Equity premia as low as three percent? Empirical evidence from analysts' earnings forecasts for domestic and international stock markets

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Abstract

The returns earned by US stocks since 1926, about eight percent more than risk-free rates, have generated an "equity premium puzzle". They exceed estimates derived from theory, from other periods and markets, and from surveys of institutional investors. Rather than examine historic experience, we compute the discount rate that equates market valuations with the present value of prevailing expectations of future flows, and subtract the risk-free rate to estimate the equity premium. Relying on a new approach based on accounting data and analysts' earnings forecasts, we project numbers for US equities, as well as for five other markets: Canada, France, Germany, Japan, and UK. The projected accounting flows are isomorphic to projected dividends, but make better use of available information and generate diagnostics that help narrow the range of reasonable growth rate assumptions. For each year between 1985 and 1998, we find that the equity premium is around three percent (or less) in all six markets examined.

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The equity risk premium, representing the excess of the expected return on the stock market over the risk-free rate, lies at the core of financial economics. Being unobservable, the equity premium has been estimated using different approaches and samples. The estimates most commonly cited in the academic literature are from Ibbotson Associates' annual reviews of the performance of various portfolios of stocks and bonds for US stock returns since 1926. They suggest that the equity premium lies in the region of seven to nine percent per year, depending on the specific series examined. Being objective and easy to interpret, the strength of this historic evidence has convinced many, especially academic financial economists, that the Ibbotson estimate is the best available proxy for the equity premium (Welch, 1999).[1]. For discussion purposes, we use "8%" and "the Ibbotson estimate" interchangeably to represent the historic mean of excess returns earned by US equities since 1926. (Unless noted otherwise, all amounts and rates are stated in nominal, not real, terms.)

Our objective is to show empirically that 8% is too high an estimate for the equity premium in recent years. Rather than examine observed returns, we estimate for each year since 1985 the discount rate that equates US stock market valuations with the present value of prevailing forecasts of future flows. Those discount rates suggest that the equity premium is only about 3 percent.[2] An examination of five other stock markets (Canada, France, Germany, Japan, and UK) provides similar results. Despite substantial variation in the underlying fundamentals across markets and over time, observing that every one of our 69 country-year estimates lies well below 8% suggests strongly that that number is too high for our sample period. Examination of various diagnostics (such as implied future profitability) confirms that the projections required to support an 8% an equity premium are unreasonable and inconsistent with past experience.

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[1] The annualized distribution of monthly common stock returns over the 30-day T-bill rate has a mean of 9.12 percent and a standard deviation of 20.06 percent (from data in Table A-16, Ibbotson, 1999). If these 73 observations are independent and identically distributed, the sample mean is a reasonable estimate for the equity premium, and the standard error of 2.35 percent associated with the sample mean allows an evaluation of other hypothesized values of the equity premium

[2] Gebhardt, Lee and Swaminathan (1999) estimate firm-specific discount rates for US equities, rather than the market discount rates considered in this paper, and obtain similar equity premium results.

As we only seek to establish a reasonable upper bound for the equity premium in recent years, we select long-term growth assumptions that are higher than past experience and we do not adjust for optimism in the analyst forecasts used for the 5 years leading up to the terminal value.[3] Also, we use the simplest structure necessary to conduct our analysis. Unlike historical estimates that measure 1-period equity premia, our estimates refer to a long-term premium expected to hold over all future years. We assume that the premium is flat over those future years; we do allow, however, for non-flat risk-free rates. Each annual estimate is conditional on the information available in that year; we do not consider an unconditional equity premium toward which those conditional premia might gravitate in the long run.

We are not the first to question the validity of the Ibbotson estimate. Mehra and Prescott (1985) initiated a body of theoretical work that has examined the so-called "equity premium puzzle." Their simple model indicates that the variance-covariance matrix of aggregate consumption and returns on stocks and bonds when combined with reasonable estimates of risk aversion imply equity premium estimates that are less than one percent. Despite subsequent efforts to bridge this gap (e.g., Abel, 1999), concerns remain about the validity of the Ibbotson estimate (see Kocherlakota 1996, Siegel and Thaler, 1997, and Cochrane 1997 for summaries).

Surveys of institutional investors also suggest an equity premium substantially below 8% (e.g., Burr, 1998).[4] Moreover, there are indications that this belief has held for many years (e.g., Benore, 1983). Also, the weighted average cost of capital used in discounted cash flow valuations provided in analysts' research reports usually imply an equity premium below five percent. Current share prices appear systematically overpriced if an 8% equity premium is used

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[3] As described later, analyst optimism has declined systematically over time and a simple adjustment for mean bias is inappropriate. Bayesian adjustments to control for observed analyst optimism are not considered because we focus on an upper bound. In general, we do not use more complex econometric techniques and data refinements that are available to get sharper point estimates (e.g., Ang and Liu, 1999, Mayfield, 1999, and Vuolteenaho, 1999).

[4] While many argue for an equity premium between 2 and 3 percent (e.g., Bogle, 1999, 76), some suggest that the premium is currently close to zero (e.g., Wien, 1998, and Glassman and Hassett, 1998) .Surveys of *individual* investors, on the other hand, suggest equity premia even higher than the Ibbotson estimate. For example, the New York Times (10/10/97, page 1, "High hopes of mutual fund investors"), reported an equity premium in excess of 16% from a telephone survey conducted by Montgomery Asset Management.

on reasonable projections of future flows. This overpricing is more evident when examining mature firms, where there is less disagreement about growth opportunities.

To identify possible reasons why the Ibbotson estimate might overstate the equity premium in recent years, apply the Campbell (1991) decomposition of observed returns (in excess of the expected risk-free rate) to the market portfolio. The four components are: i) the expected equity premium for that period; ii) news about the equity premium for future periods; iii) news about current and future period dividend growth; and iv) news about the real risk-free rate for current and future periods. Here, news represents changes in expectations between the beginning and end of the current period (for current period dividend growth and risk-free rates it represents the unexpected portion of observed values). Summing up both sides of this relation for each year since 1926 indicates that the average excess return observed would exceed the equity premium today if: i) conditional 1-year ahead equity premia have declined; ii) the conditional long-term equity premium anticipated for future years has declined; iii) news about dividend growth was positive on average; or iv) the expected real risk-free rate has declined.

The first and second reasons for why the Ibbotson estimate overstates the current equity premium, relating to declines in short and long-term equity premia, can be stated more simply. Holding aside news about dividends and real risk-free rates, an unexpected decline in the equity premium will cause valuations to rise faster than expected, since present values increase when expected rates of return decline. As a result, observed rates of return will exceed expectations and historical equity premium estimates will be biased upward. Blanchard (1993) concludes that the equity premium has declined since 1926 to two or three percent by the early 1990s, and speculates that this decline is caused by a simultaneous decline in expected real rates of return on stocks and an increase in expected real risk-free rates. (This increase in expected real risk-free rates is another puzzle, but that puzzle is beyond the scope of this paper.) The remarkable runup in stock prices during the 1990s, both domestically as well as internationally, is also consistent with a recent decline in the equity premium. Stulz (1999) argues that increased globalization has caused equity premia to decline in all markets.

Examination of historic evidence over other periods and markets suggests that the US experience since 1926 is unusual. Siegel (1992) finds that the excess of observed annual returns for NYSE stocks over short-term government bonds is 0.6, 3.5, and 5.9 percent over the periods 1802-1870, 1871-1925, and 1926-1990, respectively. Jorion and Goetzmann (1999) examine the evidence for 39 equity markets going back to the 1920s, and conclude that the high equity premium observed in the US appears to be the exception rather than the rule. Perhaps some stock markets collapsed and those markets that survived, like the US exchanges, exhibit better performance than expected (see Brown, Goetzman, and Ross, 1995). This evidence is consistent with the third reason for the high Ibbotson premium: since 1926 news about dividend growth for US stocks has been positive on average.

Partially in response to these limitations of inferring equity premia from observed returns, financial economists have considered forward-looking approaches and have examined expected dividends.[5] Informally, expected rates of return on the market equal the forward dividend yield plus expected growth in dividends (this model is discussed further in section I). While dividend yields are easily measured, expected dividend growth in perpetuity is harder to identify. Proxies used for expected dividend growth include past growth in earnings, dividends, or economy-wide aggregates (such as GDP). Unfortunately, as explained in the Appendix, the dividend growth rate that can be sustained in perpetuity is a hypothetical rate that is not necessarily anchored in any observable series, leaving considerable room for disagreement about the best proxy.

We use a different forward-looking approach, labeled the abnormal earnings model, to mitigate problems associated with the dividend growth model.[6] Recognizing that dividends equal earnings less changes in accounting (or book) values of equity allows the stream of projected dividends to be replaced by the current book value of equity plus a function of future accounting

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[5] A related approach is to run predictive regressions of market returns or equity premium on dividend yields and other variables (e.g. Campbell and Shiller, 1988). We do not consider that approach because the declining dividend yields in recent years have caused predicted equity premium to turn negative (e.g. Welch, 1999).

[6] The approach appears to have been discovered independently by a number of economists and accountants over the years. Preinreich (1938) and Edwards and Bell (1961) are two early cites. More recently, a large body of analytical and empirical work has utilized this insight (e.g., Penman, 1999). Examples of empirical investigations include market myopia (Abarbanell and Bernard, 1999), explaining cross-sectional variation in returns (Liu and Thomas, 1999), and stock picking (Frankel and Lee, 1998a and 1998b).

earnings (details follow in section I). Although it is isomorphic to the dividend present value model, the abnormal earnings approach a) uses other information that is currently available to reduce the importance of assumed growth rates, and b) narrows the range of allowable growth rates by focusing on growth in rents, rather than dividend growth.

If the equity premium is as low as our estimates suggest, required rates of return (for capital budgeting, regulated industries, and investment decisions) based on the Ibbotson estimate are severely overstated. Second, a smaller equity premium reduces the importance of estimating beta accurately, because of a decline in the sensitivity of required rates of return to variation in beta, and increases the mismeasurement of beta changes required to explain abnormal returns observed for certain market anomalies. Finally, reducing substantially the magnitude of the equity premium puzzle to be explained might reinvigorate theory-based studies.

In section I we develop the abnormal earnings approach used in this paper and compare it with the dividend growth model. Section II contains a description of the sample and methodology. The equity premium estimates for the US are reported in section III, and results of sensitivity analyses are summarized in section IV (details of these sensitivity analyses are provided in Claus and Thomas, 1999a). The results for the five other markets are summarized in section V (details are provided in Claus and Thomas, 1999b), and section VI concludes.

I. Dividend growth and abnormal earnings models.

The Gordon (1962) dividend growth model is described in equation (1). This relation implies that the expected rate of return on the stock market (k^*) equals the forward dividend yield (d_1/p_0) plus the dividend growth rate in perpetuity (g) expected for the market.

$$p_0 = \frac{d_1}{k^* - g} \Rightarrow \qquad k^* = \frac{d_1}{p_0} + g \tag{1}$$

where

p_0 = current price, at the end of year 0,

d_t = dividends expected at the end of future year t,

k^*= expected rate of return on the market, derived from the dividend growth model, and

g = expected dividend growth rate, in perpetuity.

The Gordon growth model is a special case of the general Williams (1938) dividend present value model, detailed in equation (2), with dividend growth constrained to equal g each year.

$$p_0 = \frac{d_1}{(1+k^*)} + \frac{d_2}{(1+k^*)^2} + \frac{d_3}{(1+k^*)^3} + \ldots \qquad (2)$$

Research using the dividend growth model has often assumed that g equals forecasted earnings growth rates obtained from sell-side equity analysts, who provide earnings forecasts along with their buy/sell recommendations. These forecasts refer to earnings growth over the next "cycle", which is commonly interpreted to represent the next 5 years. Consequently, we refer to this earnings growth forecast as g_5. While most studies using g_5 as a proxy for g have focused on the US market alone (e.g, Brigham, Shome and Vinson, 1985), some have examined other major equity markets also (e.g., Khorana, Moyer and Patel, 1997). Estimates of the equity premium based on the assumption that g equals g_5 are similar in magnitude to the Ibbotson estimate derived from historical data. For example, Moyer and Patel (1997) estimate the equity premium each year over their 11-year sample period (1985-1995) and generate a mean estimate of 9.38 (6.96) percent relative to the 1-year (30-year) risk-free rate. However, others have balked at using g_5 as a proxy for g (e.g, Malkiel, 1996), because it appears unreasonably high at an intuitive level, and have stepped down assumed growth rates.

The Appendix describes conceptual differences between the hypothetical rate g and historic and near-term forecasts of growth rates for dividends and earnings. From an empirical perspective, the forecasted values of g_5 for the US over our sample period, which are close to 12 percent in all years, exceeds nominal growth in S&P earnings, which has been only 6.6% since the 1920s (WSJ, 6/16/97, "As stocks trample price measures, analysts stretch to justify buying"). Also, the real growth rate implied by the nominal 12 percent earnings growth rate exceeds both forecast and realized growth in GDP (since 1970, forecasts of expected real growth in GDP have averaged 2.71 percent, and realized real growth has averaged 2.81 percent).

While we show that g_5 is systematically optimistic relative to realized earnings, it is difficult to infer reliably the level of that optimism from the relatively short time-series of

forecast errors available (reliable data on analyst forecasts go back only about 20 years). Moreover, the incentives for analysts to make optimistic forecasts vary across firms and over time. For example, the literature on US analysts' forecasts suggests that while analysts tended to make optimistic forecasts early in our sample period (to curry favor with management), more recently management has tended to guide near-term analyst forecasts downward to be able to meet or beat them when announcing earnings.[7]

The abnormal earnings model is an alternative that mitigates many of the problems noted above. Expected dividends can be related to forecasted earnings using equation (3) below, and that relation allows a conversion of the present value of dividends relation in equation (2) to the abnormal earnings relation in equation (4).

$$d_t = e_t - (bv_t - bv_{t-1}) \tag{3}$$

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \ldots \tag{4}$$

where
e_t = earnings forecast for year t,
bv_t = expected book (or accounting) value of equity at the end of year t,
$ae_t = e_t - k(bv_{t-1})$, is expected abnormal earnings for year t, or forecast accounting earnings less a charge for the cost of equity, and
k = expected rate of return on the market portfolio, derived from the abnormal earnings model.

Equation (3), also known as the "clean surplus" relation, requires that all items affecting the book value of equity, (other than transactions with shareholders, such as dividends and share repurchases/issues) be included in earnings. Under US accounting rules, there are a few transactions that bypass the income statement and violate the clean-surplus assumption. However, an examination of the items involved suggests that these violations occur ex post, and are not anticipated in analysts' earnings forecasts (e.g., Frankel and Lee, 1998b). Since we

[7] Results reported in Table V offer clear evidence of such a decline in optimism for all horizons. Bagnoli, Beneish, and Watts (1999) document how recent analyst forecasts are systematically below reported earnings for their sample, and also below "whisper" forecasts that are generally viewed as representing the market's true earnings expectations. Matsumoto (1999) offers evidence in support of management guiding analyst forecasts downward, and also investigates factors that explain cross-sectional variation in this propensity to guide analysts.

construct future book values using equation (3), by adding forecast income to and subtracting forecast dividends from beginning book values, clean surplus is maintained and the dividend and abnormal earnings relations in equations (2) and (4) are isomorphic.

Equation (4) indicates that the current stock price equals the current book value of equity plus the present value of future expected abnormal earnings. Abnormal earnings, a proxy for economic profits or rents, adjusts reported earnings by deducting a charge for equity capital. Note that the market discount rates estimated from the abnormal earnings and dividend growth approaches are labeled differently: k and k^*. Also, the standard transversality conditions apply to both models: in the limit as t approaches infinity, the present value of future price, p_t, (difference between price and book value, p_t-bv_t) must tend to zero in equation (2) (in equation (4)).

Financial economists have expressed concerns about accounting earnings deviating from "true" earnings (and book values of equity deviating from market values), in the sense that accounting numbers are noisy and easily manipulated. However, the equivalence between equations (2) and (4) is not impaired by differences between accounting and economic numbers, nor is it affected by the latitude available within accounting rules to report different accounting numbers. As long as forecasted earnings satisfy the clean surplus relation in equation (3) in terms of expectations, equation (4) is simply an algebraic restatement of equation (2), subject to the respective transversality conditions mentioned above.

Since the IBES database we use does not provide analysts' earnings forecasts beyond year 5, we assume that abnormal earnings grow at a constant rate (g_{ae}) after year 5, to incorporate dates past that horizon. Equation (4) is thus adapted as follows.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \qquad (5)$$

The last, bracketed term is a terminal value that captures the present value of abnormal earnings after year 5. The terms before are derived from accounting statements (bv_0) and analyst forecasts (e_1 to e_5). Note that there are three separate growth rates in this paper, and the different growth rates refer to different streams, correspond to different periods, and arise from different

sources: g refers to dividends, corresponds to growth in perpetuity, and is assumed by the researcher; g_5 refers to accounting earnings, corresponds to the first five years, and is provided by financial analysts; and g_{ae} refers to abnormal earnings, corresponds to the period beyond year 5, and is assumed by the researcher.

Unlike expected rates of return which are likely to be stochastic, k^* and k in equations (1) and (5) are non-stochastic discount rates (Samuelson, 1965). Barring a few recent exceptions (e.g., Ang and Liu, 1999, and Vuolteenaho, 1999), the literature has assumed implicitly that expected rates of return can be approximated by discount rates. We make that assumption too. While equation (1) is designed to only reflect a flat k^*, equation (2) can be restated to incorporate predictable variation over time in discount rates. Similarly, equation (5) can be restated to incorporate non-flat discount rates, as shown in Claus and Thomas (1999a). We consider the case when discount rates vary over future periods, based on the term-structure of risk-free rates. The equity premium is, however, assumed to remain flat. This restated version of equation (5) is

$$p_0 = bv_0 + \sum_{t=1}^{\infty}\left[\frac{ae_t}{\prod_{s=1}^{t}\left(1+r_{fs}+rp\right)}\right] \qquad (5a)$$

where
r_{ft} = forward 1-year risk-free rate for year t,
rp = equity risk premium, assumed constant over all future years,
ae_t = expected abnormal earnings for year t, equals $e_t - bv_{t-1}(r_{ft}+rp)$ for years 1 through 5, and equals $ae_5(1+g_{ae})^{t-5}$, from year 6 on.

While the abnormal earnings stream in equation (4) is equivalent to the corresponding dividend stream in equation (2), the abnormal earnings relation in equation (5) (and equation (5a)) offers the following advantages over the dividend growth model in equation (1) (empirical support follows in sections III and IV). First, a substantial fraction of the "value profile" for the abnormal earnings model in equation (5) is fixed by numbers that are currently available and do not need to be assumed by the researcher (current book value and abnormal earnings for years 1 through 5). Value profile is a representation of the fraction of total value captured by each future year. In contrast, the entire value profile for the dividend growth model is a function of the

assumed growth rate, g. Reducing the fraction of value determined by assumed growth rates results in more reliable market discount rate estimates from the abnormal earnings approach.

Second, in contrast to the potential for disagreement about a reasonable range for g, the rate at which rents can grow in perpetuity after year 5, g_{ae}, is less abstract and easier to gauge using economic intuition. For example, to obtain equity premia around 8%, rents at the market level would have to grow forever at about 15 percent, on average. Factors such as anti-trust actions, global competition, and pressure from other stakeholders suggest that aggregate rents to US equityholders are unlikely to grow at such high rates in perpetuity. The historical evidence (e.g., Myers, 1999) is also completely at odds with such high growth rates in abnormal earnings.

Third, future streams for a number of value-relevant indicators, such as price to book ratios (P/B), price to earnings ratios (P/E), and accounting return on equity (*roe*) can also be projected under the abnormal earnings approach. This allows one to paint a more complete picture of the future for different assumed growth rates. Analysis of the levels of future P/B and profitability (excess of *roe* over k) implied by growth rates required to obtain equity premium estimates around 8% are also inconsistent with past experience (e.g., Nissim and Penman, 1999).

II. Data and methodology

IBES provides the consensus of all available individual forecasts as of the middle (the Thursday following the second Friday) of each month. Forecasts and prices should be gathered soon after the prior year-end, as soon as equity book values (bv_0) are available. Rather than collect forecasts at different points in the year, depending on the fiscal year-end of each firm, we opted to collect data as of the same month each year for all firms to ensure that the risk-free rate is the same across each annual sample. Since most firms have December year-ends, and book values of equity can be obtained from the balance sheets that are required to be filed with the SEC within 90 days of the fiscal year-end, we collect forecasts as of April each year.[8] For firms with fiscal year-ends other than December, this procedure creates a slight upward bias in

[8] For the few firms violating this 90-day deadline, the book value of equity can be inferred by adding (subtracting) fourth quarter earnings (dividends) from the equity value as of the end of the third quarter.

estimated equity premium, since the stock prices used (as of April) are on average higher than those near the prior year's fiscal year-end, when bv_0 was released. In addition to earnings forecasts, IBES also provides data for actual earnings per share, dividends per share, share prices, and the number of outstanding shares. Equity book values are collected from Compustat's Industrial Annual, Research, and Full Coverage Annual Files, for years up to and including 1997.

The sample includes firms with IBES forecasts for 1 and 2 years ahead (e_1 and e_2) and a 5-year growth forecast (g_5) as well as share prices and shares outstanding as of the IBES cut off date each April. We also require non-missing data for the prior year's book value, earnings, and dividends. A forecast for year 3 is generated by growing the year 2 forecast at the forecasted growth rate, g_5: $e_3=e_2(1+g_5)$. (The few firm-years with negative Year 2 forecasted earnings are deleted). The same procedure is used to generate forecasts for years 4 and 5.[9]

Earlier years in the IBES database, before 1985, were dropped because they provided too few firms with complete data to represent the overall market. From 1985 on, the number of firms with available data increases substantially. As shown in column 1 of Table I, there are 1,559 firms in our sample in 1985, and this increases to 3,673 firms in 1998. Comparison with the total number of firms and market capitalization of all firms on NYSE, AMEX, and NASDAQ each April indicates that although our sample represents only about 30 percent of all such firms, it represents 90 percent or more of the total market capitalization. Overall, we believe our sample is fairly representative of the value-weighted market, and refer to it as "the market" hereafter.

For each year firm-level data are aggregated to generate market-level earnings, book values, dividends, and capitalization. Actual data for year 0 (the full fiscal year preceding each April when forecasts were collected) is provided in columns 2 through 6 of Table I. Forecasted and projected earnings for years 1through 5 are reported in columns 7 through 11.

Table I reveals an interesting finding relating to dividend payouts: the ratio of market dividends to earnings is around 50 percent in every year (with a noticeable decline toward the

[9] In some cases, earnings forecasts are available for years 3, 4, and 5, and do not need to be inferred using g_5. That subsample was investigated to confirm that the earnings forecasts for years 3 to 5 inferred from 5-year growth rates are unbiased proxies for the actual forecasts for those years.

end of the sample period). Although this statistic is well-known to macroeconomists, it seems high compared to anecdotal estimates of average dividend payouts. We offer two explanations for this difference. First, our ratio based on aggregates is similar to a value-weighted average dividend payout and is thus more representative of large firms, which tend to have higher dividend payouts than small firms. Second, market earnings include many loss firms, especially in the early 1990's, when accounting earnings were depressed because of write-offs and accounting changes.[10] We use this 50 percent payout ratio to project future dividends from earnings forecasts, as well as to project future book values (using equation (3)). The validity of this assumption is not critical, however: varying the payout ratio between 25 and 75 percent has little impact on the estimated discount rate (results available upon request).

Both short and long-term risk-free rates have been used in studies that estimate discount rates from flows that extend over many future periods. While short-term rates are appropriate when inferring the equity premium from historic returns (observed return less risk-free yield for that period), for studies based on forecasted flows the maturity of risk-free rates used should match that of the future flows (Ibbotson Associates, 1999). Although we allow for expected variation in risk-free rates when estimating the risk premium, using equation (5a), we find almost identical results using a constant risk-free rate in equation (5) equal to the long-term rate. In essence, the shape of the yield curves over our sample period is such that the forward rates settle rather quickly at the long-term rate, and the impact of discounting flows from earlier years in the profile at rates lower than the long-term rate is negligible. For the sensitivity analyses, we find it convenient to use the constant rate structure of equation (5), rather than the varying rate structure of equation (5a), and we selected the 10-year risk-free rate for the constant risk-free rate because it was the longest maturity for which data could be obtained from Datastream for all country-years in our sample. To allow comparisons with other studies that use 30-year risk-free rates, we

[10] Typically, dividend-payout averages are generated from payouts computed at the firm level, and loss firms are excluded from consideration because the payout ratio is meaningless when the denominator is negative. Dividends remained relatively unaffected, however, and including loss firms raises the ratio of aggregate dividends to aggregate earnings, relative to the average dividend payout of all profitable firms.

note that the mean 30-year risk free rate in April for each year of our US sample period is 31 basis points higher than the mean 10-year risk-free rate we use.

For years beyond year 5, abnormal earnings are assumed to grow at the expected inflation rate, g_{ae}. As explained in the appendix, the expected nominal inflation rate is higher than values of g_{ae} assumed in the literature, and is an upper bound for expected growth in abnormal earnings. We derive the expected inflation rate from the risk-free rate, based on the assumption that the real risk-free rate is approximately three percent.[11] Since we recognize that this assumption is only an educated guess, we consider in section IV.D other values of g_{ae} also. Fortunately, our estimated risk premium is relatively robust to variation in the assumed growth rate, g_{ae}, since a lower proportion of current market value is affected by g_{ae} in equations (5) and (5a), relative to the impact of g in equation (1).

III. Results

Since k appears in both the numerators (ae_t is a function of k) and denominators of the terms on the right-hand side of equation (5), the resulting equation is a polynomial in k with many possible roots. Fortunately, as shown by Botosan (1997), empirically only one root is real and positive. We search manually for the value of k that satisfies the relation each year, with the first iteration being close to the risk-free rate. Similarly, the equity risk premium estimate (rp) that satisfies the valuation relation in equation (5a) is estimated iteratively.

Table II provides the results of estimating rp, k, and k^*. The annual estimates for rp, reported in column 13, indicate the following. First, the estimates lie generally between three and four percent and are much lower than the historic Ibbotson estimate. Second, there is little variation over time: the estimates are remarkably close to their mean value of 3.39 percent.

The annual estimates for k, reported in column 10, vary between a high of 14.38 percent in 1985 and a low of 8.15 percent in 1998. The corresponding risk-free rates, 10-year Government T-bond yields reported in column 9, vary with the estimated k's, between a high of

[11] The observed yields on recently issued inflation-indexed government bonds supports this assumption. Although estimates of the real risk-free rate vary through time, and have historically been lower than three percent, more recently, the excess of the long-term risk-free rate over inflation forecasts has risen to 3 or 4% (e.g., Blanchard (1993) and Siegel's discussion).

11.43 percent in 1985 and 5.64 percent in 1998. As a result, the estimated equity premia reported in column 12, equal to k less r_f, exhibit little variation around the time-series mean of 3.40%.

While the equation (5a) equity premium estimates (rp) derived from non-flat risk-free rates, are in concept more accurate than those derived by subtracting 10-year risk-free rates from the flat k estimated from equation (5), the numbers reported in column 12 are very similar to those reported in column 13. Since the magnitudes of the discount rates and their relation to risk-free rates are more transparent for the risk premium estimates based on constant risk-free rates, and given that forward 1-year rates for different maturities are not available for the other five markets, we only consider the equation (5) estimates hereafter.

To understand better the relative magnitudes of the terms in equation (5), we report the aggregate market and book values in the first two columns of Table II, the present values of abnormal earnings for years 1 through 5 in columns 3 though 7, and the present value of the terminal value (representing abnormal earnings growing at the rate g_{ae} after year 5) in column 8. These abnormal earnings and their present values are based on the flat k.

Column 11 of Table II contains our estimates for k^*, the market discount rate based on the dividend growth model described by equation (1) and the assumption that dividends grow in perpetuity at the 5-year growth in earnings forecast (g_5). Since g_5 is not available at the aggregate level, we use the forecast growth in aggregate earnings from year 4 to 5 (see column 16 of Table IV) to identify g_5 at the market level. To maintain consistency with prior research using the dividend growth model, we estimate d_1 by applying the earnings growth forecast for year 1 on prior year dividends ($d_1=d_0*e_1/e_0$). Our estimates for k^* are almost identical to those reported by Moyer and Patel (1997).[12] Note that the values of k^* in column 11 are much larger than the corresponding values of k in column 10, with a time-series mean that is almost 4 percentage points higher than that for k (14.98% versus 11.04%). The mean equity premium implied by $k*$ is 7.34 percent (14.98%-7.64%), which is about the same as the Ibbotson estimate.

[12] Similar results are expected because the underlying data is taken from the same source, with minor differences in samples and procedures; for example, they use the S&P 500 index whereas we use all firms with available data.

The results in Table II can be used to illustrate two primary advantages of the abnormal earnings model over the dividend growth model. First, the abnormal earnings approach uses more available "hard" data (current book value and forecast abnormal earnings for years 1 to 5) to reduce the emphasis on "softer" growth assumptions (g_{ae}) used to build terminal values. Figure 1 contains a value profile for the terms in equation (5), using data for 1991. This year was selected because it represents a "median" profile: the terminal value is a smaller (larger) fraction of total value for years before (after) 1991. Recall from Table II, that our estimate for k in 1991 is 11.05%. The terminal value is based on abnormal earnings growing at an anticipated inflation rate of 5.04% (g_{ae} is 3% less than the risk-free rate of 8.04%). The value profile for the abnormal earnings model, represented by the solid columns in Figure 1, shows that approximately 50% of the total value is captured by current book value, 10 percent is spread over the abnormal earnings for the next five years, and only 40 percent remains in the terminal value (which is the term affected by our growth assumption). In contrast, for the dividend growth model in equation (1), the dividend growth rate (g), which is assumed to equal the 5-year analyst forecast for earnings growth (g_5=12.12%), is the primary determinant of the estimated k* (=15.16%).

To offer a different perspective on why growth assumptions are more influential for projected dividends, relative to abnormal earnings, we converted the abnormal earnings profile in Figure 1 to an isomorphic value profile for dividends, represented by the hollow columns in Figure 1. (Note that these dividends refer to the flows underlying k, from the abnormal earnings model, and are different from the flows underlying k*, the dividend growth model estimate.) The year 5 terminal value for the dividend profile in Figure 1 corresponds to a dividend growth in perpetuity of 6.8%.[13] Even though the abnormal earnings and dividend profiles in Figure 1 correspond to the same underlying projections, the terminal value for the dividend profile represents almost 85 percent of total value. As a result, assumed dividend growth rates have a larger impact on estimated discount rates, relative to abnormal earnings growth rate assumptions.

[13] This dividend growth rate is obtained by using equation (1) on projected market value in year +5, rather than current market values (p_0) and the dividend in year 6 is the dividend in year +5 (=50% of the earnings forecast for year +5) times the unknown growth rate. That is, solve for g in the relation $p_5=d_5(1+g)/(k-g)$.

For example, doubling the assumed value of g_{ae} to 10 percent increases the estimated discount rate by only about two percentage points (see section IV.D). In contrast, increases in the dividend growth assumption raise the estimated discount rate by almost the same amount.[14]

The second major benefit of the abnormal earnings approach is that we can narrow the range of reasonable growth assumptions (g_{ae}), relative to the assumed growth rate for dividends (g). Since g is a hypothetical rate, it is not easy to determine whether 12.12 percent (the value of g underlying our 1991 estimate for k^*) is more or less reasonable than the 6.8 percent dividend growth in perpetuity (after year 5) implied by our abnormal earnings model projections. Fortunately, restating implied dividend growth rates in terms of terminal growth in abnormal earnings makes it easier to see why some dividend growth assumptions are unreasonable. The assumption that dividends grow at 12.12 percent implies that abnormal earnings past year 5 would need to grow in perpetuity at about 15 percent per year in equation (5). This abnormal earnings growth rate corresponds to a real growth in rents of 10 percent (assumed long-term inflation rate is 5.04 percent). Such a high growth in real rents at the market level is clearly optimistic (see section IV.D for additional evidence).

In sum, our estimates of the equity risk premium using the abnormal earnings approach are considerably lower than the Ibbotson rate. Adjusting for analyst optimism and using more realistic terminal growth assumptions would lower them further still. While our estimates from the dividend growth approach are much closer to the Ibbotson rate, we believe they are biased upward because the assumed growth rate ($g=g_5$) is too high an estimate for dividend growth in perpetuity. The estimates from the abnormal earnings approach are more reliable because we use more available information to reduce the importance of assumed growth rates, and we are better able to reject growth rates as being infeasible by projecting rents rather than dividends. Additional benefits of using the abnormal earnings approach are illustrated in section IV.

[14] Note that in equation (1) changes in g increase k^* by exactly the same amount. For the dividend value profile in Figure 1, however, dividends for years +1 to +5 have been fixed by forecasted earnings and dividend payout assumptions. Therefore, increases in the dividend growth rate underlying the terminal value increase the estimated discount rate by a slightly smaller amount.

IV . Sensitivity Analyses

This section summarizes our attempts to gauge the robustness of our conclusion about the risk premium being much lower than historic estimates. We begin by considering two relations for P/B and P/E ratios that allow us to check whether our projections under the dividend growth and abnormal earnings models are reasonable. Next, we document the extent of analyst optimism in our data. Finally, we consider the sensitivity of our risk premium estimates to the assumed abnormal earnings growth rate (g_{ae}).[15]

A. P/B ratios and the level of future profitability

The first relation we examine is that between the P/B ratio and future levels of profitability (e.g., Penman, 1999, Claus and Thomas, 1999a), where future profitability is the excess of the forecast market accounting rate of return (roe_t) over the required rate of return, k.

$$\frac{p_0}{bv_0} = 1 + \frac{roe_1 - k}{(1+k)} + \frac{roe_2 - k}{(1+k)^2}\left(\frac{bv_1}{bv_0}\right) + \frac{roe_3 - k}{(1+k)^3}\left(\frac{bv_2}{bv_0}\right) + \ldots \qquad (6)$$

where $roe_t = \dfrac{e_t}{bv_{t-1}}$, is the accounting return on equity in year t.

This relation indicates that the P/B ratio, is explained by expected future profitability (roe_t-k).[16] Firms expected to earn an accounting rate of return on equity equal to the cost of capital should trade currently at book values (p_0/bv_0=1). Similarly, the P/B ratio expected in year 5 (p_5/bv_5), which is determined by the assumed growth in abnormal earnings after year 5 (g_{ae}), should be related to accounting profitability beyond year 5. To investigate the validity of our assumed growth rates, we examine the profiles of future P/B ratios and profitability levels to check if they are reasonable and related to each other as predicted by equation (6). Recall that

[15] We also examined Value Line data for the DOW 30 firms for two years:1985 and 1995 (details in Claus and Thomas, 1999a). Value Line provides both dividend forecasts (over a 4 or 5 year horizon) and a projected price. This price is in effect a terminal value estimate, which obviates the need to assume dividend growth in perpetuity. Unfortunately, those risk premium estimates appear to be unreliable: the estimated discount rate is 20% (8.5%) for 1985 (1995). These results are consistent with Value Line believing that the DOW 30 firms are undervalued (overvalued) in 1985 (1995); i.e., current price does not equal the present value of forecast dividends and projected prices. This view is supported by their recommendations for the proportion to be invested in equity: it was 100% through the 1980s, and declined through the 1990s (it is currently at 40%).

[16] The growth in book value terms in equation (6), bv_t/bv_0, which add a multiplicative effect, have been ignored in the discussion because of the built-in correlation with roe_t-k. Higher roe_t results in higher e_t, which in turn causes higher growth in bv_t because dividend payouts are held constant at 50 percent for all years (by assumption).

future book values are generated by adding projected earnings and subtracting projected dividends (assuming a 50% payout) to the prior year's book value. Similarly, projected market values are obtained by growing the prior year's market value at the discount rate (k) and subtracting projected dividends.

Table III provides data on current and projected values of P/B ratios and profitability. Current market and book values are reported in columns 1 and 2, and the projected market and book values in year 5 (based on the assumptions underlying the abnormal earnings approach) are reported in columns 3 and 4. These values are used to generate current and year 5 P/B ratios, reported in columns 5 and 6. Columns 7 through 12 contain the forecasted accounting rate of return on equity for years 1 to 6, which can be compared with the estimated market discount rate, k, reported in column 13, to obtain forecasted profitability.

The current P/B ratio has been greater than one in every year in the sample period, and has increased steadily over time, from 1.5 in 1985 to 3.8 in 1998. Consistent with equation (6), all forecasted *roe* values for years 1 through 6 in Table III exceed the corresponding values of k. Increases in the P/B ratio over the sample period are mirrored by corresponding increases in forecast profitability (roe_t - k) in years 1 through 5 as well as forecast profitability in the post-horizon period (after year 5), as measured by the implied price to book ratio in year 5. Finally, the tendency for P/B ratios to revert gradually over the horizon toward 1 (indicated by the year 5 values in column 6 being smaller than the year 0 values in column 5) is consistent with intuition (e.g., Nissim and Penman, 1999). Additional analysis using projected P/B ratios and *roe* to confirm the validity of our assumed terminal growth rate (g_{ae}) is described in section IV.D.

B. P/E ratios and forecast growth in profitability

The second relation we use to check the validity of our assumptions regarding g_{ae} is the price-earnings ratio, described by equation (7) below (see derivation in Claus and Thomas, 1999a). Price-earnings ratios are a function of the present value of future changes in abnormal earnings, multiplied by a capitalization factor ($=1/k$).

$$\frac{p_0}{e_1} = \frac{1}{k}\left[1 + \frac{\Delta ae_2}{e_1(1+k)} + \frac{\Delta ae_3}{e_1(1+k)^2} + \ldots\right] \qquad (7)$$

where

$Dae_t = ae_t - ae_{t-1}$,is the change in expected abnormal earnings over the prior year.

The price-earnings ratio on the left-hand side deviates slightly from the traditional representation in the sense that it is a "forward" price-earnings ratio, based on expected earnings for the upcoming year, rather than a "trailing" price-earnings ratio (p_0/e_0), which is based on earnings over the year just concluded. The relation between future earnings growth and forward price-earnings ratios is simpler than that for trailing price-earnings ratios.[17] Therefore, we use only the forward price-earnings ratio here and refer to it simply as the P/E ratio.

The results reported in table IV provide P/E ratios and growth in abnormal earnings derived from analyst forecasts, at the market level. The first 4 columns provide market values and the corresponding upcoming expected earnings for year 0 and year 5. These numbers are used to generate the current and year 5 P/E ratios reported in columns 5 and 6, which can be compared to the values of *1/k* reported in column 18.[18] According to equation (7), absent growth in abnormal earnings, the P/E ratio should be equal to *1/k*, and for positive (negative) expected growth in abnormal earnings, the P/E ratio should be greater (less) than *1/k.* Forecast growth rates in abnormal earnings for years 2 through 6 are reported in columns 7 through 11. To maintain equivalence with the terms in equation (7), growth in abnormal earnings is scaled by earnings expected for year 1 (e_1) and then discounted.

To understand the relations among the numbers in the different columns, consider the row corresponding to 1991. The market P/E ratio of 15.1 is higher than the inverse of the discount rate (1/*k*=9.0). That difference of 6.1 is represented by the sum of the present value of the abnormal earnings growth terms in future years, scaled by e_1 (this sum needs to be multiplied

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[17] Since the numerator of the P/E ratio is an ex-dividend price (p_0), the payment of a large dividend (d_0) would reduce p_0 without affecting trailing earnings (e_0), thereby destroying the relation between p_0 and e_0. This complication does not arise when expected earnings for the upcoming period (e_1) is used instead of e_0.

[18] If the numbers in Table IV appear to be not as high as the trailing P/E ratios commonly reported in the popular press, note that forward P/E ratios are generally smaller than trailing P/E ratios for the following reasons. First, next year's earnings are greater than current earnings because of earnings growth. Second, current earnings contain one-time or transitory components that are on average negative, whereas forecast earnings focus on core or continuing earnings.

by *1/k* as shown in equation (7)). These growth terms decline from 13% in year 2 to 2% in year 6, and continue to decline thereafter. By year 5, the market P/E is expected to fall (to 11.7), since some of the growth in abnormal earnings (represented by the amounts in columns 7 through 11) is expected to have already occurred by then. Turning to the other sample years, the P/E ratios in year 0 (column 5) have generally increased through the sample period, and so have the values of 1/*k*. Consistent with P/E ratios exceeding *1/k* in every year, abnormal earnings are forecast to exhibit positive growth for all cells in columns 7 to 11. Also, the P/E ratios in year 5 are forecast to decline, relative to the corresponding year 0 P/E values, because of the value represented by the amounts in columns 7 to 11.

For purposes of comparison with other work, we also report in columns 12 through 17 of table IV the growth in forecast earnings (as opposed to growth in abnormal earnings) for years 1 through 6. Note that growth in abnormal earnings need not be related in a systematic manner to growth in earnings, and that there is no explicit link in equation (7) between P/E ratios and earnings growth. However, the prior literature makes intuitive links between P/E ratios and future earnings growth, and earnings growth is easier to comprehend and relate to than growth in abnormal earnings. Forecasted growth in earnings declines over the horizon, similar to the pattern exhibited by growth in abnormal earnings. Note the similarity in the pattern of earnings growth for all years in the sample period: the magnitudes of earnings growth estimates appear to settle at around 12 percent by year 5, before dropping sharply to values around 7 percent in the post-horizon period (year 6). This issue is discussed further in section IV.D below.

The results in table IV confirm the predictions derived from equation (7) as well as the intuitive links drawn in the literature. As with the results for P/B ratios, the trends for P/E ratios and growth in abnormal earnings exhibit no apparent discrepancies that might suggest that the terminal abnormal earnings growth rates we assume are unreasonable.

C. Bias in analyst forecasts

We considered a variety of biases that may exist in the IBES forecasts, but found only the well-known optimism bias to be noteworthy (details provided in Claus and Thomas, 1999a).[19] We compute the forecast error for each firm in our sample, representing the median consensus forecast as of April less actual earnings, for different forecast horizons (year +1, +2, … +5) for each year between 1985 and 1997. Table V contains the median forecast errors (across all firms in the sample for each year), scaled by share price. In general, forecasted earnings exceed actual earnings, and the extent of optimism increases with the horizon.[20] There is, however, a gradual reduction in optimism toward the end of the sample period.

Since the forecast errors in Table V are scaled by price, comparing the magnitudes of the median forecast errors with the inverse of the trailing P/E ratios (or E/P ratios) is similar to a comparison of forecast errors with earnings levels. That comparison suggests that the bias is fairly substantial. While the trailing E/P ratios for our sample vary between 5 and 9 percent, the forecast errors in Table V vary between values that are in the neighborhood of 0.5 percent for year +1 to around 3 percent in year +5. Comparing the magnitudes of year +5 forecast errors with the implied E/P ratios indicates that forecasted earnings exceed actual earnings by as much as 50 percent at that horizon. Since we do not adjust for the considerable analyst optimism documented here, we are certain that our low equity premium estimates are not caused by unreasonably low forecasts for future flows.

D. Impact of variation in the assumed growth rate in abnormal earnings beyond year 5 (g_{ae})

We begin by considering two alternative cases for g_{ae}: 3 percent less and 3 percent more than our base case, where g_{ae} is assumed to equal the expected inflation rate. As mentioned in the appendix, our base growth rate of $g_{ae}=r_f-3\%$ is higher than any rate assumed in the prior

[19] IBES removes one-time items (typically negative) from reported earnings That is, the level of optimism would have been even higher if we had used reported numbers instead of actual earnings according to IBES.

[20] In addition to increasing with forecast horizon, the optimism bias is greater for certain years where earnings were depressed temporarily. The higher than average dividend payouts observed in Table 1 for 1987 and 1992 indicate temporarily depressed earnings in those years, and the forecast errors are also higher than average for those years. For example, the two largest median year +2 forecast errors are 1.86 and 1.81 percent, and they correspond to 2-year out forecasts made in 1985 and 1990.

abnormal earnings literature. Adding another three percent to the growth rate, which would require rents to grow at a 3 percent real rate in perpetuity, raises the level of optimism further. Dropping 3 percent from the base case, in the lower growth scenario, would be equivalent to assuming a very low nominal growth rate in abnormal earnings, and would be only slightly more optimistic than the assumptions in much of the prior abnormal earnings literature.

For the higher (lower) growth rate scenario, corresponding to $g_{ae}=r_f$ ($g_{ae}=r_f$-*6%)*), the average risk premium over the 14-year sample period increases (decreases) to a mean of 4.66 (2.18), from a mean of 3.40 percent for the base case. That is, even for this very high growth rate in abnormal earnings, the increase in the estimated risk premium is modest, and leaves it substantially below the traditional estimates of the risk premium. While increasing (decreasing) the growth rate increases (decreases) the terminal value, it also reduces (increases) the present value of that terminal value because of the higher (lower) market discount rate it engenders.

We consider next a synthetic market portfolio constructed to have no expected future abnormal earnings, to avoid the need for an assumed abnormal earnings growth rate beyond year 5. (We thank Steve Penman for suggesting this analysis.) As described in equation (6), portfolios with P/B=1 should exhibit no abnormal earnings; i.e. the return on equity should on average equal the cost of equity. To construct portfolios with P/B=1, we split all firms with available data each year into two groups: those with P/B above 1 and those with P/B less than 1. Equity market and book values for each group are aggregated to determine the overall P/B ratio for each group. The two groups are then assigned weights (that sum to 1) depending on the distance of their P/B ratios from 1, so that the weighted-average P/B for the synthetic market portfolio is 1. All current and forecast data for sample firms each year are then multiplied by those weights, to obtain the data required to estimate *k* from equation (5). The last term in equation (5), representing the terminal value of abnormal earnings beyond year 5, is set to zero. While this synthetic market is not similar to the actual market in many respects, it is similar along one important dimension: the weighted-average betas for the synthetic portfolios are close to 1 for each year in our sample.

A complete analysis of this synthetic market portfolio was conducted, similar to that reported in Tables I through IV for the actual market portfolio. The main result is that the mean risk premium estimate from the synthetic market is 2.20 percent, which is slightly lower than the mean risk premium of 3.40 percent in Table II. While low P/B firms are expected to generate higher returns (e.g., Gebhardt, Lee, and Swaminathan, 1999), we actually find lower discount rates for our synthetic markets. These results are consistent with our view that our assumed abnormal earnings growth rate is probably too high. Also, analysts appear to exhibit greater optimism for high P/B firms.

Our final sensitivity analysis considers future projections for the growth scenarios underlying the dividend growth model; i.e., where dividends grow forever at g_5. The results in Table V confirm that the 5-year earnings growth rates of about 12 percent forecast by IBES analysts are optimistic *ex post* in every year of the sample period. By projecting future numbers for the assumptions underlying the dividend growth approach, we seek to confirm that those growth rates are also optimistic *ex ante*.

The projected dividend streams underlying the dividend growth model for each year were converted to future earnings, book values, and abnormal earnings, for years 1 through 15, and the various diagnostic indicators reported for Tables III and IV were computed for those future years. Those results suggest that the optimism built into earnings forecasts translate into projections that are clearly unreasonable. As a result, our estimates for k* are clearly biased upward because of this optimism. These results are detailed in Claus and Thomas (1999a).

To provide an illustrative example of those results, we contrast in Figure 2 the patterns for future *roe* and P/B that are projected for the dividend growth and abnormal earnings approaches for 1991. The *roe* levels are marked off on the left scale, and P/B ratios are shown on the right scale. Recall that the market discount rates estimated for the abnormal earnings and dividend growth approaches are 11.05% (k) and 15.16% (k*) and the corresponding terminal growth rates for abnormal earnings and dividends are 5.04% and 12.12%.

Consistent with the descriptions above, the projections for the abnormal earnings method (indicated by bold lines) appear reasonable. The P/B ratio always exceeds one, but it trends down over time. Consistent with P/B exceeding one, the *roe* is always above the 11.05% cost of capital, and trends toward it after year 5. Note that the optimistic analyst forecasts cause *roe* projections to climb for years 1 through 5, but the subsequent decline in *roe* is caused by the moderating influence of our assumption that g_{ae} equals the inflation rate.

The results for the dividend growth approach suggest that the estimated market discount rate and the assumed dividend growth rate are too high. The profitability (*roe*) is actually below the cost of equity of 15.16% (k^*), for the first three years, even though the P/B ratio is greater than one. Thereafter, the profitability keeps increasing, to a level above 20% by year 15. Neither the high level of profitability nor its increasing trend are easily justified, especially when it is observed repeatedly for every year in our sample. Similarly, the increasing pattern for P/B, which is projected to increase from about 2 to about 3 by year 15 is hard to justify. These projections are, however, consistent with an estimated market discount rate that is too high. Since near-term forecasts of profitability made by analysts are below this market discount rate, despite the optimism documented earlier, future levels of profitability have to be unreasonably high to compensate.

V. Equity premium estimates from other markets.

Other equity markets offer a convenient opportunity to validate our domestic results. Provided the different markets are integrated and of approximately similar risk, the equity premia should be similar. We replicated the US analysis on five other markets with sufficient data to generate reasonably representative samples of those markets. Only a summary of our results is provided here; details of those analyses are in Claus and Thomas (1999b).

While most readers are familiar with the recent price runup for US stocks, examination of the stock performance of the five other markets indicates some surprising patterns. Over our sample period, US stocks have been outpaced by French equities, and have been matched by UK stocks. The performance of German equities is not far behind. Japanese stocks, however, peaked

in the late 1980's, crashed subsequently, and have not recovered since. Canadian stocks have outperformed Japanese equities, but are considerably behind the US and the other three markets. This diversity in performance observed across markets with different fundamentals offers an opportunity to obtain independent evidence on the equity premium.

As with the US data, earnings forecasts, actual earnings per share, dividends per share, share prices, and the number of outstanding shares are taken from IBES. Book values of equity as of the end of year 0 are collected from Compustat and Global Vantage for Canada and from Datastream for the remaining four countries. Unlike IBES and Compustat, Datastream drops firms that are no longer active. While such deletions are less frequent overseas, relative to the US, only surviving firms are included in our sample. Fortunately, this does not create a bias in this study since we equate market valuations with contemporaneous forecasts, and do not track performance.[21] Therefore, even if the surviving firms (included in our sample) performed systematically better or worse than firms that were dropped, our equity premium estimates are unbiased provided market prices and earnings forecasts in each year are efficient and incorporate the same information. We assume that the risk of surviving firms is similar to those of firms that were dropped. All data are denominated in local currency. Currency risk is not an issue here, since it should be present in the required rates of returns for both equities and Government bonds. Thus, the difference between the two rates should be comparable across countries.

We find that analysts' forecasts in these five markets exhibit an optimism bias, similar to that observed in the US. We considered other potential sources of measurement error in the forecasts, but are confident that any biases created by these errors are unlikely to alter our equity premium estimates much. For example, in Germany, earnings could be computed in as many as four different ways: GAAP per International Accounting Standards, German GAAP, DVFA and US GAAP.[22] IBES employees indicated that they have been more successful at achieving

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[21] Note that there is no "backfilling" in our sample, where prior years' data for successful firms are entered subsequently.

[22] The German financial analyst society, Deutsche Vereinigung fur Finanzanalyse (DVFA), has developed a system used by analysts (and often by firms) to adjust reported earnings data to provide a measure that is closer to permanent or core earnings. The adjustment process uses both reported financial information as well as firms'

consistency in recent years (all forecasts are on a DVFA basis), but they are not as certain about earlier years in their database. While differences in basis between forecast and actual items would affect analyst bias, they do not affect our estimates of market discount rates. Differences in basis across analysts contaminate the consensus numbers used, but the estimated market discount rates are relatively insensitive to changes in the near-term forecasts used.

To select the month of analysis for each country we followed the same logic as that for the US analysis. December was the most popular fiscal year-end for all countries except for Japan, where it was March. We then identified the period after the fiscal year-end by which annual earnings are required to be disclosed. This period differs across countries (see Table 1 in Alford et al., 1993): it is 3 months for Japan and the US, 4 months for France, 6 months for Canada and the UK, and 8 months for Germany. We selected the month following the reporting deadline as the "sure to be disclosed" month to collect forecasts for any given year.

To include a country-year in our sample, we required that the total market value of all firms in our sample exceed 35 percent of the market value of "primary stock holdings" for that country, as defined by Datastream. Although we used a relatively low hurdle to ensure that our sample contained a block of contiguous years for all countries, for most country-years a substantially greater proportion of the Datastream Market Index than the 35 percent minimum hurdle is represented in our sample.

The equity-premium estimates using the abnormal earnings and dividend growth approaches as well as the prevailing risk-free rates for different country-year combinations with sufficient data are reported in Table VI. The number of years with sufficient firms to represent the overall market was highest for Canada (all 14 years between 1985 and 1998), and lowest for Japan (8 years). As with the US sample, we use a 50 percent aggregate dividend payout ratio to generate future dividends and book values, and assume that abnormal earnings grow at the expected inflation rate, which is assumed to be three percent less than the prevailing risk-free rate. For the few years where r_f in Japan is below 3%, we set g_{ae}=0.

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internal records. GAAP refers to Generally Accepted Accounting Principles or the accounting rules under which financial statements are prepared in different domiciles.

The equity premium values based on the abnormal earnings approach (k-r_f) generally lie between 2 and 3 percent, except for Japan, where the estimates are considerably lower (and even negative in the early 1990s). Finding that none of the almost 70 estimates of k-r_f reported in Tables II and VI are close to the Ibbotson estimate suggests strongly that that historical estimate is too high. In contrast, the equity premium estimates based on the dividend growth approach with dividends growing in perpetuity at the 5-year earnings growth forecast (g_5) are considerably higher, similar to the pattern observed in the US. The dividend growth estimates are very close to those reported in Khorana et al. (1997), which uses a similar approach and a similar sample.

Repeating the sensitivity analyses described in section IV on these five markets produced similar conclusions. The abnormal earnings estimates generate projections that are consistent with experience, but the dividend growth estimates are biased upward and generate projections that are too optimistic because the five-year earnings growth forecast (g_5) is too high an estimate for dividend growth in perpetuity. The values of g_5 suggest mean real dividend growth rates in perpetuity that range between 6.09% for Canada and 8.25% for Japan. These real rates exceed historic real earnings growth rates, and are at least twice as high as the real GDP growth rates forecast for these countries.

The results observed for Japan are quite interesting and invite speculation. While our results suggest that the equity premium in Japan increased during the sample period, from about –1% in the early 1990s to 2% in the late 1990s, these results are also consistent with a stock market bubble that has gradually burst. That is, early in our sample period prices were systematically higher than the fundamentals (represented by analysts' forecasts) would suggest, and they have gradually declined to a level that is supported by analysts' forecasts. Note that our sample excludes the peak valuations in the late 1980's before the crash. Perhaps the implied equity premium in that period would be even more negative than the numbers we estimate for the early 1990's. Regardless of whether or not the poor performance of Japanese equities in the 1990s is due to correction of an earlier mispricing, it is useful to contrast the inferences from a historic approach with an expectational approach such as ours: the former would conclude that

equity premiums have fallen in Japan during the 1990s, whereas an expectational approach would suggest the opposite.

V. Conclusion

Barring some notable exceptions (e.g, Siegel, 1992 and 1998, Blanchard, 1993, and Malkiel, 1996), academic financial economists generally accept that the equity premium is around 8%, based on the performance of the US market since 1926. We claim that these estimates are too high for the post 1985 period that we examine, and the equity premium is probably no more than three percent. Our claim is based on estimates of the equity premium obtained for six large equity markets, derived by subtracting the 10-year risk-free rate from the discount rate that equates current prices to forecasted future flows (derived from IBES earnings forecasts). Growth rates in perpetuity for dividends and abnormal earnings need to be much higher than is plausible to justify equity premium estimates of about 8%. Not only are such growth rates substantially in excess of any reasonable forecasts of aggregate growth (e.g., GDP), the projected streams for various indicators, such as price-to-book and price-to-earnings ratios, are also internally contradictory and inconsistent with intuition and past experience.

We agree that the weight of the evidence provided by the historical performance of US stock markets since 1926 is considerable. Yet there are reasons to believe that this performance exceeded expectations, because of potential declines in the equity premium and survivor bias. In addition to our results, most other available evidence also suggests that the equity premium is probably much lower than 8%. Historical evidence from other periods and other markets as well as surveys of institutional investor suggest that the equity premium is much lower. While projecting dividends to grow at earnings growth rates forecast by analysts provides equity premium estimates as high as 8%, we show that those growth forecasts exhibit substantial optimism bias and need to be adjusted downward. Overall, we believe that the commonly accepted equity premium estimates are not supported by an analysis that compares current market prices with reasonable expectations of future flows for the markets and years that we examine.

Table I

Market capitalization, book values, dividends, and actual and forecast earnings for US stocks (1985-1998)

The market consists of firms on the IBES Summary files with forecasts for years +1, +2, and a 5-year earnings growth estimate (g_5) as of April each year, and actual earnings per share, dividends per share, number of shares outstanding and share prices as of the end of the prior fiscal year (year 0). Book values of equity for year 0 are obtained from Compustat. When missing on the IBES files, forecasted earnings per share for years +3, +4 and +5 are determined by applying g_5, the forecasted 5-year growth rate, to year +2 forecasted earnings. All per share numbers are multiplied by the number of shares outstanding to get amounts at the firm level, and these are added across firms to get amounts at the market level each year. All amounts, except for dividend payout, are in millions of dollars.

Forecast as of	# of	Actual Values for Year 0					Forecast Earnings for Years +1 to +5				
April	firms	Earnings	Dividends	Payout	Book value	Market value	Year +1	Year +2	Year +3	Year +4	Year +5
column #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1985	1,559	154,858	71,134	46%	1,191,869	1,747,133	180,945	205,294	228,208	254,181	283,706
1986	1,613	155,201	73,857	48%	1,214,454	2,284,245	178,024	203,677	226,018	251,313	280,035
1987	1,774	146,277	81,250	56%	1,323,899	2,640,743	186,319	220,178	244,174	271,432	302,529
1988	1,735	167,676	86,237	51%	1,430,672	2,615,857	222,497	246,347	273,204	303,642	338,262
1989	1,809	229,070	97,814	43%	1,541,231	2,858,585	261,278	284,616	315,204	349,721	388,776
1990	1,889	228,216	107,316	47%	1,636,069	3,143,879	257,657	295,321	328,803	366,798	410,028
1991	1,939	218,699	108,786	50%	1,775,199	3,660,296	241,760	294,262	328,513	367,521	412,073
1992	2,106	202,275	113,962	56%	1,911,383	4,001,756	252,109	308,567	344,742	386,098	433,552
1993	2,386	247,988	127,440	51%	2,140,668	4,918,359	295,862	356,086	397,969	445,840	501,081
1994	2,784	290,081	129,186	45%	2,168,446	5,282,046	339,694	402,689	450,559	505,315	568,179
1995	2,965	365,079	147,575	40%	2,670,725	6,289,760	444,593	518,600	579,954	650,120	730,648
1996	3,360	446,663	175,623	39%	3,182,952	8,207,274	512,921	588,001	659,732	742,244	837,577
1997	3,797	547,395	201,017	37%	3,679,110	10,198,036	614,932	709,087	800,129	905,787	1,029,061
1998	3,673	526,080	178,896	34%	3,412,303	12,908,495	577,297	682,524	775,707	884,529	1,012,294

Table II

Implied expected rate of return on the market (k and k^*) and equity risk premium (rp and k-r_f) for US stocks (1985-1998)

The market is an aggregate of firms on the IBES Summary files with forecasts for years +1, +2, and a 5-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0)are obtained from Compustat. When missing, forecasted earnings for years +3, +4 and +5 are determined by applying g_5, the forecasted 5-year growth rate, to year +2 forecasted earnings. k is the implied discount rate, that satisfies the valuation relation in equation (5) below. Abnormal earnings (ae_t) equal reported earnings less a charge for the cost of equity (=beginning book value of equity * k). Assuming that 50% of earnings are retained allows the estimation of future book values from current book values and forecast earnings. The terminal value represents all abnormal earnings beyond year 5. Those abnormal earnings are assumed to grow at a constant rate g_{ae}, which is assumed to equal the expected inflation rate, and is set equal to the current 10-year risk-free rate less 3%. The expected rate of return on the market is also estimated using equation (1), and is labeled k^*. Equation (1) is derived from the dividend growth model, and dividend growth in perpetuity, g, is assumed to equal the 5-year earnings growth rate, g_5. Subtracting r_f from the discount rates k and k^* generates equity premium estimates. The equity premium (rp) is also estimated using equation (5a), which is based on the same information used in equation (5), except that the constant discount rate k is replaced by forward 1-year risk-free rates at different maturities (r_{fs}) plus a constant risk premium (rp). All amounts, except for rates of return, are in millions of dollars.

$$k^* = \frac{d_1}{p_0} + g \quad (1)$$

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \quad (5)$$

$$p_0 = bv_0 + \sum_{t=1}^{\infty}\left[\frac{ae_t}{\prod_{s=1}^{t}\left(1+r_{fs}+rp\right)}\right] \quad (5a)$$

Forecasts as of April	Market value	Book value	PVabnormal earnings +1	Pvabnormal earnings +2	PVabnormal earnings +3	PVabnormal earnings +4	PVabnormal earnings +5	PVterminal value	10-year r_f	k from (5)	k^* from (1)	k-r_f	rp from (5a)
column #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1985	1,747,133	1,191,869	8,353	15,970	19,411	22,559	25,469	464,136	11.43%	14.38%	16.14%	2.95%	2.88%
1986	2,284,245	1,214,454	36,874	45,744	48,984	52,201	55,435	828,345	7.30%	11.28%	14.90%	3.98%	4.03%
1987	2,640,743	1,323,899	35,189	50,699	54,192	57,743	61,412	1,057,289	8.02%	11.12%	15.08%	3.10%	3.25%
1988	2,615,857	1,430,672	43,398	46,911	50,259	53,564	56,877	933,609	8.71%	12.15%	15.52%	3.44%	3.58%
1989	2,858,585	1,541,231	57,447	56,207	58,532	60,838	63,156	1,020,687	9.18%	12.75%	14.85%	3.57%	3.54%
1990	3,143,879	1,636,069	49,791	61,586	65,603	69,534	73,430	1,187,789	8.79%	12.33%	15.41%	3.54%	3.56%
1991	3,660,296	1,775,199	41,063	68,719	75,020	81,270	87,540	1,529,982	8.04%	11.05%	15.16%	3.01%	2.96%
1992	4,001,756	1,911,383	45,289	76,241	83,650	91,132	98,787	1,694,789	7.48%	10.57%	15.55%	3.09%	3.06%
1993	4,918,359	2,140,668	82,037	113,113	121,980	131,171	141,010	2,183,434	5.97%	9.62%	15.12%	3.65%	3.76%
1994	5,282,046	2,168,446	101,980	129,363	136,974	144,921	153,317	2,452,364	6.97%	10.47%	15.02%	3.50%	3.53%
1995	6,289,760	2,670,725	135,110	161,831	169,683	177,951	186,749	2,788,101	7.06%	11.03%	14.96%	3.97%	4.02%
1996	8,207,274	3,182,952	178,155	202,987	216,527	230,881	246,277	3,952,265	6.51%	9.96%	14.96%	3.45%	3.50%
1997	10,198,036	3,679,110	220,311	252,050	270,195	289,684	310,885	5,184,242	6.89%	10.12%	13.88%	3.23%	3.25%
1998	12,908,495	3,412,303	276,647	325,652	352,789	382,642	415,799	7,745,477	5.64%	8.15%	13.21%	2.51%	2.53%
Mean									7.64%	11.04%	14.98%	3.40%	3.39%

Table III

Price-to-book ratios (p_t/bv_t), forecast accounting return on equity (roe_t) and expected rates of return (k) for US stocks (1985-1998)

To examine the validity of assumptions underlying k, which is the implied discount rate that satisfies the valuation relation in equation (5), current price-to-book ratios are compared with estimated future returns on equity (roe_t) to examine fit with equation (6) below. The market is an aggregate of firms on the IBES Summary files with forecasts for years +1, +2, and a 5-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0)are obtained from Compustat. When missing, forecasted earnings for years +3, +4 and +5 are determined by applying g_5 to year +2 forecasted earnings. Assuming that 50% of earnings are retained allows the estimation of future book values from current book values and forecast earnings. Return on equity (roe_t) equals forecast earnings scaled by beginning book value of equity (bv_{t-1}). Market and book value amounts are in millions of dollars.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \qquad (5)$$

$$\frac{p_0}{bv_0} = 1 + \frac{roe_1 - k}{(1+k)} + \frac{roe_2 - k}{(1+k)^2}\left(\frac{bv_1}{bv_0}\right) + \ldots \qquad (6)$$

	Year 0 equity values		Year 5 equity values		Price/book ratio		Forecast accounting return on equity						k
Forecasts as of April	Market value (p_0)	Book value (bv_0)	Market value (p_5)	Book value (bv_5)	in year 0 (p_0/bv_0)	in year 5 (p_5/bv_5)	in yr 1 (roe_1)	in yr 2 (roe_2)	in yr 3 (roe_3)	in yr 4 (roe_4)	in yr 5 (roe_5)	in yr 6 (roe_6)	from eq. (5)
column #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1985	1,747,133	1,191,869	2,676,683	1,768,036	1.5	1.5	15%	16%	16%	17%	17%	17%	14.38%
1986	2,284,245	1,214,454	3,197,490	1,783,987	1.9	1.8	15%	16%	16%	17%	17%	17%	11.28%
1987	2,640,743	1,323,899	3,727,459	1,936,215	2.0	1.9	14%	16%	16%	16%	17%	17%	11.12%
1988	2,615,857	1,430,672	3,779,033	2,122,648	1.8	1.8	16%	16%	16%	17%	17%	17%	12.15%
1989	2,858,585	1,541,231	4,200,867	2,341,029	1.9	1.8	17%	17%	17%	18%	18%	18%	12.75%
1990	3,143,879	1,636,069	4,589,685	2,465,373	1.9	1.9	16%	17%	17%	18%	18%	18%	12.33%
1991	3,660,296	1,775,199	5,181,184	2,597,264	2.1	2.0	14%	16%	16%	17%	17%	17%	11.05%
1992	4,001,756	1,911,383	5,574,848	2,773,918	2.1	2.0	13%	15%	16%	16%	17%	17%	10.57%
1993	4,918,359	2,140,668	6,595,210	3,139,088	2.3	2.1	14%	16%	16%	17%	17%	17%	9.62%
1994	5,282,046	2,168,446	7,336,322	3,301,664	2.4	2.2	16%	17%	18%	18%	19%	18%	10.47%
1995	6,289,760	2,670,725	8,837,148	4,132,682	2.4	2.1	17%	18%	18%	19%	19%	19%	11.03%
1996	8,207,274	3,182,952	11,206,787	4,853,189	2.6	2.3	16%	17%	18%	18%	19%	18%	9.96%
1997	10,198,036	3,679,110	14,103,523	5,708,609	2.8	2.5	17%	18%	18%	19%	20%	19%	10.12%
1998	12,908,495	3,412,303	16,838,377	5,378,478	3.8	3.1	17%	18%	19%	20%	21%	20%	8.15%
Mean					2.2	2.1	15%	17%	17%	18%	18%	18%	11.04%

Table IV

Forward price-to-earnings ratios (p_t/e_{t+1}) and growth in forecast abnormal earnings and earnings for US stocks (1985-1998).

To examine the validity of assumptions underlying k, which is the implied discount rate that satisfies the valuation relation in equation (5), current and forecast forward price-to-earnings ratios are compared with growth in forecast abnormal earnings to examine fit with equation (7) below. The market is an aggregate of firms on the IBES Summary files with forecasts for years +1, +2, and a 5-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0) are obtained from Compustat. Abnormal earnings (ae_t) equal reported earnings less a charge for the cost of equity (=beginning book value of equity * k). Future market values are projected for each year by multiplying beginning market values by (1+k) and subtracting dividends. When missing, forecasted earnings for years +3, +4 and +5 are determined by applying g_5 to year +2 forecasted earnings. Assuming that 50% of earnings are retained allows the estimation of future book values from current book values and forecast earnings. Market equity values and earnings amounts are in millions of dollars.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \quad (5)$$

$$\frac{p_0}{e_1} = \frac{1}{k}\left[1 + \frac{\Delta ae_2}{e_1(1+k)} + \frac{\Delta ae_3}{e_1(1+k)^2} + \ldots\right] \quad (7)$$

	Year 0 values		Year 5 values		Forward P/E ratio		PV of *ae* growth (Δae_t), scaled by e_1					growth in forecast earnings						*1/k*
Forecasts as of April	Market value (p_0)	Earnings (e_1)	Market value (p_5)	Earnings (e_6)	in year 0 (p_0/e_1)	in year 5 (p_5/e_6)	+2	+3	+4	+5	+6	+1	+2	+3	+4	+5	+6	from eq.(5)
column #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
1985	1,747,133	180,945	2,676,683	308,308	9.7	8.7	5%	3%	3%	3%	1%	17%	13%	11%	11%	12%	9%	7.0
1986	2,284,245	178,024	3,197,490	299,896	12.8	10.7	7%	4%	5%	5%	1%	15%	14%	11%	11%	11%	7%	8.9
1987	2,640,743	186,319	3,727,459	324,573	14.2	11.5	10%	5%	5%	5%	1%	27%	18%	11%	11%	11%	7%	9.0
1988	2,615,857	222,497	3,781,766	364,583	11.8	10.4	4%	4%	4%	4%	1%	33%	11%	11%	11%	11%	8%	8.2
1989	2,858,585	261,278	4,200,867	420,673	10.9	10.0	2%	3%	3%	4%	1%	14%	9%	11%	11%	11%	8%	7.8
1990	3,143,879	257,657	4,589,685	442,911	12.2	10.4	7%	4%	4%	4%	1%	13%	15%	11%	12%	12%	8%	8.1
1991	3,660,296	241,760	5,181,184	442,291	15.1	11.7	13%	5%	6%	6%	2%	11%	22%	12%	12%	12%	7%	9.0
1992	4,001,756	252,109	5,574,848	463,780	15.9	12.0	14%	6%	6%	6%	2%	25%	22%	12%	12%	12%	7%	9.5
1993	4,918,359	295,862	6,595,210	531,812	16.6	12.4	13%	6%	7%	7%	1%	19%	20%	12%	12%	12%	6%	10.4
1994	5,282,046	339,694	7,174,214	604,559	15.5	11.9	11%	6%	6%	7%	1%	17%	19%	12%	12%	12%	6%	10.0
1995	6,289,760	444,593	8,837,148	783,736	14.1	11.3	9%	5%	6%	6%	2%	22%	17%	12%	12%	12%	7%	9.1
1996	8,207,274	512,921	11,206,787	893,185	16.0	12.5	8%	6%	7%	7%	2%	15%	15%	12%	13%	13%	7%	10.0
1997	10,198,036	614,932	14,103,523	1,100,714	16.6	12.8	8%	7%	7%	8%	2%	19%	16%	11%	12%	12%	7%	9.9
1998	12,908,495	577,297	16,838,377	1,069,786	22.4	15.7	12%	9%	10%	11%	2%	19%	16%	11%	12%	12%	7%	12.3
Mean					14.6	11.6	9%	5%	6%	6%	1%	19%	16%	11%	12%	12%	7%	9.2

Table V

Optimism bias in IBES forecasts for US stocks: median forecast errors for forecasts made between 1985 and 1997

The following table represents the median of all forecast errors scaled by share price for each year examined. The forecast error is calculated for each firm as of April each year, and equals the median consensus forecasted earnings per share minus the actual earnings per share, scaled by price. The year when the forecasts were made is listed in the first row, while the first column lists the horizon of that forecast. For each year and horizon combination, we report the median forecast error and the number of firms in the sample. To interpret the Table, consider the values of 0.78 percent and 1,680 reported for the +1/1985 combination., in the top left-hand corner of the table. This means that the median value of the difference between the forecasted and actual earnings for 1986 was 0.78 percent of price, and that sample consisted of 1,680 firms with available forecast errors. The results confirm that analyst forecasts are systematically positively biased and that this bias increases with the forecast horizon; however, the extent of any such bias has been declining steadily over time.

		Year forecast was made													
		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	mean
Forecast Year +1	Median	0.78%	0.65%	0.37%	0.07%	0.44%	0.58%	0.39%	0.17%	0.15%	0.03%	0.04%	0.00%	0.00%	0.28%
	Obs.	1,680	1,707	1,878	1,815	1,868	1,932	1,959	2,176	2,492	2,710	2,895	3,261	3,462	
Forecast Year +2	Median	2.05%	1.40%	0.79%	0.99%	1.74%	1.88%	1.21%	0.87%	0.58%	0.34%	0.32%	0.27%	.	1.04%
	Obs.	1,545	1,572	1,732	1,701	1,757	1,815	1,896	2,084	2,287	2,594	2,694	2,852	.	
Forecast Year +3	Median	2.84%	0.99%	1.44%	2.22%	2.78%	2.39%	1.50%	0.95%	0.63%	0.54%	0.45%	.	.	1.52%
	Obs.	1,406	1,449	1,596	1,576	1,634	1,744	1,826	1,936	2,159	2,396	2,346	.	.	
Forecast Year +4	Median	2.63%	2.04%	2.80%	3.19%	3.17%	2.83%	1.54%	0.91%	0.77%	0.60%	.	.	.	2.05%
	Obs.	1,285	1,344	1,492	1,474	1,586	1,696	1,724	1,825	2,024	2,132	.	.	.	
Forecast Year +5	Median	3.54%	3.44%	3.86%	3.59%	3.43%	2.91%	1.36%	0.94%	0.74%	.	.	.	.	2.65%
	Obs.	1,201	1,260	1,411	1,432	1,528	1,621	1,618	1,704	1,815	.	.	.	.	

Table VI

Implied equity premium using abnormal earnings and dividend growth approaches (k-r_f *and* k^*-r_f) for International stocks (1985-1998)

The market is an aggregate of firms on the IBES Summary files with forecasts for years +1, +2, and a 5-year earnings growth estimate (g_5) as of April each year, and actual earnings, dividends, number of shares outstanding and prices as of the end of the prior full fiscal year (year 0). Book values of equity for year 0 (bv_0)are obtained from Compustat, Global Vantage and Datastream. Forecasted earnings for years +3, +4 and +5 are determined by applying g_5, the forecasted 5-year growth rate, to year +2 forecasted earnings. All amounts are measured in local currencies. r_f is the 10-year Government bond yield. k is the implied discount rate, that satisfies the valuation relation in equation (5) below. Abnormal earnings (ae_t) equal reported earnings less a charge for the cost of equity (=beginning book value of equity * k). Assuming that 50% of earnings are retained allows the estimation of future book values from current book values and forecast earnings. The terminal value represents all abnormal earnings beyond year 5. Those abnormal earnings are assumed to grow at a constant rate g_{ae}, which is assumed to equal the expected inflation rate, and is set equal to r_f less 3%. The expected rate of return on the market is also estimated using equation (1), and is labeled k^*. Equation (1) is derived from the dividend growth model, and dividend growth in perpetuity, g, is assumed to equal the 5-year earnings growth rate, g_5.

$$p_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + \frac{ae_4}{(1+k)^4} + \frac{ae_5}{(1+k)^5} + \left[\frac{ae_5(1+g_{ae})}{(k-g_{ae})(1+k)^5}\right] \qquad (5)$$

$$k^* = \frac{d_1}{p_0} + g \qquad (1)$$

	Canada			France			Germany			Japan			UK		
Year	r_f	k-r_f	k*-r_f	r_f	k-r_f	k*-r_f	r_f	k-r_f	k*-r_f	r_f	k-r_f	k*-r_f	r_f	k-r_f	k*-r_f
1985	10.50%	4.41%	7.45%												
1986	8.82%	2.93%	6.64%												
1987	9.16%	1.56%	4.53%	8.72%	2.06%	6.06%									
1988	9.66%	2.83%	4.67%	9.35%	4.00%	3.90%	6.78%	3.43%	4.59%						
1989	9.29%	3.08%	3.66%	8.76%	3.64%	6.11%	6.83%	3.87%	5.48%				10.16%	3.17%	7.24%
1990	10.69%	1.51%	2.97%	9.66%	3.04%	4.23%	8.99%	1.10%	3.23%				11.39%	2.57%	5.06%
1991	10.08%	0.75%	3.71%	8.81%	2.94%	4.41%	8.42%	1.03%	4.72%	6.72%	-0.95%	0.38%	10.49%	2.47%	7.27%
1992	8.18%	0.42%	6.36%	8.74%	2.26%	5.81%	7.89%	2.16%	5.03%	5.38%	-0.86%	-0.34%	9.12%	2.77%	8.69%
1993	7.32%	1.69%	6.59%	7.18%	2.31%	10.57%	6.14%	0.70%	4.19%	4.45%	-1.05%	4.36%	7.64%	3.29%	10.75%
1994	9.29%	1.65%	7.67%	6.82%	1.70%	8.24%	7.26%	1.30%	8.77%	4.24%	-1.04%	4.56%	8.63%	2.87%	8.50%
1995	7.93%	2.71%	6.77%	7.80%	2.06%	10.04%	6.70%	2.22%	9.84%	2.80%	1.12%	9.50%	8.44%	3.02%	8.59%
1996	7.69%	2.69%	6.89%	6.39%	2.38%	12.26%	6.41%	2.14%	8.40%	3.17%	0.79%	7.82%	7.92%	3.34%	8.43%
1997	6.35%	2.28%	7.10%	5.66%	2.28%	9.69%	5.68%	2.28%	11.56%	2.47%	1.65%	9.46%	7.02%	2.53%	7.81%
1998	5.36%	2.68%	7.44%	5.02%	2.53%	13.44%				1.65%	1.99%	10.89%	5.84%	2.09%	6.77%
mean	8.59%	2.23%	5.89%	7.74%	2.60%	7.90%	7.11%	2.02%	6.58%	3.86%	0.21%	5.83%	8.66%	2.81%	7.91%
s.d.	1.55%	1.04%	1.62%	1.51%	0.68%	3.27%	1.04%	1.03%	2.82%	1.67%	1.31%	4.27%	1.68%	0.40%	1.49%

Figure 1
Comparison of value profile for abnormal earnings versus dividends, for abnormal earnings approach
US Stocks as of April, 1991

Based on the data in Table II, for the abnormal earnings approach described by equation (5), abnormal earnings are assumed to grow at 5.04%, the anticipated inflation rate, past year 5, and the resulting market discount rate (*k*) is 11.05%. For the abnormal earnings profile, the fractions represented by book value, abnormal earnings in years +1 through +5, and the terminal value are shown by the solid columns. For the dividend profile corresponding to those abnormal earnings projections, the fractions of current market capitalization that are represented by dividends in years +1 through +5 and the terminal value are shown by the hollow columns.

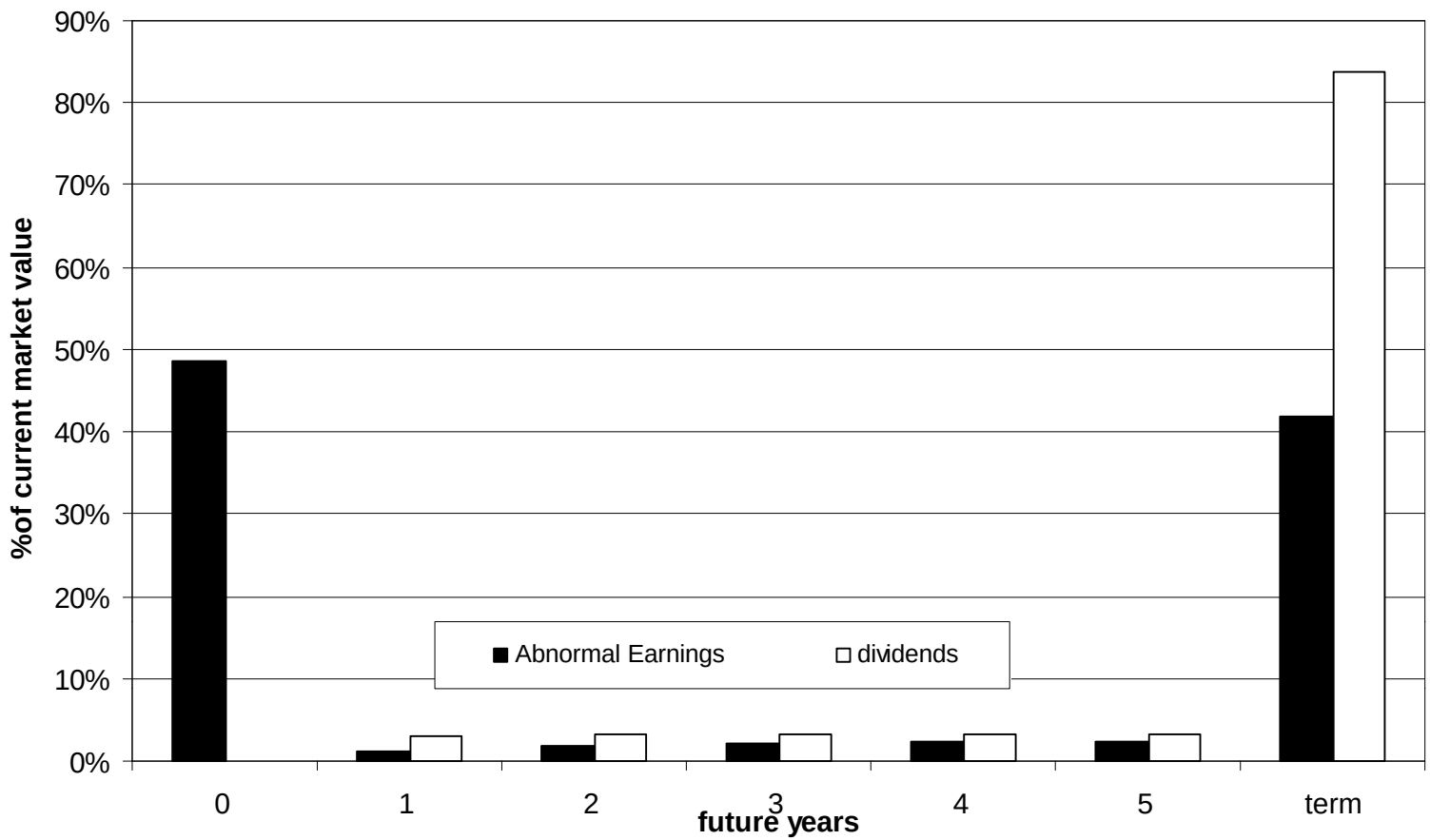
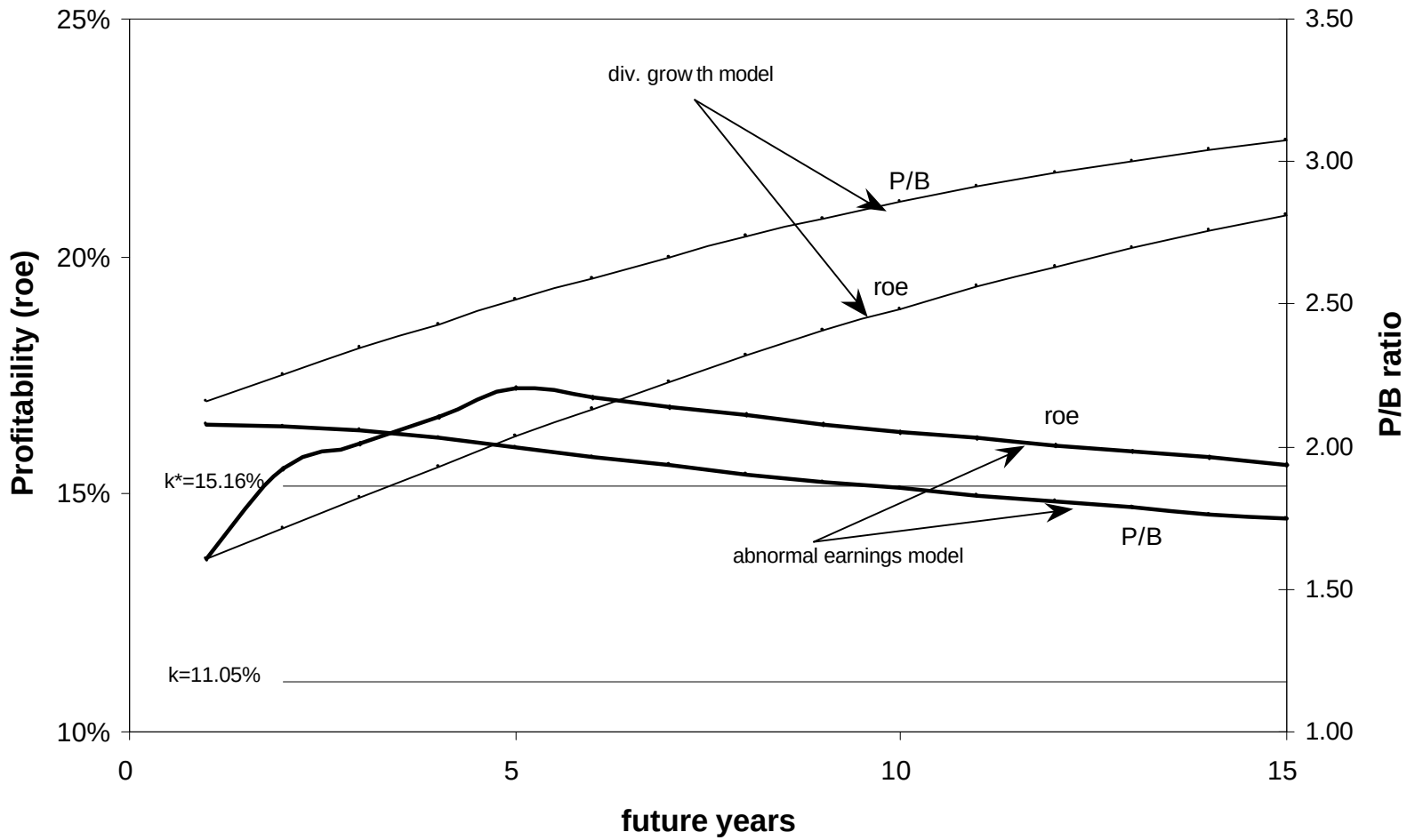


Figure 2
Pattern of future Price to Book (P/B) ratios and profitability, measured as excess of accounting return on equity (roe) over estimated discount rates (k* & k), for dividend growth and abnormal earnings approaches for US stocks as of April, 1991

For the dividend growth model described by equation (1) in Table II, dividends are assumed to grow at the consensus five-year earnings growth rate of 12.12%, and future *roe* is compared with the estimated market discount rate of 15.16% (*k**). For the abnormal earnings model described by equation (5) in Table II, abnormal earnings are assumed to grow at an anticipated inflation rate of 5.04%, and *roe* is compared with the estimated market discount rate of 11.05% (*k*). Projected P/B ratios are shown for both models.



References

Abarbanell, Jeffrey and Victor Bernard. 1999. Is the U.S. stock market myopic? *Journal of Accounting Research*. (forthcoming).

Abel, A.B. 1999. Risk premia and term premia in general equilibrium. *Journal of Monetary Economics*. 43, 3-33.

Alford, A., Jennifer Jones, Richard Leftwich, and Mark Zmijewski. 1993. The relative informativeness of accounting disclosures in different countries, *Journal of Accounting Research*, 31, 183-223.

Ang, A. and J. Liu. 1999. A generalized model for stock valuation. Working paper, Columbia University, New York, NY.

Bagnoli, M., M.D. Beneish, and S.G. Watts. 1999. Whisper forecasts of quarterly earnings per share, *Journal of Accounting and Economics*, (forthcoming).

Benore, C. 1983. A survey of investor attitudes toward the electrical power industry. New York. Paine Webber Mitchell Hutchins, Inc. (May)

Blanchard, O.J., 1993. Movements in the equity premium, Brookings papers on Economic Activity. 2, 75-138.

Bogle, J.C. 1999. *Common Sense on Mutual Funds*. Wiley.

Botosan, Christine A., 1997. Disclosure level and the cost of equity capital. *Accounting Review* 72, 323-50.

Brigham, E., D. Shome, and S. Vinson. 1985. Risk premium approach to measuring a utility's cost of equity *Financial Management* (Spring) 33-45.

Brown, S. J., W. N. Goetzmann, and S. A. Ross. 1995. Survival. *Journal of Finance.* 50, 853-873.

Burr, B.B. 1998. 20%+ again? Keep dreaming. *Pensions and Investments*. (26), 1: 33-34.

Campbell, J.Y. 1991. A variance decomposition for stock returns. *The Economic Journal*, 101 (405) 157-179.

Campbell, J.Y. and R.J. Shiller. 1988. The dividend-price ratio and expectations of future dividends and discount factors, *Review of Financial Studies*, 1, 195-228.

Claus, J.J. and J.K. Thomas. 1999a. The equity risk premium is lower than you think it is: empirical estimates from a new approach. working paper, Columbia University, New York, NY.

Claus, J.J. and J.K. Thomas. 1999b. Measuring the equity premium using earnings forecasts: An international analysis. working paper, Columbia University, New York, NY.

Cochrane, J.H. 1997. Where is the market going? Uncertain facts and novel theories, *Economic Perspectives*. 21, 3-37.

Edwards, E.O.and P.W. Bell. 1961. *The Theory and Measurement of Business Income.* University of California Press, Berkeley, CA

Frankel, R. and C.M.C. Lee. 1998a. Accounting valuation, market expectation, and cross-sectional stock returns, *Journal of Accounting and Economics*. 25, 283-319

Frankel, R. and C.M.C. Lee. 1998b. Accounting diversity and international valuation, working paper, University of Michigan, Ann Arbor, MI.

Gebhardt, W., C.M.C. Lee and B. Swaminathan. 1999. Toward an ex ante cost of capital. Working paper, Cornell University, Ithaca, NY.

Glassman, J. and K. Hassett, 1998. Are stocks overvalued? Not a chance. *Wall Street Journal*, (March 30).

Gordon, M. 1962. The investment, financing and valuation of the corporation. Irwin, Homewood, IL.

Ibbotson Associates, Inc. 1999. Stocks, Bonds, Bills and Inflation. Yearbook. Chicago, IL

Jorion, P. and W. N. Goetzmann, 1999. Global stock markets in the twentieth century, *Journal of Finance*. 54, 953-980.

Khorana, A., R.C. Moyer, and A. Patel. 1997. An examination of equity risk premium forecasts in G-6 countries. Working paper. Babcock Graduate School of Management, Wake Forest University, Winston-Salem, NC.

Kocherlakota, N. R.1996. The equity premium: it's still a puzzle. *Journal of Economic Literature.* 34, 42-71.

Liu, J. and J.K. Thomas. 1999. Stock returns and accounting earnings. *Journal of Accounting Research*. (forthcoming).

Malkiel, B. 1996. The equity premium puzzle. Keynote speech at l996 Ibbotson Associates equity risk premium conference. Chicago, IL.

Matsumoto, D.A. 1999. Management's Incentives to Guide Analysts' Forecasts, Working Paper, Harvard Business School, Boston, MA (August).

Mayfield, E.S. 1999. Estimating the market risk premium. Working paper, Harvard Business School, Boston, MA (October).

Mehra, R. and E.C. Prescott. 1985. The Equity Premium: A Puzzle *Journal of Monetary Economics.* 15, 145-161.

Moyer, R.C. and A. Patel. 1997. The equity market risk premium: a critical look at alternative ex ante estimates. Working paper. Babcock Graduate School of Management, Wake Forest University, Winston-Salem, NC.

Myers, J. N., 1999, Conservative accounting and finite firm life: Why residual income valuation estimates understate stock price, working paper, University of Washington, Seattle (WA).

Nissim, D. and S.H. Penman. 1999. Ratio analysis and equity valuation. Working paper, Columbia Business School, New York, NY.

Penman, S.H., 1999. *Financial Statement Analysis and Security Valuation*, Irwin/McGraw Hill, (New York, NY)

Preinreich, G.A.D. 1938. Annual survey of economic theory: the theory of depreciation. *Econometrica* 6, 219-241.

Samuelson, P.1965. Proof that properly anticipated prices fluctuate randomly. *Industrial Management Review* (spring) .

Siegel, J.J. l992. The equity premium: stock and bond returns since 1802. *Financial Analysts Journal*. January/February. 28-38.

Siegel, J.J. l998. *Stocks for the long run*. 2nd edition, McGraw-Hill (New York, NY).

Siegel, J.J. and R. Thaler, 1997. The Equity Risk Premium Puzzle, *Journal of Economic Perspectives*, 11(1), 191-200

Stulz, R.M. 1999. Globalization, corporate finance, and the cost of capital. *Journal of Applied Corporate Finance*. 12 (3), 8-25.

Vuolteenaho, T. 1999. Understanding the aggregate book-to-market ratio. Working paper. University of Chicago, Chicago, IL.

Welch, I., 1999. Views of financial economists on the equity premium and professional controversies. Working paper, UCLA, Los Angeles, CA.

Wien, B.R., 1998. U.S. Strategy: Risk Premium-R.I.P. Morgan Stanley Dean Witter report dated 5/11/98.

Williams, J. B. 1938. *The Theory of Investment Value*. Cambridge, Mass: Harvard University Press.

Zhang, X. 1997. Conservative accounting and equity valuation . working paper, University of California, Berkeley, CA.

Appendix

Assumed growth rates in perpetuity for dividends (g) and abnormal earnings (g_{ae})

While the conceptual definition of g is clear—it is the dividend growth rate that can be sustained in perpetuity, given current capital and future earnings[1]—it is not easy to discern that rate from fundamentals. To illustrate, take two firms that are similar in every way, except that both firms have in this period announced different dividend policies, which result in a higher expected forward dividend yield (d_1/p_0) for one firm than the other, say 7 percent and 1 percent. What can be said about g for the two firms? Examination of equation (1) indicates that g for the low dividend yield firm must be 6 percent higher than g for the high dividend yield firm, assuming they both have the same discount rate (k^*). If k^* equals 10 percent, for example, the value of g for the two firms must be 3 percent and 9 percent. These two values of g are substantially different from each other, even though the two firms are not.

In addition to being a hypothetical rate, g need not be related to historic or forecasted near-term growth rates for earnings or dividends. Dividend payout ratios could change over time because of changes in the investment opportunity set available and the relative attractiveness of cash dividends versus stock buybacks. Since changes in dividend payout affect the dividend yield, which in turn affects g, historic growth rates may not be relevant for g. Also, if dividend policies are likely to change over time, g need not be related to g_5 (the growth rate forecast for earnings over the next five years), a rate that is frequently used to proxy for g. Various scenarios could be constructed for the two firms in the example above to obtain similar historic and/or near-term forecast growth rates, and yet their values of g could be very different.

Despite the difficulties noted above, both historic and forecast rates for aggregate dividends, earnings, and other macroeconomic measures (such as GDP) have been used as proxies for g. We note that these proxies create additional error. First, it is important to hold the unit of investment constant through the period where growth is measured. In particular any

[1] Assuming too high a rate would cause the capital to be depleted in some future period, and assuming too low a rate would cause the capital to grow "too fast".

growth created at the aggregate level by the issuance/retirement of equity since the beginning of the period, should be ignored. Second, profits from all activities conducted outside the publicly-traded corporate sector that are include in the macroeconomic measures should be deleted, and all overseas profits relating to this sector that is excluded from some macroeconomic measures should be included.

To control for the unit of investment problem, we use forecasted growth in per share earnings rather than aggregate earnings, and to mitigate the problems associated with identifying g, we focus on growth in rents (abnormal earnings), g_{ae}, rather than dividends. To understand the benefits of switching to g_{ae}, it is important to describe some features of abnormal earnings. Expected abnormal earnings would equal zero if book values of equity reflected market values.[2] If book values measure input costs fairly, but do not include the portion of market values that represent economic rents (not yet earned), abnormal earnings would reflect those rents and be expected to be positive. However, the magnitude of such rents at the aggregate market level is likely to be small, and any rents that emerge are likely to be dissipated over time for the usual reasons (anti trust actions, global competition, etc.). As a result, much of the earlier literature using the abnormal earnings approach has assumed zero growth in abnormal earnings past the "horizon" date.[3]

Returning to the two-firm example, shifting the focus from growth in dividends to growth in rents removes much of the confusion caused by transitory changes in dividend payouts and dividend yields: these factors should have no impact on growth in rents, since the magnitude and growth in rents are determined by economic factors such as monopoly power. That is, even though the two firms have different forecasted earnings and dividends, the forecasted abnormal earnings and growth in abnormal earnings should be identical.

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[2] That is, if market prices are efficient and book values are marked to market values each period, market (book) values are expected to adjust each period so that no abnormal returns (abnormal earnings) are expected in the future.

[3] That is, abnormal earnings persist, but show no growth. Some papers are even more conservative, and have assumed that abnormal earnings drop to zero past the horizon date.

We believe, however, that the popular assumption of zero growth in abnormal earnings may be too pessimistic because accounting statements are conservative and understate input costs: assets (liabilities) tend to be understated (overstated) on average. For example, many investments (such as research and development, advertising, and purchased intangibles) are written off too rapidly in many domiciles. As a result, abnormal earnings tend to be positive, even in the absence of economic rents. Growth in abnormal earnings under conservative accounting is best understood by examining the behavior of the excess of *roe* (the accounting rate of return on the book value of equity) over *k* (the discount rate). Simulations and theoretical analyses (e.g., Zhang, 1997) of the steady-state behavior of the accounting rate of return under conservative accounting suggest two important determinants: the long-term growth in investment and the degree of accounting conservatism. These analyses also suggest that *roe* approaches *k*, but remains above it in the long-term.

Even though a decline in the excess of *roe* over *k* should cause the magnitude of abnormal earnings to fall over time, a countervailing factor is the growth in investment, which increases the base on which abnormal earnings are generated. We assume as a first approximation that the latter effect is greater than the former, and that abnormal earnings increase in perpetuity at the expected inflation rate. Since we recognize that this approximation is ad hoc, we elected to err on the side of choosing too high a growth rate, to ensure that our equity premium estimates were not biased downward. Also, we conduct sensitivity analyses to identify the impact on our equity premium estimates of varying the assumed growth rate within a reasonable range.