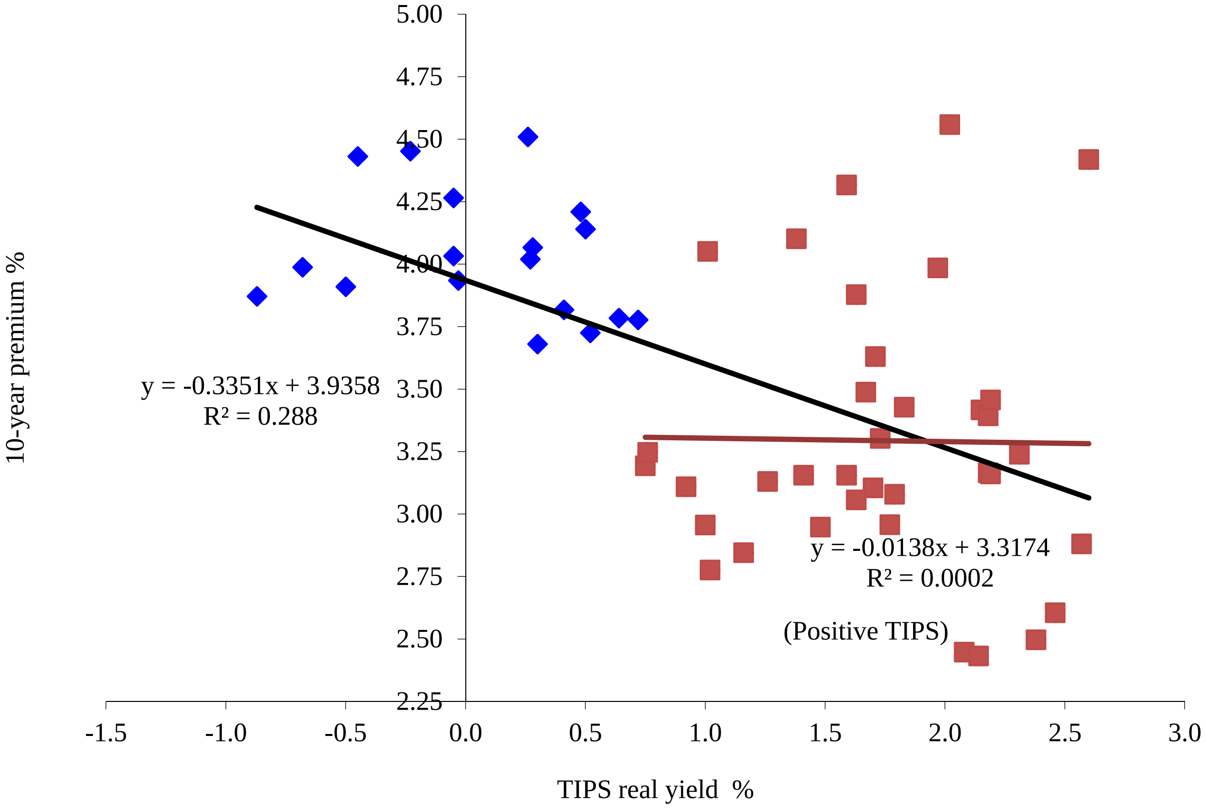


Looking at the data in Figure 3, it appears that the inference may be complicated by a non-linear relation. At very high levels of valuation, the expected return (the risk premium) was low.

We also examine the real yield on Treasury Inflation Indexed Notes. The risk premium is like an expected real return on the equity market. It seems reasonable that there could be a correlation between expected real rates of return stocks and bonds. Figure 4 examines the 10-year on the run yield on the Treasury Inflation Indexed Notes.

Figure 4

The equity risk premium and the real yield on Treasury Inflation Indexed Notes

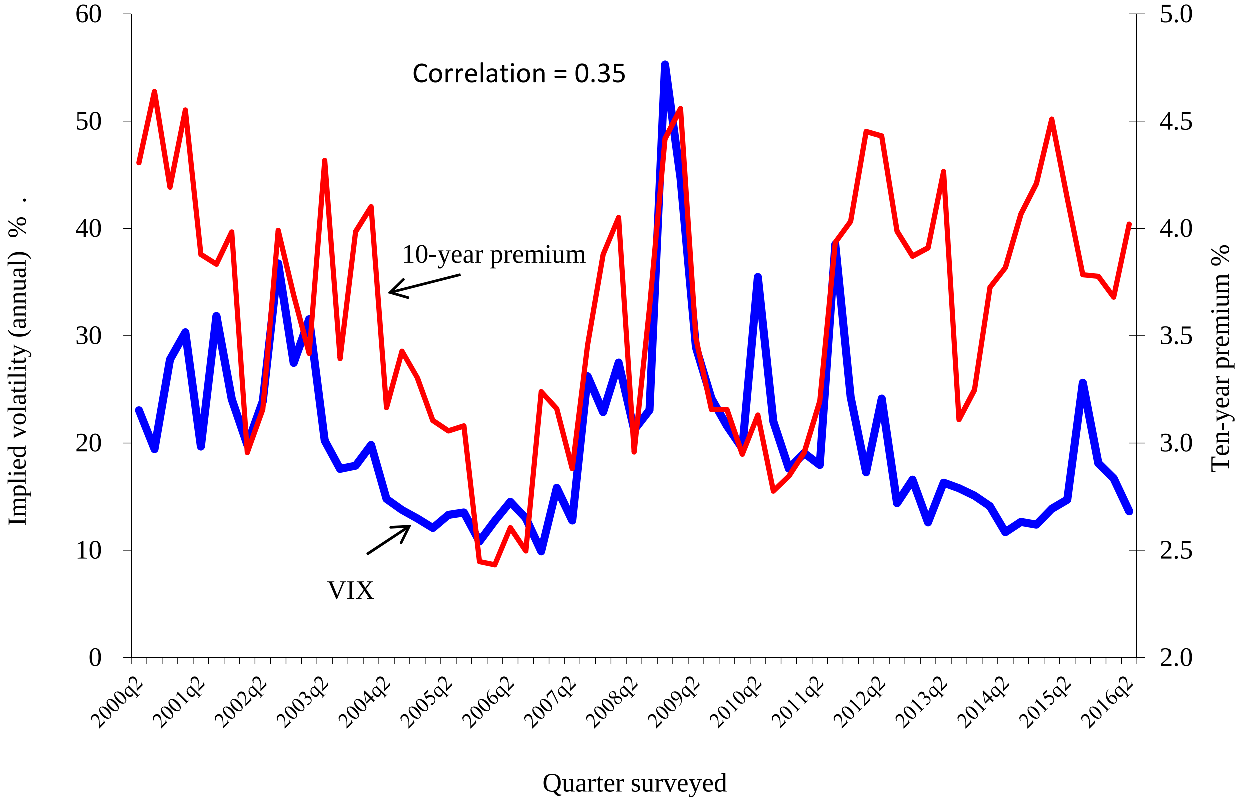


Overall, there is a negative correlation of -0.517. However, this correlation is driven by the negative TIPS yields. This is consistent with the idea that in periods of heightened uncertainty, investors engage in a flight to safety and accept low or negative TIPS yields – and at the same time demand a high risk premium for investing in the equity market.

Finally, we consider two alternative measures of risk and the risk premium. Figure 5 shows that over our sample there is evidence of a strong positive correlation between market volatility and the long-term risk premium. We use a five-day moving average of the implied volatility on the S&P index option (VIX) as our volatility proxy. The correlation between the risk premium and volatility is 0.35. If the closing day of the survey is used, the correlation is roughly the same. Asset pricing theory suggests that there is a positive relation between risk and expected return. While our volatility proxy doesn't match the horizon of the risk premium, the evidence, nevertheless, is suggestive of a positive relation. Figure 5 also highlights a strong recent divergence between the risk premium and the VIX.

Figure 5

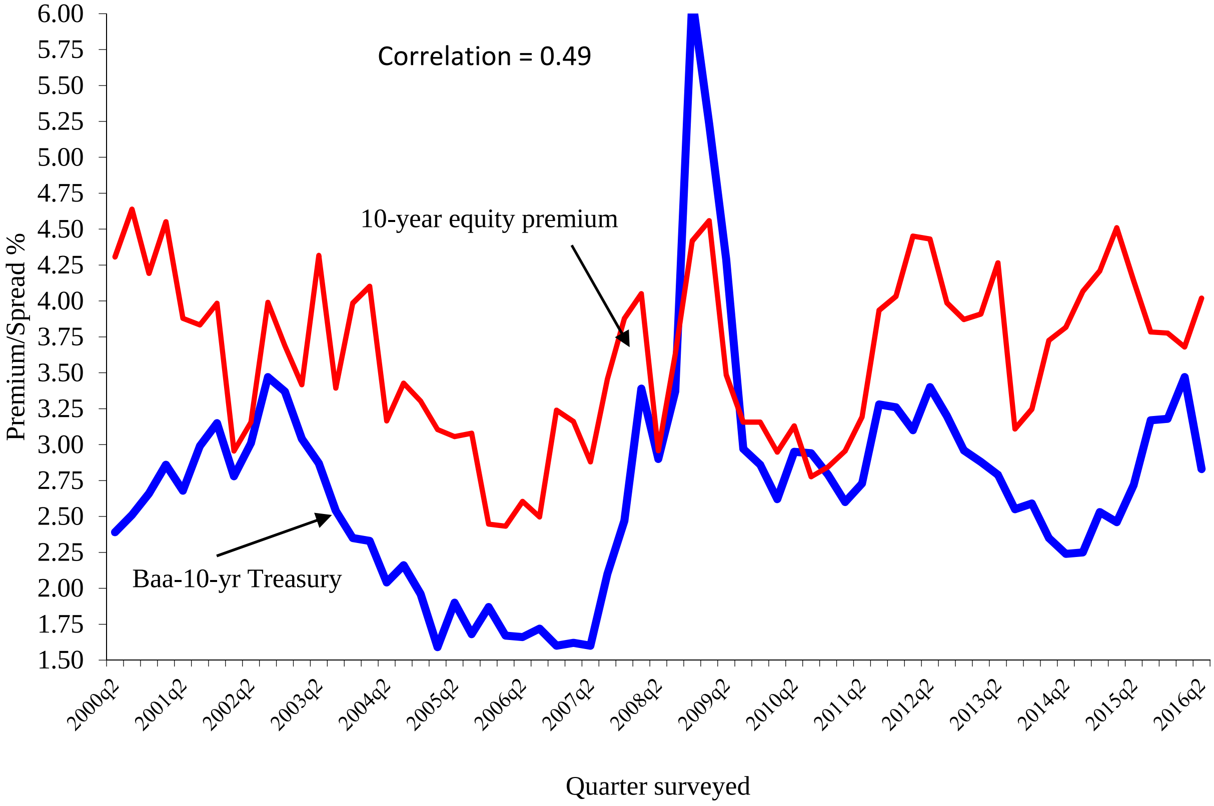
The equity risk premium and the implied volatility on the S&P 500 index option (VIX)



We also consider an alternative risk measure, the credit spread. We look at the correlation between Moody's Baa rated bond yields less the 10-year Treasury bond yield and the risk premium. Figure 6 shows a highly significant relation between the time-series with a correlation of 0.49. Similar to Figure 5, there is a strong recent divergence.

Figure 6

The equity risk premium and credit spreads



2.8 Other survey questions

The June 2016 survey contains a number of other questions. http://www.cfosurvey.org presents the full results of these questions. The site also presents results conditional on demographic firm characteristics. For example, one can examine the CFOs views of the risk premium conditional on the industry in which the CFO works.

2.9 Risk premium data and corporate policies

Research by Ben-David, Graham and Harvey (2013) uses the one-year risk premium forecasts as a measure of optimism and the 80% confidence intervals as a direct measure of overconfidence. By linking email addresses that respondents provide to archival corporate data, Ben-David et al. find that the tightness of the confidence intervals is correlated with corporate investment. Overconfident managers invest more.

Campello, Graham and Harvey (2010) use the survey during the financial crisis and the higher risk premiums to examine the implications of financial constraints on the real activities of the firm. They provide new evidence on the negative impact of financial constraints on firms' investment plans.

Campello, Giambona, Graham and Harvey (2011) use the survey during the financial crisis to study how firms managed liquidity during the financial crisis.

Graham, Harvey and Puri (2013) administer a psychometric test using the survey instrument and link CEO optimism and risk aversion to corporate financial policies.

Graham, Harvey and Puri (2015) use survey data to study how capital is allocated within the firm and the degree to which CEOs delegate decision making to CFOs.

Graham, Harvey and Rajgopal (2005) use survey data to study how managers manipulate earnings. Dichev, Graham, Harvey, and Rajgopal (2013) study earnings quality.

Graham, Harvey, Popadak and Rajgopal (2016) use a similar survey sample to study corporate culture.

2.10 CFO Survey compared to other surveys

Table 2 compares the predictive ability of the Duke-CFO survey with other popular surveys. The table reports the correlations between the current quarter Duke-CFO survey of either optimism about the economy or optimism about the firm's prospects with the subsequent quarter's realization for five surveys: UBS-Gallup, CEO Survey, Conference Board Consumer Confidence, University of Michigan Consumer Confidence and ISM Purchasing Manager's Index. Both of the Duke-CFO optimism measures significantly predict all five of these popular barometers of economic confidence. Related analysis shows that our CFO survey anticipates economic activity sooner (usually one quarter sooner) than do the other surveys.

Table 2

The ability of the Duke CFO survey to predict other surveys

	Predictive correlations	
Survey	Optimism about economy	Optimism about firm's prospects
UBS-Gallup	0.289	0.380
CEO Survey	0.814	0.824
Conference Board Consumer Confidence	0.513	0.767
University of Michigan Consumer Confidence	0.341	0.253
ISM Purchasing Managers Index	0.694	0.497

3. Conclusions

We provide a direct measure of ten-year market returns based on a multi-year survey of Chief Financial Officers. Importantly, we have a 'measure' of expectations. We do not claim it is the true market expectation. Nevertheless, the CFO measure has not been studied before.

While there is relatively little time-variation in the risk premium, premia are higher during recessions and higher during periods of uncertainty. We also link our analysis to the actual investment decisions of financial managers. We are able to impute the weighted average cost of capital given the CFO estimates of equity risk premia, current corporate bond yields and marginal tax rates. This imputed measure is significantly less than the WACCs that CFOs report using in project evaluation. One way to reconcile this is that CFOs use very long-term averages of equity premia and bond rates when calculating WACCs. We provide evidence on the actual hurdle rates used by companies. These hurdle rates are, on average, 400bp higher than the reported WACCs.

While we have over 23,000 survey responses in 16 years, much of our analysis uses summary statistics for each survey. As such, with only 65 unique quarters of predictions and a variable of interest that has a 10-year horizon, it is impossible to evaluate the accuracy of the market excess return forecasts. For example, the June 4, 2007 10-year annual forecast was 7.83% and the realized annual S&P 500 return through June 2, 2016 is 3.2%. Our analysis shows some weak correlation between past returns, real interest rates and the risk premium. In contrast, there is significant evidence on the relation between two common measures of economic risk and the risk premium. We find that both the implied volatility on the S&P index as well as a commonly used measure of credit spreads are correlated with our measured equity risk premium.

References

Asness, C. S., 2000, Stocks vs. bonds: Explaining the equity risk premium, *Financial Analysts Journal*, May/June.

Ben-David, I., J. R. Graham, and C. R. Harvey, 2013, Managerial miscalibration. *Quarterly Journal of Economics*, 128:4, 1547-1584. Available at SSRN: http://ssrn.com/abstract=1640552

Brav, A., J. R. Graham, C. R. Harvey, and R. Michaely, 2005, Payout policy in the 21st century, *Journal of Financial Economics* 77:3, 483-529. Available at SSRN: http://ssrn.com/abstract=571046

Campello, M., J. R. Graham and C. R. Harvey, 2010. The real effects of financial constraints: Evidence from a financial crisis, *Journal of Financial Economics* 97, 470-487. Available at SSRN: http://ssrn.com/abstract=1318355

Campello, M., E. Giambona, J. R. Graham and C. R. Harvey, 2011. Liquidity management and corporate investment during a financial crisis, *Review of Financial Studies* 24:6, 1944-1979. Available at SSRN: http://ssrn.com/abstract=144400

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, 1629-1666.

Davidson, L. B., and D. O. Cooper, 1976, A simple way of developing a probability distribution of present value, *Journal of Petroleum Technology*, September, 1069-1078.

Dichev, I., Graham, J. R., C. R. Harvey, and S. Rajgopal, 2013, Earnings quality: Evidence from the field, *Journal of Accounting and Economics* 56, 1-33. Available at SSRN: http://ssrn.com/abstract=2078535

Duff and Phelps, 2015. *2015 Valuation Handbook*. John Wiley and Sons, NJ,

Fama, E. F. and French, K. R., 2002, The equity premium, *Journal of Finance* 57, 637-659.

Fernandez, P., 2004 Market risk premium: Required, historical and expected, Unpublished working paper, University of Navarra. Available at SSRN: http://ssrn.com/abstract=601761

Fernandez, P., 2006 Market risk premium in 100 textbooks, Unpublished working paper, University of Navarra. Available at SSRN: http://ssrn.com/abstract=1148373

Fernandez, P., 2009 Market risk premium used in 2008 by professors: A survey with 1,400 answers, Unpublished working paper, University of Navarra. Available at SSRN: http://ssrn.com/abstract=1344209

Gebhardt, W. R., C. M. C. Lee, and B. Swaminathan, 2001, Toward an implied cost of capital, *Journal of Accounting Research* 39, 135-176.

Goyal, A. and I. Welch, 2003, Predicting the risk premium, *Management Science* 49, 639-654.

Graham, J. R. and C. R. Harvey, 2001, Theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60, 187-243. Available at SSRN: http://ssrn.com/abstract=220251

Graham, J. R. and C. R. Harvey, 2003, Expectations of equity risk premia, volatility and asymmetry from a corporate finance perspective, Working paper, Available at SSRN: http://ssrn.com/abstract=292623

Graham, J. R., and C. R. Harvey, 2009, The CFO Global Business Outlook: 1996-2009. http://www.cfosurvey.org.

Graham, J. R., C. R. Harvey and M. Puri, 2013, Managerial attitudes and corporate actions, *Journal of Financial Economics,* 109:1, 103-121. Available at SSRN: http://ssrn.com/abstract=1432641

Graham, J. R., C. R. Harvey and M. Puri, 2015, Capital allocation and delegation of decision-making authority within firms, *Journal of Financial Economics, 115:3,* 449-470. Available at SSRN: http://ssrn.com/abstract=1527098

Graham, J. R., C. R. Harvey, and S. Rajgopal, 2005, The economic implications of corporate financial reporting, *Journal of Accounting and Economics* 40, 3-70. Available at SSRN: http://ssrn.com/abstract=491627

Graham, J. R., C. R. Harvey, J. Popadak, and S. Rajgopal, 2016. Corporate culture: Evidence from the field, Unpublished working paper, Available on SSRN: http://ssrn.com/abstract=2805602

Harris, R. S. and F. C. Marston, 2001, The market risk premium: Expectational estimates using analysts' forecasts, *Journal of Applied Finance* 11, 6-16.

Harvey, C. R., 2001, The specification of conditional expectations, *Journal of Empirical Finance* 8, 573-638.

Jagannathan, R., E. R. McGrattan and A. Scherbina, 2001, The declining U.S. equity premium, *Quarterly Review*, Federal Reserve Bank of Mineapolis.

Jagannathan, R., D. A. Matsa, V. Tarhan and I. Meier. 2016. Why Do Firms Use High Discount Rates?. *Journal of Financial Economics*. 120(3): 445-463.

Keefer, D. L. and S. E. Bodily, 1983, Three-point approximations for continuous random variables, *Management Science* 29, 5 595-609.

Morningstar, 2013. *Ibbotson SBBI 2013 Valuation Yearbook*. Morningstar, Chicago, IL.

Pástor, L. And R. Stambaugh, 2001, The equity premium and structural breaks, *Journal of Finance* 56, 1207-1239.

Poterba, J. M. and Summers, L. H., 1995, A CEO survey of U.S. companies' time horizons and hurdle rates, *Sloan Management Review*, Fall, 43-53.

Sharpe, S. A. and G. A. Suarez, 2013, The insensitivity of investment to interest rates: Evidence from a survey of CFOs, Working paper, Federal Reserve Bank, Washington, DC.

Siegel, J. J., 1999, The shrinking equity premium, *Journal of Portfolio Management*, 10-17.

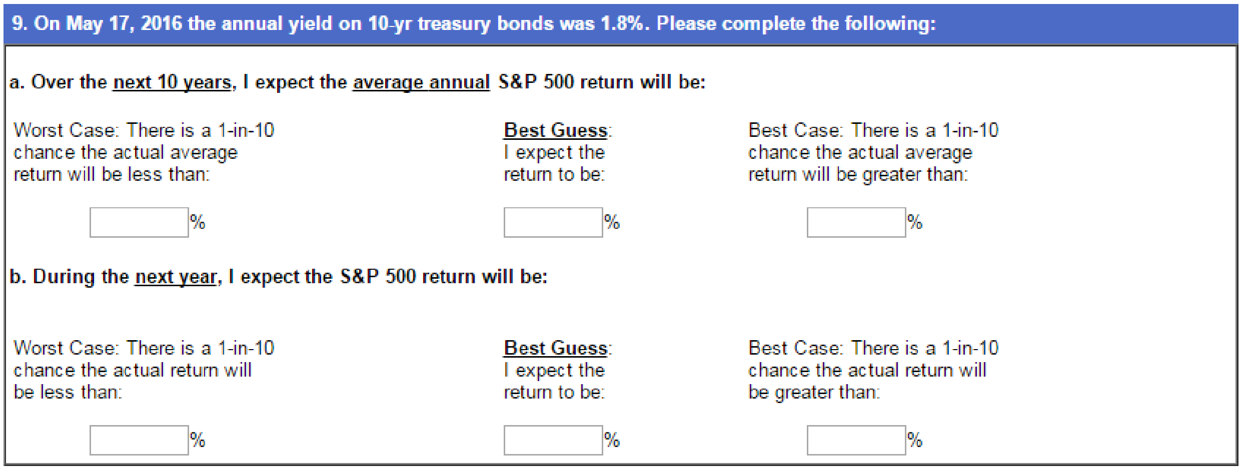
Welch, I., 2000, Views of financial economists on the equity premium and other issues, *Journal of Business* 73 (October): 501-37.

Welch, I., 2001, The equity premium consensus forecast revisited, Unpublished working paper, Cowles Foundation for Research in Economics, Yale University, New Haven, CT. Available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=285169.

Welch, I., 2009, Views of economists about the equity premium and policy, Unpublished working paper, Brown University. Available at http://welch.econ.brown.edu/academics/equpdate-results2009.html

Appendix A

Excerpt from the Survey Instrument



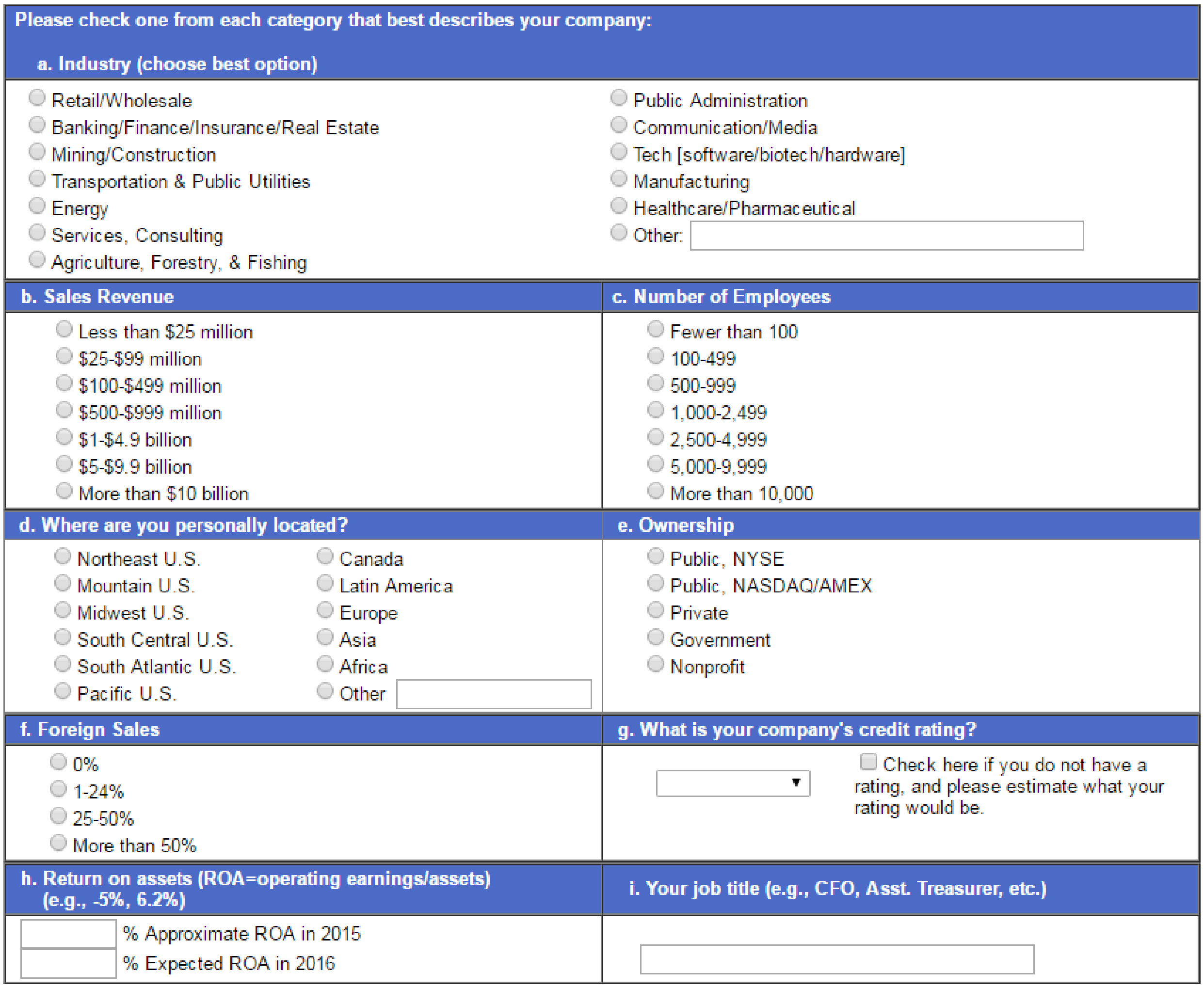
9. On May 17, 2016 the annual yield on 10-yr treasury bonds was 1.8%. Please complete the following:

a. Over the next 10 years, I expect the average annual S&P 500 return will be:

Worst Case: There is a 1-in-10 chance the actual average return will be less than:	**Best Guess**: I expect the return to be:	Best Case: There is a 1-in-10 chance the actual average return will be greater than:
%	%	%

b. During the next year, I expect the S&P 500 return will be:

Worst Case: There is a 1-in-10 chance the actual return will be less than:	**Best Guess**: I expect the return to be:	Best Case: There is a 1-in-10 chance the actual return will be greater than:
%	%	%



Please check one from each category that best describes your company:

a. Industry (choose best option)

- ○ Retail/Wholesale
- ○ Banking/Finance/Insurance/Real Estate
- ○ Mining/Construction
- ○ Transportation & Public Utilities
- ○ Energy
- ○ Services, Consulting
- ○ Agriculture, Forestry, & Fishing
- ○ Public Administration
- ○ Communication/Media
- ○ Tech [software/biotech/hardware]
- ○ Manufacturing
- ○ Healthcare/Pharmaceutical
- ○ Other:

b. Sales Revenue

- ○ Less than $25 million
- ○ $25-$99 million
- ○ $100-$499 million
- ○ $500-$999 million
- ○ $1-$4.9 billion
- ○ $5-$9.9 billion
- ○ More than $10 billion

c. Number of Employees

- ○ Fewer than 100
- ○ 100-499
- ○ 500-999
- ○ 1,000-2,499
- ○ 2,500-4,999
- ○ 5,000-9,999
- ○ More than 10,000

d. Where are you personally located?

- ○ Northeast U.S.
- ○ Mountain U.S.
- ○ Midwest U.S.
- ○ South Central U.S.
- ○ South Atlantic U.S.
- ○ Pacific U.S.
- ○ Canada
- ○ Latin America
- ○ Europe
- ○ Asia
- ○ Africa
- ○ Other

e. Ownership

- ○ Public, NYSE
- ○ Public, NASDAQ/AMEX
- ○ Private
- ○ Government
- ○ Nonprofit

f. Foreign Sales

- ○ 0%
- ○ 1-24%
- ○ 25-50%
- ○ More than 50%

g. What is your company's credit rating?

☐ Check here if you do not have a rating, and please estimate what your rating would be.

h. Return on assets (ROA=operating earnings/assets) (e.g., -5%, 6.2%)

% Approximate ROA in 2015

% Expected ROA in 2016

i. Your job title (e.g., CFO, Asst. Treasurer, etc.)

A new perspective on analyst sophistication:
Errors and dubious judgments in analysts' DCF valuation models

Jeremiah Green	John R. M. Hand[*]	X. Frank Zhang
Penn State University	UNC Chapel Hill	Yale University
jrg28@psu.edu	hand@unc.edu	frank.zhang@yale.edu

Abstract

We argue that sell-side equity analysts make a startling number of mistakes and questionable judgments in their DCF equity valuation models. For a sample of 120 analyst reports issued 2012-2013, we estimate that the median analyst makes five DCF theoretic or implementation errors and five dubious DCF modeling judgments. We assess the economic significance of analysts' DCF mistakes by recalculating their target prices after correcting for major errors. Doing so increases analysts' estimated target prices by a median (mean) of 37% (29%). We conclude that with regard to valuing firms' equity, sell-side analysts are less sophisticated, and more optimistic, than prior research has supposed.

This version: June 24, 2014

Keywords: Analyst sophistication; DCF; valuation; errors

JEL codes: G12, G17, G32

---

[*] Corresponding author; tel. 919.962.3173, fax 919.962.4727. We appreciate the helpful comments of Gavin Cassar, Peter Joos, Kalin Kolev, Ed Maydew, Michael Mauboussin, Nathan Sharp, Lakshmanan Shivakumar, Jake Thomas, Irem Tuna, Florin Vasvari, and workshop participants at London Business School, UNC Chapel Hill and the 2014 Yale Accounting Conference. However, all of the errors and dubious judgments present in the paper are our own.

1. Introduction

Sell-side equity analysts are usually viewed by academics and investors as being sophisticated economic agents—intelligent, knowledgeable, competitive, and well incentivized to analyze and predict the levels and risks of the cash flows of the firms they follow in a sophisticated manner. As such, the view that the financial expertise of sell-side equity analysts will be apparent in their written reports to investors would seem to be obvious.

In this study, we argue that at least with respect to constructing and executing a DCF equity valuation model, such a view is markedly wrong. We base this claim on the analyses we conduct on a stratified random sample of 120 sell-side analyst reports containing DCF valuations of various kinds, each of which was issued in 2012 or 2013 by a U.S. brokerage house. After setting out a template of the data and formulae that we define to be the correct approach to constructing and executing a DCF equity valuation model, we grade analysts' DCFs. In our grading, we identify conceptual and implementation errors as well as dubious judgments.

After tallying the grades, we estimate that sell-side analysts make a median of five DCF theoretic and/or implementation errors, and five dubious DCF modeling judgments. Examples of errors include using materially too large or too small of a risk free rate; assuming an impossibly high growth rate in free cash flows beyond the terminal year; failing to apply a mid-year adjustment factor to yearly free cash flows; and not scaling up the estimated equity value from the valuation date to the target price date. Examples of dubious judgments are setting the terminal year far too close to the report date; providing no justification for or detail behind the WACC that is used; and when such detail is provided, assuming an equity weight that is more than 20% away from the weight implied by the equity value obtained from the DCF itself.

Not every aspect of analysts' DCF modeling is rife with errors or dubious judgments. For example, we find evidence that sell-side analysts understand that as they forecast out in time toward the terminal year, the rates of growth in the firm's revenues, EBIT, depreciation, working capital, CAPEX and free cash flows should in expectation decline, and that the firm's effective tax rate should in expectation tend toward the combined stated federal and state tax rate. However, even in these directionally correct results, we observe that most analysts are optimistic (sometimes absurdly so) in that the median rates of growth they forecast to occur in the terminal year are frequently implausibly large. We find that one consequence of this optimism is that analysts' forecasted ROEs increase, not decrease, toward the terminal year, rising to an economically questionable mean of almost 20% in the terminal year itself.

We also report evidence that is partially consistent with the hypothesis that more sophisticated analysts or analyst teams make fewer DCF errors or dubious judgments. When we regress DCF error rates and dubious judgment rates on proxies for analyst sophistication, we observe that some of our proxies (those based on the quantity of information analysts provide as to how they arrive at their WACC, their forecasted free cash flows and equity value, and their forecasts of future financial statements) load significantly in the predicted negative direction.

One criticism of our study could be that we are merely identifying many small errors that in aggregate impart little or no bias into the key output of analysts' DCF valuation models, namely their target prices. We seek to address this concern by calibrating the economic significance of analysts' DCF modeling mistakes after recalculating target prices corrected for five major errors. For the smallish subset of firms where this is feasible, we find that three of the five errors have material mean effects on target prices and the annualized expected return AER embedded in them when corrected: too high risk free rates (14% increase in AER), end of year rather than mid-year discounting (5% increase in AER), and not scaling up equity value from the valuation date to the target price date (12% increase in AER). Overall, we estimate that correcting analysts' major errors in aggregate increases analysts' AERs by a median (mean) of 37% (29%), which we posit is an economically significant amount. We conclude that with regard to valuing firms' equity, not only are sell-side equity analysts markedly less sophisticated than prior research has supposed, but they are also more optimistic since the correct translation of the free cash flow and WACC information they forecast and use in their DCF models yields estimates of the firms' future stock prices that are far higher than those in their stated target prices, which in their uncorrected forms per se have been found to be quite optimistic.

Our study contributes to several literatures. First, by grading how well they convert their financial forecasts and other data into projected future equity values, we add to the research that has studied how equity analysts transform information into target prices (Bandyopadhyay, Brown and Richardson, 1995; Block, 1999; Bradshaw 2002, 2004; Demirakos, Strong and Walker, 2004). In this way, our paper also seeks to respond to the long-standing calls made by Schipper (1991), Brown (1993), Ramnath, Rock and Shane (2008), Bradshaw (2011) and Groysberg and Healy (2013) that researchers look inside the 'black box' of sell-side analysts and illuminate their decision processes. Although we do not conduct the most direct approach to understanding how sophisticated analysts are in constructing and executing their DCF model (for example, we do not employ real-time process tracing on analysts while they are constructing their DCF models, or examine analysts' actual working model files (Markou and Taylor, 2014)), what we do by studying directly and in detail the content of analysts' written DCF models yields new insights as compared to the classic large-scale database approach of indirectly examining the correlations between inputs, outputs and conditioning variables. As such, in our quantitative analysis of analysts' actual DCF models, our study complements work by Asquith, Mikhail and Au (2005) that catalogs the contents of analyst reports, and by Brown, Call, Clement and Sharp (2013) who employ survey data to examine the inputs that sell-side analysts use in their decisions and the incentives that motivate those decisions.

We also add to the research literature on optimism in analysts' forecasts by showing that with regard to target prices, analysts are far more optimistic than previously thought. Prior work has found that analysts' 12-month ahead target prices are upward biased by an average of 15% for U.S. firms and 18% for non-U.S. firms (Bradshaw, Brown and Huang, 2013; Bradshaw, Huang and Tan, 2013). We estimate that the expected returns in the target prices that analysts *should* report based on the free cash flows they forecast and the discount rates they use are far more optimistic, being at least twice those of the target prices they actually do report. Also, relative to most research that studies analyst optimism, such as biases in analysts' short-term earnings forecasts, we argue that not only are we better able to measure the economic magnitude of the particular aspect of optimism we study, but we think there are fewer competing explanations for the optimism we document, such as the conflict-of-interest argument (Francis and Philbrick, 1993; Lin and McNichols, 1998; Ertimur, Muslu and Zhang, 2011) since it is hard to argue that analysts deliberately make as many errors or dubious judgments as they do.

Third, we add to the literature on analyst sophistication. Historically, such research has focused on analysts' earnings forecasts, and has concluded that analysts exhibit financial sophistication in the sense that their short-term earnings forecasts tend to be more accurate than those of time-series models. However, recent work has both challenged this widely held belief (Bradshaw, Drake, Myers and Myers, 2012), and broadened beyond it by starting to indirectly investigate the degree of sophistication reflected in analysts' cash flow and accrual forecasts (Givoly, Hayn and Lehavy, 2013a, 2013b; Call, Chen and Tong, 2013a, 2013b) and target prices (Dechow and You, 2013), using large-scale archival analysis. Our study contributes to these new directions by directly showing that while analysts display certain aspects of what would be expected in competently forecasting long-term financial statement data, they are surprisingly unsophisticated with regard to the basic skill of constructing and executing a DCF equity valuation model. Moreover, we argue that the benchmarks we use for determining if analysts are or are not sophisticated are relatively objective—few would disagree with the economic assumptions underlying DCF, and we seek to be generous in how far we allow analysts to depart from correctly following the contents and mechanics of DCF valuation before we grade them as having made an error or a dubious judgment.

Fourth, we add a new dimension to the literature on implementing equity valuation models. Some prior work in this area has at times heatedly debated how and why large-sample implementations of the free cash flow, residual income and dividend discount models yield at times vastly different results, even though the models are theoretically all isomorphic to the underlying principle of the present value of expected future dividends and should therefore yield the same output equity value given the same inputs (Penman and Sougiannis, 1998; Francis, Olsson and Oswald, 2000; Lundholm and O'Keefe, 2001a, 2001b; Penman, 2001). Other work has emphasized the importance of high quality forecasts of future cash flows to obtaining a high quality estimate of equity value (Palepu, Bernard and Healy, 1996; Brealey and Myers, 2013; Lundholm and Sloan, 2013). Our contribution is to highlight the importance of users implementing their DCF model correctly, regardless of what is input into the model. Our results suggest that even if the fundamental financial statement data that sell-side analysts input into their DCF valuation model is of very high quality, the output target price can be enormously wrong if analysts make simple implementation errors of the kind we document, such as not discounting annual free cash flows mid-year, or not scaling up their initial valuation from the valuation date to the target price date.[1]

Lastly, we contribute to the literature on asset pricing in finance. Although asset pricing is key to many aspects of finance, and DCF valuation key to many aspects of asset pricing, few scholars have explored whether analysts make mistakes in how they arrive at their estimates of equity value, and if so, which kinds of errors. Moreover, the evidence that has been reported by is for the most part anecdotal.[2] Our paper is the first to adopt a conventional academic approach

---

[1] Brealey and Myers (2013) state that "[I]t's easy for a discounted cash flow business valuation to be mechanically perfect and practically wrong." Based on our empirical results, it seems to be easy for analysts to be both mechanically wrong and practically wrong.

[2] For example, Tham and Velez-Pareja (2004) list nine errors they propose users might make in DCF models, but provide no evidence on how empirically common or important the mistakes are. Mauboussin (2006, pp. 2, 5) details a "list of the most frequent [8] errors we see in DCF models" identified from "various sellside reports" but does not report sample statistics, nor economic significance of the errors. Petersen and Plenborg (2009) study three general and non-public valuation spreadsheets they obtained from Danish brokers. Fernandez (2013) classifies 119 (often overlapping) types of errors in the company valuations performed by financial analysts, investment banks and financial consultants obtained in his capacity as a consultant in company acquisitions, sales, mergers, and arbitrage processes. Lundholm and Sloan (2013, p.239) note with regard to the DCF-to-all-investors model that "Unfortunately, because the computation of the free cash flow to all investors is rather involved and because "all investors" models require a weighted-average cost of capital that is consistent with the other costs of capital, it is the

to evaluating the sophistication with which analysts construct and execute DCF equity valuation models in that we use a stratified, random, recent and reasonably-sized sample, together with a clearly defined set of grading criteria. At the same time, however, we readily acknowledge that in constructing and executing our study, we like the analysts we grade have had to make judgments. Although we seek to clearly define what we grade to be an analyst error versus a dubious judgment, we readily grant that readers may disagree with our grading criteria, and in this sense our results undoubtedly contain a level of subjectivity and even error.

The remainder of our paper proceeds as follows. In section 2 we present our sample selection criteria and provide descriptive statistics on the brokers, analysts and in sampled reports. In section 3 we make clear how we grade analysts' DCF valuation models, and report what we estimate to be present in terms of graded errors and dubious judgments. In section 4 we estimate the effects of correcting five major errors on the annualized expected returns embedded in analysts' target prices. In section 5 we develop and test the hypothesis that more sophisticated analysts make fewer errors and dubious judgments, using proxies we create for analyst sophistication based on the forecasted financial statements that often accompany analysts' DCFs. In section 6 we expand our investigation of analysts' financial sophistication into how well their financial statement forecasts conform to the economic forces that affect firms in the long run. We conclude in section 7 by presenting and discussing the questions that we argue that our findings raise for future research, and conclude our study.

2. Sell-side equity analyst reports that contain DCF equity valuation models

2.1 Sample selection

Table 1 shows the criteria we employed to obtain our sample of 120 DCF-based sell-side equity analyst reports. Since the contents of analysts' reports are not available in machine readable form that we are aware of, we searched Investext to identify analyst reports in 2012-13 that contained the keywords "DCF" or "discounted cash flow" in their Table of Contents (panel A). We then retained only those reports that were for companies, for the U.S., and provided by brokers. From the resulting set of 9,436 analyst reports in 2012-13, we selected five at random from each of the 24 months ending Dec. 2013. After inspecting each report, we determined that a few did not contain sufficient DCF information, or the right kind of DCF information, to be

---

rare user who can successfully compute the DCF-to-all-investors model without error. By automating the required computations, *eVal* makes sure you don't mess up along the way."

useful. Panel B lists the reasons that led us to make exclusions. After randomly choosing replacements for excluded reports, we converged to 120 DCF-based sell-side equity analyst reports spread evenly by month Jan. 2012 - Dec. 2013.

In panel C of Table 1 we report the frequency with which each of seven types of DCF models was present in the 120 sampled reports. Of DCF models, 109 are built around estimating the cash flows to all investors, with just three directly focused on cash flows to equity investors. In nine reports we judged there to be too little information to readily classify the DCF model. Within the DCF-to-all-investors category of models, over half employ the 'workhorse' NOPAT approach that is commonly taught in MBA finance classes. In the NOPAT approach, forecasted free cash flows are arrived at by first forecasting net operating profit after adjusted taxes, then adding both forecasted depreciation and the forecasted change in working capital, and subtracting forecasted capital expenditures.

2.2 Descriptive statistics on brokers, analysts and firms

In Table 2 we provide descriptive statistics for the brokers, analysts and firms covered in the sample of 120 DCF-based equity analyst reports. Panel A shows that the reports come from a wide range of brokers, 37 in all, with the largest numbers coming from prominent and well known brokers. Panel B indicates that the reports are authored or coauthored by 180 different analysts, of whom 60 hold the CFA professional qualification and 8 have a PhD. Of reports, 90% are updates rather than initiations, and the average number of pages in a report is 14.5. Lastly, panel C shows that the firms in the reports are widely spread across 26 of the 48 Fama-French industries, range greatly in market cap (between $5 million and $238 billion), and at the report date have been publicly traded between zero and 88 years.

3. Grading analysts' DCF valuation models

3.1 Prototypical timeline involved in a DCF equity valuation model

In Figure 1 we display the prototypical timeline involved in constructing and executing a DCF valuation model for a 12/31 fiscal year-end firm. The timeline centers on the analyst's report date, which without loss of generality we take to be 9/24/12. Other key dates in the timeline are 9/24/13 (the date the assumed 12-month target price applies to), 12/31/12 (the fiscal year-end of the first year of the forecast horizon that the analyst projects free cash flows for), and

12/31/11 (the most recent fiscal year-end for which actual annual free cash flows are known, and the valuation date of the DCF model).

3.2 Our definition of a condensed correctly structured and executed DCF-to-all-investors equity valuation model

In Figure 2 we lay out what we define for the purposes of this study to be a correctly structured and executed DCF-to-all-investors equity valuation model. We refer to Figure 2 as our condensed DCF model. We emphasize that what we lay out in the condensed DCF model is not 100% correct in that it deliberately differs in several ways from what we do take to be 100% correct, namely the DCF-to-all-investors equity valuation model detailed by Lundholm and Sloan in their textbook *Equity Valuation and Analysis with eVal* (2013, 3rd ed.). We detail out the differences in the Notes to Figure 2.

We adopt a less than fully correct DCF valuation model against which to grade analysts for two main reasons. First, most of the differences (detailed in the Notes to Figure 2) are in expectation likely to occur infrequently and be economically small. Second, it is rare for analysts to include the items represented by these differences in their models, and we wish to avoid biasing our study in favor of concluding that analysts construct and execute DCF valuation models in an unsophisticated manner. Thus, if analysts are aware of the differences but rationally choose to exclude them because they are infrequent and immaterial, then we risk downwardly bias our assessment of analyst sophistication if we were to include the differences in our grading template. Conversely, if analysts are not aware that the differences exist but we grade analysts under the presumption that they should be aware, then we risk concluding that analysts are unsophisticated based on a large number of economically small aspects of DCF modeling and execution, rather than on economically or theoretically important errors.

3.3 Descriptive statistics on key components of analysts' DCF valuation models

Before grading analysts' DCF models, we entered the information underlying the DCF models into Excel templates similarly laid out to those shown in Figure 2.[3] Figure 2 adopts the DCF-to-all-investors approach of valuing equity that is commonly taught in undergraduate and MBA classes and in-house broker training courses. Although not all analysts follow the DCF-to-

---

[3] In a few cases, an analyst report contains more than one DCF model, typically because the analyst presents multiple DCF-based valuation scenarios for the same firm. If this occurs, we input and use the scenario associated with the target price most emphasized by the analyst.

all-investors approach, where a different approach is used we conform the information provided by the analyst into the template laid out in Figure 2. We record one DCF per analyst report, and place each firm's completed template on a separate tab within our Excel data file. Table 3 then gives descriptive statistics on the key components of the DCF models.

In panel A of Table 3 we describe analysts' stated target prices, target price horizons, and the annualized expected returns embedded in them. In panel B we report when the terminal year occurs and the assumed post-terminal year perpetual growth in annual free cash flows. In panel C we present analysts' assumptions regarding WACC and its components. We focus on these aspects of the full set of DCF information analysts may provide, rather than on free cash flows, terminal values, the components of free cash flows, enterprise value or equity value because these are all denominated in unscaled dollars, not percent.

The first numerical column in each panel is NOBS, the number of valid observations per variable. It can be seen from the dispersion in NOBS that analysts vary greatly in the quantity and type of relevant DCF model information that they report. For example, while all 120 DCF-based analyst reports contain a target price (panel A), just 15 explicitly disclose the horizon underlying the risk free rate assumed within WACC (panel C). We return to analyzing the quantity of analysts' disclosures about and surrounding their DCF models in section 5.

Panel A shows that for the 111 analyst reports that provide both a stated analyst target price and a target price horizon, the mean (median) annualized expected return embedded in stated target prices is 18% (13%). Of individual expected returns, 77% are positive. The mean return of 18% compares to the 24% reported by Bradshaw, Brown and Huang (2013) for U.S. firms during the period 2000-2009, the 16% reported by Joos and Piotroski (2013) for Morgan Stanley reports issued 2007-2012.

Panel B reveals that both WACC and its components vary widely in magnitude across analysts' DCF models. The maximum WACC of 21% is five times that of the minimum WACC of 4.5%; RF varies between 0.2% and 5.0%; betas range between 0.55 and 2.50; the annual market risk premium varies between 4% and 11%; and the weight on equity in calculating WACC ranges from 14% to 100%.

Panel C presents similarly diverse numbers to those in panels A and B. The post-terminal year perpetual annual rates analysts explicitly assume that free cash flows (and implicitly assume all key balance sheet and income statement numbers) will grow by vary between -100% and

15%.[4] Likewise, the number of years in analysts' forecasts of future free cash flows including the terminal year range between a low of 1 year and a high of 16 years, with the median analyst DCF model setting the terminal year 8 years out from the forecast date.

3.4 Identifying errors and dubious judgments in analysts' DCF valuation models

The extremes reported in Table 3 in the components of analysts' DCF valuations point to the possibility that some of them are errors, and/or some are economically dubious judgments. However, without specificity as to what is theoretically correct and what is economically sensible, we cannot appropriately identify which analyst assumptions are errors or dubious judgments, and which are merely aggressive or conservative positions taken by the analyst.

Table 4 lists the errors that we grade analysts on, both with respect to the numerator-oriented level, growth and timing of free cash flows aspects of analysts' DCF models (panel A), and with respect to the denominator-related discount rate aspects of valuation (panel B). The errors identified in Table 4 are following in Table 5 by the list of potential dubious judgments that we grade analysts on, spanning both numerator and denominator aspects of DCF. We identify errors and dubious judgments using only those observations for which there is sufficient data available to make a determination of whether there is error or dubious judgment.

In Tables 4 and 5 we grade analysts' DCF models based on what we define for purposes of this study to be the economically sensible cutoff values (or range of cutoff values) for certain of the condensed DCF model elements shown in Figure 2, and for certain of the theoretically oriented inter-relationships between them. In openly defining what we grade to be an analyst error versus a dubious judgment, we fully concede that at times we are overlaying our judgment into what is versus what is not an error, and what is versus what is not a dubious judgment. This is important to emphasize because we recognize that some readers may disagree with a variety of our grading criteria. In this sense, our results undoubtedly contain a level of subjectivity.

For example, we grade the analyst as having made an error in their risk free rate RF assumption if their RF is more than +/- 30 bps away from the 10-year Treasury rate on the analyst report date (error code 2.1, panel B of Table 4). An example of a cutoff value that leads us to conclude that the analyst has made a dubious judgment is an annual market risk premium in excess of 9% (dubious judgment code 3.2, Table 5). An example of an error based on a theoretic

---

[4] A post-terminal year perpetual growth rate of -100% is how we code free cash flows that are assumed by the analyst to cease after the terminal year. An example of this can be found in the report on Gilead Sciences done by Deutsche Bank on 11/13/2012.

inter-relationship between elements of the condensed DCF model is that we define an erroneous analyst terminal value as one that is more than +/-3% away from the terminal value that we calculate from the analyst's terminal year free cash flow forecast, given the analyst's WACC and forecasted perpetual growth rate (error code 1.3.2, panel A of Table 4).

Although different types of analyst errors may be positively correlated, our goal is to identify errors that are as much as possible independent of one another.[5] We provide our justifications for the critical values and theoretically oriented interrelationships between DCF elements that are central to Tables 4 and 5 in Appendix 1. In Appendix 2 we illustrate specifics of our error and dubious judgment grades (along with disclosure scores that we develop and discuss in section 5.2) for three different sample analyst reports.[6]

3.5 Errors in analysts' DCF valuation models

3.5.1 Errors having to do with the numerator-oriented level, growth and timing of free cash flows aspects of analysts' DCF models

In panel A of Table 4, we catalog the 15 errors that we grade analysts on with regard to the upper half of Figure 2, namely the numerator-oriented level, growth and timing of free cash flows aspects of their DCF models. The errors range from incorrectly deriving free cash flows from underlying financial statement forecasts, to adding total rather than just non-operating cash to enterprise value, to using too high or too low an effective tax rate in the terminal year. Rather than describing the results of grading analysts on every error, we sample three we consider noteworthy.

First, the most common error analysts make is projecting implausibly large rates of revenue growth in the terminal year (error code 1.8.1). Based on their DCF model annotations, we estimate that analysts make this error 50% of the time. We define the error rate of a graded item as the number of graded errors divided by NOBS, the number of observations for which we can cleanly tell whether an error has or has not taken place. Since NOBS is rarely equal to 120, the number of analyst reports in our sample, when we state that "we estimate that analysts make a given error Z% of the time", we intend this to pertain to the population of all analyst reports that satisfy our sample selection criteria laid out in Table 1. This means that we also assume that

---

[5] For example, it is not necessarily the case that an analyst whose forecasted revenue growth rate in the terminal year T is excessively high must also have an excessively high forecasted CAPEX growth rate in year T.

[6] Between them, the DCF portions of the three sample reports span 12 of the 15 numerator-related errors listed in Table 4 panel A; 11 of the 13 denominator-related errors listed in Table 4 panel B; and 13 of the 20 dubious judgments listed in Table 5.

the decision by an analyst to report or not report the information we need to determine if an error has been made is uncorrelated with the probability that the analyst has made an error.

Second, the least common error analysts make is converting dollar equity value into per share equity value (error code 1.6.2), which we estimate occurs 4% of the time. Lastly for panel A, the error that ex-ante we propose is most likely to be economically material is overestimating the perpetual growth rate in free cash flows beyond the terminal year (error code 1.3). Based on our maximum allowable terminal growth rate cutoff of 5% per year, we estimate that just 7% of analysts err in what they assume for this important variable.[7] Overall, we note that both the median (mean) error rates across all 15 potential errors listed in panel A are 23% (25%).

3.5.2 Errors having to do with the denominator-related discount rate aspects of valuation

In panel B of Table 4, we catalog the 13 potential errors we propose analysts may make with regard to the lower half of Figure 2, namely those involving the denominator-related discount rate aspects of valuation. The errors range from assuming that the before-tax cost of debt is zero, to using an equity weight in calculating WACC that is inconsistent with the equity value obtained from the analyst's actual DCF valuation, to several types of incorrect discounting of future free cash flows (including not discounting them at all). Rather than discuss the results pertaining to each and every error, we highlight a subset.

The most common error analysts make in discounting is not scaling up their estimated equity value from the valuation date to the target price date (error code 2.8). We estimate that analysts make this error 93% of the time. In contrast, the least common mistake analysts make is assigning no weight to preferred stock in calculating WACC even though the firm has preferred stock outstanding (error code 2.4.2). We estimate this occurs just 3% of the time.[8] We also note three errors that ex-ante we posit will likely be economically material: [1] the already mentioned

---

[7] We view 5% as conservative in grading errors for the projected rate of growth in post-terminal year free cash flows because 5% is 2% larger than the value assumed by Lundholm and Sloan in *Equity Valuation and Analysis with eVal* (2013, 3rd ed., p.174), the source of our assumed 100% correctly structured and executed DCF-to-all-investors equity valuation model. Lundholm and Sloan state that they use 3% as the default terminal value for sales growth (and therefore free cash flows also). Their reasoning is that "Historically, the annual growth rate in the U.S. economy, as measured by the nominal GDP growth rate, has averaged around 6%, composed of roughly 4% real growth and 2% price inflation. However, the financial crisis of 2007-2008 sent both real growth and inflation plummeting into negative territory, albeit briefly. The long-term forecasts from the Congressional Budget Office and the Federal Reserve at the end of 2010 put real growth at 2-3% and inflation at 1-2%. So, in most cases a terminal sales growth rate forecast should fall between 3% and 5% … We use 3% as the default terminal value for Sales Growth in *eVal*." Also, our sample of analyst reports is from 2012-13, very close in time to 2010. If we use Lundholm and Sloan's cutoff of 3%, then we estimate a much larger analyst error rate of 32%.

[8] This error is rare in large part because firms rarely have preferred stock. If analysts do not mention preferred stock in their DCF models, we assume that this is because they are aware the firm has no preferred stock.

error of not scaling up estimated equity value from the valuation date to the target price date (error code 2.8, error rate = 93%); [2] using an RF is more than +/- 30 bps away from the 10-year Treasury Bill yield on the date of the analyst's report (error code 2.1, error rate = 84%); and [3] discounting annual free cash flows as if they occur at year end rather than mid-year (error code 2.7, error rate = 83%). Lastly, we note that the median and mean error rates across all 13 of the error codes listed in panel B are 32% and 20%, respectively.

3.6 Dubious judgments in analysts' DCF valuation models

In Table 5 we lay out the 20 dubious judgments that we propose analysts may make in executing their DCF models. They range from assuming an implausibly large beta, to not providing the reader of the report with any valuation parameter sensitivity analyses, to providing little or no information about the components of WACC or providing very little in the way of forecasted future financial statement data for the reader of the report. As with Table 4, rather than discuss each and every dubious judgment, we highlight a few examples.

The most common type of dubious judgment occurs in the area of analysts treating all of a firm's cash as a financial asset, rather than their estimating some portion of the cash to be operating in nature (dubious judgment code 3.10.1). We estimate that this dubious judgment happens 95% of the time.[9] Another common type of dubious judgment occurs in the area of the net financial asset/liability adjustments analysts make to enterprise value in order to arrive at equity value (dubious judgment code 3.10.2), which we estimate happens 54% of the time.[10] In contrast, the least common area for a dubious judgment to occur is analysts setting their actual or implied target price date prior to their report date, which we estimate happens only 2% of the time (dubious judgment code 3.11.3). We also note three types of dubious judgment that we posit have the potential to be economically significant. First, we estimate that 18% of the time analysts employ an excessively large market risk premium, which we define as one greater than 9% (dubious judgment code 3.2). Second, 42% of the time the valuation date lies beyond the analyst report date (dubious judgment code 3.11.1). Third, in 26% of analysts' DCF models, the

---

[9] We note that one reason for the high rate of our grading dubious judgments in the area of cash is that at least one large brokerage in our dataset instructs its analysts to treat all cash as a financial asset and not to attempt to extract an estimate of operating cash. As such, our estimated dubious judgment rate of 95% with regard to analysts treatment of cash may overstate the degree to which they would make a dubious judgment if left to themselves.

[10] Examples of adjustments to enterprise value that we define as dubious judgments include adding more cash of financial assets (or subtracting materially more or less debt or financial liabilities) than shown on the firm's balance sheet at the effective valuation date; adding rather than subtracting debt; not adjusting for minority interest or preferred stock when shown on the firm's balance sheet at the effective valuation date; adding assets or subtracting liabilities that we judge to be operating rather than financial in nature; and subtracting a 'public market discount'.

ROE embedded in forecasts of terminal year financial statements (that typically but not always accompany analysts' DCF models) is less than 5% or greater than 25%, both of which we assume to be economically implausible (dubious judgment code 3.7). Overall, we note that dubious judgments are not uncommon, as the mean and median rates at which they occur per Table 5 are 23% and 16%, respectively.

3.7 Errors and dubious judgments aggregated within and across analysts

Having described the types of errors and dubious judgments we grade individual analysts on in their DCF equity valuation models, and the absolute and relative frequencies with which we estimate each occurs across analysts, we turn to aggregating errors and dubious judgments within and then across analysts, and by broker. The results are reported in Table 6.

Table 6 panel A shows that in our sample of 120 broker reports issued between Jan. 2012 and Dec. 2013, sell-side analysts make an estimated mean (median) of 5.4 (5) errors and 4.5 (5) dubious judgments in constructing and executing their DCF equity valuation models. When scaled by the number of errors and dubious judgments for which analysts provide sufficient information for us to grade them on, we estimate that analysts' mean (median) error rate is 32% (32%) and their mean (median) rate of making dubious judgments is 41% (40%). Panel B lists the mean number of errors and dubious judgments, and the mean error and dubious judgment rates, by broker. Inspection of the means reported in Panel B indicates that the valuation models shown in the sell-side equity analyst reports published by large brokers contain similar numbers and rates of errors and dubious judgments to those of small brokers.

The magnitudes of these statistics lead us to infer that sell-side equity analysts make a disturbingly large number of mistakes in their DCF equity valuation models. Of course, it is unreasonable to suppose that in their DCF models, analysts never make mistakes or dubious judgments. This said, sell-side equity analysts have been widely seen by academics as sophisticated economic agents. Given their responsibilities and the nature of their employers, they are intelligent, knowledgeable, competitive and well incentivized to analyze and predict the levels and risks of the cash flows of the firms they follow. As such, even though we are mindful that we do not have a perfect benchmark to judge analysts' DCF modeling abilities against, we argue that it is very surprising that analysts make as many errors and dubious judgments in their DCF equity valuation models as we estimate they do. We return to discuss some of the implications of our findings, and questions that arise from them, in section 7.

4. Economic magnitude of analysts' errors

One criticism that could legitimately be made against our inference that analysts make a alarmingly large number of errors and dubious judgments in their DCF equity valuation models is that we merely identify a variety of small errors that in aggregate impart little or no bias into the key output of analysts' DCF valuation models, namely target prices. We speak to this concern by calibrating the economic significance of analysts' DCF modeling mistakes after recalculating analysts' stated target prices and the annualized expected returns (AERs) embedded in them to correct for each of five major types of errors.

The errors we correct are those where [i] the analyst's post-terminal year growth rate in free cash flows g exceeds 5%; [ii] the analyst incorrectly includes FCFs that occurred prior to the valuation date, or makes incorrect adjustments to ENTVAL in arriving at EQVAL; [iii] the analyst's RF is more than +/- 30 bps away from the 10-year Treasury Bill yield on analyst's report date; [iv] the analyst's FCF are discounted end-of-year, not mid-year; and [v] the analyst does not scale up EQVALPS from the valuation date to the target date. We focus on these errors because based on the formulae underlying DCF valuation, we judge them to be the most likely to yield material changes in analysts' target prices when the errors are corrected.

Table 7 reports the results of correcting each error in a mutually exclusive manner. In measuring the average effects of correcting a given error, we include both observations where we can identify that analysts have made an error and observations where they have not. For example, in correcting what we judge to be analysts' errors about g, the post-terminal year growth rate in free cash flows, we take the 109 analyst reports that per panel B of Table 3 disclose g, and recalculate the analyst's target price after reducing to 5% all values of g > 5%. This turns out to be feasible for 57 of the initial 109 observations.

We estimate that correcting errors [i] and [ii] yields no materailly positive or negative material changes in the AERs implied by corrected target prices. In contrast, correcting error [iv] increases AERs by a mean and median of 5% (viz., about half the mean value of RE reported in panel C of Table 3), while the largest impacts on AERs come from correcting errors [iii] and [v]. Thus, we estimate that changing RF to the 10-year Treasury yield on the analyst report date when RF is more than +/- 30 bps away from the 10-year Treasury yield on the analyst report date increases AERs by a mean (median) of 14% (21%). We also estimate that scaling up EQVALPS from the valuation date to the target price date for the 93% of the time that this is not done by the analyst increases AERs by a mean (median) of 12% (11%).

Lastly, we provide a crude estimate of what might happen to analysts' AERs if all five errors [i] - [v] were corrected simultaneously. We do so by imposing two additional assumptions. First, we assume that the mean and median AERs we estimate from correcting any one error can be added together to arrive an unbiased estimate of the mean and median AER that would be obtained if all five errors were simultaneously corrected. And second, we assume that the errors we can identify in analysts' DCF models because the analyst shows us enough information to be able to grade them generalize to analyst reports where the analyst does not show us enough information to be able to grade that aspect of their report. Given these assumptions, the last line of Table 7 indicates that we estimate that correcting for all five types of errors where present would increase analysts' target prices by a median (mean) of 37% (29%). We argue this is an economically material amount.

In total, the results we report in Tables 3-7 lead us to conclude that at least with regard to valuing equity, not only are sell-side analysts markedly less sophisticated than prior research has supposed, but they are also more optimistic in that the correct translation of the fundamental free cash flow and WACC information that they place into their DCF valuation models yields estimates of the relevant firms' future stock prices that are far higher than those obtained from analysts' stated target prices, which prior research has found to be quite optimistic to begin with.

5. Explaining variation in error rates and dubious judgment rates in analysts' DCF models

In this section we test the hypothesis that, holding constant analysts' poor average sophistication in constructing and executing DCF valuation models, more sophisticated analysts will nevertheless exhibit lower error rates and dubious judgment rates than will less sophisticated analysts. We first develop several proxies for analyst sophistication, and then use the proxies in cross-sectional regressions. Our proxies center on the quantity of information analysts disclose about the inputs to, and the contents of, their DCF model by leveraging the idea that more sophisticated analysts will seek to separate themselves from less sophisticated analysts by disclosing more information about their DCF models to investors because their knowledge is greater and they are more confident in what they know.

5.1 Scoring the quantity of disclosure about the inputs to, and the contents of, DCF models

We create four DCF disclosure scores, each of which is aimed at measuring how much of several types of information analysts provide in their reports about their DCF models. For each type of score, a higher value captures the notion that the analysts responsible for the higher value are disclosing to investors a greater fraction of the total information the investors wish to see. We argue that by supplying investors with more of what they demand, analysts with higher DCF disclosure scores will be seen as more sophisticated and in equilibrium will indeed be more sophisticated because the degree to which they are sophisticated is, as we have shown earlier in our paper, readily estimable by grading their DCF models.

5.1.1 Forecasted financial statements

We begin with a measure of the quantity of fundamental financial statement data that analysts generate and that is therefore available for input into their DCF models. Our proxy for this is the number of forecasted future financial statements that analysts do (or do not) include in their reports. Many academics and practitioners argue that in-depth and high-quality forecasted financial statements are critical to achieving a sophisticated equity valuation.[11] Along with their DCF models, analysts' commonly provide at least one year's worth of one or more forecasted income statements, balance sheets and statements of cash flow.

Table 8 provides descriptive statistics on the number and type of annual financial statements forecasted by analysts in our sample of 120 reports issued Jan. 2012 - Dec. 2013. Lines 1a and 1b show that for the sample as a whole, analysts forecast a mean of 3.7 years' worth of full annual income statements. The minimum is zero years, the maximum is 11 years, and at least one year of full income statements is forecasted 92% of the time (110 out of 120 reports). We define a full financial statement as one that contains all or almost all of the lines that would be expected to be present in that financial statement as disclosed in the typical 10-K, keeping in mind the firm's industry. In line 1b, we note that for the 10 reports that do not contain one or more forecasted full annual income statements, it is sometimes the case that the analyst forecasts a 'mini' or partial annual income statement, which we define as one that contains only a few of the lines typically present in a full annual income statement.

Although not as prevalent as income statements, lines 2a-3b show that full balance sheets and statements of cash flow are each forecasted in about 56% of reports. Across all 120 sample analyst reports, the mean number of years of both forecasted full balance sheets and statements of cash flow is about 2.3. This is smaller than the 3.7 years' worth of forecasted full annual income statements in part because it is less likely that an analyst will forecast full versions of

---

[11] For example, Lundholm and Sloan in the preface to their book *Equity Valuation and Analysis with eVal* (2013, pp.xii) state that "Our overriding theme [in this book] is that good forecasts of the future financial statements are the key input to a good valuation … [O]ur main point [is] that the key to good valuations is good forecasts."

these financial statements. Lines 2b and 3b indicate that when no full balance sheets and statements of cash flow are forecasted, the mean number of mini balance sheets and statements of cash flow that are forecasted is small, amounting to one year or less.

5.1.2 DCF disclosure scores

We score analysts on how much information they disclose to investors through their forecasted financial statements by awarding three (one) points for each forecasted annual full (mini) income statement, balance sheet, and statement of cash flows, and then dividing the sum by nine times T, where the number of years ahead to the terminal year in the DCF model. Since T can exceed the number of years the analyst forecasts future financial statements for, the disclosure quality score for forecasted financial statements can exceed 100%. At the same time, because T may not be shown in the analyst's DCF model (e.g., the analyst simply states what WACC is and what their estimated equity value per share is, and no more), there are some reports for which a forecasted financial statements score cannot be calculated.

Next, we score analysts on the quantity of information they provide to investors about how they arrive at their forecasted annual future free cash flows. We award one point for each of the following 10 lines in Figure 2 that are explicitly or implicitly forecasted by the analyst: EBITDA, depreciation & amortization, EBIT, taxes on EBIT, NOPAT, depreciation & amortization (again), Δ working capital, after tax operating cash flows, CAPEX, and free cash flows. We then divide the sum by 10, the maximum number of lines.[12]

Third, we measure the quantity of analysts' disclosures about their WACC. We do so by awarding one point for each of the 11 components used in calculating WACC as shown in the lower right hand side of Figure 2: RF horizon, RF, beta, market risk premium, RE, equity weight, RD before tax, tax rate, RD after tax, debt weight, and WACC. We divide the sum by 11.[13]

Lastly, we score analysts on how much data they provide investors about how they convert their forecasted future free cash flows into equity value per share. In this regard, and in strong though not complete parallel with what is shown in the lower left hand side of Figure 2, we award one point for each of 12 items when explicitly shown on the analyst's DCF: Horizon year (maximum of 1 pt), PV of FCF in each individual year in forecast horizon (maximum of 1

---

[12] An explicit forecast occurs when the analyst writes a number down for a given line. An implicit forecast occurs when the analyst does not write a number down for a given line, but the number for the given line can be deduced from other lines the analyst has explicitly forecasted.

[13] In the few cases where the firm has preferred stock, we score one additional point for the interest rate on preferred and one point for the weight on preferred, and increase the denominator to 13.

pt), total PV of all forecasted FCFs, terminal value, PV of terminal value, enterprise value, cash, debt, equity value, shares used to deflate equity value, equity value per share, and date that the forecasted equity value per share applies to. The resulting sum is divided by 12.[14]

In Table 9 we provide descriptive statistics on the distribution of the four scores across our sample of analyst reports. Holding constant the large dispersion that is present in all types of score, we observe a separation of scores into two groups: On the one hand, information to do with deriving FCF and then converting the FCF into EQVALPS, where the median disclosure scores are 85% and 78%, respectively. On the other hand, forecasted financial statement and WACC information, with much lower median disclosure scores of 33% and 32%, respectively. In part, these findings indicate that analysts are much more willing to provide investors with information about the numerator aspects of their DCF models (viz., deriving FCF and converting the FCF into EQVALPS) than about the denominator aspects (viz., WACC information). Whether this is because analysts are more confident predicting the levels of future free cash flows than their riskiness, or whether it reflects differential strategic behavior in light of the availability of their reports to competitor analysts, is difficult to determine.

5.2 Do more sophisticated analysts make fewer errors and fewer dubious judgments?

We now turn to using all four of the disclosure scores developed in section 5.1 as proxies for analyst sophistication in testing the hypothesis that more sophisticated analysts will manifest lower DCF error rates and dubious judgment rates than less sophisticated analysts. We do so by regressing DCF error rates and DCF dubious judgment rates on the four disclosure scores and five supplementary variables.[15] We predict that each disclosure score will be negatively associated with analysts' error rates and dubious judgment rates. The supplementary variables we include are a dummy variable for there being at least one CFA on the analyst team, the number of pages in the analyst report, the number of analysts on the analyst team, the number of years the firm had been publicly traded as of the report date, and the prominence of the brokerage firm. We predict a negative coefficient on each of these latter variables.[16]

---

[14] In the few cases where the firm has preferred stock and/or minority interest, we score one additional point for preferred stock and one additional point for minority interest, and increase the denominator to a maximum of 14.

[15] To maximize the number of regression observations, we replace the nine missing values of the disclosure scores covering forecasted financial statements with the mean score value of 44% (see Table 9, NOBS = 111 not 120).

[16] The reasoning behind our sign predictions is straightforward. We expect analysts with a CFA qualification to be more sophisticated in DCF modeling; more pages in the analyst report to reflect more detailed and therefore more sophisticated analysis; more analysts on the analyst team to increase the probability that team members will match to their sub areas of expertise including DCF modeling; more prominent brokerage firms to employ more financially

We present the results of estimating the two regressions in Table 10. We find that while four of the eight estimated coefficients on the disclosure scores are reliably negative at the 5% one-tailed significance level. Moreover, the adjusted R^2 of 30% in the dubious judgment regression indicates that the disclosure scores in aggregate explain a material fraction of the cross-sectional variation in analysts' DCF dubious judgment rates. We therefore interpret Table 10 as generally supportive of the hypothesis that more sophisticated analysts make fewer mistakes and dubious judgments than do less sophisticated analysts.

6. Analysts' sophistication with regard to long-run economic forces

In this section we conclude our empirical assessment of the sophistication of DCF equity analysts by studying how well the long-run economic forces that are expected to govern firms' activities show up in the forecasted financial statements that we documented in section 5.1.1 often accompany analysts' DCF valuation models. If analysts are only somewhat sophisticated, then we expect to observe that the rates of growth in all the financial statement lines that they forecast going out in time through to their DCF terminal year will on average decline. If analysts are very sophisticated, then we further expect to observe that their forecasted rates of growth in the terminal year will not exceed the expected perpetual rate of worldwide economic growth.

In Figure 3 we display the trajectories of the medians of key ratios extracted from analysts' forecasted financial statements in event time relative to analysts' DCF terminal year (where available). Panel A shows the median rates of growth in certain dollar-denominated financial statements variables, while panel B reports the median values of the percentage-based ROE and the effective tax rate variables.

Looking first at panel A, it can clearly be seen that the median rates of growth in all five dollar-denominated financial statement variables on average decline as the terminal year approaches. This is consistent with analysts being sufficiently sophisticated to recognize the economic reality that in the long run, high rates of projected firm growth and all its correlates must in expectation decline and converge toward a figure no larger than the expected rate of nominal growth in the world economy. Also consistent with such an sophistication view is the result in panel B where the median effective tax rate increases as the terminal year approaches.

---

sophisticated analysts; and more mature firms to be easier to model and so provide fewer opportunities for analysts to make errors or dubious judgments on. We measure broker prominence by the log of the number of times the broker appears in our sample.

However, Figure 3 reports evidence that we view as being inconsistent with many analysts being highly sophisticated in their understanding of long-run economic forces. First, pivoting on our assumption expressed in the cutoff in error code 1.3 (Table 4, panel A) that during our 2012-13 sample period the correct expected perpetual rate of annual worldwide economic growth should not exceed 5%, panel A shows that the median analyst projection of the rate of growth in long-term free cash flows is more than 5%. Second, even where the median rates of projected growth in revenues, depreciation, EBIT and CAPEX are smaller than 5%, less than but still close to 50% of individual analysts' projections exceed 5%. Taken together, the evidence in panel A leads us to conclude that close to 50% of analysts in our sample are optimistic and only partially reflect the realities of long-run economic forces in their DCF forecasts.

The evidence we present in panel B regarding where analysts project ROE will be as time increases from the forecast date toward the terminal year echoes this conclusion.[17] Specifically, panel B shows that median ROE is forecasted to *increase* as the terminal year approaches, rising from a linearly fitted value of 12.5% nine years before the terminal year to 18.4% in the terminal year. We argue that this is not what would be expected to be observed in a random sample of publicly traded firms and given a mean forecasted cost of equity of 11.1% (Table 3, panel C). We interpret the gap of 7.3% between 18.4% and 11.1% as indicating that analysts on average are inappropriately optimistic and partially unsophisticated about the projected long-run profitability of the companies they follow.[18] As such, we also propose that the evidence in Figure 3 is consistent with the results in Table 7 where we estimated that analysts are markedly more optimistic than previously assumed because the correct translation of the fundamental free cash flow and WACC information that they place into their DCF valuation models yielded estimates of the relevant firms' future stock prices that were far higher than those obtained from analysts' stated target prices, which prior research has found to be quite optimistic to begin with.

---

[17] We define ROE as annual net income divided by end of year shareholder equity.

[18] This would not necessarily be true for a sample heavily concentrated in intangible intensive firms such as pharmaceuticals, or a sample tilted toward newly listed firms. For such firms, it might reasonably be expected that the expensing required of most intangible assets under U.S. GAAP, combined with successful intangible-intensive companies being those that create natural monopolies for themselves, would lead to ROEs that both increased toward the terminal year, and at the terminal year were higher than RE (Lundholm and Sloan, 2013, Ch. 4).

7. Conclusions and questions for future research

In this study, we have sought to determine how well sell-side equity analysts construct and execute the DCF valuation models that they frequently include in their reports to investors. Using a stratified random sample of 120 analyst reports containing DCF valuation models from Investext that were issued during Jan. 2012 - Dec. 2013, we estimate that analysts make a median of five errors and five dubious judgments in their DCF models. As such, and subject to the caveat that our results are to some degree predicated on our judgments as to what is a DCF error and what is not, we conclude that the number of errors and dubious judgments that we estimate sell-side equity analysts make are startlingly high. Most academics and investors see sell-side analysts as being sophisticated economic agents. Although such sophistication may be present in the many and rich non-DCF valuation parts of their reports, we find a marked lack of sophistication in analysts' ability in the DCF valuation part of their reports to construct and execute a DCF equity valuation model.

In order to estimate the economic magnitude of their lack of DCF valuation sophistication, we show that the errors that analysts make are not small and mean zero in their effect on analysts' target prices. Specifically, we estimate that recalculating analysts' stated target prices after correcting for five major and common errors overall increases target prices by about one third. This leads us to conclude that sell-side equity analysts are both less sophisticated and more optimistic than prior research has supposed. This conclusion is bolstered by additional results we find using the forecasted financial statements that analysts often include in their DCF-oriented reports—namely that analysts only partially reflect in their financial forecasts the economic realities that affect long-run forecasts. In particular, analysts are too optimistic about the rates of growth they are forecasting for revenues and free cash flows in the DCF terminal year, with the improper result that the ROEs they forecast increase over time and rise to a level that is implausibly higher than firms' cost of equity capital.

Looking to the future, we suggest that our study raises a number of disquieting questions. For example, why do sell-side analysts make so many mistakes and dubious judgments in their DCF valuation models? How do they continue to do so, given the repeated nature of the task, and the fact that their errors are on display for their clients, their bosses and colleagues at competing sell-side brokerages to see? Do buy-side analysts make similar numbers of errors and dubious judgments (Crawford, Gray, Johnson and Price, 2013; Groysberg, Healy, Serafeim and Sahnthikumar, 2013)? Are analysts just poorly trained—and if so, is that the fault of their academic teachers, or poor in-house training? Or do they not care because the importance of financial models to them and their compensation has fallen over time (Bradshaw, 2011)? Why don't brokerage firms make their analysts use correct and uniform valuation templates, such as those available for little or no cost from websites such as www.lundholmandsloan.com and www.wallstreetprep.com? Would analysts revise and/or reverse engineer their free cash flow and/or cost of capital inputs if they were aware of their mistakes in combining them into a valuation, such that they ended up back at their original error-riddled target price? Do sophisticated consumers of analysts' reports such as institutional investors and corporate CFOs not realize that analysts make so many DCF valuation mistakes and dubious judgments? Or are they quite aware of, and therefore largely discount analysts' DCF models and price targets? But then why do stock prices move when analysts change their price targets? Do investment banks and corporate CFOs make the same kinds of mistakes and dubious judgments as analysts when evaluating M&A targets for their clients or for their own organization? Do hedge funds or other types of sophisticated investors exploit analysts' erroneously executed DCF valuations? And are the brokerage firms that employ analysts who make large numbers of DCF modeling errors exposing themselves to heretofore-unrecognized legal risks? Given the central importance of accurate valuation in economics and finance, we believe that these questions are worthy of future research, particularly because the answers should be useful to both academics and practitioners.

REFERENCES

Asquith, P., Mikhail, M. and A. Au. 2005. Information content of equity analyst reports. *Journal of Financial Economics* 38, 17-39.

Block, S.B. 1999. A study of financial analysts: Practice and theory. *Financial Analysts Journal* 55(4), 86-95.

Bradshaw, M.T. 2002. The use of target prices to justify sell-side analysts' stock recommendations. *Accounting Horizons* 16(1), 27-41.

Bradshaw, M.T. 2004. How do analysts use their earnings forecasts in generating stock recommendations? *The Accounting Review* 79(1), 25-50.

Bradshaw, M.T. 2009. Analyst information processing, financial regulation, and academic research. *The Accounting Review* 84(4), 1073-1083.

Bradshaw, M.T. 2011. Analysts' forecasts: What do we know after decades of work? Working paper, Boston College.

Bradshaw, M.T., Brown, L.D., and K. Huang. 2013. Do sell-side analysts exhibit differential target price forecasting ability? *Review of Accounting Studies* 18: 930-955.

Bradshaw, M.T., Huang, K. and H. Tan. 2013. Analyst target price optimism around the world. Working paper, Boston College.

Brown, L.D. 1993. Earnings forecasting research: Its implications for capital markets research. *International Journal of Forecasting* 9(3), 295-320.

Brown, L.D., Call, A.C., Clement, M.B., and N.Y. Sharp. 2013. Inside the "black box" of sell-side financial analysts. Working paper, UT Austin.

Call, A.C., Chen, S., and Y.H. Tong, 2013. Are analysts' cash flow forecasts naïve extensions of their own earnings forecasts? *Contemporary Accounting Research* 30(2), 438-465.

Courteau, L., Kao, J.L., and G.D. Richardson. 2001. Equity valuation employing the ideal versus ad hoc terminal value expressions. *Contemporary Accounting Research* 18(4), 625-661.

Crawford, S., Gray, W., Johnson, B., and R.A. Price. 2013. The investment value of contrarian buy-side recommendations. Working paper,

Dechow, P.M., and You, H. 2013. 2013. Understanding and predicting target price valuation errors. Working paper, UC Berkeley.

Demirakos, E.G., Strong, N.C., and M. Walker. 2004. What valuation models do analysts use? *Accounting Horizons* 18(4), 221-240.

Ertimur, Y., Muslu, V., and F. Zhang. 2011. Why are recommendations optimistic? Evidence from analysts' coverage initiations. *Review of Accounting Studies* 16, 679-718

Fernandez, P. 2013. 119 common errors in company valuations. Working paper, IESE.

Francis, J., and D. Philbrick. 1993. Analysts' decisions as products of a multi-task environment. *Journal of Accounting Research* 31(2), 216-230.

Francis, J., Olsson, P., and D.R. Oswald. 2000. Comparing the accuracy and explainability of dividend, free cash flow, and abnormal earnings equity value estimates. *Journal of Accounting Research* 38(1), 45-70.

Givoly, D., Hayn, C., and R. Lehavy. 2009. The quality of analysts' cash flow forecasts. *The Accounting Review* 84(6), 1877-1911.

Givoly, D., Hayn, C., and R. Lehavy. 2013. Analysts' cash flow forecasts are not sophisticated: A rebuttal of Call, Chen and Tong (2013). Working paper, Penn State.

Groysberg, B., and Healy, P. 2013. Wall Street Research: Past, present, and future. *Stanford University Press*.

Groysberg, B., Healy, P., Serafeim, G. and D. Shanthikumar. 2013. The stock selection and performance of buy-side analysts. *Management Science* 59(5), 1062-1075.

Joos, P.R., and J.D. Piotroski. 2013. The best of all possible worlds: Analyst ex ante valuation forecast optimism and the distribution of scenario-based valuations. Working paper, Stanford.

Kaplan, S.N., and R.S. Ruback. The valuation of cash flow forecasts: An empirical analysis. *Journal of Finance* 50(4), 1059-1093.

Levin, J., and P. Olsson. 2000. Terminal value techniques in equity valuation – Implications of the steady state assumption. Working paper, Stockholm School of Economics.

Lin, H., and M. McNichols. 1998. Underwriting relationships, analysts' earnings forecasts and investment recommendations. *Journal of Accounting and Economics* 25, 101-127.

Lundholm, R., and T. O'Keefe. 2001a. Reconciling value estimates from the discounted cash flow model and the residual income model. *Contemporary Accounting Research* 18(2), 311-335.

Lundholm, R., and T. O'Keefe. 2001b. On comparing residual income and discounted cash flow models of equity valuation: A response to Penman 2001. *Contemporary Accounting Research* 18(4), 693-696.

Lundholm, R. and R. Sloan. Equity valuation and analysis with *eVal*. 1st, 2nd and 3rd editions (2006, 2007, 2013). McGraw-Hill, New York.

Markou, A., and S. Taylor. 2014. Peering inside the analyst 'Black Box': How do equity analysts model companies? Working paper, Cambridge University.

Mauboussin, M.J. 2006. Common errors in DCF models. Legg Mason Capital Mgmt., March 16.

Penman, S.H. 2001. On comparing residual income and discounted cash flow models of equity valuation: A response to Lundholm and O'Keefe. *Contemporary Accounting Research* 18(4), 681-692.

Penman, S.H., and T. Sougiannis. 1998. A comparison of dividend, cash flow, and earnings approaches to equity valuation. *Contemporary Accounting Research* 15(3), 343-383.

Petersen, C., and T. Plenborg. 2009. The implementation and application of firm valuation models. *Journal of Applied Business Research* 25(1), 1-11.

Previts, G., Bricker, R., Robinson, T., and S.J. Young. 1994. A content analysis of sell side financial analysts company reports. *Accounting Horizons* 8, 55-70.

Ramnath, S., Rock, S., and P. Shane. 2008. Financial analysts' forecasts and stock recommendations: A review of the research. *Foundations and Trends in Finance* 2, 311-420.

Schipper, K. 1991. Analysts' forecasts. *Accounting Horizons* 5(4), 105-121.

Tham, J., and I. Velez-Pareja. 2004. Top 9 (unnecessary and avoidable) mistakes in cash flow valuation. Unpublished manuscript, Duke University.

Twedt, B. and L. Rees. 2013. Reading between the lines: An empirical examination of qualitative attributes of financial analysts' reports. Working paper, Texas A&M.

APPENDIX 1

Justifications for the set of critical values and theoretically oriented interrelationships between DCF elements covered in Tables 4 and 5

In grading analysts' DCF models, on many occasions we employ a +/- 3% cutoff between what the analyst reports and what we calculate based on the raw data analysts' provide on their DCF model page(s) before we assign an error as having occurred. We do not require an exact match to allow for the fact that what analysts show on their DCF model page(s) is often rounded up or down relative to the exact underlying calculations.

Panel A: Error cutoffs

1.2 t_0 is the valuation date, defined as the beginning of Year 1 of the analyst's valuation horizon. Thus, in Figure 2 we have t_0 = 12/31/2011 because Year 1 = 2012 and the firm's fiscal year-end is 12/31. We typically identify t_0 based on determining the date that yields us the closest correspondence between what analysts' show PV(FCF[1-T]) to be or calculate to be, and what we calculate PV(FCF[1-T]) to be based on what analysts show on their DCF model page(s) with regard to FCF[1-T], WACC and cash flow timing.

1.3 We use 5% as the cutoff above which we grade analysts as assuming an erroneously high g, the growth rate in post-terminal value FCF (and all other financial statement variables). This is 2% higher than in *Equity Valuation and Analysis with eVal* (2013, 3rd ed., p.174), the source of our assumed 100% correctly structured and executed DCF-to-all-investors equity valuation model. Lundholm and Sloan state that they use 3% as the default terminal value for sales growth (and therefore free cash flows also). Their reasoning is that "Historically, the annual growth rate in the U.S. economy, as measured by the nominal GDP growth rate, has averaged around 6%, composed of roughly 4% real growth and 2% price inflation. However, the financial crisis of 2007-2008 sent both real growth and inflation plummeting into negative territory, albeit briefly. The long-term forecasts from the Congressional Budget Office and the Federal Reserve at the end of 2010 put real growth at 2-3% and inflation at 1-2%. So, in most cases a terminal sales growth rate forecast should fall between 3% and 5% … We use 3% as the default terminal value for Sales Growth in *eVal*." We use 5% rather than 3% in order to seek to be conservative in estimating that analysts make an error in this important area of valuation.

1.8.1 We use min(2g, 6%) as the cutoff above which we deem analysts' terminal year revenue growth,
1.8.2 CAPEX growth, and FCF growth to be erroneous to allow some headroom in the growth rate in
1.8.6 analysts' forecasted financial statements and/or FCF components relative to g.

1.8.4 We use +/- 50% as the cutoff between CAPEX and D&A in the terminal year to allow for the possibility that substantial differences between CAPEX and D&A in the terminal year may not be erroneous because management might still be able or planning to set CAPEX to a level starting the year after the terminal year that would equate CAPEX and D&A.

1.8.5 We set the lower cutoff for terminal year ETR at 25% to conservatively allow for the possibility that the firm will be able to avail itself of permanent U.S. and/or foreign tax benefits.

2.1 We select the 10-year Treasury yield as the correct RF horizon to follow Lundholm and Sloan (2013, p.218). Like Lundholm and Sloan, we judge the 10-year yield to well balance the mix of very short term horizons and very long term horizons in the DCF model. The 10-year rate is also very commonly used in practice. We apply +/- 30 bps as the error determination cutoffs to allow for analysts being slow to update their DCF models if interest rates suddenly change.

2.2 Given that we observe a mean RE of approximately 11%, we use +/- 30 bps as our cutoff bounds to conform to our general +/- 3% cutoff.

2.3.2 We use the same tax rate cutoff bounds as in 1.8.5 because WACC will in large part apply to long term FCF. As such, the tax rate should be that which is expected to apply in the long run, and since in the firm will only exist in the long run if it is profitable, in the long run the most likely tax rate the firm will face is the sum of the statutory federal rate plus a weighted average of state tax rates (net of federal tax benefits).

2.3.4 We use +/- 20 bps as our cutoff bounds rather than +/- 30 bps as in RE because before-tax RD is typically about 2/3rds the size of RE.

2.4.1 We apply cutoffs of +/- 10% rather than 0% to allow for rounding related slippage between analysts' calculations and our own.

Panel B: Dubious judgment cutoffs

We acknowledge that the cutoffs we use in grading analysts as having made a dubious judgment are more subjective than those we use for grading errors. Below we provide explanations for the areas of DCF model judgment that may be less familiar to readers.

3.6 We set the minimum horizon for a non-dubious terminal year horizon at 4 years in light of the arguments made by many academics and practitioners that T needs to be set a fair way out into the future, not close to the valuation date. For example, Lundholm and Sloan (2013) set T to be 11 years in *eVal*. In the earlier 2007 edition of their textbook (in which they set the default T at an even higher 23 years), they state that "you should be very cautious about using the perpetuity formula too soon … Because year T is the starting value for an infinite stream of future values, even a small error in the year T cash flow or residual income gets greatly amplified, resulting in a big mistake in the valuation." (p.222).

3.11.1
3.11.3 Setting the valuation date t_0 after the report date is not necessarily fatal, but is dangerous because it may be the case that the firm is reasonably forecasted to undertake material operating, financing or investing actions between t_0 and the report date. Ditto with regard to setting t_0 after the target price date.

3.11.2 Setting t_0 more than 400 calendar days prior to the report date is dubious because it compounds the effects of the error that analysts make 93% of the time by not scaling up their EQVALPS from t_0 to the target price date (error code 2.8, Table 4 panel B).

3.12.1 We subjectively set a cutoff of 20% for each of the four disclosure scores we compute, discuss
3.12.2 and use in section5.1.2 and 5.2. We do so based on what we propose is the reasonable argument
3.12.3 that the investor reading the analyst's report will value knowing at least 20% of what could be
3.12.4 disclosed (given the assumed DCF-to-all-investors valuation framework laid out in Figure 2).

APPENDIX 2

Analyst DCF-to-all-investors as-reported example #1: Level 3 Communications (3/16/12, Cowen & Company)

Error and dubious judgment codes as defined in Table 4 and Table 5

Errors		Dubious judgments	
1.8.1		3.2	
1.8.2		3.4	
1.8.5		3.5.2	
1.8.6		3.10.1	
2.1		3.10.2	
2.2			
2.4.1			
2.5			
2.8			
Number	9	Number	5
Rate	43%	Rate	25%

DCF model disclosure quality scores:	
Forecasted financial statements	67%
Deriving FCF	40%
WACC	73%
Converting FCF to EQVALPS	92%

Implied date of analyst's DCF model t_0: 20111231

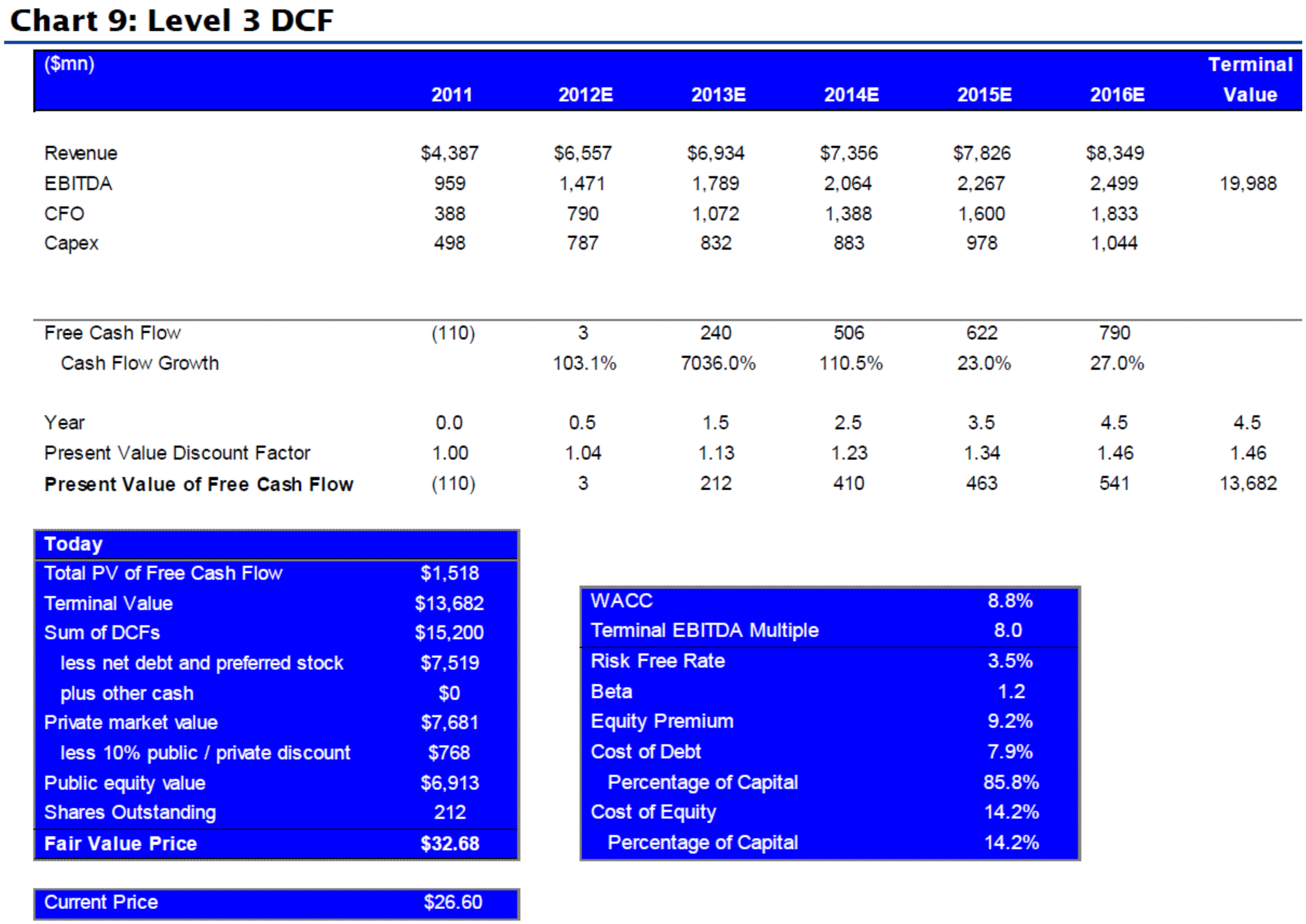


Chart 9: Level 3 DCF

($mn)	2011	2012E	2013E	2014E	2015E	2016E	Terminal Value
Revenue	$4,387	$6,557	$6,934	$7,356	$7,826	$8,349	
EBITDA	959	1,471	1,789	2,064	2,267	2,499	19,988
CFO	388	790	1,072	1,388	1,600	1,833	
Capex	498	787	832	883	978	1,044	
Free Cash Flow	(110)	3	240	506	622	790	
Cash Flow Growth		103.1%	7036.0%	110.5%	23.0%	27.0%	
Year	0.0	0.5	1.5	2.5	3.5	4.5	4.5
Present Value Discount Factor	1.00	1.04	1.13	1.23	1.34	1.46	1.46
Present Value of Free Cash Flow	(110)	3	212	410	463	541	13,682

Today	
Total PV of Free Cash Flow	$1,518
Terminal Value	$13,682
Sum of DCFs	$15,200
less net debt and preferred stock	$7,519
plus other cash	$0
Private market value	$7,681
less 10% public / private discount	$768
Public equity value	$6,913
Shares Outstanding	212
Fair Value Price	**$32.68**

Current Price	$26.60

WACC	8.8%
Terminal EBITDA Multiple	8.0
Risk Free Rate	3.5%
Beta	1.2
Equity Premium	9.2%
Cost of Debt	7.9%
Percentage of Capital	85.8%
Cost of Equity	14.2%
Percentage of Capital	14.2%

APPENDIX 2 (continued)

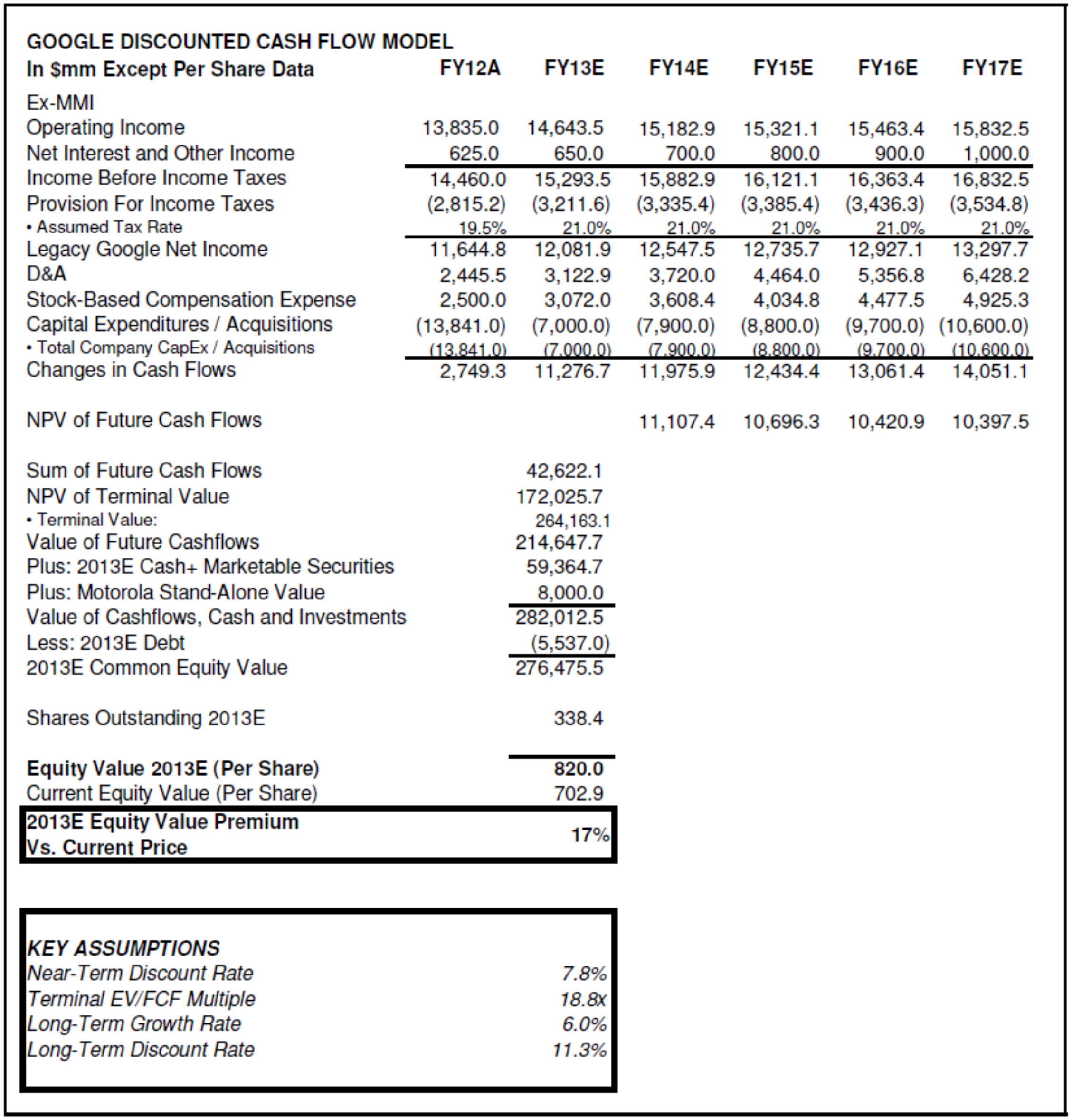
Analyst DCF-to-all-investors as-reported example #2: Google (1/23/13, Pivotal Research Group)

Error and dubious judgment codes as defined in Table 4 and Table 5

Errors		Dubious judgments	
1.1		3.6	
1.3		3.8	
1.4		3.10.1	
1.5		3.10.2	
1.6.1		3.11.3	
1.8.1		3.12.3	
1.8.2			
1.8.3			
1.8.4			
1.8.5			
1.8.6			
2.6			
2.7			
2.8			
Number	14	Number	7
Rate	74%	Rate	50%

DCF model disclosure quality scores:	
Forecasted financial statements	33%
Deriving FCF	100%
WACC	9%
Converting FCF to EQVALPS	92%

Implied date of analyst's DCF model t_0: 20131231



GOOGLE DISCOUNTED CASH FLOW MODEL

In $mm Except Per Share Data	**FY12A**	**FY13E**	**FY14E**	**FY15E**	**FY16E**	**FY17E**
Ex-MMI						
Operating Income	13,835.0	14,643.5	15,182.9	15,321.1	15,463.4	15,832.5
Net Interest and Other Income	625.0	650.0	700.0	800.0	900.0	1,000.0
Income Before Income Taxes	14,460.0	15,293.5	15,882.9	16,121.1	16,363.4	16,832.5
Provision For Income Taxes	(2,815.2)	(3,211.6)	(3,335.4)	(3,385.4)	(3,436.3)	(3,534.8)
• Assumed Tax Rate	19.5%	21.0%	21.0%	21.0%	21.0%	21.0%
Legacy Google Net Income	11,644.8	12,081.9	12,547.5	12,735.7	12,927.1	13,297.7
D&A	2,445.5	3,122.9	3,720.0	4,464.0	5,356.8	6,428.2
Stock-Based Compensation Expense	2,500.0	3,072.0	3,608.4	4,034.8	4,477.5	4,925.3
Capital Expenditures / Acquisitions	(13,841.0)	(7,000.0)	(7,900.0)	(8,800.0)	(9,700.0)	(10,600.0)
• Total Company CapEx / Acquisitions	(13,841.0)	(7,000.0)	(7,900.0)	(8,800.0)	(9,700.0)	(10,600.0)
Changes in Cash Flows	2,749.3	11,276.7	11,975.9	12,434.4	13,061.4	14,051.1
NPV of Future Cash Flows			11,107.4	10,696.3	10,420.9	10,397.5
Sum of Future Cash Flows		42,622.1				
NPV of Terminal Value		172,025.7				
• Terminal Value:		264,163.1				
Value of Future Cashflows		214,647.7				
Plus: 2013E Cash+ Marketable Securities		59,364.7				
Plus: Motorola Stand-Alone Value		8,000.0				
Value of Cashflows, Cash and Investments		282,012.5				
Less: 2013E Debt		(5,537.0)				
2013E Common Equity Value		276,475.5				
Shares Outstanding 2013E		338.4				
Equity Value 2013E (Per Share)		**820.0**				
Current Equity Value (Per Share)		702.9				
2013E Equity Value Premium Vs. Current Price		**17%**				

KEY ASSUMPTIONS	
Near-Term Discount Rate	*7.8%*
Terminal EV/FCF Multiple	*18.8x*
Long-Term Growth Rate	*6.0%*
Long-Term Discount Rate	*11.3%*

APPENDIX 2 (continued)

Analyst DCF-to-all-investors as-reported example #3: MoSyS (4/19/13, Feltl and Company)

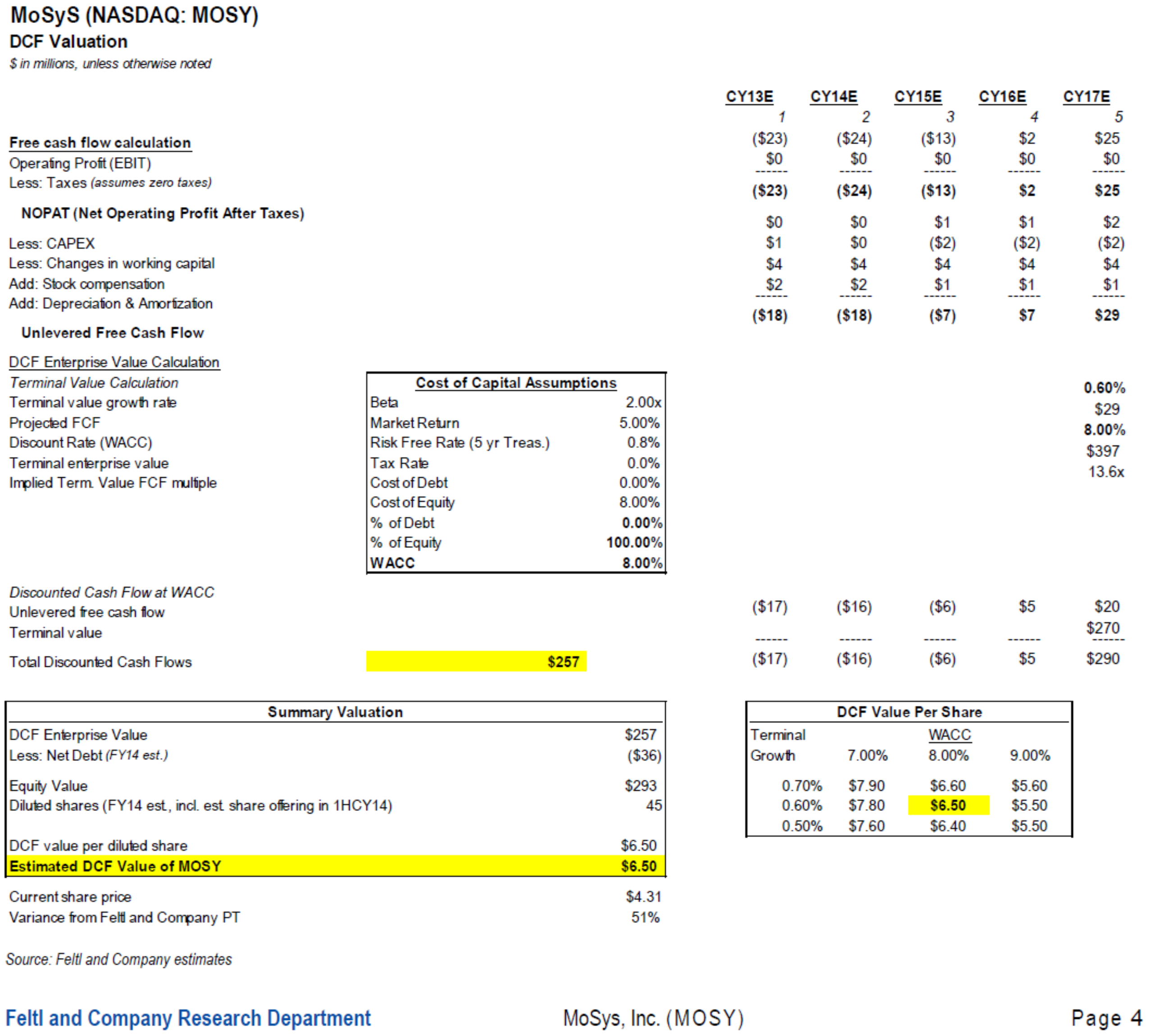
Error and dubious judgment codes
as defined in Table 4 and Table 5

Errors		Dubious judgments	
1.7.1		3.1	
1.8.2		3.3	
1.8.4		3.10.1	
1.8.5		3.11.2	
1.8.6		3.12.1	
2.1			
2.2			
2.3.1			
2.3.2			
2.3.3			
2.4.3			
2.5			
2.7			
2.8			
Number	14	Number	5
Rate	54%	Rate	26%

DCF model disclosure quality scores:

Forecasted financial statements	13%
Deriving FCF	100%
WACC	100%
Converting FCF to EQVALPS	83%

Implied date of analyst's DCF model t_0: 20121231



MoSyS (NASDAQ: MOSY)

DCF Valuation

$ in millions, unless otherwise noted

	CY13E	CY14E	CY15E	CY16E	CY17E
	1	2	3	4	5
Free cash flow calculation					
Operating Profit (EBIT)	($23)	($24)	($13)	$2	$25
Less: Taxes *(assumes zero taxes)*	$0	$0	$0	$0	$0
NOPAT (Net Operating Profit After Taxes)	**($23)**	**($24)**	**($13)**	**$2**	**$25**
Less: CAPEX	$0	$0	$1	$1	$2
Less: Changes in working capital	$1	$0	($2)	($2)	($2)
Add: Stock compensation	$4	$4	$4	$4	$4
Add: Depreciation & Amortization	$2	$2	$1	$1	$1
Unlevered Free Cash Flow	**($18)**	**($18)**	**($7)**	**$7**	**$29**

DCF Enterprise Value Calculation

Terminal Value Calculation	
Terminal value growth rate	**0.60%**
Projected FCF	$29
Discount Rate (WACC)	**8.00%**
Terminal enterprise value	$397
Implied Term. Value FCF multiple	13.6x

Cost of Capital Assumptions	
Beta	2.00x
Market Return	5.00%
Risk Free Rate (5 yr Treas.)	0.8%
Tax Rate	0.0%
Cost of Debt	0.00%
Cost of Equity	8.00%
% of Debt	**0.00%**
% of Equity	**100.00%**
WACC	**8.00%**

Discounted Cash Flow at WACC		CY13E	CY14E	CY15E	CY16E	CY17E
Unlevered free cash flow		($17)	($16)	($6)	$5	$20
Terminal value						$270
Total Discounted Cash Flows	**$257**	($17)	($16)	($6)	$5	$290

Summary Valuation	
DCF Enterprise Value	$257
Less: Net Debt *(FY14 est.)*	($36)
Equity Value	$293
Diluted shares (FY14 est., incl. est. share offering in 1HCY14)	45
DCF value per diluted share	$6.50
Estimated DCF Value of MOSY	**$6.50**
Current share price	$4.31
Variance from Feltl and Company PT	51%

DCF Value Per Share			
Terminal		WACC	
Growth	7.00%	8.00%	9.00%
0.70%	$7.90	$6.60	$5.60
0.60%	$7.80	**$6.50**	$5.50
0.50%	$7.60	$6.40	$5.50

Source: Feltl and Company estimates

Feltl and Company Research Department MoSys, Inc. (MOSY) Page 4

TABLE 1

Selection criteria used in arriving at 120 DCF-based analyst reports taken from Investext (5 analyst reports per month, all dated Jan. 2012 – Dec. 2013), and the frequency of the general types of DCF models created and used by analysts in the sampled reports.

Panel A: Investext search criteria

Keyword(s):	DCF or ("discounted cash flow*") in **Table of Contents**
Report type:	**Company**
Geography:	**United States**
Contributor:	**Non-broker research excluded**

Panel B: Sample refinement criteria. Where an analyst report was excluded for one of the reasons below, another analyst report adhering to the Investext search criteria in panel A was selected at random from the same month as the excluded report.

Base sample:	139 analyst reports	
Excluded:	No FCF shown in DCF model	7
	DCF covers only part of company	5
	Firm is non-U.S. company	3
	Firm is a financial company	2
	DCF is acquisition-oriented	1
	Other	1
Final sample:	120 analyst reports (5 per month)	

Panel C: Frequency of the general types of DCF models used by analysts in sample reports

DCF to all investors		# reports
1.1	NOPLAT + depn. +/- ΔWCap - CAPEX	60
1.2	Adj. EBITDA - cash taxes +/- ΔWCap - CAPEX	18
1.3	CFOPS + (1 - tax rate)(int exp) - CAPEX	7
1.4	NI +/- adjustments - CAPEX	13
1.5	Unlevered FCFs given, but no derivation	11
DCF to equity		
2.1	Levered FCFs	2
Dividend discount model		
3.1	Dividends to equity	1
Insufficient or no information		
4.1	Usually no FCFs provided at all	8
		120

TABLE 2

Descriptive statistics on the brokers, analysts and firms in the 120 DCF-based analyst reports sampled from Investext; see Table 1 for sample selection criteria.

Panel A: Number of sampled analyst reports by authoring broker

Total = 120 analyst reports from 37 different U.S. brokers that contribute to Investext					
Morgan Stanley	17	Maxim Group	3	Feltl & Company	1
JP Morgan	11	Oppenheimer	3	HSBC Global Research	1
Deutsche Bank	9	Piper Jaffray	3	Indaba Global Research	1
Jefferies	7	Pivotal Research Group	3	Leerink Swann	1
Cowen	7	Susquehanna	3	Miller Tabak	1
Credit Suisse	6	Brean Capital	2	Morgan Keegan	1
BMO Capital Markets	5	Caris	2	National Alliance Securities	1
Barclays	3	Indigo Equity Research	2	Norne Securities	1
Canaccord Genuity	3	KLR Group	2	Sephirin Group	1
Cantor Fitzgerald	3	Ladenburg Thalmann	2	Wedbush	1
Craig Hallum	3	Stonegate Securities	2	Wunderlich Securities	1
Evercore Partners	3	Buckingham Research	1	Zephirin Group	1
Macquarie	3				

Panel B: Number of reports analyst is author on, analyst professional qualifications, and number of analysts on the analyst team

Analyst is author on:	
One report	120
Two reports	34
Three reports	22
Four reports	2
Five reports	1
Six reports	1
# different analysts	180
# analyst-reports	273

Professional qualification	#
CFA	60
CPA	1
MD	3
PhD	8
# analyst-reports	72

# analysts on team	
Min.	1
Mean	2.2
Max.	5

% of reports with ≥ 1 CFA on analyst team	42%

Type of report	#
Update / revision	108
Initiation	12

# pages in analyst report	
Min.	5
Mean	14.5
Max.	40

Panel C: Industry, market cap and publicly traded age of firms covered in analyst reports

Industry	#
Business services	25
Pharmaceuticals	16
Communications	7
Avg. per other (23)	3.1

Market cap ($ mil)		
Min.	$	5
Median	$	5,648
Mean	$	19,129
Max.	$	237,851

# years firm listed	
Min.	0
Median	14
Mean	19
Max.	88

TABLE 3

Descriptive statistics on key valuation components disclosed in the DCF models in 120 analyst reports sampled from Investext, Jan. 2012 – Dec. 2013. In the panels, NOBS is the number of analyst reports for which there is valid data; T is the terminal year in the analyst's DCF model; and g the analyst's stated post-terminal year perpetuity growth rate.

Panel A: Analysts' reported target prices, target price horizons, and the annualized expected stock returns embedded in analysts' reported target prices

	NOBS	Min.	10th pctile	50th pctile	Mean	90th pctile	Max.
Current stock price	120	$ 0.26	$ 8.87	$ 33.71	$ 61.10	$ 85.07	$ 726.71
Target stock price	120	$ 2.00	$ 10.00	$ 34.20	$ 70.23	$ 95.00	$ 850.00
Horizon (months)	111	3.5	10	12	12	12	15
Annualized expected return embedded in target stock price	111	-51%	-12%	13%	18%	36%	411%

Panel B: When the terminal year occurs (T), and the annual growth rate in free cash flows assumed by the analyst to occur in perpetuity after the terminal year (g)

TV element	NOBS	Min.	10th pctile	50th pctile	Mean	90th pctile	Max.
T	111	1	4	8	8	11	16
g	109	-100%	0%	3.0%	1.7%	5.0%	15%

Panel C: Analysts' assumed WACC and components of WACC

WACC component	NOBS	Min.	10th pctile	50th pctile	Mean	90th pctile	Max.
RF horizon (yrs)	15	5	10	10	11	10	30
RF	58	0.2%	1.8%	3.3%	3.1%	4.0%	5.0%
BETA	56	0.55	0.72	1.20	1.18	1.50	2.50
MKTPREM	55	4%	4.5%	6.5%	6.8%	10%	11%
RE	57	7.8%	8.4%	11%	11%	14%	23%
EQWEIGHT	58	14%	60%	83%	82%	100%	100%
RD (before-tax)	42	0%	0%	5.0%	5.1%	8.0%	11.2%
Tax rate on RD	44	0%	15%	35%	31%	40%	40%
RD (after-tax)	42	0%	0%	3.5%	3.7%	6.3%	8.3%
DEBTWEIGHT	55	0%	0%	18%	19%	40%	86%
WACC	120	4.5%	7.5%	10%	10%	13%	21%

TABLE 4

Types and frequency of errors made in the DCF models of 120 analyst reports sampled from Investext, Jan. 2012 – Dec. 2013

Panel A: Errors having to do with the numerator-oriented level, growth and timing of free cash flows in analysts’ DCF models

#	Error code	Error category	Description of error having to do with level, growth and timing of free cash flows in analyst's DCF model.	NOBS	Error rate
1.	1.1	FCF derivation	Analyst's derivation of FCF from their underlying financial statement forecasts has ≥ 1 error. For example, analyst's DCF always shows ΔWCAP = zero or no ΔWCAP each year 1-T when adjusting NOPLAT to derive FCF[1-T].	98	15%
2.	1.2	FCF[1-T]	Analyst includes FCF[0] in the calculation of EQVAL at t_0	110	16%
3.	1.3	TV_g	Analyst's assumed post-terminal year T perpetual growth rate in free cash flows g > 5%	109	7%
4.	1.4	TV_$	Analyst's TV is more than +/- 3% away from the TV obtained by correctly using the FCF[T], WACC and g information provided by the analyst.	73	25%
5.	1.5	ENTVAL	Analyst's ENTVAL is more than +/- 3% away from the ENTVAL obtained by correctly using the FCF[1-T], TV, WACC and g provided by the analyst.	61	26%
6.	1.6.1	EQVAL	Analyst's EQVAL is more than +/- 3% away from the EQVAL obtained by correctly using the ENTVAL and ADJ to ENTVAL provided by the analyst.	62	31%
7.	1.6.2	EQVALPS	Analyst's EQVALPS is more than +/- 3% away from the EQVALPS obtained by correctly using the EQVAL and SHS provided by the analyst.	113	4%
8.	1.7.1	SHS	Analyst's SHS is more than +/- 3% away from outstanding [fully diluted] common shares per Compustat at end of fiscal period prior to date of analyst’s report when analyst's DCF they are using outstanding [fully diluted] common shares.	93	15%
9.	1.7.2	DILUTION	Analyst's SHS in DCF model is not fully diluted, and is more than +/- 3% away from the fully diluted SHS per firm's most recent financial statements as of the analyst's report date.	113	6%
10.	1.8.1	At T	Analyst's % revenue growth in year T > min(2g, 6%)	76	50%
11.	1.8.2	At T	Analyst's % growth in CAPEX in year T > min(2g, 6%)	87	39%
12.	1.8.3	At T	Analyst's % revenue growth in year T > (analyst's % growth in CAPEX in year T + 3%)	67	33%
13.	1.8.4	At T	CAPEX[T] > (1.5 x D&A[T]) or < (0.5 x D&A[T])	66	32%
14.	1.8.5	At T	Analyst's ETR[T] is < 25% or > 40%	71	30%
15.	1.8.6	At T	Analyst's % FCF growth in year T > min(2g, 6%)		

Mean	23%
Median	25%

Notes:
i. FCF = unlevered free cash flow; FCF[1-T] = FCF for years 1 - terminal year T out from the valuation date; ΔWCAP = annual change in non-cash working capital.
ii. TV = analyst's terminal value; ENTVAL = analyst's enterprise value; EQVAL = analyst's equity value; EQVALPS = EQVAL per common share.
iii. SHS = shares used by analyst in deflating EQVAL to arrive at EQVALPS; CAPEX = annual capital expenditures forecasted by analyst.
iv. D&A = annual depreciation + amortization forecasted by analyst; ETR = firm's effective tax rate implicit in analyst's financial statement or DCF forecasts.

TABLE 4 (continued)

Panel B: Errors having to do with the denominator-related discount rate aspects of analysts' DCF models

#	Error code	Error category	Description of error having to do with the discount rates and discounting methods in analyst's DCF model.	NOBS	Error rate
1.	2.1	RF	Analyst's RF is more than +/- 30 bps away from the 10-year Treasury yield on the date of the analyst's report.	58	84%
2.	2.2	RE	Analyst's RE is more than +/- 30 bps from the RE obtained by correctly using CAPM components provided by analyst.	48	13%
3.	2.3.1	RD	Analyst's before-tax RD is zero.	42	14%
4.	2.3.2	RD	Analyst's tax rate applied to before-tax RD < 25% or > 40%	44	20%
5.	2.3.3	RD	Analyst's after-tax RD is zero.	42	17%
6.	2.3.4	RD	Analyst's RD is more than +/- 20 bps from the RD obtained by correctly using the components provided by the analyst.	34	3%
7.	2.4.1	WACC	Analyst's EQWEIGHT is more than +/- 10% away from the EQWEIGHT implied by the ratio of the analyst's EQVAL to the analyst's [ENTVAL - EQVAL].	56	30%
8.	2.4.2	WACC	Analyst assigns no weight to preferred stock in calculating WACC, even though the firm's financial statements show that the firm has preferred stock.	62	3%
9.	2.4.3	WACC	Analyst's WACC is more than +/- 30 bps away from the WACC obtained by correctly using the RE, RD, EQWEIGHT and DEBTWEIGHT information provided by the analyst.	37	22%
10.	2.5	PV(FCF[1-T])	Analyst's PV(FCF[1-T]) is more than +/- 3% away from the PV(FCF[1-T]) obtained by correctly using the analyst's FCF[1-T] and WACC.	75	13%
11.	2.6	PV(TV)	Analyst's PV(TV) is more than +/- 3% away from the PV(TV) obtained by correctly using the analyst's TV and WACC, and the T stated by the analyst or inferred from the analyst's FCF[1-T] and stated PV(FCF[1-T]).	76	24%
12.	2.7	MID_YEAR	Analyst's FCF are discounted explicitly at the end of the year or as if the FCF occur at the end of the year, not evenly over the year.	111	83%
13.	2.8	SCALE_UP	Analyst does not grow EQVALPS from the valuation date to the target date using RE.	103	93%
				Mean	32%
				Median	20%

Notes: v. RF = risk-free rate; RE = cost of equity; RD = cost of debt; WACC = after-tax weighted average cost of capital.
vi. EQWEIGHT = weight applied to RE in calculating WACC; DEBTWEIGHT = weight applied to after-tax RD in calculating WACC.
vii. PV(z) = present value of z, using WACC.

TABLE 5

Types and frequency of the dubious judgments made in the DCF models of 120 analyst reports from Investext, Jan. 2012 – Dec. 2013

#	Dubious judgments: Code	Label	Description of dubious judgment having to do analyst's DCF model.	NOBS	Dubious judgment rate
1.	3.1	BETA	Analyst's beta > 2.0	56	4%
2.	3.2	MKTPREM	Analyst's market risk premium > 9%	55	18%
3.	3.3	RE	Analyst's cost of equity < 8%	57	5%
4.	3.4	EQWEIGHT	Analyst's weight applied to RE in calculating WACC < 50%	58	5%
5.	3.5.1	WACC	Analyst's WACC < 7%	120	6%
6.	3.5.2	WACC	Analyst's WACC is constant over time when analyst's EQWEIGHT is more than +/- 20% away from the EQWEIGHT implied by the ratio of the analyst's EQVAL to the analyst's [ENTVAL - EQVAL].	56	14%
7.	3.6	TV_T	Analyst's terminal year is 4 years or less from valuation date t_0	111	14%
8.	3.7	LRROE	ROE[T] implicit in analyst's forecasted financial statements or DCF model < 5% or > 25%	19	26%
9.	3.8	TVFRAC	Analyst's TV accounts for > 85% of ENTVAL.	106	22%
10.	3.9	SENSITIVITY	Analyst provides no sensitivity analysis of effects of WACC, g or future FCF on EQVALPS.	120	48%
11.	3.10.1	CASH	Analyst adds total cash, not the operating component of total cash, to ENTVAL.	109	95%
12.	3.10.2	NET_FA	Analyst's adjustments to ENTVAL for net financial assets, contingent equity claims, minority interest and preferred stock in arriving at EQVAL are dubious (e.g., not subtracting minority interest, or adding rather than subtracting debt).	112	54%
13.	3.11.1	TIMING	$t_0 > t_{report}$	111	42%
14.	3.11.2	TIMING	$t_{report} > t_0 + 400$ calendar days.	111	3%
15.	3.11.3	TIMING	$t_0 > t_{tpx}$	103	2%
16.	3.11.4	TIMING	No t_{tpx} date provided by analyst in DCF or broker in disclosure section of analyst's report.	120	8%
17.	3.12.1	DISCLOSURE	Analyst's disclosure score regarding forecasted financial statements < 20%	111	27%
18.	3.12.2	DISCLOSURE	Analyst's disclosure score regarding derivation of FCF < 20%	120	19%
19.	3.12.3	DISCLOSURE	Analyst's disclosure score regarding WACC < 20%	120	48%
20.	3.12.4	DISCLOSURE	Analyst's disclosure score regarding converting FCF to EQVALPS < 20%	120	4%

Mean	23%
Median	16%

Notes: i. Valuation date t_0 is the date that best reconciles the analyst's forecasted FCF and TV with their present values and the analyst's ENTVAL.
ii. ROE[T] = implicit ROE in terminal year T, defined as net income in year T ÷ shareholder equity at end of year T.
iii. ENTVAL = analyst's enterprise value; EQVAL = analyst's equity value.
iv. t_0 = Effective date on which analyst's valuation is centered (viz., beginnning of Year 0 in Figure 2 = 12/31/11).
v. t_{report} = Date of analyst's report (viz., 9/24/12 in Figure 2).
vi. t_{tpx} = Date to which analyst's price target applies (viz., 6/30/13 in Figure 2).
v. Disclosure scores are defined and tabulated in Table 9.

TABLE 6

Numbers and rates of errors and dubious judgments made in the DCF models of 120 analyst reports sampled from Investext, Jan. 2012 – Dec. 2013. Rates are calculated per analyst report based on the numbers of error or judgment categories (see Tables 4 and 5) for which determining whether an error or dubious judgment has been made is possible.

Panel A: Errors and dubious judgments across all 120 observations

	NOBS	Min.	10th pctile	50th pctile	Mean	90th pctile	Max.
Number of errors per analyst	120	0	2	5	5.4	8	14
Number of gradeable errors per analyst	120	1	10	17	17.5	26	28
Error rate	120	0%	15%	32%	32%	47%	100%
Number of dubious judgments per analyst	120	1	2	5	4.5	6	8
Number of gradeable dubious judgments per analyst	120	7	13	15	15.8	19	20
Dubious judgment rate	120	5%	15%	29%	29%	43%	62%

Panel B: Errors and dubious judgments averaged by broker

Broker	Number of reports in sample	Mean number of errors	Mean number of dubious judgments	Mean error rate	Mean dubious judgment rate
Morgan Stanley	17	4.4	3.7	27%	25%
JP Morgan	11	5.4	3.7	38%	24%
Deutsche Bank	9	7.0	4.9	33%	30%
Jefferies	7	5.3	4.1	42%	30%
Cowen	7	5.9	5.1	32%	33%
Credit Suisse	6	5.3	5.2	30%	31%
BMO Capital Markets	5	4.4	4.4	30%	34%
Barclays	3	6.3	5.3	29%	32%
Canaccord Genuity	3	4.3	5.7	30%	38%
Cantor Fitzgerald	3	5.3	6.0	35%	40%
Craig Hallum	3	4.3	5.0	23%	36%
Evercore Partners	3	6.7	2.3	24%	12%
Macquarie	3	6.0	7.0	34%	42%
Maxim Group	3	5.0	4.0	34%	31%
Oppenheimer	3	5.3	2.3	25%	12%
Piper Jaffray	3	8.7	4.3	43%	25%
Pivotal Research Gp	3	7.3	6.7	39%	48%
Susquehanna	3	5.0	5.3	40%	38%
Brean Capital	2	5.5	7.0	29%	37%
Caris	2	4.5	5.5	25%	39%
Indigo Equity Research	2	2.5	3.0	31%	30%
KLR Group	2	3.0	2.0	20%	13%
Ladenburg Thalmann	2	7.0	3.5	45%	27%
Stonegate Securities	2	5.0	4.5	20%	29%
Buckingham Research	1	4.0	7.0	50%	50%
Feltl & Company	1	14.0	5.0	54%	26%
HSBC Global Research	1	1.0	5.0	11%	38%
Indaba Global Research	1	5.0	5.0	21%	26%
Leerink Swann	1	5.0	6.0	42%	43%
Miller Tabak	1	6.0	4.0	33%	29%
Morgan Keegan	1	4.0	5.0	15%	26%
National Alliance Sec.	1	6.0	3.0	35%	20%
Norne Securities	1	6.0	4.0	25%	21%
Sephirin Group	1	4.0	3.0	33%	21%
Wedbush	1	4.0	2.0	20%	13%
Wunderlich Securities	1	7.0	4.0	28%	21%
Zephirin Group	1	3.0	2.0	20%	14%

TABLE 7

Estimated impacts on the annualized expected return implied by the target prices in 120 analyst reports sampled from Investext, Jan. 2012 – Dec. 2013, before versus after major errors in analysts’ DCF models are corrected.

Annualized expected return (AER):	NOBS	Median	Mean	Std.dev.
AER embedded in uncorrected target price	111	13%	18%	48%
Δ AER from correcting target price for these errors:				
i. Analyst's post-terminal year growth rate g > 5%	57	0%	-2%	20%
ii. Analyst incorrectly includes FCF prior to valuation date, or makes incorrect adjustments to ENTVAL in arriving at EQVAL.	120	0%	0%	23%
iii. Analyst's RF is more than +/- 30 bps away from the 10-year Treasury Bill yield on analyst's report date.	18	21%	14%	29%
iv. Analyst's FCF are discounted end-of-year, not mid-year.	111	5%	5%	3%
v. Analyst does not scale up EQVALPS from the valuation date to the target date.	103	11%	12%	8%
All errors i. - v. combined by summing the median and mean percentages columns.		37%	29%	

TABLE 8

Distribution of the type and number of forecasted annual financial statements in 120 analyst reports containing DCF models sampled from Investext, Jan. 2012 – Dec. 2013.

			Number of years forecasted					
#	Type of forecasted annual financial statement	NOBS	Min.	10th pctile	50th pctile	Mean	90th pctile	Max.
1a.	Full I/S	120	0	2	3	3.7	8	11
1b.	Mini or partial I/S (when no full I/S provided)	10	0	0	3	2.1	3	3
2a.	Full B/S	120	0	0	2	2.3	6	11
2b.	Mini or partial B/S (when no full B/S provided)	54	0	0	0	0.7	3	3
3a.	Full SCF	120	0	0	2	2.2	6	11
3b.	Mini or partial SCF (when no full SCF provided)	52	0	0	0	1.0	3	6
4.	≥ 1 full set of {B/S, I/S, SCF}	120	49% of firms have ≥ 1 full set of {B/S, I/S, SCF}					

Note: We define a mini financial statement as one that contains only a few of the lines that would typically be present in a full financial statement. One example of a mini SCF would be an SCF that presents only net income, cash from operations, cash from investing, and cash from financing lines.

TABLE 9

Distribution of disclosure quality scores of the inputs to, and the contents of, DCF equity valuation models in 120 analyst reports sampled from Investext, Jan. 2012 – Dec. 2013, and the correlations between the scores.

Panel A: Descriptive statistics on disclosure quality scores

#	Disclosure quality score for:	NOBS	Min.	10th pctile	50th pctile	90th pctile	Max.
A.	Forecasted financial statements	111	4%	9%	33%	100%	233%
B.	Deriving FCF	120	0%	10%	85%	100%	100%
C.	WACC	120	9%	9%	36%	91%	100%
D.	Converting FCF to EQVALPS	120	0%	66%	81%	92%	92%
	Total disclosure quality score (equally-weighted avg. of A-D)	120	9%	34%	57%	78%	110%

Panel B: Pearson correlations between the scores

	Pearson correlations	B.	C.	D.
A.	Forecasted financial statements	-0.01	0.04	-0.21
B.	Deriving FCF		0.13	0.31
C.	WACC			-0.03
D.	Converting FCF to EQVALPS			

Notes: Disclosure quality scores are computed as follows:

A. Forecasted financial statements: 3 (1) points are scored for each annual full (mini) B/S, I/S and SCF forecasted by the analyst. The sum is then divided by 3 x 3 x T. Since T sometimes exceeds the number of years the analyst forecasts future financial statements for, the disclosure quality score for forecasted financial statements can exceed 100%. Also, because T may not be shown in the analyst's DCF model (e.g., the analyst simply states what WACC is and what their estimated equity value per share is), there are some reports for which the score cannot be calculated.

B. Deriving FCF: 1 point is scored for each of the following 10 lines that are explicitly or implicitly forecasted by the analyst in their DCF-to-all-investors model: EBITDA, depreciation & amortization, EBIT, taxes on EBIT, NOPAT, depreciation & amortization (again), Δ working capital, after tax operating cash flows, CAPEX, and free cash flows. The sum is then divided by 10. An explicit forecast occurs when the analyst writes a number down for a given line. An implicit forecast occurs when the analyst does not write a number down for a given line, but the number for the given line can be deduced from other lines the analyst has explicitly forecasted.

C. WACC: 1 point is scored for each of the 11 components used in calculating WACC per panel C of Table 3. The sum is then divided by 11.

D. Converting FCF to EQVALPS. 1 point is scored for each of the following 12 items when explicitly shown on the analyst's DCF: Horizon year (max of 1 pt), PV of FCF in each individual year in forecast horizon (max of 1 pt), total PV of all forecasted FCFs, terminal value, PV of terminal value, enterprise value, cash, debt, equity value, shares used to deflate equity value, equity value per share, and date that the forecasted equity value per share applies to. The sum is then divided by 12.

TABLE 10

Regressions of the error rates and dubious judgment rates made by analysts in their DCF models in 120 analyst reports sampled from Investext, Jan. 2012 – Dec. 2013, on hypothesized explanatory variables.

		Dependent variable			
	Pred. coef	DCF model error rate		DCF model dubious judment rate	
Independent variables	sign	Coef.	t-stat.	Coef.	t-stat.
Forecasted financial statements disclosure score	-	0.00	0.02	-0.05	-1.85
Deriving FCF disclosure score	-	0.06	1.54	-0.05	-1.85
WACC disclosure score	-	-0.11	-3.04	-0.15	-6.09
Converting FCF to EQVALPS disclosure score	-	-0.08	-1.12	-0.02	-0.35
CFA on analyst team? (y=1, n=0)	-	-0.01	-0.50	0.01	0.76
# pages in analyst report	-	0.00	-0.15	0.00	-1.13
# analysts on analyst team	-	0.02	0.99	0.00	0.09
ln(1 + # years firm has been publicly listed)	-	-0.02	-1.49	0.01	1.10
Prominence of brokerage firm	-	-0.01	-0.56	-0.02	-1.10
Adjusted R-squared		5%		30%	
F-stat (significance)		1.7 (0.10)		6.6 (< 0.001)	
# obs.		120		120	

FIGURE 1

Prototypical timeline in DCF valuation model in a sell-side equity analyst company report. Dates are illustrative only, and assume a 12-month ahead target price horizon.

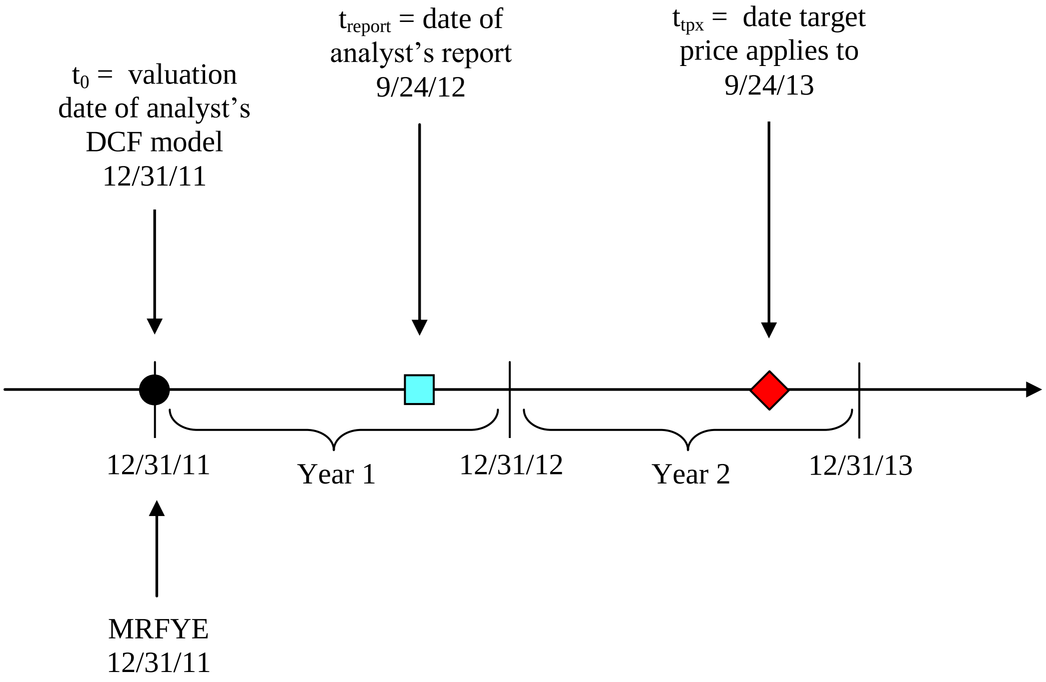


FIGURE 2

Illustration of our definition of a correctly structured and executed condensed DCF-to-all-investors equity valuation model

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10 = T
Fiscal year of forecast (FYE = 12/31)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Revenues	$ 11,000	$ 11,990	$ 12,949	$ 13,856	$ 14,687	$ 15,421	$ 16,038	$ 16,519	$ 16,850	$ 17,018
Earnings before interest, taxes, and depn, depln & amortzn (EBITDA)	$ 2,200	$ 2,398	$ 2,590	$ 2,771	$ 2,937	$ 3,084	$ 3,208	$ 3,304	$ 3,370	$ 3,404
- Depn, depln & amortzn	$ (220)	$ (240)	$ (259)	$ (277)	$ (294)	$ (308)	$ (321)	$ (330)	$ (337)	$ (340)
= Operating income (EBIT)	$ 1,980	$ 2,158	$ 2,331	$ 2,494	$ 2,644	$ 2,776	$ 2,887	$ 2,973	$ 3,033	$ 3,063
- Taxes on EBIT	$ (436)	$ (518)	$ (606)	$ (698)	$ (793)	$ (888)	$ (982)	$ (1,070)	$ (1,153)	$ (1,225)
= Unlevered net income (NOPAT)	$ 1,544	$ 1,640	$ 1,725	$ 1,796	$ 1,851	$ 1,888	$ 1,905	$ 1,903	$ 1,880	$ 1,838
+ Depn, depln & amortzn	$ 220	$ 240	$ 259	$ 277	$ 294	$ 308	$ 321	$ 330	$ 337	$ 340
- Δ Working capital	$ (50)	$ (50)	$ (48)	$ (45)	$ (42)	$ (37)	$ (31)	$ (24)	$ (17)	$ (8)
= After-tax operating cash flow	$ 1,714	$ 1,831	$ 1,936	$ 2,027	$ 2,103	$ 2,159	$ 2,195	$ 2,209	$ 2,201	$ 2,170
- CAPEX	$ (313)	$ (328)	$ (341)	$ (352)	$ (359)	$ (362)	$ (362)	$ (359)	$ (352)	$ (341)
= Free cash flow (FCF) to all investors	$ 1,402	$ 1,502	$ 1,594	$ 1,676	$ 1,744	$ 1,797	$ 1,833	$ 1,851	$ 1,849	$ 1,829
Terminal value of FCF beyond T										$ 20,493
PV of yearly FCFs years 1-T	$ 1,274	$ 1,241	$ 1,197	$ 1,144	$ 1,082	$ 1,014	$ 940	$ 862	$ 783	$ 704

PV of total FCFs years 1-T	$ 10,242
+ PV of terminal value	$ 7,891
= Enterprise value	$ 18,133
- Interest bearing debt & financial liabilities	$ (2,370)
+ Non-operating ("excess") cash & other financial assets	$ 130
- Contingent equity claims	$ (160)
- Minority interest	$ (20)
- Preferred stock	$ (100)
= Equity value at analyst valuation date before time adjustments	$ 15,613
x Adjustment factor to recognize that cash flows are mid-year	5.4%
x Adjustment to scale up equity value from valuation date to report date	7.9%
= Equity value at analyst valuation date	$ 17,749
Common shs outstanding at analyst report date	1,000
= Equity value per share at analyst report date	$ 17.75
x Adjustment to scale up equity value from report date to target price date	8.2%
= Forecasted equity value per share at analyst target price date	$ 19.21

RF Horizon (years):	10
RF:	1.7%
Beta:	1.50
Market risk premium:	6.0%
RE:	10.7%
Equity weight:	90.0%
RD (before tax):	5.8%
Tax rate:	40%
RD (after tax):	3.5%
Debt weight:	10.0%
WACC:	10.0%

Valuation date:	12/31/2011
Analyst report date:	9/24/2012
Target price date:	6/30/2013
Perpetuity growth rate in annual FCF after terminal year:	1.0%
Current stock price:	$ 17.02
Target stock price:	$ 19.21
Annualized expected return in target price:	17.1%

Note: Some numbers reflect the effects of rounding.

FIGURE 2 (continued)

Notes:

i. The DCF-to-all-investors equity valuation model in Figure 2 is stylized in that it is a deliberately condensed version of what we assume to be 100% correct, namely the DCF-to-all-investors valuation model detailed by Lundholm and Sloan in their book *Equity Valuation and Analysis with eVal* (3rd edition, 2013, especially p.154-155; p.225; pp.239-243). We adopt a less than fully correct DCF valuation model against which to grade analysts for two main reasons. First, most of the differences detailed in the Notes to Figure 2 are in expectation likely to occur infrequently and be economically small. Second, it is rare for analysts to include the items represented by these differences in their models, and we wish to avoid biasing our study in favor of concluding that analysts construct and execute DCF valuation models in an unsophisticated manner. Thus, if analysts are aware of the differences but rationally choose to exclude them because they are infrequent and immaterial, then we risk downwardly bias our assessment of analyst sophistication if we include the differences in our grading template. Conversely, if analysts are not aware that the differences exist but we grade analysts under the presumption that they should be aware, then we risk concluding that analysts are unsophisticated based on a large number of economically small aspects of DCF modeling and execution, rather than on economically or theoretically important errors.

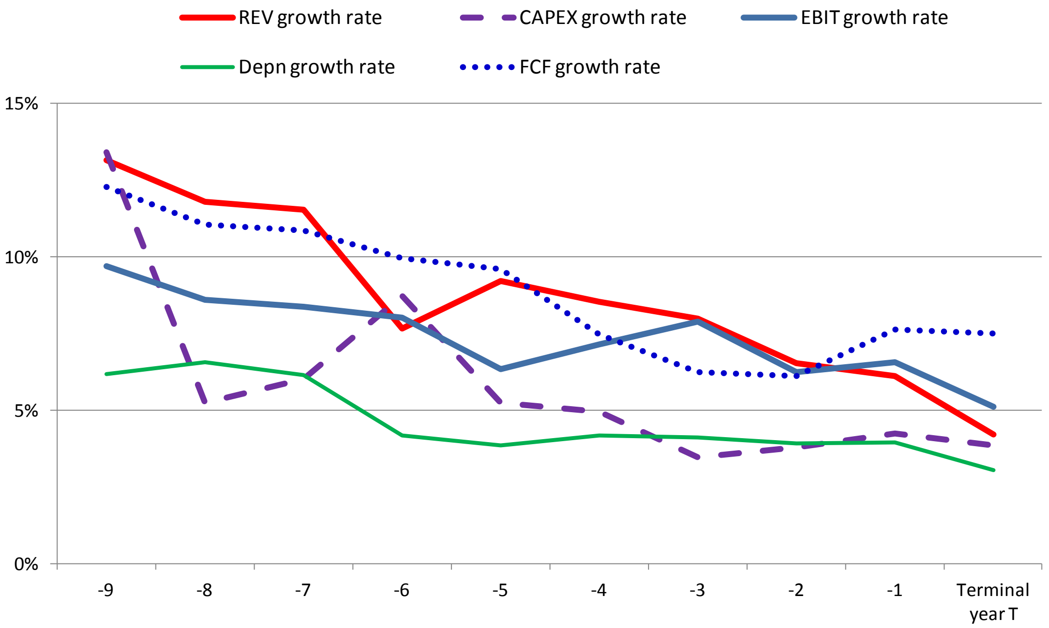
ii. The differences that we itemize between our stylized model and that of Lundholm and Sloan are as follows. We explicate the differences because if an analyst's DCF model does not conform to Lundholm and Sloan's assumed 100% correct model, but does conform to our reduced model, we do <u>not</u> grade the analyst as having made an error or dubious judgment.

- We do not include a line for the Change in Deferred Taxes after Taxes on EBIT. Some analysts address the deferred tax effect of the line Taxes on EBIT by forecasting Cash Taxes on EBIT instead of (book) Taxes on EBIT.
- We do not include lines for Non-Operating Income (Loss) or Extraordinary Items & Discontinued Operations after the Depreciation & Amortization add-back line after NOPAT.
- We do not include lines for Increase in Investments, Purchase of Intangibles, Increase in Other Assets, Increase in Other Liabilities, or Clean Surplus Plug after the CAPEX line.
- We do not include the cost of preferred stock or the cost of minority interest in calculating WACC.
- We do not mark the firm's financial assets and liabilities to their market values.
- We ignore company warrants, and ascribe no value to the conversion options embedded in convertible bonds.
- We address the contingent equity claim of employee stock options by (leniently) only grading the analyst as having made an error if the analyst arrives at their equity value per share by dividing their dollar equity value of the firm by outstanding common shares, and then only if the difference between basic and fully diluted common shares as of the most recent fiscal period prior to the report date exceeds 5% of common shares outstanding.
- We do not include information about year T+1 in Figure 2, even though a 100% correct DCF model should show year T+1 to prove out to the reader that steady state has been achieved (Levin and Olsson, 2000; Lundholm and Sloan, 2013). We do not grade analysts as having made an error if they do not show year T+1 data, although we do grade them with regard to the economic plausibility of the implied rates of growth in key financial statement variables and ratios in year T.

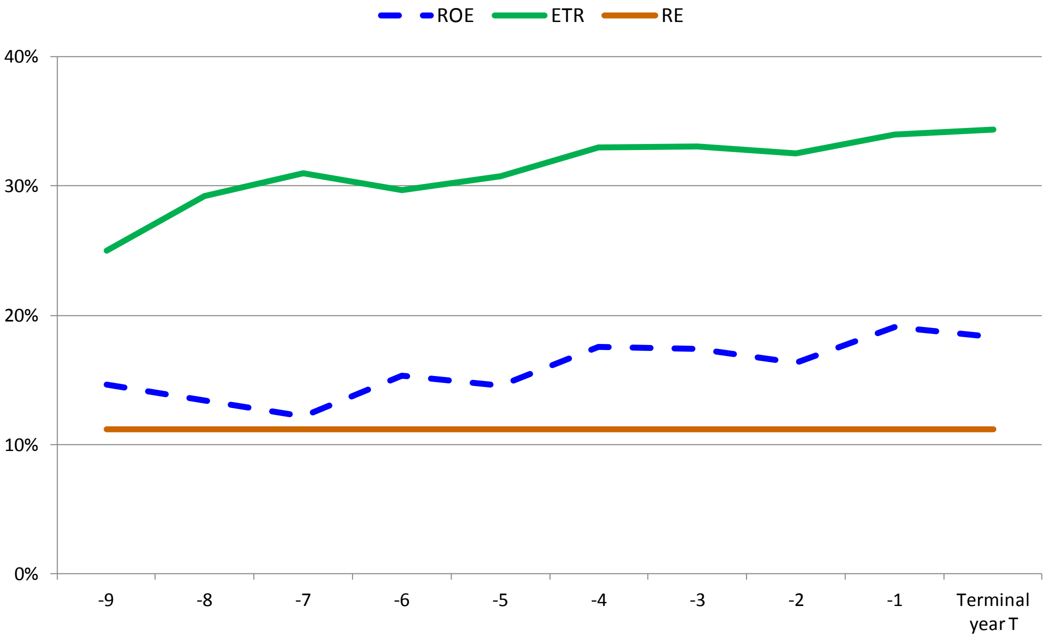
FIGURE 3

Trajectories of key financial statement ratios in event time relative to the DCF terminal year. Ratios are derived from the forecasted financial statements and/or DCF equity valuation models in 120 analyst reports sampled from Investext, Jan. 2012 – Dec. 2013.

Panel A Median rates of growth in financial statement variables



Panel B Median values of firms' ROE, effective tax rate ETR, and cost of equity capital RE



Note: The number of observations from which the median values plotted above are taken range between 12 and 108. The median number of observations in any given event year is 58.

The dual use of residual income and discounted cash flow valuation methods by U.S. sell-side equity analysts

John R. M. Hand[*]
UNC Chapel Hill
hand@unc.edu

Joshua Coyne
Univ. of Memphis
jgcoyne@memphis.edu

Jeremiah Green
Penn State
jrg28@psu.edu

X. Frank Zhang
Yale University
frank.zhang@yale.edu

Abstract

We explore the use of residual income (RI) valuation by U.S. sell-side equity analysts by comparing the characteristics and performance of RI valuations with those of discounted cash flow (DCF) when both methods are used by the same analysts for the same firm in the same report. We find that analysts are equally likely to adopt RI valuations built around forecasting net operating income (RNOA-RI) as around net income (ROE-RI). However, the economic properties of RNOA-RI and ROE-RI valuations are quite different. RNOA-RI valuations are optimistic relative to future prices and contain forecasted RNOAs that increase toward a terminal year median of 28%, whereas ROE-RI valuations are unbiased relative to future stock prices and contain ROEs that decline toward a terminal year median of 17%. Supporting our conclusion that ROE-RI valuations tend in practice to be superior to DCF and RNOA-RI valuations, we observe that analysts' ROE-RI valuations are stronger determinants of analysts' target prices than are their DCF or RNOA-RI counterparts.

This version: January 20, 2015

Keywords: Equity analysts; DCF; residual income; valuation; analyst sophistication

JEL codes: G12, G17, G32

---

[*] Corresponding author; tel. 919.962.3173. We appreciate the helpful comments provided by Peter Joos, Trevor Harris, and workshop participants at UNC Chapel Hill. All errors are our own.

1. Introduction and overview

Beginning with the seminal papers of Ohlson (1995) and Feltham and Ohlson (1995), residual income (RI) valuation has gained prominence in academic accounting. Notable examples of its use include the value-relevance literature (Barth, Beaver and Landsman, 2001), identifying mispriced stocks (Lee, Myers and Swaminathan, 1999), estimating firms' costs of capital (Li and Mohanram, 2014), and understanding risk and growth (Penman 2011; Penman and Reggiani, 2013). RI is also widely taught alongside DCF methods in MBA valuation classes (Easton, McAnally, Sommers and Zhang, 2014; Lundholm and Sloan, 2013; Penman, 2012) and in the CFA curriculum (Pinto, Henry, Robinson and Stowe, 2010; CFA 2014 Level II Program curriculum).

In this study we contribute to the RI valuation literature by providing the first academic evidence on the use of RI in practice by sell-side equity analysts. Given the predominance of DCF in analysts' formal valuation modeling and the need to control for multiple determinants of DCF and RI valuations when undertaken by different analysts for different firms on different dates, we study analysts' RI methods using the subset of analyst reports issued by U.S. brokers that contain dual equity valuations—one from a DCF model and one from an RI model. We identify 422 such reports from Investext that span 103 firms over the period May 1998 - Oct. 2011.

Using this dataset, we conduct a series of empirical descriptions and tests. First, we observe that half of analysts' RI valuations are built around forecasting operating income and/or the return on net operating assets (the RNOA-RI method), and half are built on forecasting net income and/or the return on equity (the ROE-RI method). We then note that although in their DCF valuations analysts rarely report any measures of the economic rates of return implied by their forecasts of free cash flows, in their RNOA-RI (ROE-RI) valuations analysts almost always show such metrics in the form of RNOA and residual RNOA (ROE and residual ROE). The visibility of these long-term forecasted rates of return allows us to assess the sophistication of analysts' implementation of each RI valuation method since the effects of competition require that rational forecasts of long-term RNOA and ROE converge toward firms' weighted average and equity costs of capital, respectively.

Second, we find that analysts' DCF and ROE-RI valuations are often materially different from each other, while analysts' RNOA-RI valuations are very close to their DCF estimates. Specifically, we observe that ROE-RI valuations are lower than their DCF counterparts by an average of 5% and just 9% (44%) of ROE-RI valuations are within +/- 1% (5%) of DCF valuations. In contrast, RNOA-RI valuations are on average almost exactly equal to their DCF counterparts and 34% (93%) are within +/- 1% (5%) of DCF valuations. The magnitude of the difference in the differences between DCF vs. RNOA-RI and DCF vs. ROE-RI valuations lead us to hypothesize that analysts' ROE-RI valuations are created independently of their DCF valuations, whereas analysts' RNOA-RI valuations are purely a repackaging of their preexisting DCF data inputs and valuations.

Third, we find that RNOA-RI valuations are optimistic relative to realized one-year-ahead prices by an average of 7% and contain forecasted RNOAs that increase toward a terminal year median of 28%. We argue that because a terminal year RNOA of 28% is economically implausible, and because analysts' DCF and RNOA-RI valuations are so similar to each other, analysts' RNOA-RI and DCF valuations reflect an equal lack of sophistication in economic forecasting. In contrast, analysts' ROE-RI valuations are more sophisticated in that they are unbiased relative to future prices and contain future ROEs that more sensibly decline over time toward a terminal year median of 17%.

Fourth, we propose that the divergent trajectories in analysts' forecasts of RNOA and ROE highlight a previously unrecognized practical advantage of using ROE-RI. This is that by focusing on the evolution of just ROE instead of the evolutions of both RNOA and financial leverage, ROE-RI reduces the risk that the user will make the economically unreasonable financial leverage assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholders. We argue that the reason that analysts' forecasts of RNOA increase over time while their forecasts of ROE decrease is that in their RNOA-RI and DCF models analysts are making exactly this assumption, and to such a degree that its negative effect on ROE more than compensates for the positive impact of increasing RNOAs.

Lastly, we examine the role of different valuations in determining target prices by regressing analysts' target prices on analysts' DCF, RNOA-RI, and ROE-RI valuations. We find that between DCF and ROE-RI valuations, analysts' target prices are more determined by their ROE-RI valuations than their DCF counterparts. In contrast, between DCF and RNOA-RI valuations, only DCF matters in explaining analysts' target prices. The latter result supports our hypothesis that RNOA-RI valuations are mere derivatives of underlying DCF valuations, but that ROE-RI valuations are not.

Overall, we conclude from our data that ROE-RI valuation is in practice superior to DCF and RNOA-RI, and suggest that this makes its infrequent use by practitioners puzzling. We also conclude that while DCF has been criticized as promoting upwardly biased value estimates because it rarely reports the RNOAs that underlie projected free cash flows (Bernard, 1994), simply making the RNOAs visible as is the case in the RNOA-RI valuations we study does not necessarily yield more conservative valuations than DCF. We argue that the benefits of RI can only be obtained when practitioners explicitly allow their long-term forecasts to reflect the pervasive effects of competition, which in turn necessitates that analysts' forecasted RNOAs and ROEs fade toward the weighted average and equity costs of capital, respectively. We hope that our findings and perspectives will encourage both analyst and non-analyst practitioners to use ROE-RI valuation more frequently.

The remainder of our paper proceeds as follows. In section 2 we review the academic and practitioner literatures on DCF and RI valuation, and in section 3 motivate our interest in RI as undertaken by sell side equity analysts. In section 4 we present the criteria we use to arrive at a set of analyst reports that contain dual DCF and RI valuations. In section 5 we present our findings on the characteristics and performance of the DCF, RNOA-RI and ROE-RI valuations in our dataset. We conclude in section 6.

2. Prior academic and practitioner literature on DCF and RI valuation

2.1 DCF valuation

The literature on DCF is often seen as beginning with two important texts: Irving Fisher's *The Theory of Interest* (1930) and John Burr Williams' *The Theory of Investment Value* (1938). In the latter book—based on his Ph.D. thesis, the topic of which was suggested to him by Joseph Schumpeter—Williams argues that the value of an asset should be evaluated by "the rule of present worth." Applied to common stock, this meant that the intrinsic value of equity should rationally be viewed as the present value of expected future cash flows in the form of dividends and selling price.[1]

From this starting point, finance academics in the 1960s began to flesh out the dividend discount model (DDM), initially by focusing via the CAPM on the discount rate. As MBA programs that finance academics taught in grew in size and stature, they began to pay more attention to the practical limitations of the DDM due to its focusing on the distribution of cash to shareholders, the magnitude and timing of which Modigliani and Miller (1961) argue are irrelevant to shareholder value.[2] This concern led to the development of the current warhorse approach to valuation taken in the classroom, research and Wall Street, namely the "discounted cash flow" or DCF model. Isomorphic to the DDM, in the DCF model valuation centers on forecasting the cash flows generated by the firm's operating and investing activities, rather than the distribution of cash paid out via the firm's financing activities. The DCF model is typically implemented by predicting the expected future free cash flows to all investors, discounting them by the firm's weighted average cost of capital, and then subtracting the value of the firm's net financial liabilities to arrive at equity value.

Although the DCF method was well laid out and promoted by prominent academics and practitioners such as Copeland and Weston (1979), Brealey and Myers (1981, 1984), Rappaport (1986), and Copeland, Koller and Murrin (1990, 1995), until the late 1990s the main capital market users of DCF were investment banks in supplying fairness opinions to target shareholders in

---

[1] See Wikipedia's entries for John Burr Williams, and for Discounted Cash Flow.

[2] To quote Penman (2012, p.6), "A conundrum has to be resolved (in implementing the DDM): Value is based on expected dividends, but forecasting dividends is irrelevant to valuation."

corporate mergers and change of control transactions such as management buyouts (DeAngelo, 1990).[3] Even until the late 1990s sell-side equity analysts focused on multiples and tended to ignore DCF models (Arnold and Moizer 1984, Block 1999, Barker, 1999; Bradshaw, 2002; Demirako, Strong and Walker, 2004; Asquith, Mikhail and Au, 2005). However, starting in the early 2000s, analysts placed a greater emphasis on DCF models, a change that Imam, Barker and Clubb (2008) and Imam, Chan and Shah (2013) attribute to the lack of rational valuation methods used in the Internet bubble and associated criticisms of the research quality of investment analysts. The place of DCF as of today in the practitioner world is such that virtually every equity valuation model used by leading investment banks is based on DCF (Viebig, Poddig and Varmaz, 2008).[4]

Somewhat in contrast to this prevalence, however, relatively little in the way of finance research has centered on research questions that require or use explicitly derived DCF valuations. Kaplan and Ruback (1995) examine the DCF method in the context of highly leveraged transactions and find that that DCF valuation has approximately the same valuation accuracy as EV/EBITDA multiples. In the context of firms emerging from Ch. 11, Gilson, Hotchkiss and Ruback (2000) find that DCF valuations have a similar degree of accuracy as valuations that use comparable-firm multiples. More recently, motivated by studies that find that analysts use target prices to justify their recommendations (Bradshaw, 2002) and that analysts' target prices are useful to investors (Brav and Lehavy, 2003), a few papers have investigated the degree to which analysts' price targets are based on underlying DCF versus multiples-based valuations. Results suggest that while multiples-based valuation dominates DCF in importance when setting target prices (Imam, Barker and Clubb, 2008), DCF models are significantly more likely to be met at the end of a 12-month forecast horizon than are price-to-earnings models (Demirakos, Strong and Walker, 2010).

2.2 Residual income valuation

The academic literature on RI in part parallels that of DCF, but has some notable differences. The first parallel is that like DCF, the origins of RI date to the late 1930s when Preinrich (1938) derived from a 1925 paper by Hotelling an expression for 'capital value' that equated capital value to

---

[3] Per DeAngelo (1986, p.101), "Directors can be held liable for breach of fiduciary duty if they fail to consider explicit valuation evidence before acting on a bid. This standard of caser is usually satisfied by an investment banker's opinion that the offer is inadequate. Thus, managers who resist a hostile bid typically hire an investment bank to provide them a DCF-based opinion that the offer terms are inadequate. It should also be noted that DCF is only one of multiple valuation approaches that investment banks may provide their client in such situations, other examples being comparable firm valuations, comparable acquisition valuations, and asset-based valuations."

[4] Viebig, Poddig and Varmaz (2008, p.9) state that "The most sophisticated DCF models used by financial analysts today are, in our opinion, Credit Suisse's Cash Flow Return on Investment (CFROI) model, Morgan Stanley's ModelWare and UBS's Value Creation Analysis Model (VCAM). In Part VI [of our book] we discuss leveraged buyout (LBO) models used by Goldman Sachs, UBS and other leading investment banks."

book value plus discounted excess profits.[5] Despite subsequent work by Edwards and Bell (1961, Ch. 2, Appendix B), Peasnell (1982) and Brief and Lawson (1992), the use of RI in valuation was largely ignored until the 'rediscovering' attention paid to it in the seminal papers of Ohlson (1995) and Feltham and Ohlson (1995). The second parallel of RI with DCF is that RI is now widely taught in MBA programs alongside DCF (Lundholm and Sloan, 2006, 2007, 2013) as well as in the CFA curriculum (Pinto, Henry, Robinson and Stowe, 2010; CFA 2014 Level II Program curriculum).

However, the use of RI by academics and practitioners differs sharply from the use of DCF by academics and practitioners. Unlike DCF, since 1995 RI valuation has been fruitfully used in many areas of research, including the value-relevance literature (Barth, Beaver and Landsman, 2001), identifying mispriced stocks (Lee, 1999; Ali, Hwang and Trombley, 2003), estimating firms' costs of capital (Li and Mohanram, 2014), and understanding risk and growth (Penman 2011; Penman and Reggiani, 2013). Moreover, unlike DCF, informally derived evidence suggests that RI is only infrequently used by practitioners to value stocks.[6] For example, and as reflected in our analyst reports dataset containing dual DCF and RI valuations, of investment banks only Morgan Stanley has historically embraced RI (Harris, Estridge and Nissim, 2008).

The attraction of RI valuation to academics—especially accounting researchers—arises for both theoretical and empirical reasons. On the theory side, RI is algebraically isomorphic to DDM; it exhibits the Modigliani and Miller (1958, 1961) dividend displacement property; it focuses on the creation not distribution of value; by moving away from pure cash accounting it nests the DCF model within it as a special case; and it makes central to valuation the long-term expected return on net operating assets or equity. In terms of empirics, among other benefits RI has been seen as one way to legitimize the use of cross-sectional 'price levels' regressions. It also provides a compact way to embed analysts' near term earnings forecasts into models of intrinsic value, and provides a way for cost of capital estimates to be extracted from stock prices. At the same time, however, RI has generated its share of academic controversy, most notably with regard to how and why large-scale machine-driven implementations of DCF and RI valuations at times yield very different results, even

---

[5] Specifically, Preinrich (1938, p.240) states that "By means of elementary operations, the capital-value formula [equation] (43) can easily be converted into [equation] (57)" in which capital value equals book value plus discounted excess profits. Equation (43) comes from the capital value concept advanced in Hotelling (1925) that equates the capital value of a single machine to the discounted net rental of the machine plus the discounted scrap value of the machine. This said, however, Cwynar (2009) argues that Alfred Marshall's *Principles of Economics* (1890) and Robert Hamilton's *An Introduction to Merchandize* (1777) contain even earlier demonstrations of the concept of residual income.

[6] Residual income does form the basis of the approach taken by many practitioners to evaluate firm performance, the most noteworthy example of which is Stern Stewart & Co.'s economic value added or EVA metric.

though both approaches should yield the same output given the same inputs (Penman and Sougiannis, 1998; Francis, Olsson and Oswald, 2000; Lundholm and O'Keefe, 2001a, 2001b; Penman, 2001).

3. Research motivation and method

3.1 Research motivation

We seek to contribute to the literature on RI valuation by providing evidence on the use of RI by U.S. sell-side equity analysts. The chief motivation for our research is the argument that because sell-side equity analysts are economically important stock market participants, studying their use of RI valuation sheds light on the economic importance of RI methods. If RI valuation leads to more economically sensible analyst forecasts and yields less biased analyst valuations than other approaches such as DCF, then the view that the development of RI valuation methods has had practical value is supported. On the other hand, if analysts' RI valuations are more biased than their DCF valuations, then it may be that the teaching of RIV by academics to their MBA students who take jobs on Wall Street has been flawed, or for reasons that are not well understood RI valuation has attributes that diminish its practical usefulness which in turn warrants understanding by scholars.

3.2 Research method

Our research method is to directly analyze the subset of sell side equity analysts reports that contain dual equity valuations—one from a DCF model and (at least) one from an RI model.[7] As compared to collecting one set of analyst reports that only contain DCF valuations and a separate set that only contains RI valuations, the strength of our approach is that it controls for many of the potential determinants of variation in DCF and RI valuations that arise when such valuations are done by different analysts for different firms in different reports on different dates. These include the identities and experience of the issuing analysts, the date and macroeconomic timing of the report, the report's stock recommendation, the identify and history of the firm, the firm's industry, the equity and weighted average costs of capital used by the analysts, and the quantitative and qualitative components of the analysts' information set outside of the inputs used in the DCF and RI valuations.[8] In addition, because analysts can use either RNOA-RI or ROE-RI valuations (or both), our dual-valuation approach allows us to assess different roles that RNOA-RI and ROE-RI valuation methods

---

[7] Awe view understanding the reasons behind when and why analysts use multiple valuation methods in general (not limited to DCF and RI, but broadened to DCF, RI, sum of the parts, dividend discount, and multiples) as being a worthwhile topic for future research, but outside the defined scope of our paper.

[8] Work by Bonini, Zanetti, Bianchini and Salvi (2010), Bilinkski, Lyssimachou and Walker (2013) and Bradshaw, Huang and Tan (2014) indicates that the accuracy and optimism in analysts' target prices is a complex function of many economic determinants that vary across analysts, firms, time, institutional incentives and legal regimes.

play relative to DCF in analysts' reports. However, we recognize that the benefits we achieve in terms of high internal validity come with the counterweight that our findings may have a low degree of external validity because the choice of whether to use only DCF, only RI, or both DCF and RI may be systematically associated with the characteristics and performance of equity valuations produced by each method. To the extent that this is so, we expect that our results will not fully generalize back to the population of actual or potential users of DCF and RI valuation methods.

We adopt a hand-collection, textual content-based approach to investigating the role of RI valuation in analyst reports because we are unaware of any preexisting archival database that contains reliable information on the valuation methods used by, and modeling details associated with, analyst valuations.[9] Content-based analysis has gained greater academic acceptance in recent years due to the advantages it can offer with regard to addressing research questions that seek to look inside the 'black box' of analysts' the decision processes (Schipper, 1991; Bradshaw, 2011; Brown, call, Clement and Sharp, 2013; Green, Hand and Zhang, 2014; Markou and Taylor, 2014).

4. Sell-side equity analyst reports that contain both DCF and RI equity valuation models

4.1 Sample selection and examples of DCF and RI valuations

Table 1 presents the criteria we employ to identify sell-side equity analyst reports that contain both a DCF and a RI model, and their associated valuations. We searched Investext to identify analyst reports issued over the period 1/1/98 – 12/31/13 that contained the keywords "residual income" and either "DCF" or "discounted cash flow*" in their Table of Contents (panel A). We then retained only those reports that were for companies, for the U.S., and provided by brokers. This yielded an initial set of 478 reports. After inspecting each report, for reasons listed in panel B we excluded 56 reports as they lacked certain data items, such as no dollar per share figure provided for either the DCF or RI valuation. The final dataset of 422 reports covers 103 different firms.

We impose the restriction that the keywords be present in the Table of Contents, rather than the weaker requirement that the keywords be present only in the Text, in order to maximize the likelihood that the resulting reports will contain fully developed DCF and RI valuation models, rather than just single number or single sentence mentions of the keywords without supporting valuation structures. Although using the weaker requirements yielded 3,050 reports, untabulated analysis reveals that almost all of these reports (outside the initial set of 478 obtained under the Table of Contents restriction) do not contain full blown DCF and RI models.

---

[9] We therefore differ from the indirect type of approach taken by Gleason, Johnson and Li (2013) who infer the type of valuation model used by analysts in setting their price targets by comparing actual price targets with pseudo-price targets that the authors create using an ROE-based RI model and a PEG model.

We note that searching Investext for reports over the 1998-2013 period that contain only the keywords “residual income” and not also “DCF” or “discounted cash flow*” in the Table of Contents yielded 2,426 reports, while similarly searching for only the keywords “DCF” or “discounted cash flow*” but not also “residual income” resulted in 46,878 reports. The former figure suggests that residual income has been infrequently used by sell-side analysts working for U.S. brokers, both in an absolute sense (our data imply that one report containing an RI model was issued every two business days) and relative to DCF (present in about 10 reports per business day and thus 18 times more common than RI).

Panel C shows that all but five of the analyst reports were issued by a single broker, Morgan Stanley. The dominance of Morgan Stanley stems from the initiatives put into place by Professor Trevor Harris of Columbia University while he was an advisor to and employee at Morgan Stanley. This dominance likely reduces the generalizability of our results over and above the aspects of our quasi-experimental approach highlighted in section 3.2, but is an unavoidable feature of our design.[10]

Per panel D, each analyst report in our final dataset contains a DCF and an RI valuation. We note that of the 422 reports, 156 contain an RI model that centers on forecasting NOI and/or RNOA, 155 contain an RI model that centers on forecasting NI and/or ROE, and 111 contain both RNOA-based and ROE-based valuations. The RNOA-RI method parallels DCF by estimating the value of the entire firm, from which net financial liabilities are subtracted in order to arrive at the value of equity, while the ROE-RI method estimates the value of equity directly and is the approach most commonly (although not exclusively) taught in MBA classes and used in academic research.

In Figures 1 and 2 we supply illustrative examples of the dual valuations in our dataset. Figure 1 is taken from p.10 of Morgan Stanley’s report on Nike issued on 12/12/02, and shows the DCF and RNOA-RI valuations exactly as disclosed. The DCF model is structured in a standard manner, both with regard to numerator components that culminate in forecasted free cash flows to all investors, and the components of the firm’s weighted average cost of capital (WACC). The RNOA-RI model located immediately below the DCF model is also conventional in structure and detail, although in places it uses terminology different to that in most valuation texts.[11] Figure 2 comes from Morgan Stanley’s report on Carnival Corp. issued on 1/29/04, and shows the DCF and ROE-RI valuations shown in that report on p.9 and p.10, respectively. Similar to Figure 1, the DCF model in panel A is structured in a standard and detailed manner, as is the ROE-RI model in panel B.

---

[10] We note that Joos and Piotrosk (2013) and Joos, Piotroski and Srinivasan (2014) also use data from a single broker (Morgan Stanley) to informative and interesting ends.

[11] For example, the model uses ROCE to denote return on capital employed rather than to denote return on common equity. In this report, capital (and ‘invested capital’) is net operating assets not assets or equity. The model also uses EVA to denote the dollar amount of abnormal net operating income.

4.2 *Descriptive statistics on analysts, firms and forecasted financial statements in reports*

In Table 2 we present descriptive statistics pertaining to the analysts and firms in our dataset of 422 equity analyst reports. Panel A shows that the reports are authored or coauthored by 86 different analysts, many of whom hold the CFA professional qualification but none of whom have a CPA, MD or PhD. The mean number of analysts authoring a report is 2.2 and the median number of pages in a report is 15. Of reports, 84% are updates/revisions rather than initiations, and of the stock recommendations given, 50% are overweight or outperform, 43% are neutral or equal-weight and 7% are reduce or underweight. Per panel C, firms are distributed across 26 of the 48 Fama and French (1997) defined industry classifications. Firms also vary widely in size, with market capitalizations as of the analysts' report date ranging between $224 million and $187 billion.

4.3 *Descriptive statistics on key components of analysts' valuation models*

In panel A of Table 3 we summarize what analysts report about the costs of capital they use across their DCF, RNOA-RI and ROE-RI valuation models. Outside of the maturity horizon for the risk free rate, analysts disclose the risk free rate, beta, equity market premium, cost of equity capital, and weighted average cost of capital almost 98% of the time. The median values of all items appear reasonable given the 1998-2011 window during which analysts wrote their reports.[12]

Panel B reports statistics on the distribution of the fraction of equity value made up by the present value of the post-terminal year free cash flows, residual net operating income and residual net income in analysts' valuation models. A common complaint leveled by practitioners against DCF is the typically very high fraction of equity value represented by the terminal value, since small changes in the firm's discount rate or assumed rate of growth in free cash flows in perpetuity beyond the terminal year can generate large changes in the firm's estimated equity value. Given the role of the book value of net operating assets or equity in RI models, we expect to observe that the fraction of equity value represented by the present value of post-terminal year residual net operating income or residual net income will be markedly lower than the fraction of equity value represented by the present value of post-terminal year free cash flows. We find that this is the case for ROE-RI where the median is 26% as compared to 65% for DCF valuation, but less so for RNOA-RI where the median is a much larger 53%.

---

[12] The 98% rate of disclosure for the components of firms' costs of capital is substantially higher than the median of 48% rate reported by Green, Hand and Zhang (2014) for a random sample of 120 analyst reports issued during 2012-13 that each contains a DCF valuation model. Since we focus on analyst reports that include both DCF and RI models, we posit that such analysts tend to be more sophisticated and thus disclose more information in their reports. In addition, our sample is dominated by Morgan Stanley, which has a higher reputation than most brokerage firms.

Lastly, panel C gives distributional statistics on the forecasted rates of growth in key components of analysts' DCF, RNOA-RI, and ROE-RI valuations in the terminal year T and in perpetuity beyond T. Where available, this data is taken from what analysts disclose in their models, examples of which are shown in Figures 1 and 2, or is reasonably inferable from their models.[13] From panel C we note that the median length of the explicit forecast horizon for ROE-RI valuations is 19 years, twice as long as the 10 years for DCF and RNOA-RI models. Also, the median rate of growth in post-terminal year residual income is 1.0%, somewhat lower than the 2.3% rate of growth in residual net operating income in RNOA-RI models and the 2.4% rate of growth in free cash flows in DCF models. All else held equal, this suggests that ROE-RI models may yield more conservative valuations than either RNOA-RI or DCF valuations.

5. Performance of DCF, RNOA-RI and ROE-RI valuation models

5.1 Comparison of DCF with RNOA-RI and ROE-RI valuations

In panel A of Table 4 we report statistics on the proximity of analysts' DCF valuations to the RNOA-RI and ROE-RI valuations they make for the same firm in the same report at the same point in time. Contrary to the theoretical prediction that DCF and RI should yield identical valuations, we document that analysts often produce different DCF and RI valuations. The visible nature of these differences—they are clearly visible in the layouts of analysts' valuations—suggests that not only are rounding errors and material differences in underlying assumptions exist across different valuation models, but that analysts are comfortable with presenting different valuations to their clients.

In panel A, we note that of the RNOA-RI and ROE-RI methods, ROE-RI is the approach that most often produces value estimates that markedly differ from analysts' DCF valuations, with just 9% (44%) of ROE-RI valuations being within 1% (5%) of the accompanying DCF figure. This contrasts with RNOA-RI valuations where a much larger 34% (93%) of valuations are within 1% (5%) of the DCF figure. The magnitude of the difference in the differences between DCF vs. RNOA-RI and DCF vs. ROE-RI valuations, combined with the strong similarities in forecast horizon and the positioning of RNOA-RI directly underneath (rather than above) the DCF valuation lead us to hypothesize that analysts' RNOA-RI valuations are merely a repackaging of preexisting DCF data inputs and valuations, while analysts' ROE-RI valuations are created more independently of their DCF valuations.

---

[13] For example, given the present value of terminal value of free cash flows PV_TV, free cash flows FCF_T in period T, and weighted average cost of capital WACC, we take the rate of growth in post-terminal year free cash flows g to be that which equates PV_TV with $FCF\_T*(1+g)/[(WACC-g)*(1+WACC)^T]$.

5.2 Target prices and expected returns

For the subset of reports where there is an analyst price target, panel B of Table 4 describes the distribution of stock prices per CRSP as of one trading day prior to the analyst report date, the target prices stated in the report, and the expected annualized returns implied by the target prices.[14] We define realized annual returns on a without-dividend basis, and unexpected returns as realized less expected.[15] Panel B allows us to calibrate our dataset of analyst reports against others in the literature, given that the pervasive finding in prior research is that target prices are on average highly optimistic, both in the U.S. and around the world. For example, Bradshaw, Brown and Huang (2013) and Bradshaw, Huang and Tan (2014) find that analysts' 12-month ahead target prices are upward biased by an average of 15% for U.S. firms and 18% for non-U.S. firms, respectively.

Panel B reveals that the mean (median) expected return implicit in analysts' target prices in our dataset is 14% (16%), with 91% of individual expected returns being positive. We find that the mean unexpected target price return in our dataset is insignificantly different from zero (-2%, t-statistic = -0.8) although the median unexpected return is a reliably negative -5% (Binomial z-statistic = -3.2). We interpret these results as indicating that there is less optimism displayed in the target prices issued by the analysts in our study than in other studies. To the extent that optimism in target prices reflects less than fully rational information processing, the relative paucity of optimism in the target prices in our dataset suggests that the analysts we study may be more sophisticated than the typical analyst, consistent with their using RI-based valuation methods, or that using both DCF and RI valuation methods leads to less optimistic target prices in general.

5.3 Expected, realized and unexpected returns in DCF, RNOA-RI and ROE-RI valuations

We evaluate the return performance of analysts' DCF and RI valuations by measuring the expected, realized and unexpected 12-month signed returns associated with them. This is possible because the valuations provided by analysts in their reports are either directly stated by analysts to be 12-month ahead forecasts, or can be projected to be because of their tight proximity in magnitude to analysts price targets which almost always have a 12-month forecast horizon.

Since there are an average of 4.1 reports per firm in our dataset (viz., 422 reports covering 103 firms), there is material overlap within and across firms in the 12-month windows over which we measure expected, realized and unexpected returns. We seek to mitigate the effects of the resulting lack of independence across observations by aggregating returns by firm and across time. For each

---

[14] Virtually all target prices are associated with a 12-month forecast horizon.

[15] We define realized returns as not including any dividends paid between the analyst report date and the target price date because analysts' target prices typically are defined as the stock price that will be in place on the target date.

firm and for each valuation method, we sort individual returns by report date from earliest to latest. Then beginning with the earliest return, we average into one firm-valuation-method observation all subsequent returns for that same firm and same valuation method for which the report date is within 12 months of the earliest return. We then repeat the process using the first report issued after the last report that is part of the just-defined 12 month window. In terms of aggregated returns, this process yields 136, 70 and 93 triplets of expected, realized and unexpected returns associated with DCF-based, RNOA-based and ROE-RI valuations, respectively.

In panel C we report statistics pertaining to these aggregated returns. Since our experimental approach is to directly compare and contrast DCF and RI valuations on a within-firm and within-report basis, we use only those 70 (93) of the 136 DCF returns that match to the 70 RNOA-based (93 ROE-based) RI returns. Based on these returns, we highlight the following results in panel C.

First, per the uppermost part of panel C, in terms of accuracy the mean unexpected return associated with both DCF and RNOA-RI valuations is -7% (t-statistic = -1.7) while the median unexpected returns are each -8% (binomial z-statistics = -2.4 and -2.6 versus a null of 50%). We interpret this as indicating that DCF and RNOA-RI valuations are optimistic when they are provided in the same report. Virtually the same value estimates from DCF and RNOA-RI valuations suggest that RNOA-RI is not independent from DCF, confirming our more anecdotal observation that analysts typically derive their operating income or ROA forecasts from the cash flow spreadsheet. Second, the mean unexpected return associated with ROE-RI valuations is 5% (t-statistic = 1.3), and the median expected return is 2% (t-statistic = 0.7). This suggests that ROE-RI valuations are unbiased predictors of 12-month ahead stock prices. Third, when directly evaluated against each other, ROE-RI valuations are more conservative than DCF valuations, since the mean difference in expected returns is 5% (t-statistic = 3.4) and the median difference is 2% (t-statistic = 2.0).

Finally, we examine the subsample of analyst reports that contain all three of DCF and RNOA-RI, and ROE-RI valuations. Panel D of Table 4 shows that DCF and RNOA-RI valuations produce virtually the same value estimates, confirming the finding in Panel C. Although ROE-RI valuations are less optimistic than their DCF counterparts, the differences are not statistically significant due to our small sample size of 28 observations. The finding of less optimistic ROE-RI valuations in this subsample, similar to what observed in Panel C, helps rule out the self-selection concern that analysts who construct ROE-RI models are sophisticated and that such sophistication manifests itself in both their ROE-RI and DCF valuations. Our results indicate that ROE-RI valuations provide relatively independent information to DCF whereas RNOA-RI valuations are a manifestation of DCF. Analyst reports with ROE-RI valuations tend to be less optimistic, possibly because their more independent estimates from ROE-RI help analysts to adjust their DCF estimates.

5.4 Long-run forecasted RNOAs and ROEs in analysts' dual DCF and RI valuations

Since RI methods are typically promoted as making long-term forecasted RNOAs or ROEs the central features of valuation, in Figure 3 we display the median annual RNOAs and ROEs forecasted by analysts in our dataset, together with the median weighted average and equity costs of capital that analysts employ. Panel A is shown in event time starting with the first forecasted year beyond the most recent year of realized data available to the analyst, while panel B is in event time relative to the terminal year of the valuation, denoted “0”. Panel C limits the view taken in panel B to only the reports in which analysts provide all three valuations—DCF, RNOA-RI and ROE-RI.

From Figure 3 it is clear that median forecasted RNOAs in analysts' RNOA-RI valuations increase both as the forecast horizon increases per se (panel A) and as the forecast horizon approaches the terminal year (panels B and C). For example, per panel B median RNOAs rise from 19% one year out from the report to 28% in the terminal year at which point they are 20 percentage points larger than analysts' median WACCs of 8%. Since panel C of Table 4 reported that RNOA-RI valuations are very close in size to their DCF counterparts, the median RNOAs shown in Figure 3 must also be the median RNOAs embedded in, but not visibly presented on the face of analysts' DCF valuations. In contrast, Figure 3 makes plain that median forecasted ROEs taken from the ROEs that are visibly presented in analysts' ROE-RI valuation models decrease as the forecast horizon increases. Median ROEs fall from 21% one year out beyond the report date to 17% in the terminal year at which point they are 8 percentage points larger than analysts' median REs of 9%.

The striking results reported in Figure 3 lead us to argue that DCF and RNOA-RI valuations reflect a lack of sophistication in long-term economic forecasting that is not shared by analysts ROE-RI valuations. We arrive at this conclusion because the effects of competition require that rational forecasts of long-term RNOA and ROE converge toward firms' weighted average and equity costs of capital, respectively, yet of the long-horizon paths in RNOA and ROE shown in Figure 3, only that of ROE declines toward its cost of capital benchmark. Not only does the increasing path of RNOAs not make economic sense, but all else held equal it predicts that RNOA-RI valuations will be optimistic per se, and more optimistic than ROE-RI valuations. The evidence on unexpected returns in panel C of Table 4 supports these predictions—RNOA-RI valuations are optimistic relative to realized one-year-ahead prices by an average of 7%, while ROE-RI valuations are unbiased.

We draw one additional conclusion from the divergent trajectories of RNOA and ROE in Figure 3 when combined with the relatively similar RNOA-RI and ROE-RI valuations in Table 4. This is that ROE-RI has a previously unrecognized practical advantage over DCF and RNOA-RI stemming from the fact that ROE combines a firm's operating profitability with its financing stance.

Since ROE = RNOA + [FLEV x SPREAD], where FLEV = net financial liabilities divided by common equity and SPREAD = net financial expense divided by net financial liabilities, by focusing on the evolution of just ROE rather than the evolutions of both RNOA and financial leverage, ROE-RI reduces the risk that a practitioner will make the economically implausible financial leverage assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholders. We argue that the reason that analysts' forecasts of RNOA increase over time in Figure 3 while their forecasts of ROE decrease is that in their RNOA-RI and DCF models analysts are making the assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholder, and to such a degree that its negative effect on ROE more than compensates for the positive impact of increasing RNOAs. Equivalently, we conjecture that for either unconscious behavioral or consciously strategic reasons, analysts who use DCF or RNOA-RI optimistically project increasing RNOAs and then allow FLEV x SPREAD to turn highly negative in order for their resulting valuations to not be wildly in excess of current prices. We therefore posit that a practical advantage of ROE-RI over DCF and RNOA-RI is that it prevents analysts from visibly presenting two mostly offsetting errors (an ever increasing RNOA and an ever more negative FLEV x SPREAD) to their clients.

5.5 The role of different valuation models in determining analysts' target prices

The last aspect of analysts' dual DCF and RI valuations that we study is to explore the role of different valuation models in determining analysts' target prices. We do so by regressing analysts' target prices on their DCF, RNOA-RI, and ROE-RI valuations. If RNOA-RI is just a manifestation of DCF, we expect the coefficient on DCF valuation to be close to one and the coefficient on RNOA-RI valuation to be close to zero. If ROE-RI plays a more significant role in determining target prices than DCF does, we expect the coefficient on ROE-RI valuation to be higher than that on DCF valuation. Finally, if analysts use multiple valuation methods because they believe that averaging different valuations from different methods yields less noisy and more accurate results, then their target prices will reflect the influence of multiple methods, and we will observe significant regression coefficient estimates on more than one type of valuation.

Table 5 reports the regression results. In model 1, analysts' price targets—where provided, which is less in 100% of reports—are projected onto analysts' DCF and RNOA-RI valuations. The results clearly show that DCF valuations are tightly associated with target prices (t-statistics on estimated coefficients relative to nulls of zero and one are 5.5 and -0.5, respectively, with an adjusted R^2 = 96%), while RNOA-RI valuations are incrementally irrelevant (t-statistic = -0.4). This result also confirm the idea that analysts' RNOA-RI valuations are entirely derived from, and are not in any economically meaningful sense independent of, analysts' DCF valuations.

In contrast, in model 2 where analysts' price targets are projected onto DCF and ROE-RI valuations, both independent variables exhibit reliably non-zero coefficient estimates. Moreover, in a manner opposite to that of model 1, in model 2 ROE-RI valuations and not DCF valuations are the primary determinant of analysts' price targets: the estimated coefficient on the RNOE-based RI valuation is 1.10 (t-statistic = 14.6) while the estimated coefficient on the DCF valuation is -0.18 (t-statistic = -2.4). This suggests analysts' ROE-RI valuations are materially independent of analysts' DCF valuations, consistent with analysts' using the two types of valuation methods because each method has a degree of non-overlapping practical benefit to it. In analyst reports with both DCF and ROE-based methods, ROE-RI valuations are the main driver of target prices.

In model 3 we restrict the data sets used in models 1 and 2 to the subset of observations where both RNOA-RI and ROE-RI valuations accompany analysts' DCF valuations, and then simultaneously project all three valuations onto target prices. The resulting parameter estimates and their associated t-statistics indicate that in this situation all three valuations are important, although the very high correlation between DCF and RNOA-RI valuations is the likely cause for the large and similarly sized but oppositely signed coefficient estimates on DCF and RNOA-RI. Consistent with this, in model 4 we keep the dataset used in model 3 but include DCF and ROE-RI valuations, and exclude RNOA-RI valuations, the results parallel those of model 2 in that we observe that both DCF and ROE-RI valuations drive analysts' target prices: the estimated coefficient on the RNOE-based RI valuation is 0.71 (t-statistic = 5.4) while the estimated coefficient on the DCF valuation is 0.26 (t-statistic = 2.0).[16]

Overall, the results in Table 5 indicate that in analyst reports with both DCF and RNOA-RI, RNOA-RI valuations are not independent of DCF since target prices are solely driven by DCF valuations. However, in analyst reports with both DCF and ROE-RI, analysts largely rely on ROE-RI in setting their target prices. Analysts' preference for ROE-RI over DCF or RNOA-RI valuations is sensible given that ROE-RI valuations are empirically unbiased while DCF and RNOA-RI valuations are not. We also note that the finding that ROE-RI and not DCF valuations largely determine target prices helps alleviate the concern that our study suffers from the selection bias that those analysts who choose to use ROE-RI are of higher ability than those who use DCF. This is because if ROE-RI does not play an active role, we should not expect ROE-RI valuations to load more significantly than DCF valuations in determining target prices, but they do.

---

[16] We note that the estimated coefficients on DCF valuations in models 2 and 4 have the opposite sign. We are not able to offer a satisfactory explanation for why this is the case.

6. Conclusions

In this study, we contribute to the residual income valuation literature by providing the first academic evidence on the use of RI in practice by sell-side equity analysts. We do so by comparing the hand-collected characteristics and performance of RI valuations with those of DCF when both methods are used by the same analysts for the same firm in the same report.

We find that analysts are equally likely to adopt RI valuations built around forecasting net operating income as around net income. However, we observe that the economic properties of RNOA-RI and ROE-RI are quite different along several dimensions. First, contrary to the theoretical equivalence of DCF and RI, analysts' DCF and ROE-RI valuations are often materially different from each other, while their RNOA-RI and DCF valuations are very close to each other. Second, we conclude that the reason that analysts' RNOA-RI and DCF valuations are so similar is that analysts' RNOA-RI valuations are simply a repackaging of their DCF data inputs and valuations. Not only do analysts visually place their DCF valuations before and above their RNOA-RI valuations and use the same forecast horizon for each, but between DCF and RNOA-RI valuations, only DCF matters in explaining analysts' target prices. In contrast, between DCF and ROE-RI valuations, analysts' target prices are more determined by their ROE-RI valuations than their DCF counterparts.

Third, we document that analysts' RNOA-RI valuations are optimistic relative to future prices and contain forecasted returns on net operating assets that increase toward a terminal year median of 28%, whereas ROE-based RI valuations contain returns on equity that are unbiased relatively to future stock prices and decline toward a terminal year median of just 17%. As such, we conclude that analysts' RNOA-RI and DCF valuations reflect a lack of sophistication in economic forecasting that is not found in their ROE-RI valuations because their RNOA forecasts fail to reflect the effects of competition require that rational forecasts of long-term RNOA should converge toward firms' weighted average costs of capital.

Lastly, by focusing on the evolution of just ROE instead of the evolutions of both RNOA and financial leverage, we argue that ROE-RI reduces the risk that the user will make the economically unreasonable financial leverage assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholders. We conjecture that for either unconscious behavioral or consciously strategic reasons, analysts who use DCF or RNOA-RI optimistically project increasing RNOAs and then allow FLEV x SPREAD to turn highly negative in order for their resulting valuations to not be wildly in excess of current prices.

Overall, our results corroborate early evidence in the valuation literature that DCF results in overly optimistic valuations. While DCF has been criticized as promoting upwardly biased value estimates because it rarely highlights the RNOAs that underlie projected free cash flows (Bernard, 1994), our results indicate that simply making the RNOAs visible as is the case in the RNOA-RI valuations we study does not necessarily yield more conservative valuations than DCF. With their attention on DCF and with RNOA-RI being only repackaging of DCF, analysts appear to ignore the economically implausible and persistently increasing RNOAs that are implicitly detailed in the presentation of their RNOA-RI valuations. In contrast, our dataset demonstrate the superiority of ROE-RI valuations when used by equity analysts. Analysts' ROE-RI valuations generate economically sensible ROE forecasts, drive their target prices, and are unbiased relative to future stock prices. All told, we propose that ROE-RI models deserve more attention from practitioners, and express the hope that our findings will encourage analyst and non-analyst practitioners to use ROE-RI valuation more frequently.

REFERENCES

Ali, A., Hwang, L-S., and M.A. Twombley. 2003. Residual-income-based valuation predicts future stock returns: Evidence on mispricing vs. risk explanations. *The Accounting Review* 78(2), 377-396.

Arnold, J., and P. Moizer. 1984. A survey of the methods used by UK investment analysts to appraise investments in ordinary shares. *Accounting and Business Research* Summer: 195-207.

Asquith, P., Mikhail, M. and A. Au. 2005. Information content of equity analyst reports. *Journal of Financial Economics* 38, 17-39.

Barker, R. 1999. Survey and market-based evidence of industry-dependence in analyst' preferences between the dividend yield and price-earnings ratio valuation models. *Journal of Business Finance & Accounting* 26(3/4): 393-418.

Barth, M.E., Beaver, W.H., and W.R. Landsman. 2001. The relevance of the value relevance literature for financial accounting standard setting: Another view. *Journal of Accounting & Economics* 31: 77-104.

Bernard, V.L. 1994. Accounting-based valuation methods, determinants of market-to-book ratios, and implications for financial statements analysis. Unpublished manuscript, University of Michigan.

Bilinski, P., Lyssimachou, D., and M. Walker. 2013. Target price accuracy: International evidence. *The Accounting Review* 88(3), 825-851.

Block, S.B. 1999. A study of financial analysts: Practice and theory. *Financial Analysts Journal* 55(4), 86-95.

Bonini, S., Zanetti, L., Bianchini, R., and A. Salvi. 2010. Target price accuracy in equity research. *Journal of Business Finance & Accounting* 37(9-10), 1177-1217.

Bradshaw, M.T. 2002. The use of target prices to justify sell-side analysts' stock recommendations. *Accounting Horizons* 16(1), 27-41.

Bradshaw, M.T. 2011. Analysts' forecasts: What do we know after decades of work? Working paper, Boston College.

Bradshaw, M.T., Brown, L.D., and K. Huang. 2013. Do sell-side analysts exhibit differential target price forecasting ability? *Review of Accounting Studies* 18: 930-955.

Bradshaw, M.T., Huang, K. and H. Tan. 2014. Analyst target price optimism around the world. Working paper, Boston College.

Brav, A. and R. Lehavy. 2003. An empirical analysis of analysts' target prices: Short-term informativeness and long-term dynamics. *Journal of Finance* 58(5): 1933-1967.

Brealey, R.A., and S.C. Myers. 1981, 1984. *Principles of corporate finance*. 1st and 2nd editions. McGraw-Hill.

Brief, R.P., and R.A. Lawson. 1992. The role of the accounting rate of return in financial statement analysis. *The Accounting Review* 67(2): 411-426.

Brown, L.D. 1993. Earnings forecasting research: Its implications for capital markets research. *International Journal of Forecasting* 9(3), 295-320.

Brown, L.D., Call, A.C., Clement, M.B., and N.Y. Sharp. 2013. Inside the "black box" of sell-side financial analysts. Working paper, UT Austin.

Copeland, T.E., and J.F. Weston. 1979. *Financial theory and corporate policy*. 1st edition, Reading, MA, Addition-Wesley.

Copeland, T.E., Koller, T. and J. Murrin. 1990, 1995. *Valuation: Measuring and managing the value of companies*. 1st and 2nd editions, New York, John Wiley & Sons, Inc.

Courteau, L., Kao, J.L., and G.D. Richardson. 2001. Equity valuation employing the ideal versus ad hoc terminal value expressions. *Contemporary Accounting Research* 18(4), 625-661.

Cwynar, A. 2009. Residual income: The essence, history and premises of utilization. *Journal of Information, Control and Management Systems* 9(2): 95-108.

DeAngelo, L. 1990. Equity valuation and corporate control. *The Accounting Review* 65(1), 93-112.

Demirakos, E.G., Strong, N.C., and M. Walker. 2004. What valuation models do analysts use? *Accounting Horizons* 18(4), 221-240.

Demirakos, E.G., Strong, N.C., and M. Walker. 2010. Does valuation model choice affect target price accuracy? *European Accounting Review* 19(1): 35-72.

Easton, P.D., McAnally, M.L., Sommers, G.A., and X.-J. Zhang. 2014. *Financial Statement Analysis & Valuation*. 4th edition. Cambridge Business Publishers.

Edwards, E., and P. Bell. 1961. *The theory and measurement of business income.* Berkeley, University of California Press.

Fama, E.F., and K.R. French. 1997. Industry costs of equity. *Journal of Financial Economics* 43, 153-193.

Feltham, G.A., and J.A. Ohlson. 1995. Valuation and clean surplus accounting for operating and financial activities. *Contemporary Accounting Research* 11, 689-732.

Fisher, I. 1930. *The theory of interest.* 1st edition, New York: The Macmillan Co.

Francis, J., Olsson, P., and D.R. Oswald. 2000. Comparing the accuracy and explainability of dividend, free cash flow, and abnormal earnings equity value estimates. *Journal of Accounting Research* 38(1), 45-70.

Gilson, S.C., Hotchkiss, E.S., and R.S. Ruback. 2000. Valuation of bankrupt firms. *Review of Financial Studies* 13(1): 43-74.

Gleason, C.A., Johnson, W.B., and H. Li. 2013. Valuation model use and the price target performance of sell-side analysts. *Contemporary Accounting Research* 30(1), 80-115.

Green, J.G., Hand, J.R.M., and F. Zhang. 2014. Errors and questionable judgments in analysts' DCF valuation models. Working paper, UNC Chapel Hill.

Harris, T.S., Estridge, J., and D. Nissim. 2008. Morgan Stanley ModelWare's approach to intrinsic value: Focusing on risk-reward trade-offs. In Equity valuation: Models from leading investment banks. Eds. Viebig, J., T. Poddig, and A. Varmaz. John Wiley & Sons, Ltd.

Hotelling, H. 1925. A general mathematical theory of depreciation. *Journal of the American Statistical Association*, 20, 340-353.

Imam, S., Barker, R., and C. Clubb. 2008. The use of valuation models by UK investment analysts. *European Accounting Review* 17(3): 503-535.

Iman, S., Chan, J., and S.Z.A. Shah. 2013. Equity valuation models and target price accuracy in Europe: Evidence from equity reports. *International Review of Financial Analysis* 28: 9-19.

Joos, P.R., and J.D. Piotroski. 2013. The best of all possible worlds: Analyst ex ante valuation forecast optimism and the distribution of scenario-based valuations. Working paper, Stanford University.

Joos, P.R., Piotroski, J.D., and S. Srinivasan. 2014. Can analysts assess fundamental risk and valuation uncertainty? An empirical analysis of scenario-based value estimates. Working paper, Stanford University.

Kaplan, S.N., and R.S. Ruback. The valuation of cash flow forecasts: An empirical analysis. *Journal of Finance* 50(4), 1059-1093.

Lee, C.M.C., Myers, J., and B. Swaminathan. 1999. What is the intrinsic value of the Dow? *Journal of Finance* 54(5), 1693-1741.

Li, K. and P. Mohanram. 2014. Evaluating cross-sectional forecasting models for implied cost of capital. *Review of Accounting Studies*, forthcoming.

Lundholm, R., and T. O'Keefe. 2001a. Reconciling value estimates from the discounted cash flow model and the residual income model. *Contemporary Accounting Research* 18(2), 311-335.

Lundholm, R., and T. O'Keefe. 2001b. On comparing residual income and discounted cash flow models of equity valuation: A response to Penman 2001. *Contemporary Accounting Research* 18(4), 693-696.

Lundholm, R. and R. Sloan. 2013. *Equity valuation and analysis with eVal*. 3rd edition. McGraw-Hill, New York.

Markou, A., and S. Taylor. 2014. Peering inside the analyst 'Black Box': How do equity analysts model companies? Working paper, Cambridge University.

Marshall, A. 1890. *Principles of economics*. London, Macmillan.

Modigliani, F., and M. Miller. 1961. Dividend policy, growth and the valuation of shares. *Journal of Business* 23 (October), 411-433.

Ohlson, J.A. 1995. Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research* 11(2), 661-687.

Peasnell, K.V. 1982. Some formal connections between economic values and yields and accounting numbers. *Journal of Business Finance & Accounting* 9(3): 361-381.

Penman, S.H. 2001. On comparing residual income and discounted cash flow models of equity valuation: A response to Lundholm and O'Keefe. *Contemporary Accounting Research* 18(4), 681-692.

Penman, S.H. 2011. Accounting for risk and return in equity valuation. *Journal of Applied Corporate Finance* 23(2), 50-58.

Penman, S.H. 2012. Paths to valuation, asset pricing, and practical investing: Can accounting and finance approaches be reconciled? In *Bridging the GAAP: Recent Advances in Finance and Accounting*, 3-20. Eds. I. Venezia and Z. Wiener, World Scientific Publishing.

Penman, S.H. 2012. *Financial Statement Analysis and Security Valuation*. 5th edition. McGraw-Hill/Irwin.

Penman, S.H., and F. Reggiani. 2013. Returns to buying earnings and book value: Accounting for growth and risk. *Review of Accounting Studies* 18(4), 1021-1049.

Penman, S.H., and T. Sougiannis. 1998. A comparison of dividend, cash flow, and earnings approaches to equity valuation. *Contemporary Accounting Research* 15(3), 343-383.

Pinto, J.E., Henry, E., Robinson, T.R., and J.D. Stowe. 2010. *Equity asset valuation.* 2nd edition, CFA Institute.

Preinrich, G.A.D. 1938. *Annual survey of economic theory: The theory of depreciation*. Econometrica 6(3), 219-241.

Rappaport, A. 1986. *Creating shareholder value*. Free Press.

Schipper, K. 1991. Analysts' forecasts. *Accounting Horizons* 5(4), 105-121.

Viebig, J., T. Poddig, and A. Varmaz. 2008. Equity valuation: Models from leading investment banks. John Wiley & Sons, Ltd.

William, J.B. 1938. *The theory of investment value*. Harvard University Press.

TABLE 1

Criteria applied in arriving at 422 sell-side equity analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011), and descriptive statistics on authoring brokers, report dates, and types of analysts' RI models.

Panel A: Investext search criteria

Asset class: **All**
Dates: **Custom,** 01/01/98 **to** 12/31/13
Keyword(s): DCF or ("discounted cash flow*") in **Table of Contents**
and "residual income" in **Table of Contents**
Report type: **Company**
Geography: **United States**
Contributor: **Non-broker research excluded**

Panel B: Sample refinement criteria

Base sample: 478 analyst reports

Excluded:	No $/share DCF valuation provided	26
	No $/share RI valuation provided	19
	Firm is a non-U.S. company	5
	No determinable valuation date	3
	No target price provided	2
	Insufficient stock price/return data	1

Final sample: 422 analyst reports covering 103 different firms

Panel C: Number of sampled analyst reports by authoring broker, and distribution of report dates

Broker	# reports in sample
Morgan Stanley	417
Cowen & Company	4
HSBC Global Research	1

Date of report	
Min.	19980513
25th pctile	20011105
Median	20021163
75th pctile	20041019
Max.	20111003

Panel D: Frequency of DCF and RI valuation models used by analysts in sample reports

Type of equity valuation model contained in analysts' report		
DCF to all investors	422	
Residual income (RI), of which:	422	
1. To all investors, forecasting NOI and RNOA		168
2. To equity investors, forecasting NI and ROE		152
3. Both types of RI valuation models		102

TABLE 2

Descriptive statistics on the analysts and firms in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011).

Panel A: Number of reports authored by analysts, analysts' professional qualifications, and number of analysts on the analyst team

# reports analyst is on	
Min.	1
Median	2
Mean	10.9
Max.	142

# analysts on team	
Min.	1
Mean	2.2
Max.	5
# unique analysts	86

# pages in report	
Min.	6
Median	15
Mean	20
Max.	110

Type of report	#
Initiation	67
Update/revision	355

Stock recommendation	#
Reduce or underweight	26
Neutral or equal-weight	184
Overweight or outperform	212

% of reports with one or more CFAs on analyst team	28%

Panel B: Industry and market cap of covered firms

Industry	#	Industry (continued)	#
Business services	89	Telecommunications	6
Consumer goods	77	Personal services	4
Apparel	55	Rubber & plastic products	3
Recreational products	30	Aircraft	2
Construction materials	26	Automobiles & trucks	2
Chemicals	24	Shipping containers	2
Retail	24	Trading	2
Transportation	16	Wholesale	2
Computers	14	Agriculture	1
Business supplies	11	Coal	1
Restaurants, hotel, motel	11	Food products	1
Construction	9	Insurance	1
Electronic equipment	8	Machinery	1

Market cap ($ mil.)		
Min.	$	224
Median	$	7,529
Mean	$	16,825
Max.	$	187,763

TABLE 3

Statistics on the components of costs of capital, and the terminal and post-terminal rates of growth in key components of the DCF, RNOA-based RI and ROE-based RI valuations, that are forecasted by analysts in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011).

Panel A: Components of analysts' cost of capital estimates

Components of costs of capital	# obs	Min.	Median	Mean	Max.
RF horizon (yrs)	295	10	30	21	30
RF	412	3.0%	5.0%	4.9%	6.5%
BETA	412	0.68	1.00	1.14	2.55
MKTPREM	412	2.5%	4.0%	4.0%	8.0%
RE	417	6.7%	9.0%	9.3%	14%
WACC	418	5.8%	8.8%	8.9%	13%

Panel B: Fraction of total equity value represented by the present value of post-terminal year free cash flows (DCF model), residual net operating income (RNOA-RI model), and residual income (ROE-RI model)

pv(TV)/Eq_value	# obs	Min.	Median	Mean	Max.
DCF	409	17%	65%	64%	289%
RNOA	266	10%	53%	50%	280%
ROE	243	-0.5%	26%	32%	75%

Panel C: Forecasted rates of growth in key components of DCF valuations and RNOA-based and ROE-RI valuations in terminal year T (denoted by the prefix "g_"), and in perpetuity beyond T (denoted by "g_perp > T")

	Terminal value-related item	# obs	Min.	Median	Mean	Max.
DCF	# years ahead is T	416	5	10	11	40
	g_perp > T	402	-8.0%	2.4%	2.6%	7.6%
	g_REV_T	386	-15%	4.2%	4.6%	15%
	g_CAPEX_T	403	-65%	2.4%	2.4%	40%
	g_FCF_T	403	-20%	5.2%	6.2%	79%
RNOA	# years ahead is T	267	5	10	10	24
	g_perp > T	265	-5.9%	2.1%	2.1%	6.3%
	g_RNOI_T	264	-58%	5.2%	5.2%	28%
ROE	# years ahead is T	253	5	19	17	40
	g_perp > T	235	-32%	1.0%	2.1%	11%
	g_RI_T	232	-80%	4.1%	3.2%	30%

TABLE 4

Statistics on the valuations, target prices and returns associated with the DCF, RNOA-based RI and ROE-RI valuations in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011).

Panel A: Proximity of analysts' DCF valuations to their RNOA-RI and ROE-RI valuations of the same firm in the same report

		Difference in analysts' valuations			
Valuation comparison	# obs	Exactly the same	Within 1%	Within 2%	Within 5%
DCF vs. RNOA	267	6%	34%	59%	93%
DCF vs. ROE	254	2%	9%	21%	44%

Panel B: Analysts' target prices and the annualized expected, realized and unexpected stock returns associated with them (only for subset where there is a target price provided by analysts)

	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
Current stock price	285	$ 6.60	$ 31.55	$ 35.94	$ 246.10			
Target stock price	285	$ 9.00	$ 35.00	$ 42.28	$ 320.00			
Expected return in target	285	-27%	16%	14%	53%	21.5	91%	-13.9
Realized return	285	-68%	8%	13%	134%	6.9	62%	4.0
Unexpected target return	283	-69%	-5%	-2%	121%	-0.8	41%	-3.2

Note: Target price horizon is almost always 12 months beyond report date.

Panel C: Comparisons of the expected, realized and unexpected returns in analysts' valuations, where observations are aggregated by firm and across time, by 12-month windows

Unexpected return = realized - expected (on an aggregated basis)	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
DCF when there is an RNOA valuation	70	-110%	-8%	-7%	86%	-1.7	36%	-2.4
RNOA valuation	70	-110%	-8%	-7%	83%	-1.7	34%	-2.6
DCF when there is an ROE valuation	93	-88%	0%	0%	116%	0.0	52%	0.3
ROE valuation	93	-85%	2%	5%	118%	1.3	54%	0.7

Expected return (on an aggregated basis)	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
DCF when there is an RNOA valuation	70	-23%	15%	15%	69%	6.3	77%	4.5
RNOA valuation	70	-20%	13%	15%	60%	6.5	76%	4.3
DCF - RNOA	70	-8%	-1%	0%	14%	0.4	39%	-1.9
DCF when there is an ROE valuation	93	-23%	19%	19%	96%	7.7	77%	5.3
ROE valuation	93	-35%	15%	13%	65%	6.2	74%	4.7
DCF - ROE	93	-29%	2%	5%	53%	3.4	60%	2.0

Realized return (on an aggregated basis)	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
RNOA valuation	70	-67%	7%	8%	106%	2.2	64%	2.4
ROE valuation	93	-68%	16%	19%	107%	5.5	76%	5.1

TABLE 4 (continued)

Panel D: Comparisons of the unexpected returns in analysts' valuations, where observations are restricted to analyst reports that contain all three of a DCF, RNOA-RI and ROE-RI valuations. Valuations are aggregated by firm and across time, by 12-month windows.

Unexpected return when all 3 present	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
DCF	28	-71%	8%	9%	86%	1.3	61%	-1.1
RNOA	28	-68%	6%	8%	83%	1.3	61%	-1.1
ROE	28	-72%	0%	6%	79%	1.0	50%	0.0
DCF - ROE	28	-15%	3%	2%	14%	2.2	61%	-1.1

Notes:

Since there are an average of 4.1 reports per firm in our dataset (422 reports covering 103 different firms), there is overlap within and across firms in the 12-month windows over which we measure expected, realized and unexpected returns. In panel C we seek to minimize the impacts of this lack of independence by aggregating returns by firm and across time. For each firm and for each valuation method, we sort individual returns by report date from earliest to latest. We start with the earliest return, and average together into one firm-valuation-method observation all subsequent returns for that same firm and same valuation method for which the report date was within 12 months of the earliest return. We then repeat the process using the first report issued after the last report that is part of the just-defined 12 month window. In terms of aggregated returns, this process yields 136, 70 and 93 triplets of expected, realized and unexpected returns associated with DCF-based, RNOA-based and ROE-RI valuations, respectively.

TABLE 5

OLS regressions of analyts' target prices on analysts' DCF valuations, RNOA-based RI valuations, and ROE-based RI valuations. Sample is the subset of the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011), and for which there is an analyst target price. t-statistics relative to a null parameter value of zero are in parentheses.

Independent variables:	Pred. sign on coef.	Model 1	Model 2	Model 3	Model 4
Intercept		\$5.28	\$3.16	\$1.52	\$1.77
		(8.5)	(5.8)	(3.2)	(3.4)
DCF valuation	+	0.92	-0.18	-2.32	0.26
		(5.5)	(-2.4)	(-3.6)	(2.0)
RNOA-based valuation	+	-0.06		2.80	
		(-0.4)		(4.1)	
ROE-based valuation	+		1.10	0.49	0.71
			(14.6)	(3.7)	(5.4)
Adj. R-squared		96%	98%	99%	99%
# obs.		183	183	84	84

FIGURE 1

Example of an analyst report in which both DCF and RNOA-based RI valuations are presented, and on one single page as shown below. Firm is Nike Inc. (12/12/02, Morgan Stanley, p.10).

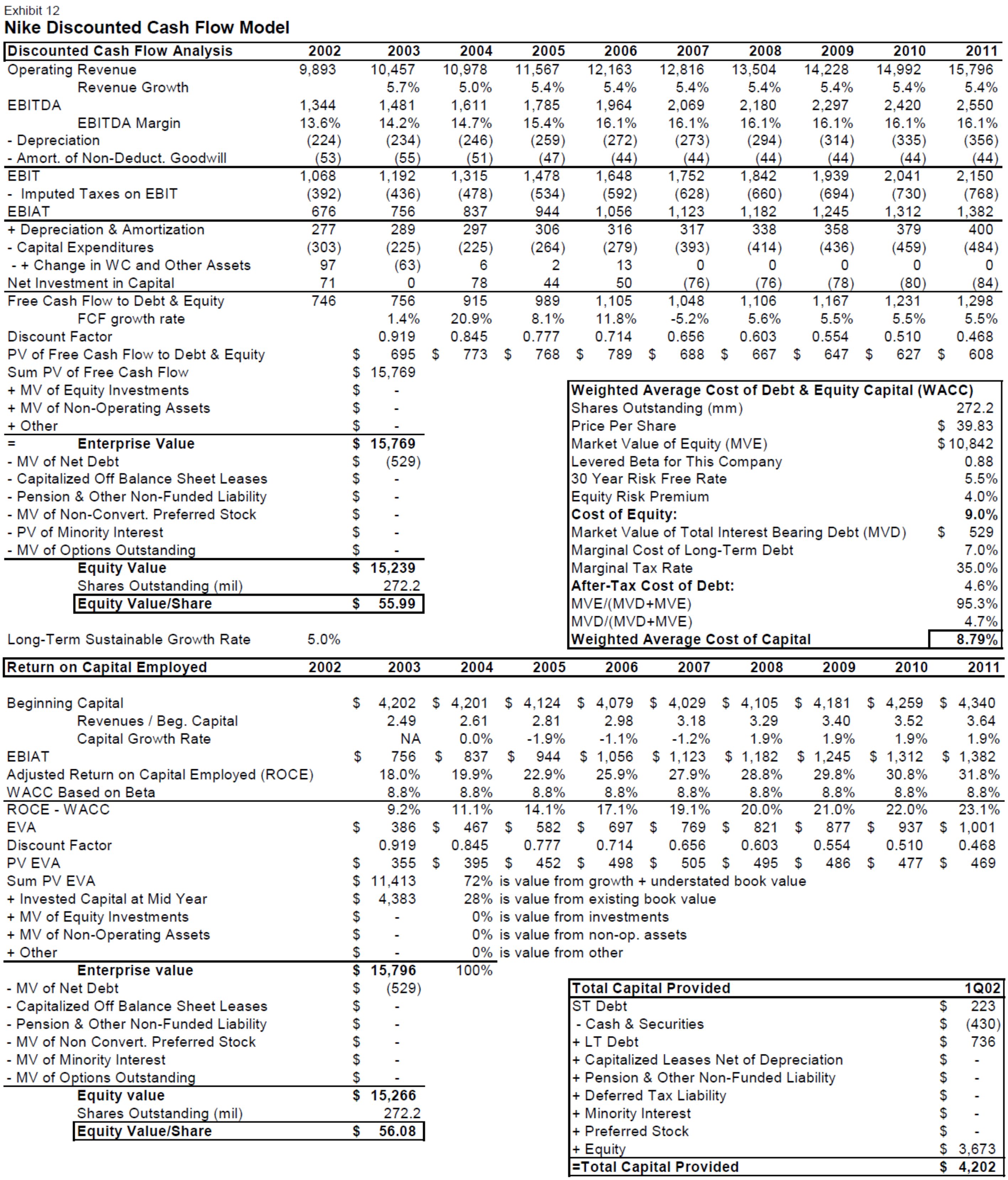


Exhibit 12

Nike Discounted Cash Flow Model

Discounted Cash Flow Analysis	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Operating Revenue	9,893	10,457	10,978	11,567	12,163	12,816	13,504	14,228	14,992	15,796
Revenue Growth		5.7%	5.0%	5.4%	5.4%	5.4%	5.4%	5.4%	5.4%	5.4%
EBITDA	1,344	1,481	1,611	1,785	1,964	2,069	2,180	2,297	2,420	2,550
EBITDA Margin	13.6%	14.2%	14.7%	15.4%	16.1%	16.1%	16.1%	16.1%	16.1%	16.1%
- Depreciation	(224)	(234)	(246)	(259)	(272)	(273)	(294)	(314)	(335)	(356)
- Amort. of Non-Deduct. Goodwill	(53)	(55)	(51)	(47)	(44)	(44)	(44)	(44)	(44)	(44)
EBIT	1,068	1,192	1,315	1,478	1,648	1,752	1,842	1,939	2,041	2,150
- Imputed Taxes on EBIT	(392)	(436)	(478)	(534)	(592)	(628)	(660)	(694)	(730)	(768)
EBIAT	676	756	837	944	1,056	1,123	1,182	1,245	1,312	1,382
+ Depreciation & Amortization	277	289	297	306	316	317	338	358	379	400
- Capital Expenditures	(303)	(225)	(225)	(264)	(279)	(393)	(414)	(436)	(459)	(484)
- + Change in WC and Other Assets	97	(63)	6	2	13	0	0	0	0	0
Net Investment in Capital	71	0	78	44	50	(76)	(76)	(78)	(80)	(84)
Free Cash Flow to Debt & Equity	746	756	915	989	1,105	1,048	1,106	1,167	1,231	1,298
FCF growth rate		1.4%	20.9%	8.1%	11.8%	-5.2%	5.6%	5.5%	5.5%	5.5%
Discount Factor		0.919	0.845	0.777	0.714	0.656	0.603	0.554	0.510	0.468
PV of Free Cash Flow to Debt & Equity		$ 695	$ 773	$ 768	$ 789	$ 688	$ 667	$ 647	$ 627	$ 608

Sum PV of Free Cash Flow	$ 15,769
+ MV of Equity Investments	$ -
+ MV of Non-Operating Assets	$ -
+ Other	$ -
= **Enterprise Value**	**$ 15,769**
- MV of Net Debt	$ (529)
- Capitalized Off Balance Sheet Leases	$ -
- Pension & Other Non-Funded Liability	$ -
- MV of Non-Convert. Preferred Stock	$ -
- PV of Minority Interest	$ -
- MV of Options Outstanding	$ -
Equity Value	**$ 15,239**
Shares Outstanding (mil)	272.2
Equity Value/Share	**$ 55.99**
Long-Term Sustainable Growth Rate	5.0%

Weighted Average Cost of Debt & Equity Capital (WACC)	
Shares Outstanding (mm)	272.2
Price Per Share	$ 39.83
Market Value of Equity (MVE)	$ 10,842
Levered Beta for This Company	0.88
30 Year Risk Free Rate	5.5%
Equity Risk Premium	4.0%
Cost of Equity:	**9.0%**
Market Value of Total Interest Bearing Debt (MVD)	$ 529
Marginal Cost of Long-Term Debt	7.0%
Marginal Tax Rate	35.0%
After-Tax Cost of Debt:	4.6%
MVE/(MVD+MVE)	95.3%
MVD/(MVD+MVE)	4.7%
Weighted Average Cost of Capital	**8.79%**

Return on Capital Employed	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Beginning Capital		$ 4,202	$ 4,201	$ 4,124	$ 4,079	$ 4,029	$ 4,105	$ 4,181	$ 4,259	$ 4,340
Revenues / Beg. Capital		2.49	2.61	2.81	2.98	3.18	3.29	3.40	3.52	3.64
Capital Growth Rate		NA	0.0%	-1.9%	-1.1%	-1.2%	1.9%	1.9%	1.9%	1.9%
EBIAT		$ 756	$ 837	$ 944	$ 1,056	$ 1,123	$ 1,182	$ 1,245	$ 1,312	$ 1,382
Adjusted Return on Capital Employed (ROCE)		18.0%	19.9%	22.9%	25.9%	27.9%	28.8%	29.8%	30.8%	31.8%
WACC Based on Beta		8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%
ROCE - WACC		9.2%	11.1%	14.1%	17.1%	19.1%	20.0%	21.0%	22.0%	23.1%
EVA		$ 386	$ 467	$ 582	$ 697	$ 769	$ 821	$ 877	$ 937	$ 1,001
Discount Factor		0.919	0.845	0.777	0.714	0.656	0.603	0.554	0.510	0.468
PV EVA		$ 355	$ 395	$ 452	$ 498	$ 505	$ 495	$ 486	$ 477	$ 469

Sum PV EVA	$ 11,413	72%	is value from growth + understated book value
+ Invested Capital at Mid Year	$ 4,383	28%	is value from existing book value
+ MV of Equity Investments	$ -	0%	is value from investments
+ MV of Non-Operating Assets	$ -	0%	is value from non-op. assets
+ Other	$ -	0%	is value from other
Enterprise value	**$ 15,796**	100%	
- MV of Net Debt	$ (529)		
- Capitalized Off Balance Sheet Leases	$ -		
- Pension & Other Non-Funded Liability	$ -		
- MV of Non Convert. Preferred Stock	$ -		
- MV of Minority Interest	$ -		
- MV of Options Outstanding	$ -		
Equity value	**$ 15,266**		
Shares Outstanding (mil)	272.2		
Equity Value/Share	**$ 56.08**		

Total Capital Provided	**1Q02**
ST Debt	$ 223
- Cash & Securities	$ (430)
+ LT Debt	$ 736
+ Capitalized Leases Net of Depreciation	$ -
+ Pension & Other Non-Funded Liability	$ -
+ Deferred Tax Liability	$ -
+ Minority Interest	$ -
+ Preferred Stock	$ -
+ Equity	$ 3,673
=Total Capital Provided	**$ 4,202**

Source: Morgan Stanley research

FIGURE 2

Example of an analyst report in which both DCF and ROE-based RI valuations are presented, using two pages as shown below. Firm is Carnival Corp & Plc (1/29/04, Morgan Stanley, pp. 9-10).

Panel A: The DCF model, disclosed on p.9 of the report

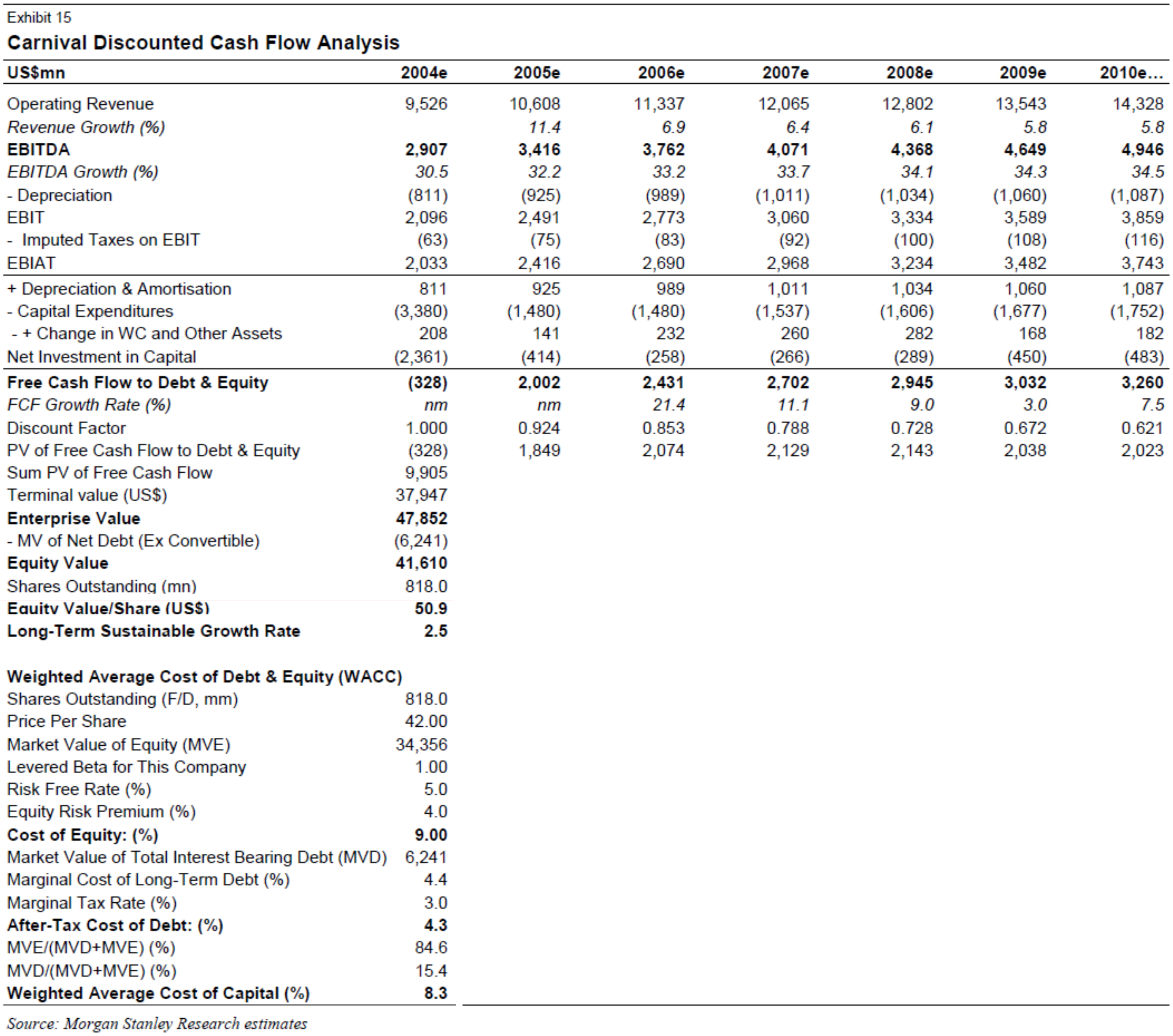


Exhibit 15

Carnival Discounted Cash Flow Analysis

US$mn	**2004e**	**2005e**	**2006e**	**2007e**	**2008e**	**2009e**	**2010e…**
Operating Revenue	9,526	10,608	11,337	12,065	12,802	13,543	14,328
Revenue Growth (%)		*11.4*	*6.9*	*6.4*	*6.1*	*5.8*	*5.8*
EBITDA	**2,907**	**3,416**	**3,762**	**4,071**	**4,368**	**4,649**	**4,946**
EBITDA Growth (%)	*30.5*	*32.2*	*33.2*	*33.7*	*34.1*	*34.3*	*34.5*
- Depreciation	(811)	(925)	(989)	(1,011)	(1,034)	(1,060)	(1,087)
EBIT	2,096	2,491	2,773	3,060	3,334	3,589	3,859
- Imputed Taxes on EBIT	(63)	(75)	(83)	(92)	(100)	(108)	(116)
EBIAT	2,033	2,416	2,690	2,968	3,234	3,482	3,743
+ Depreciation & Amortisation	811	925	989	1,011	1,034	1,060	1,087
- Capital Expenditures	(3,380)	(1,480)	(1,480)	(1,537)	(1,606)	(1,677)	(1,752)
- + Change in WC and Other Assets	208	141	232	260	282	168	182
Net Investment in Capital	(2,361)	(414)	(258)	(266)	(289)	(450)	(483)
Free Cash Flow to Debt & Equity	**(328)**	**2,002**	**2,431**	**2,702**	**2,945**	**3,032**	**3,260**
FCF Growth Rate (%)	*nm*	*nm*	*21.4*	*11.1*	*9.0*	*3.0*	*7.5*
Discount Factor	1.000	0.924	0.853	0.788	0.728	0.672	0.621
PV of Free Cash Flow to Debt & Equity	(328)	1,849	2,074	2,129	2,143	2,038	2,023
Sum PV of Free Cash Flow	9,905						
Terminal value (US$)	37,947						
Enterprise Value	**47,852**						
- MV of Net Debt (Ex Convertible)	(6,241)						
Equity Value	**41,610**						
Shares Outstanding (mn)	818.0						
Equity Value/Share (US$)	**50.9**						
Long-Term Sustainable Growth Rate	**2.5**						
Weighted Average Cost of Debt & Equity (WACC)							
Shares Outstanding (F/D, mm)	818.0						
Price Per Share	42.00						
Market Value of Equity (MVE)	34,356						
Levered Beta for This Company	1.00						
Risk Free Rate (%)	5.0						
Equity Risk Premium (%)	4.0						
Cost of Equity: (%)	**9.00**						
Market Value of Total Interest Bearing Debt (MVD)	6,241						
Marginal Cost of Long-Term Debt (%)	4.4						
Marginal Tax Rate (%)	3.0						
After-Tax Cost of Debt: (%)	**4.3**						
MVE/(MVD+MVE) (%)	84.6						
MVD/(MVD+MVE) (%)	15.4						
Weighted Average Cost of Capital (%)	**8.3**						

Source: Morgan Stanley Research estimates

FIGURE 2 (continued)

Panel B: The ROE-RI model, disclosed on p.10 of the report

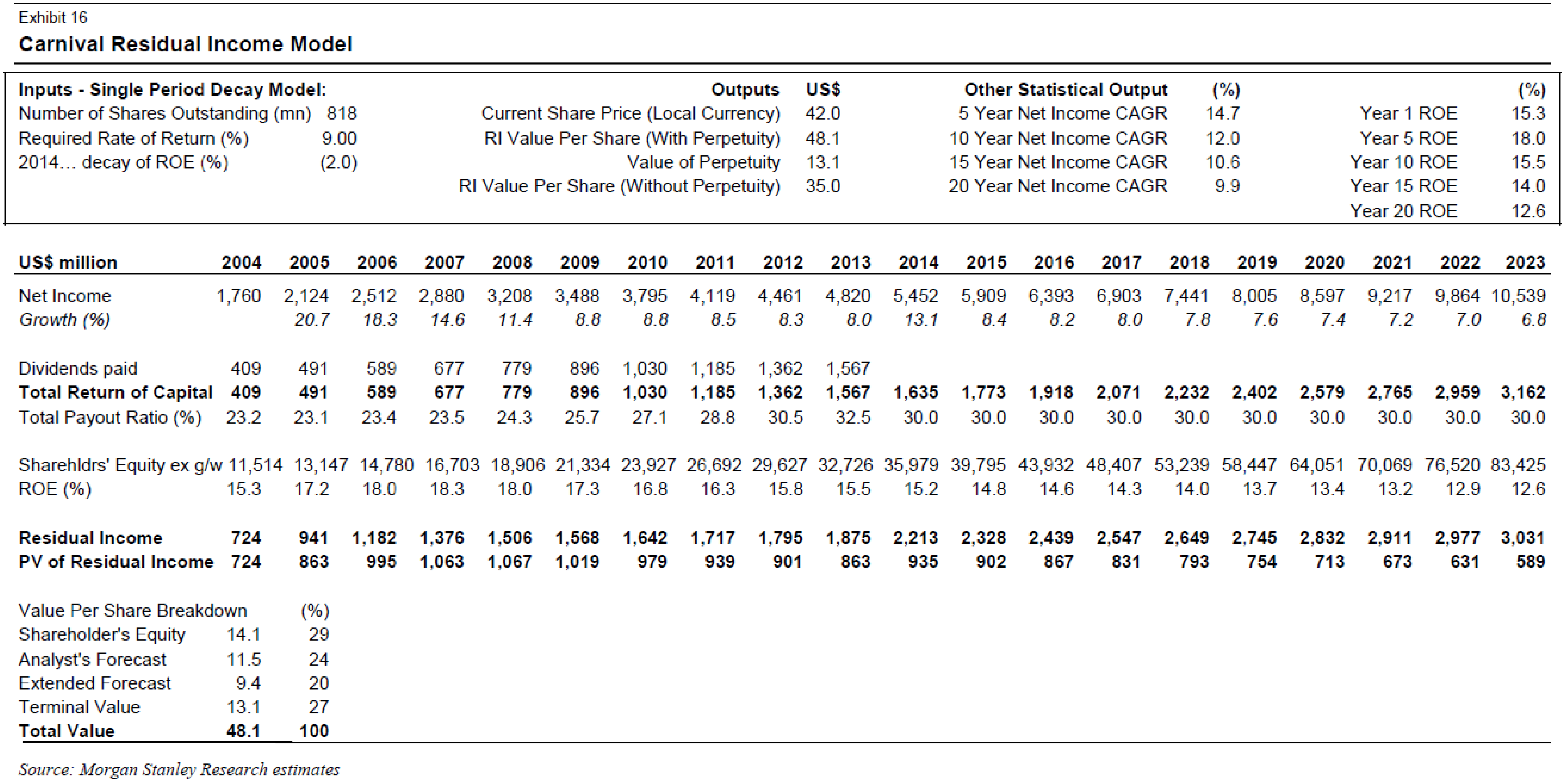


Exhibit 16

Carnival Residual Income Model

Inputs - Single Period Decay Model:		**Outputs**	**US$**	**Other Statistical Output**	**(%)**		**(%)**
Number of Shares Outstanding (mn)	818	Current Share Price (Local Currency)	42.0	5 Year Net Income CAGR	14.7	Year 1 ROE	15.3
Required Rate of Return (%)	9.00	RI Value Per Share (With Perpetuity)	48.1	10 Year Net Income CAGR	12.0	Year 5 ROE	18.0
2014… decay of ROE (%)	(2.0)	Value of Perpetuity	13.1	15 Year Net Income CAGR	10.6	Year 10 ROE	15.5
		RI Value Per Share (Without Perpetuity)	35.0	20 Year Net Income CAGR	9.9	Year 15 ROE	14.0
						Year 20 ROE	12.6

US$ million	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Net Income	1,760	2,124	2,512	2,880	3,208	3,488	3,795	4,119	4,461	4,820	5,452	5,909	6,393	6,903	7,441	8,005	8,597	9,217	9,864	10,539
Growth (%)		*20.7*	*18.3*	*14.6*	*11.4*	*8.8*	*8.8*	*8.5*	*8.3*	*8.0*	*13.1*	*8.4*	*8.2*	*8.0*	*7.8*	*7.6*	*7.4*	*7.2*	*7.0*	*6.8*
Dividends paid	409	491	589	677	779	896	1,030	1,185	1,362	1,567										
Total Return of Capital	**409**	**491**	**589**	**677**	**779**	**896**	**1,030**	**1,185**	**1,362**	**1,567**	**1,635**	**1,773**	**1,918**	**2,071**	**2,232**	**2,402**	**2,579**	**2,765**	**2,959**	**3,162**
Total Payout Ratio (%)	23.2	23.1	23.4	23.5	24.3	25.7	27.1	28.8	30.5	32.5	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Sharehldrs' Equity ex g/w	11,514	13,147	14,780	16,703	18,906	21,334	23,927	26,692	29,627	32,726	35,979	39,795	43,932	48,407	53,239	58,447	64,051	70,069	76,520	83,425
ROE (%)	15.3	17.2	18.0	18.3	18.0	17.3	16.8	16.3	15.8	15.5	15.2	14.8	14.6	14.3	14.0	13.7	13.4	13.2	12.9	12.6
Residual Income	**724**	**941**	**1,182**	**1,376**	**1,506**	**1,568**	**1,642**	**1,717**	**1,795**	**1,875**	**2,213**	**2,328**	**2,439**	**2,547**	**2,649**	**2,745**	**2,832**	**2,911**	**2,977**	**3,031**
PV of Residual Income	**724**	**863**	**995**	**1,063**	**1,067**	**1,019**	**979**	**939**	**901**	**863**	**935**	**902**	**867**	**831**	**793**	**754**	**713**	**673**	**631**	**589**

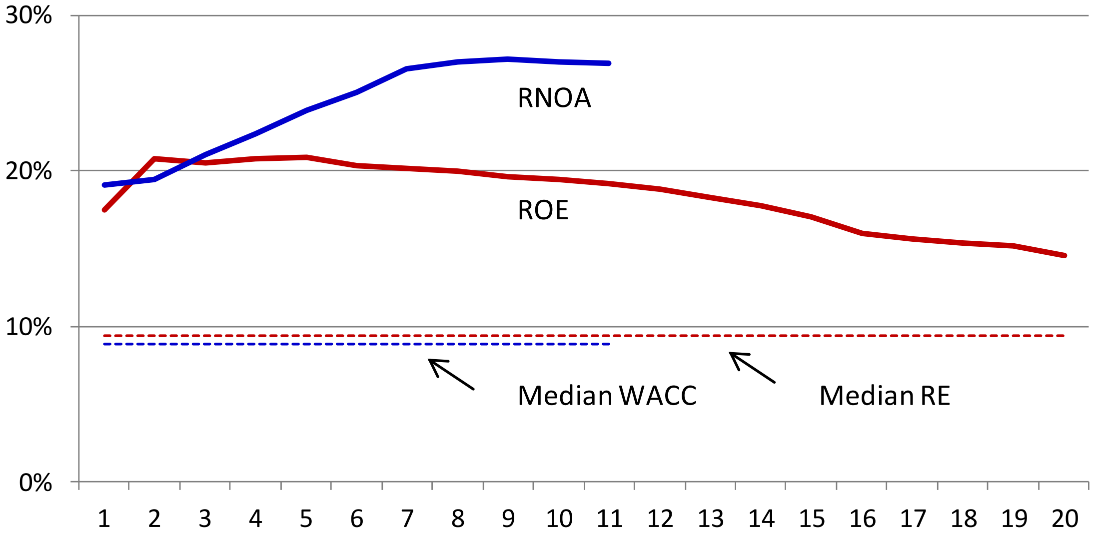
Value Per Share Breakdown		(%)
Shareholder's Equity	14.1	29
Analyst's Forecast	11.5	24
Extended Forecast	9.4	20
Terminal Value	13.1	27
Total Value	**48.1**	**100**

Source: Morgan Stanley Research estimates

FIGURE 3

Median annual RNOAs and ROEs forecasted by analysts in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations. Panel A is in event time starting with the first year explicitly forecasted by analysts. Panel B is in event time relative to year 0, defined as the terminal year of the analyst's valuation model.

Panel A: Median future annual RNOAs and ROEs forecasted by analysts



Panel B: Median annual RNOAs and ROEs forecasted by analysts up to the terminal year 0

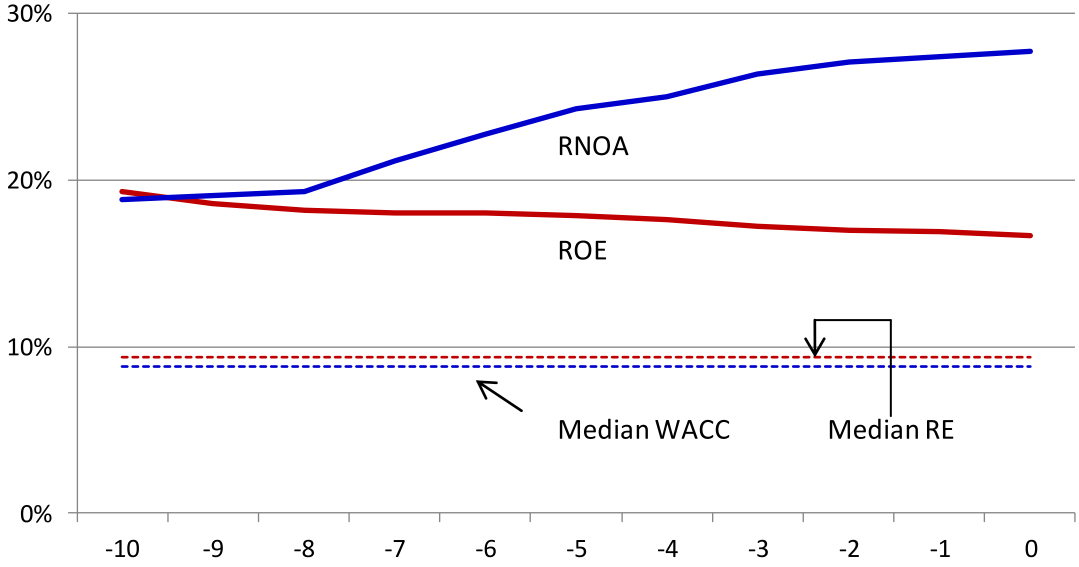


FIGURE 3 (continued)

Panel C: Median annual RNOAs and ROEs forecasted by analysts up to the terminal year 0 for the subsample of analyst reports with all three of DCF, RNOA-RI, and ROE-RI valuations.