The Equity Premium

Eugene F. Fama and Kenneth R. French[*]

Abstract

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

Eugene F. Fama
Graduate School of Business
University of Chicago
1101 East 58th Street
Chicago, IL 60637
(773) 702-7282
Eugene.fama@gsb.uchicago.edu

Kenneth R. French
Sloan School of Management
Massachusetts Institute of Technology
50 Memorial Drive
Cambridge, MA 02139
(617) 258-8365
KFrench@mit.edu

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

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

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

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

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

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

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

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

The logic that leads to (2) applies to any variable that is cointegrated with the stock price. For example, the dividend-price ratio may be non-stationary because firms move away from dividends toward share repurchases as a way of returning earnings to stockholders. But if the earnings-price ratio, Y_t/P_t, is

stationary, the average growth rate of earnings, $A(GY_t) = A((Y_t-Y_{t-1})/Y_{t-1})$, is an alternative estimate of the expected rate of capital gain. And $A(GY_t)$ can be combined with the average dividend yield to produce another estimate of the expected stock return,

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

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

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

The estimate of the expected real equity premium for 1872-2000 from the dividend growth model (2) is 3.54% per year. The estimate from the average stock return, 5.57%, is almost 60% higher. The difference between the two is largely due to the last fifty years. The equity premium for 1872-1950 from the dividend growth model, 4.17% per year, is close to the estimate from the average return, 4.40%. In contrast, the equity premium for 1951-2000 produced by the average return, 7.43% per year, is almost three times the estimate, 2.55%, from (2). The estimate of the expected real equity premium for 1951-2000 from the earnings growth model (3), 4.32% per year, is larger than the estimate from the dividend growth model (2). But the earnings growth estimate is still less than 60% of the estimate from the average return.

Three types of evidence suggest that the lower equity premium estimates for 1951-2000 from fundamentals are closer to the expected premium. (i) The estimates from fundamentals are more precise. For example, the standard error of the estimate from the dividend growth model is less than half the

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

standard error of the estimate from the average return. (ii) The Sharpe ratio for the equity premium from the average stock return just about doubles from 1872-1950 to 1951-2000. In contrast, the equity premium from the dividend growth model has a similar Sharpe ratio for 1872-1950 and 1951-2000. (iii) Most important, valuation theory specifies relations among the book-to-market ratio, the return on investment, and the cost of equity capital (the expected stock return). The 1951-2000 estimates of the expected stock return from the dividend and earnings growth models line up with other fundamentals in the way valuation theory predicts. But the book-to-market ratio and the return on investment suggest that the expected return estimate from the average stock return is too high.

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

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

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

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

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

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

I. The Unconditional Expected Stock Return

Table 1 shows estimates of the expected real equity premium for 1872-2000. The market portfolio is the S&P 500 and its antecedents. The deflator is the Producer Price Index until 1925 (from Shiller, 1989) and the Consumer Price Index thereafter (from Ibbotson Associates). The riskfree interest rate is the annual real return on six-month commercial paper, rolled over at mid-year. The riskfree rate and S&P earnings data are from Shiller (1989), updated by Vuolteenaho (2000) and us. Beginning in 1925, we construct S&P book equity data from the book equity data in Davis, Fama, and French (2000), expanded to include all NYSE firms. The data on dividends, prices, and returns for 1872-1925 are from Shiller (1989). Shiller's annual data on the level of the S&P (used to compute returns and other variables involving price) are averages of daily January values. The S&P dividend, price, and return data for 1926-2000 are from Ibbotson Associates, and the returns for 1926-2000 are true annual returns.

Without showing the details, we can report that the CRSP value-weight portfolio of NYSE, AMEX, and NASDAQ stocks produces average returns and dividend growth estimates of the expected return close to the S&P estimates for periods after 1925 when both indices are available. What one takes to be the riskfree rate has a bigger effect. For example, substituting the one-month Treasury bill rate for the six-month commercial paper rate causes estimates of the annual equity premium for 1951-2000 to rise by about 1.00%. But for our main task – comparing equity premium estimates from (1), (2), and (3) – differences in the riskfree rate are an additive constant that does not affect inferences.

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

The dividend and earnings growth models (2) and (3) assume that the market dividend-price and earnings-price ratios are stationary. The first three annual autocorrelations of D_t/P_t for 1872-2000 are 0.73, 0.51, and 0.47. For the 1951-2000 period that occupies much of our attention, the autocorrelations are 0.83, 0.72, and 0.69. The autocorrelations are large, but their decay is roughly like that of a stationary first-order autoregression (AR1). This is in line with formal evidence (Fama and French, 1988; Cochrane,

1994; Lamont, 1998) that the market dividend-price ratio is highly autocorrelated but slowly mean-reverting. S&P earnings data for the early years of 1872-2000 are of dubious quality (Shiller, 1989), so we estimate expected returns with the earnings growth model (3) only for 1951-2000. The first three autocorrelations of Y_t/P_t for 1951-2000, 0.80, 0.70, and 0.61, are again roughly like those of a stationary AR1.

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

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

A. The Equity Premium

For much of the 1872-2000 period – up to about 1950 – the dividend growth model and the average stock return produce similar estimates of the expected return. Thereafter the two estimates diverge.

To illustrate, Table 1 shows results for 1872-1950 (79 years) and 1951-2000 (50 years). 1950 is a big year, with a high real stock return (23.40%), and high dividend and earnings growth estimates of the return (29.96% and 24.00%). But because the three estimates of the 1950 return are similarly high, the ordering of expected return estimates, and the inferences we draw from them, are unaffected by whether 1950 is allocated to the earlier or the later period. Indeed, pushing the 1950 break-year backward or forward several years does not affect our inferences.

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

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

B. Evaluating the Expected Return Estimates for 1951-2000

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

(i) The expected return estimates from the dividend and earnings growth models are more precise than the average return. The standard error of the dividend growth estimate of the expected return for 1951-2000 is 0.74%, versus 2.43% for the average stock return. Since earnings growth is more volatile than dividend growth, the standard error of the expected return from the earnings growth model, 1.93%, is

higher than the estimate from the dividend growth model. But it is smaller than the 2.43% standard error of the average stock return. Claus and Thomas (2000) also argue that expected return estimates from fundamentals are more precise than average returns, but they provide no direct evidence.

(ii) Table 1 shows Sharpe ratios for the three equity premium estimates. Only the average premium in the numerator of the Sharpe ratio differs for the three estimates. The denominator for all three is the standard deviation of the annual stock return. The Sharpe ratio for the dividend growth estimate of the 1872-1950 equity premium, 0.22, is close to that produced by the average stock return, 0.23. More interesting, the Sharpe ratio for the 1951-2000 equity premium from the dividend growth model, 0.15, is lower than but similar to that for 1872-1950. The Sharpe ratio for the 1951-2000 equity premium from the earnings growth model, 0.25, is somewhat higher than the dividend growth estimate, 0.15, but it is similar to the estimates for 1872-1950 from the dividend growth model, 0.22, and the average return, 0.23.

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

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

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

should find that (except for sampling error) the average income return on book equity is greater than estimates of the cost of equity capital (the expected stock return),

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

Table 1 shows that (4) is confirmed when we use the dividend and earnings growth models to estimate the expected real stock return for 1951-2000. The estimates of E(R), 4.74% (dividend growth model) and 6.51% (earnings growth model), are below 7.60%, the average real income return on book equity, $A(Y_t/B_{t-1})$. In contrast, the average real stock return for 1951-2000, 9.62%, exceeds the average income return by more than 2.0%. An expected stock return that exceeds the expected income return on book equity implies that the typical corporate investment has a negative net present value. This is difficult to reconcile with an average book-to-market ratio substantially less than 1.0.

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

II. Unexpected Capital Gains

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

A. Is 1951-2000 Dividend Growth Unexpectedly High?

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

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

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

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

The behavior of dividends and earnings provides little evidence that rationally assessed (i.e., true) long-term expected growth is high at the end of the sample period. If anything, the growth rate of real dividends declines during 1951-2000 (Table 2). The average growth rate for the first two decades, 1.60%, is higher than the average growth rates for the last three, 0.68%. The regressions in Table 3 are more formal evidence on the best forecast of post-2000 real dividend growth rates. Regressions are shown for forecasts one year ahead (the explanatory variables for year t dividend growth are known at the end of year t-1) and two years ahead (the explanatory variables are known at the end of year t-2).

The regression for 1875-1950 suggests strong forecast power one year ahead. The slopes on the lagged payout ratio, the dividend-price ratio, and the stock return are close to or more than two standard errors from zero, and the regression captures 38% of the variance of dividend growth. Even in the 1875-1950 period, however, power to forecast dividend growth does not extend much beyond a year. When dividend growth for year t is explained with variables known at the end of year t-2, the regression R^2 falls from 0.38 to 0.01. Without showing the details, we can report that extending the forecast horizon from two to three years causes all hint of forecast power to disappear. Thus, for 1875-1950, the best forecast of dividend growth more than a year or two ahead is the historical average growth rate.

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

Long-term expected earnings growth also is not unusually high in 2000. There is no clear trend in real earnings growth during 1951-2000. The most recent decade, 1991-2000, produces the highest average growth rate, 7.58% per year (Table 2). But earnings growth is volatile. The standard errors of ten-year

average growth rates vary around 5.0%. It is thus not surprising that the 1981-1990 decade immediately preceding 1991-2000 produces the lowest average real earnings growth rate, 0.37% per year.

The regressions in Table 3 are formal evidence on the predictability of 1951-2000 earnings growth. There is some predictability of near-term growth, but it is largely due to transitory variation in earnings that is irrelevant for forecasting long-term earnings. In the 1951-2000 regression to forecast earnings growth one year ahead, the slope on the first lag of the stock return is positive (0.28, t = 2.39), but the slope on the second lag is negative (-0.25, t = -2.18) and about the same magnitude. Thus, the prediction of next year's earnings growth from this year's return is reversed the following year. In the 1951-2000 one-year forecast regression, the only variable other than lagged returns with power to forecast earnings growth (t = -2.54) is the third lag of earnings growth. But the slope is negative, so it predicts that the strong earnings growth of recent years is soon to be reversed.

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

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

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

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

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

Some of the decline in D_t/P_t and E_t/P_t during 1951-2000 is probably anticipated in 1950. The dividend-price ratio for 1950, 7.18%, is high (Figure 1). The average for 1872-2000 is 4.64%. If D_t/P_t is mean-reverting, the expectation in 1950 of the yield in 2000 is close to the unconditional mean, say 4.64%. The actual dividend-price ratio for 2000 is 1.22%. The 2000 stock price is thus $4.64/1.22 = 3.80$ times what it would be if the dividend yield for 2000 hit the historical mean. Roughly speaking, this unexpected capital gain adds about 2.67% to the compound annual return for 1951-2000.

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

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

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

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

III. Estimating the Expected Stock Return: Issues

There are two open questions about our estimates of the expected stock return. (i) In recent years the propensity of firms to pay dividends declines and stock repurchases surge. How do these changes in dividend policy affect our estimates of the expected return? (ii) Under rather general conditions the

dividend and earnings growth models (2) and (3) provide estimates of the expected stock return. Are the estimates biased and does the bias depend on the return horizon? This section addresses these issues.

A. Repurchases and the Declining Incidence of Dividend Payers

Share repurchases surge after 1983 (Bagwell and Shoven, 1989; Dunsby, 1995), and after 1978 the fraction of firms that do not pay dividends steadily increases (Fama and French, 2000). More generally, dividends are a policy variable, and changes in policy can raise problems for estimates of the expected stock return from the dividend growth model. There is no problem in the long-term, as long as dividend policies stabilize and the dividend-price ratio resumes its mean-reversion, though perhaps to a new mean. (An appendix, available on request, provides an example involving repurchases.) But there can be problems during transition periods. For example, if the fraction of firms that do not pay dividends steadily increases, the market dividend-price ratio is probably non-stationary; it is likely to decline over time, and the dividend growth model is likely to underestimate the expected stock return.

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

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

B. The Investment Horizon

The return concept in discrete time asset pricing models is a one-period simple return, and our empirical work focuses on the one-year return. But many if not most investors are concerned with long-

term returns, that is, terminal wealth over a long holding period. Do the advantages and disadvantages of different expected return estimates depend on the return horizon? This section addresses this question.

1. The Expected Annual Simple Return

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

The standard deviation of the annual simple rate of capital gain for 1951-2000 is 3.29 times the standard deviation of the annual dividend growth rate (Table 1). The resulting downward bias of the average dividend growth rate as an estimate of the expected annual simple rate of capital gain is roughly 1.28% per year (half the difference between the variances of the two growth rates). Corrected for this bias, the dividend growth estimate of the 1951-2000 equity premium in simple returns rises from 2.55 to 3.83% (Table 4), which is still far below the estimate from the average return, 7.43%. Since the earnings growth rate and the annual rate of capital gain have similar 1951-2000 standard deviations, 13.79% and 16.77% (Table 1), the bias of the earnings growth estimate of the expected return is smaller (0.46%). Corrected for bias, the estimate of the 1951-2000 equity premium from the earnings growth model rises from 4.32 to 4.78% (Table 4), which again is far below the 7.43% estimate from the average return.

2. Long-Term Expected Wealth

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

compounded expected simple growth rate, $E[\Pi_{t=1}^{T}(1+GD_t)] = [1+E(GD)]^{T}$. And if the dividend-price ratio is stationary, for long horizons the expected compounded dividend growth rate is the expected compounded rate of capital gain, $E[\Pi_{t=1}^{T}(1+GD_t)] = E[\Pi_{t=1}^{T}(1+GP_t)]$. Thus, when the horizon T is long, compounding the true expected annual simple return from the dividend growth model produces an unbiased estimate of the expected long-term return, $[1+E(RD)]^{T} = E[\Pi_{t=1}^{T}(1+R_t)]$.

In contrast, if the dividend growth rate is unpredictable and the dividend-price ratio is stationary, part of the higher volatility of annual rates of capital gain is transitory, the result of a mean-reverting expected annual return (Cochrane, 1994). Thus, compounding even the true unconditional expected annual simple return, $E(R)$, yields an upward biased measure of the expected compounded return, $[1+E(R)]^{T} > E[\Pi_{t=1}^{T}(1+R_t)]$.

There is a similar problem in using the average (simple) earnings growth rate to estimate long-term expected wealth. The regressions in Table 3 suggest that the predictability of earnings growth for 1951-2000 is due to transitory variation in earnings. As a result, annual earnings growth is 2.71 times more volatile than dividend growth (Table 1). The compound growth rate of earnings for 1951-2000, 1.89%, is 2.05 times the compound dividend growth rate, 0.92%. But because earnings are more volatile, the average simple growth rate of earnings, 2.82%, is 2.69 times the average simple growth rate of dividends, 1.05%. As a result, the average simple growth rate of earnings produces an upward biased estimate of the compound rate of growth of long-term expected wealth.

We can correct the bias by subtracting half the difference between the variance of earnings growth and the variance of dividend growth (0.82%) from the average earnings growth rate. The estimate of the expected rate of capital gain provided by this adjusted average growth rate of earnings is 2.00% per year. Using this adjusted average growth rate of earnings, the earnings growth estimate of the expected real stock return for 1951-2000 falls from 6.51 to 5.69%. The estimate of the equity premium falls from 4.32 to 3.50% (Table 4), which is closer to the 2.55% obtained when the average dividend growth rate is used to estimate the expected rate of capital gain. Similarly, adjusting for the effects of transitory return volatility causes the estimate of the equity premium from realized stock returns to fall from 7.43% to 6.16%, which

is still far above the bias-adjusted estimate of the earnings growth model (3.50%) and the estimate from the dividend growth model (2.55%).

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

VI. Conclusions

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

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

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

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

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

(iii) Most important, the average stock return for 1951-2000 is much greater than the average income return on book equity. Taken at face value, this says that investment during the period is on average unprofitable (its expected return is less than the cost of capital). In contrast, the lower estimates of the expected stock return from the dividend and earnings growth models are less than the income return on investment, so the message is that investment is on average profitable. This is more consistent with book-to-market ratios that are rather consistently less than 1.0 during the period.

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

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

Our main concern, however, is the unconditional expected stock return, not the end-of-sample conditional expected value. Here there are some nuances. If we are interested in the unconditional expected annual simple return, the 1951-2000 estimates from fundamentals are downward biased. The bias is rather large when the average growth rate of dividends is used to estimate the expected rate of capital gain, but it is small for the average growth rate of earnings. On the other hand, if we are interested in the long-term expected growth of wealth, the dividend growth model is probably best, and the average

stock return and the earnings growth estimate of the expected return are upward biased. But our bottom line inference does not depend on whether one is interested in the expected annual simple return or long-term expected wealth. In either case, the bias-adjusted expected return estimates for 1951-2000 from fundamentals are a lot (more than 2.6% per year) lower than bias-adjusted estimates from realized returns. (See Table 4.) Based on this and other evidence, our main message is that the unconditional expected equity premium of the last fifty years is probably far below the realized premium.

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Table 1 — Real Equity Premium and Related Statistics for the S&P Portfolio

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

	Inf_t	F_t	D_t/P_{t-1}	GD_t	GY_t	GP_t	RD_t	RY_t	R_t	RXD_t	RXY_t	RX_t	SD	SY	SR
Means of Annual Values of Variables															
1872-2000	2.16	3.24	4.70	2.08	NA	4.11	6.78	NA	8.81	3.54	NA	5.57	.20	NA	.31
1872-1950	.99	3.90	5.34	2.74	NA	2.96	8.07	NA	8.30	4.17	NA	4.40	.22	NA	.23
1951-2000	4.00	2.19	3.70	1.05	2.82	5.92	4.74	6.51	9.62	2.55	4.32	7.43	.15	.25	.44
Standard Deviations of Annual Values of Variables															
1872-2000	7.51	8.48	1.39	12.37	NA	17.83	12.56	NA	18.03	13.00	NA	18.51			
1872-1950	9.11	10.63	1.12	15.28	NA	18.48	15.41	NA	18.72	16.02	NA	19.57			
1951-2000	3.11	2.46	1.17	5.09	13.79	16.77	5.21	13.51	17.03	5.62	14.02	16.73			
Means of Annual Continuously Compounded Returns and Growth Rates															
1872-2000	1.86	2.87		1.34	NA	2.48			7.00						
1872-1950	.59	3.33		1.60	NA	1.22			6.41						
1951-2000	3.88	2.14		.92	1.89	4.46			7.94						

	b_t/p_t	RD_t	RY_t	R_t	Y_t/B_{t-1}
Means of Annual Values of Variables					
1951-2000	.66	4.74	6.51	9.62	7.60

Table 2 — Means of Simple Real Equity Premium and Related Statistics for the S&P Portfolio for Ten-Year Periods

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

	Inf_t	F_t	D_t/P_{t-1}	GD_t	GY_t	GP_t	RD_t	RY_t	R_t	RXD_t	RXY_t	RX_t
1872-1880	-2.77	9.86	6.29	4.62	NA	7.13	10.91	NA	13.42	1.06	NA	3.56
1881-1890	-1.72	7.23	5.04	.69	NA	.04	5.73	NA	5.08	-1.51	NA	-2.15
1891-1900	.18	5.08	4.40	4.49	NA	4.75	8.89	NA	9.15	3.81	NA	4.08
1901-1910	1.95	3.18	4.45	3.25	NA	2.33	7.70	NA	6.78	4.52	NA	3.60
1911-1920	6.82	.82	5.70	-3.43	NA	-6.52	2.27	NA	-.83	1.45	NA	-1.64
1921-1930	-1.70	7.41	5.72	9.07	NA	11.83	14.78	NA	17.54	7.37	NA	10.13
1931-1940	-1.23	2.80	5.31	.36	NA	2.21	5.67	NA	7.52	2.87	NA	4.72
1941-1950	6.04	-4.57	5.90	3.02	NA	2.33	8.91	NA	8.22	13.48	NA	12.79
1951-1960	1.79	1.05	4.68	1.22	.61	10.64	5.90	5.30	15.32	4.85	4.24	14.27
1961-1970	2.94	2.27	3.21	1.98	2.07	2.69	5.19	5.27	5.90	2.92	3.01	3.63
1971-1980	8.11	-.30	4.04	-.86	3.47	-1.92	3.18	7.50	2.12	3.48	7.80	2.42
1981-1990	4.51	5.32	4.19	2.32	.37	5.40	6.51	4.56	9.59	1.19	-.75	4.28
1991-2000	2.68	2.61	2.36	.58	7.58	12.80	2.94	9.94	15.16	.32	7.32	12.54

Table 3 - Regressions to Forecast Real Dividend and Earnings Growth Rates, GD_t and GD_t

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

OneYear: The Regressions Forecast Real Dividend Growth, GD_t, with Variables Known at t-1

	Int	d_{t-1}/y_{t-1}	d_{t-1}/p_{t-1}	GD_{t-1}	GD_{t-2}	GD_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	R^2
1875-1950, N = 76 Years										
Coef	29.56	-23.12	-2.63	-.12	-.07	-.03	.22	.13	.09	.38
t-Stat	3.22	-3.17	-1.77	-1.08	-.64	-.29	2.24	1.37	1.01	
1951-2000, N = 50 Years										
Coef	-2.16	2.97	.11	-.07	-.20	-.06	.11	.07	.01	.01
t-Stat	-.40	.33	.16	-.45	-1.57	-.45	2.17	1.33	.22	

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

	Int	d_{t-2}/y_{t-2}	d_{t-2}/p_{t-2}	GD_{t-2}	GD_{t-2}	R_{t-2}	R_{t-3}	R^2
1875-1950, N = 76 Years								
Coef	6.61	-11.60	.31	-.26	.05	.24	.11	.07
t-Stat	.64	-1.28	.18	-2.02	.39	2.03	1.00	
1951-2000, N = 50 Years								
Coef	-4.11	7.62	.32	-.14	-.03	.05	-.01	-.05
t-Stat	-.73	.81	.46	-1.13	-.28	.99	-.16	

One Year: the Regressions Forecast Real Earnings Growth, GY_t, with Variables Known at t-1

	Int	Y_{t-1}/B_{t-2}	d_{t-1}/y_{t-1}	y_{t-1}/p_{t-1}	GY_{t-1}	GY_{t-2}	GY_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	R^2
1951-2000, N = 50 Years											
Coef	5.48	.11	13.06	-1.36	.21	-.13	-.31	.28	-.25	.03	.40
t-Stat	.33	.11	.52	-1.91	1.17	-.89	-2.64	2.39	-2.18	.26	

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

	Int	Y_{t-2}/B_{t-3}	d_{t-2}/y_{t-2}	y_{t-2}/p_{t-2}	GY_{t-2}	GY_{t-3}	R_{t-2}	R_{t-3}	R^2
1951-2000, N = 50 Years									
Coef	-7.60	.46	2.05	-.74	-.16	-.39	-.31	-.12	.23
t-Stat	-.43	1.66	.76	-1.02	-.92	-2.54	-2.59	-.97	

Table 4 – Estimates of the Real Equity Premium in Simple Annual and Long-Term Returns: 1951-2000

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

| | Unadjusted | Bias-Adjusted | |
		Annual	Long-Term
$A(RXD_t)$	2.55	3.83	2.55
$A(RXY_t)$	4.32	4.78	3.50
$A(RX_t)$	7.43	7.43	6.16

Figure 1 - Dividend-Price and Earnings-Price Ratios