Stock Market Returns in the Long Run:
Participating in the Real Economy

(Forthcoming Financial Analyst Journal)

Roger G. Ibbotson, Ph.D.
Professor in the Practice of Finance
Yale School of Management
135 Prospect Street
New Haven, CT 06520-8200
Phone: (203) 432-6021
Fax: (203) 432-6970

Chairman
Ibbotson Associates, Inc.
225 N. Michigan Ave. Suite 700
Chicago, IL 60601-7676
Phone: (312) 616-1620
Fax: (312) 616-0404

Peng Chen, Ph.D., CFA
Vice President, Director of Research
Ibbotson Associates, Inc.
225 N. Michigan Ave. Suite 700
Chicago, IL 60601-7676
Phone: (312) 616-1620
Fax: (312) 616-0404
E-mail: pchen@ibbotson.com

July 9, 2002

ABSTRACT

We estimate the forward-looking long-term equity risk premium by extrapolating the way it participated in the real economy. We decompose the 1926-2000 historical equity returns into supply factors including inflation, earnings, dividends, price to earnings ratio, dividend payout ratio, book value, return on equity, and GDP per capita. There are several key findings: First, the growth in corporate productivity measured by earnings is in line with the growth of overall economic productivity. Second, P/E increases account for only a small portion of the total return of equity (1.25% of the total 10.70%). The bulk of the return is attributable to dividend payments and nominal earnings growth (including inflation and real earnings growth). Third, the increase in factor share of equity relative to the overall economy can be more than fully attributed to the increase in the P/E ratio. Fourth, there is a secular decline in the dividend yield and payout ratio, rendering dividend growth alone a poor measure of corporate profitability and future growth. Contrary to several recent studies, our supply side model forecast of the equity risk premium is only slightly lower than the pure historical return estimate. The long-term equity risk premium (relative to the long-term government bond yield) is estimated to be about 6% arithmetically, and 4% geometrically. Our estimate is in line with both the historical supply measures of the public corporations (i.e., earnings) and the overall economic productivity (GDP per capita).

I. INTRODUCTION

Numerous authors are directing their efforts toward estimating expected returns on stocks incremental to bonds.[1] These equity risk premium studies can be categorized into four groups based on the approaches they have taken. The first group of studies try to derive the equity risk premiums from historical returns between stocks and bonds as was done in Ibbotson and Sinquefield (1976a,b). The second group, which includes our current paper, uses fundamental information such as earnings, dividends, or overall economic productivity to measure the expected equity risk premium. The third group adopts demand side models that derive expected equity returns through the payoff demanded by investors for bearing the risk of equity investments, as in the Ibbotson, Siegel, and Diermeier (1984) demand framework, and especially in the large body of literature following the seminal work of Mehra and Prescott (1985). The fourth group relies on opinions of investors and financial professionals through broad surveys.

Our paper uses supply side models. We first used this type of model in Diermeier, Ibbotson, and Siegel (1984). There have been numerous other authors who have also used supply side models, usually focusing on the Gordon (1962) constant dividend growth model. For example, Siegel (1999) predicts that the equity risk premium will shrink in the future due to low current dividend yields and high equity valuations. Fama and French (2002) use a longer time period (1872 to 1999) to get historical expected geometric equity risk premiums of 2.55% using dividend growth rates, and 4.32% using earnings growth rates.[2] They argue that the increase in P/E ratio has resulted in a realized equity risk premium that has been higher than ex ante expected. Campbell and Shiller (2001) argue for low returns, because they believe the current market is overvalued. Arnott and Ryan (2001) argue that the forward-looking equity risk premium is actually negative. This stems from using the low current dividend yield plus their very low forecast dividend growth.

Arnott and Bernstein (2002) argue similarly that the forward-looking equity risk premium is near zero or negative. We later argue that mixing the current low dividend yields and payout ratios with historical dividend yield growth violates Miller and Modigliani (1961) dividend theory.

The survey results generally support somewhat higher equity risk premiums. For example, Welch (2000) conducted a survey among 226 academic financial economics on equity risk premium expectations. The survey shows that the geometric long horizon equity risk premium forecast is almost 4%.[3] Graham and Harvey (2001) conducted a multi-year survey of CFOs of U.S. corporations, they find that the expected 10-year geometric average equity risk premium ranges from 3.9% to 4.7%.

In this paper, we link historical equity returns with factors commonly used to describe the aggregate equity market and overall economic productivity. Unlike some studies, our results are portrayed on a per share basis (per capita in the case of GDP). The factors include inflation, earnings per share, dividends per share, price to earnings ratio, dividend payout ratio, book value per share, return on equity, and GDP per capita.[4] We first decompose the historical equity returns into different sets of components based on six different methods. Then, we examine each of the components within the six methods. Finally, we forecast the equity risk premium through supply side models using historical data.

Our long-term forecasts are consistent with the historical supply of U.S. capital market earnings and GDP per capita growth over the period 1926-2000. In an important distinction from the forecasts of many others, our forecasts assume market efficiency and a constant equity risk premium.[5] Thus the current high P/E ratio represents the market's forecast of higher earnings growth rates. Furthermore, our forecasts are consistent with Miller and Modigliani (1961) theory so that dividend payout ratios do not affect P/E ratios and high earnings retention rates (usually associated with low yields) imply higher per share future growth. To the extent that corporate cash is not used for reinvestment, it is assumed to be used to repurchase a company's own shares or perhaps more frequently to purchase other companies' shares. Finally, our forecasts treat inflation as a pass-through, so that the entire analysis can be done in real terms.

II. THE SIX METHODS FOR DECOMPOSING HISTORICAL EQUITY RETURNS

We present six different methods of decomposing historical equity returns. The first two methods (especially method 1) are models based entirely on historical returns. The other four methods are models of the supply side. We evaluated each method and its components by applying historical data from 1926 to 2000. The historical equity return and earnings data used in this study are obtained from Wilson and Jones (2002).[6] The average compounded annual return for the stock market over the period 1926-2000 is 10.70%. The arithmetic annual average return is 12.56% and the standard deviation is 19.67%. In as much as our methods use geometric averages, we focus on components of the geometric return (10.70%). Later in the paper when we do our forecasts, we convert geometric average returns to arithmetic average returns.

Method 1 – Building Blocks Method

Ibbotson and Sinquefield (1976a,b) develop a building blocks method to explain equity returns. The three building blocks are inflation, real risk-free rate, and equity risk premium. Inflation is represented by the changes in the Consumer Price Index (CPI). The equity risk premium and the real risk-free rate for year t, ERP_t and RRf_t , are given by

$$ERP_t = \frac{1+R_t}{1+Rf_t} - 1 = \frac{R_t - Rf_t}{1+Rf_t} \quad (1)$$

$$RRf_t = \frac{1+Rf_t}{1+CPI_t} - 1 = \frac{Rf_t - CPI_t}{1+CPI_t} \quad (2)$$

$$R_t = (1+CPI_t) \times (1+RRf_t) \times (1+ERP_t) - 1 \quad (3)$$

R_t is the return of U.S. stock market represented by the S&P 500 index. Rf_t is the return of risk-free assets represented by the income return of long-term U.S. government bonds. The compounded average for equity return is 10.70% from 1926-2000. For the equity risk premium, we can interpret that investors were compensated 5.24% per year for investing in common stocks rather than long-term risk-free assets like the long-term US government bonds.[7] This also shows that roughly half of the total historical equity return has come from the equity risk premium, and the other half is from inflation and long-term real risk-free rate. The average U.S. equity returns from 1926 and 2000 can be reconstructed as follows:

$$\begin{aligned} \overline{R} &= (1+\overline{CPI}) \times (1+\overline{RRf}) \times (1+\overline{ERP}) - 1 \\ 10.70\% &= (1+3.08\%) \times (1+2.05\%) \times (1+5.24\%) - 1 \end{aligned} \quad (4)$$

Method 2 – Capital Gain and Income Method

The equity return can be broken into capital gain (cg) and income return (Inc) based on the form in which the return is distributed. Income return of common stock is distributed to investors through dividends, while capital gain is distributed through price appreciation. Real capital gain

(Rcg) can be computed by subtracting inflation from capital gain. The equity return in period t can then be decomposed as follows:

$$R_t = \left[(1+CPI_t)\times(1+Rcg_t)-1\right]+Inc_t+Rinv_t \tag{5}$$

The average income return is calculated to be 4.28%, the average capital gain is 6.19%, and the average real capital gain is 3.02%. $Rinv$, the re-investment return, averages 0.20% from 1926 to 2000. The average U.S. equity return from 1926 to 2000 can be computed according to

$$\begin{aligned} \overline{R} &= \left[(1+\overline{CPI})\times(1+\overline{Rcg})-1\right]+\overline{Inc}+\overline{Rinv} \\ 10.70\% &= \left[(1+3.08\%)\times(1+3.02\%)-1\right]+4.28\%+0.20\% \end{aligned} \tag{6}$$

Figure 1 shows the decomposition of the building blocks method and the capital gain and income method from 1926 to 2000.

Method 3 – Earnings Model

The real capital gain portion of the return in the capital gain and income method can be broken into growth in real earnings per share (g_{REPS}) and growth in the price to earnings ratio ($g_{P/E}$),

$$Rcg_t = \frac{P_t}{P_{t-1}}-1=\frac{P_t/E_t}{P_{t-1}/E_{t-1}}\times\frac{E_t}{E_{t-1}}-1=(1+g_{P/E,t})\times(1+g_{REPS,t})-1 \tag{7}$$

Therefore, the equity's total return can be broken into four components: inflation; the growth in real earnings per share; the growth in the price to earnings ratio; and income return.

$$R_t = \left[(1+CPI_t)\times(1+g_{REPS,t})\times(1+g_{P/E,t})-1\right]+Inc_t+Rinv_t \tag{8}$$

The real earnings of US equity increased 1.75% annually from 1926. The P/E ratio was 10.22 at the beginning of 1926. It grew to 25.96 at the end of 2000. The highest P/E (136.50) was recorded during the depression in 1932 when earnings were near zero, while the lowest (7.26) was recorded in 1979. The average year-end P/E ratio is 13.76.[8] Figure 2 shows the price to earnings ratio from 1926 to 2000. The U.S. equity returns from 1926 and 2000 can be computed according to

$$\begin{aligned} \overline{R} &= \left[(1+\overline{CPI})\times(1+\overline{g_{REPS}})\times(1+\overline{g_{P/E}})-1\right]+\overline{Inc}+\overline{Rinv} \\ 10.70\% &= \left[(1+3.08\%)\times(1+1.75\%)\times(1+1.25\%)-1\right]+4.28\%+0.20\% \end{aligned} \quad (9)$$

Method 4 – Dividends Model

Dividend (Div) equals the earnings times the dividend payout ratio (PO); therefore, the growth rate of earnings can be calculated by the difference between the growth rate of dividend and the growth rate of the payout ratio.

$$EPS_t = \frac{Div_t}{PO_t} \quad (10)$$

$$(1+g_{REPS,t}) = \frac{(1+g_{RDiv,t})}{(1+g_{PO,t})} \quad (11)$$

We substitute dividend growth and payout ratio growth for the earnings growth in equation 8. The equity's total return in period t can be broken into five components: 1) inflation; 2) the growth rate of the price earnings ratio; 3) the growth rate of the dollar amount of dividend after inflation; 4) the growth rate of the payout ratio; and 5) the dividend yield.

$$R_t = \left[(1+CPI_t)\times(1+g_{P/E,t})\times\frac{(1+g_{RDiv,t})}{(1+g_{PO,t})}-1\right]+Inc_t+Rinv_t \quad (12)$$

Figure 3 shows the annual income return (dividend yield) of U.S. equity from 1926 to 2000. The dividend yield dropped from 5.15% at the beginning of 1926 to only 1.10% at the end of 2000. Figure 4 shows the year-end dividend payout ratio from 1926 to 2000. On average, the dollar amount of dividends grew 1.23% after inflation per year, while the dividend payout ratio decreased 0.51% per year. The dividend payout ratio was 46.68% at the beginning of 1926. It decreases to 31.78% at the end of 2000. The highest dividend payout ratio (929.12%) was recorded in 1932, while the lowest was recorded in 2000. The U.S. equity returns from 1926 and 2000 can be computed according to

$$\overline{R} = \left[(1+\overline{CPI})\times(1+\overline{g_{P/E}})\times\frac{(1+\overline{g_{RDiv}})}{(1+\overline{g_{PO}})} - 1 \right] + \overline{Inc} + \overline{Rinv}$$
$$10.70\% = \left[(1+3.08\%)\times(1+1.25\%)\times\frac{1+1.23\%}{1-0.51\%} - 1 \right] + 4.28\% + 0.20\% \tag{13}$$

Method 5 – Return on Book Equity Model

We can also break the earnings into book value of equity (BV) and return on equity (ROE).

$$EPS_t = BV_t \times ROE_t \tag{14}$$

The growth rate of earnings can be calculated by the combined growth rate of BV and ROE.

$$(1+g_{REPS,t}) = (1+g_{RBV,t})(1+g_{ROE,t}) \tag{15}$$

We substitute BV growth and ROE growth for the earnings growth in the equity return decomposition. The equity's total return in period t can be computed by,

$$R_t = \left[(1+CPI_t)\times(1+g_{P/E,t})\times(1+g_{RBV,t})\times(1+g_{ROE,t}) - 1 \right] + Inc_t + Rinv_t \tag{16}$$

We estimate that the average growth rate of the book value after inflation is 1.46% from 1926 to 2000.[9] The average ROE growth per year is calculated to be 0.31% during the same time period.

$$\overline{R} = \left[(1+\overline{CPI}\ )\times(1+\overline{g_{P/E}})\times(1+\overline{g_{BV}})\times(1+\overline{g_{ROE}})-1\right]+\overline{Inc}+\overline{Rinv}$$
$$10.70\% = \left[(1+3.08\%)\times(1+1.25\%)\times(1+1.46\%)\times(1+0.31\%)-1\right]+4.28\%+0.20\% \quad (17)$$

Method 6 - GDP Per Capita Model

Diermeier, Ibbotson, and Siegel (1984) proposed a framework to analyze the aggregate supply of financial asset returns. Since we are only interested in the supply model of the equity returns in this study, we developed a slightly different supply method based on the growth of the economic productivity. This method can be expressed by the following equation:

$$R_t = \left[(1+CPI_t)\times(1+Rg_{GDP/POP,t})\times(1+g_{FS,t})-1\right]+Inc_t+Rinv_t \quad (18)$$

The return of the equity market over the long run can be decomposed into four components: 1) inflation; 2) real growth rate of the overall economic productivity (the GDP per capita ($g_{GDP/POP}$)); 3) the increase of the equity market relative to the overall economic productivity (increase in the factor share of equities in the overall economy (g_{FS})); and 4) dividend yields. Instead of assuming a constant factor share, we examine the historical growth rate of factor share relative to the overall growth of the economy.

Figure 5 shows the growth of the stocks market, GDP per capita, earnings, and dividends initialized to unity at the end of 1925. In the early 1930s, the stock market, earnings, dividends, and GDP per capita level dropped significantly. Overall, GDP per capita slightly outgrew earnings and dividends, but they all grew at approximately the same rate. In other words, overall economic productivity increased slightly faster than corporate earnings and dividends through the past 75 years. Although GDP per capita outgrew earnings and dividends, the overall stock market price grew faster than GDP per capita. This is primarily because the P/E ratio increased 2.54 times during the same time period. We calculate that the average annual increase in the factor share of the equity market relative to the overall economy to be 0.96%. The factor share increase is less than the annual increase of P/E ratio (1.25%) over the same time period. This suggests that the increase in the equity market share relative to the overall economy can be fully attributed to the increase in the P/E ratio.

$$\overline{R} = \left[(1+\overline{CPI}\ )\times(1+\overline{Rg_{GDP/POP}})\times(1+\overline{g_{FS}})-1\right]+\overline{Inc}+\overline{Rinv} \qquad (19)$$
$$10.70\% = \left[(1+3.08\%)\times(1+2.04\%)\times(1+0.96\%)-1\right]+4.28\%+0.20\%$$

Summary of Historical Equity Returns and its Components

Figure 6 shows the decomposition of models two through six into their components. The differences across the five models are the different components that represent the capital gain portion of the equity returns.

There are several important findings. First, as shown in Figure 5, the growth in corporate earnings is in line with the growth of the overall economic productivity. Second, P/E increases account for only 1.25% of the 10.70% total equity returns. Most of returns are attributable to dividend payments and nominal earnings growth (including inflation and real earnings growth). Third, the increase in relative factor share of the equity can be fully attributed to the increase in the P/E ratio. Overall economic productivity outgrew both corporate earnings and dividends from 1926 through 2000. Fourth, despite the record earnings growth in the 1990s, the dividend yield and the payout ratio declined sharply, which renders dividends alone a poor measure for corporate profitability and future earnings growth.

III. THE LONG -TERM FORECAST OF THE SUPPLY OF EQUITY RETURNS

Supply side models can be used to forecast the long-term expected equity return. The supply of stock market returns is generated by the productivity of the corporations in the real economy. Over the long run, the equity return should be close to the long run supply estimate. In other words, investors should not expect a much higher or a much lower return than that produced by the companies in the real economy. We believe the investors' expectations on the long-term equity performance should be based on the supply of equity returns produced by corporations.

The supply of equity returns consists of two main components: current returns in the form of dividends and long-term productivity growth in the form of capital gains. We focus on three supply side models: the earnings model, the dividend model, and the GDP per capita model (Method 3, Method 4, and Method 6 in section III).[10] We study the components of the three methods. Specifically, we identify which components are tied to the supply of equity returns, and which components are not. Then, we estimate the long-term sustainable return based on historical information on these supply components.

Method 3F – Forward-Looking Earnings Model

According to the earnings model (equation 8), the historical equity return can be broken into four components: the income return; inflation; the growth in real earnings per share; and the growth in the P/E ratio. Only the first three of these components are *historically* supplied by companies. The growth in P/E ratio reflects investors' changing prediction of *future* earnings growth. Although we forecast that the past supply of corporate growth will continue, we do not forecast any change in investors' predictions. Thus, the supply of the equity return (SR) only includes inflation, the growth in real earnings per share, and income return.

$$SR_t = \left[(1+CPI_t)\times(1+g_{REPS,t})-1\right]+Inc_t+Rinv_t \quad (20)$$

The long-term supply of U.S. equity returns based on the earnings method is 9.37%. This model uses the historical income return as an input for reasons that are discussed in the later section "Differences Between the Earnings Model (3F) and the Dividends Model (4F)".

$$\begin{aligned}\overline{SR} &= \left[(1+\overline{CPI})\times(1+\overline{g_{REPS}})-1\right]+\overline{Inc}+\overline{Rinv} \\ 9.37\% &= \left[(1+3.08\%)\times(1+1.75\%)-1\right]+4.28\%+0.20\%\end{aligned} \quad (21)$$

The supply side equity risk premium ($SERP$) based on the earnings model is calculated to be 3.97%. This is shown in Figure 7.

$$\overline{SERP} = \frac{(1+\overline{SR})}{(1+\overline{CPI})\times(1+\overline{RRf})}-1 = \frac{1+9.37\%}{(1+3.08\%)\times(1+2.05\%)}-1 = 3.97\% \quad (22)$$

Method 4F – Forward-Looking Dividends Method

The forward-looking dividend model is also referred to as the constant dividend growth model (or the Gordon model), where the expected equity return equals the dividend yield plus the expected dividend growth rate. The supply of the equity return in the Gordon model includes inflation, the growth in real dividend, and dividend yield. As is commonly done with the constant dividend growth model, we have used the current dividend yield of 1.10%, instead of the historical dividend yield of 4.28%. This reduces the estimate of the supply of equity returns to 5.44%. The equity risk premium is estimated to be 0.24%. Figure 8 shows the equity risk premium estimate based on the earnings model and the dividends model. In the next section, we show why we disagree with the dividends model and prefer to use the earnings model to estimate the supply side equity risk premium.

$$\overline{SR} = \left[(1+\overline{CPI})\times(1+\overline{g_{RDiv}})-1\right]+Inc(00)+\overline{Rinv}$$
$$5.54\% = \left[(1+3.08\%)\times(1+1.23\%)-1\right]+1.10\%+0.20\% \quad (23)$$

$$\overline{SERP} = \frac{(1+\overline{SR})}{(1+\overline{CPI})\times(1+\overline{RRf})}-1 = \frac{1+5.54\%}{(1+3.08\%)\times(1+2.05\%)}-1 = 0.24\% \quad (24)$$

Differences Between the Earnings Model (3F) and the Dividends Model (4F)

There are essentially two differences between the earnings model (3F) and the dividends model (4F). The two differences are reconciled in the two right bars (4F') in Figure 8. The differences relate to the low current payout ratio, and the high current P/E ratio.

First, the earnings model uses the historical earnings growth to reflect the growth in productivity, while the dividend model uses historical dividend growth. Historical dividend growth underestimates historical earnings growth because of the decrease in the payout ratio. Overall, the dividend growth underestimated the increase in earnings productivity by 0.51% per year from 1926 to 2000. The low current payout ratio is also reflected in today's low dividend yield. The payout ratio is at a historic low of 31.8%, compared to the historical average payout of 59.2%. Applying such a low rate forward would mean that even more earnings would be retained in the future than in the historical period. Had more earnings been retained, the historic earnings growth would have been 0.95% per year higher. Thus, it is necessary to adjust the 1.10% current yield upward by 0.95% assuming the historical average dividend payout ratio.

Using the current dividend payout ratio in the dividend model, 4F, creates two errors, both of which violate Miller and Modigliani (1961) theory. The firms' dividend payout ratio only affects the form in which shareholders receive their returns, (i.e. dividends or capital gains), but not their total return. Using the low current dividend payout ratio should not affect our forecast, thus the dividend model has to be upwardly adjusted by 1.46% (both 0.51% and 0.95%), so as not to violate M&M Theory. Firms today likely have such low payout ratios in order to reduce the tax burden of their investors. Instead of paying dividends, many companies reinvest earnings, buy back shares or use their cash to purchase other companies.[11]

The second difference between models 3F and 4F is related to the current P/E ratio (25.96) being much higher than the historical average (13.76). The current yield (1.10%) is at a historic low both because of the previously mentioned low payout ratio and because of the high P/E ratio. Even assuming the historical average payout ratio, the current dividend yield would be much lower than its historical average (2.05% vs. 4.28%) This difference is geometrically estimated to be 2.28% per year. The high P/E ratio can be caused by 1) mis-pricing; 2) low required rate of return; and/or 3) high expected future earnings growth rate. Mis-pricing is eliminated by our assumption of market efficiency. A low required rate of return is eliminated since we assume a constant equity risk premium through the past and future periods that we are trying to estimate. Thus, we interpret the high P/E ratio as the market expectation of higher earnings growth.[12]

$$\overline{SR} = \left[(1+\overline{CPI})\times(1+\overline{g_{RDiv}})\times(1-\overline{g_{PO}})-1\right]+Inc(00)+AY+AG+\overline{Rinv} \qquad (25)$$
$$9.67\% = \left[(1+3.08\%)\times(1+1.23\%)\times(1+0.51\%)-1\right]+1.10\%+0.95\%+2.28\%+0.20\%$$

To summarize, there are three differences between the earnings model and the dividends model. The first two differences relate to the dividend payout ratio and are direct violations of the Miller

& Modigliani (1961) theorem. We interpret that the third difference is due to the expectation of higher than average earnings growth, predicted by the high current P/E ratio. These differences reconcile the earnings and dividend models. Equation 25 presented model 4F', which reconciles the difference between the earnings model and the dividends model.

Geometric vs. Arithmetic

The estimated equity returns (9.37%) and equity risk premiums (3.97%) are geometric averages. The arithmetic average is often used in portfolio optimization. There are several ways to convert the geometric average into an arithmetic average. One method is to assume the returns are independently log-normally distributed over time. Then the arithmetic and geometric roughly follows the following relationship:

$$R_A = R_G + \frac{\sigma^2}{2}, \qquad (26)$$

where R_A is the arithmetic average, R_G is the geometric average, and σ^2 is the variance. The standard deviation of equity returns is 19.67%. Since almost all the variation in equity returns is from the equity risk premium (rather than the risk free rate), we need to add 1.93% to the geometric equity risk premium estimate to convert into arithmetic. $R_A = R_G + 1.93\%$. Adding the 1.93 percent to the geometric estimate, the arithmetic average equity risk premium is estimated to be 5.90% for the earnings model.

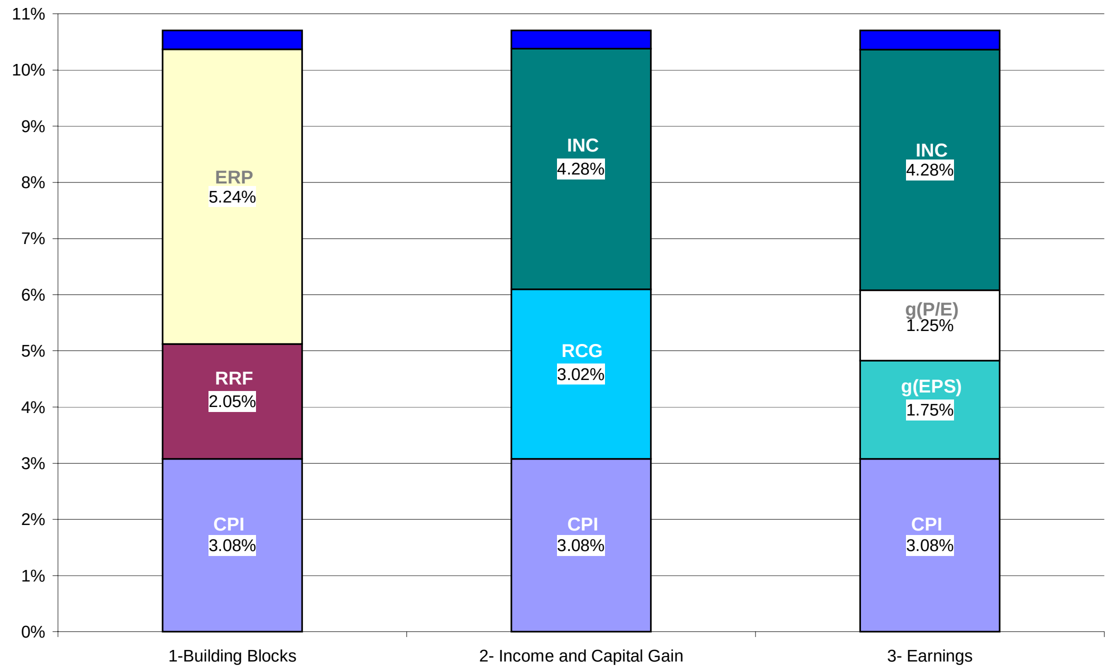
To summarize, the long-term supply of equity return is estimated to be 9.37% (6.09% after inflation) conditional on the historical average risk free rate. The supply side equity risk premium is estimated to be 3.97% geometrically and 5.90% arithmetically.[13]

IV. CONCLUSIONS

We adopt a supply side approach to estimate the forward looking long-term sustainable equity returns and equity risk premium. We analyze historical equity returns by decomposing returns into factors commonly used to describe the aggregate equity market and overall economic productivity. These factors include inflation, earnings, dividends, price-to-earnings ratio, dividend-payout ratio, book value, return on equity, and GDP per capita. We examine each factor and its relationship with the long-term supply side framework. We forecast the equity risk premium through supply side models using historical information. A complete tabulation of all the numbers from all models is presented in Appendix. Contrary to several recent studies on equity risk premium that declare the forward looking equity risk premium to be close to zero or negative, we find the long-term supply of equity risk premium is only slightly lower than the straight historical estimate. The equity risk premium is estimated to be 3.97% in geometric terms and 5.90% on an arithmetic basis. This estimate is about 1.25% lower than the straight historical estimate. The differences between our estimates and the ones provided by several other recent studies are principally due to the inappropriate assumptions used, which violate the Miller and Modigliani Theorem. Also our models interpret the current high P/E ratios as the market forecasting high future growth, rather than a low discount rate or an overvaluation. Our estimate is in line with both the historical supply measures of the public corporations (i.e., earnings) and the overall economic productivity (GDP per capita).

Our estimate of the equity risk premium is far closer to the historical premium than being zero or negative. This implies that stocks are expected to outperform bonds over the long run. For long-term investors, such as pension funds or individuals saving for retirement, stocks should continue to one of the favored asset classes in their diversified portfolios. Due to our lowered equity risk premium estimate (compared to historical performance), some investors should lower their equity allocations and/or increase their savings rate to meet future liabilities.

Figure 1: Decomposition of Historical Equity Returns 1926-2000
Geometric Mean = 10.70%



ERP is equity risk premium, RRF is the real risk free rate, CPI is the Consumer Price Index (inflation), INC is dividend income, RCG is real capital gain, g(P/E) is growth rate of P/E ratio, and g(EPS) is growth rate of earnings per share. The block on the top is the re-investment return plus the geometric interactions among the components. Including the geometric interactions ensures the components sums up to 10.70% in this and subsequent figures. Table 1 in the appendix gives the detailed information on the reinvestment and geometric interaction for all the methods.

Figure 2: P/E Ratio 1926-2000

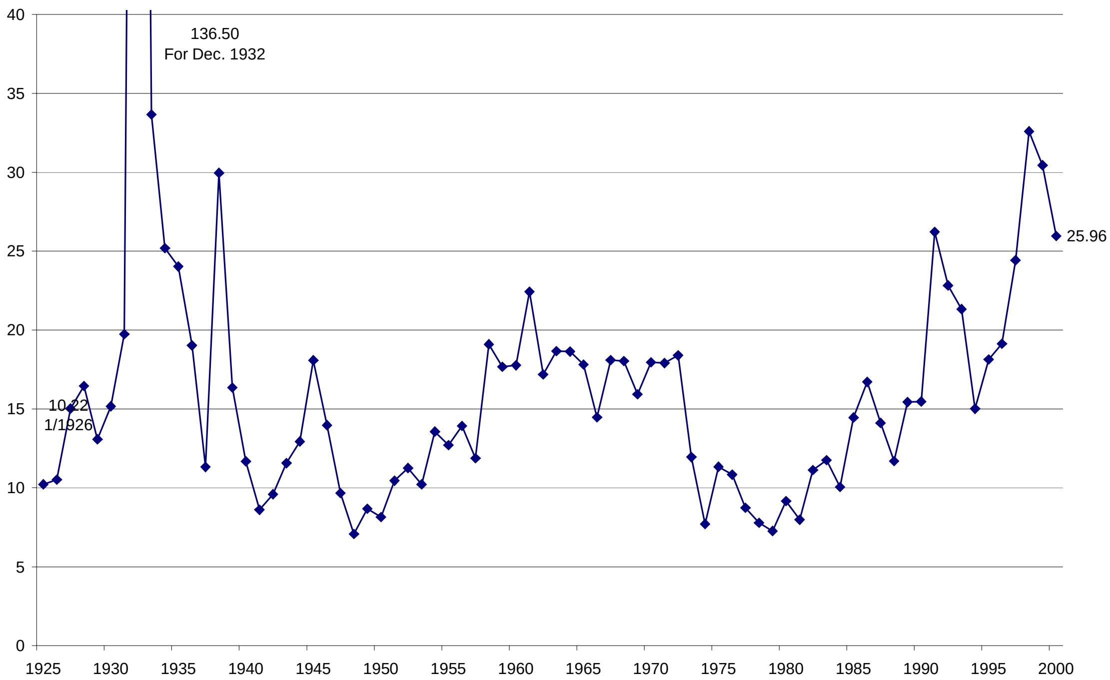


Figure 3: Income Return (Dividend Yield) % 1926-2000

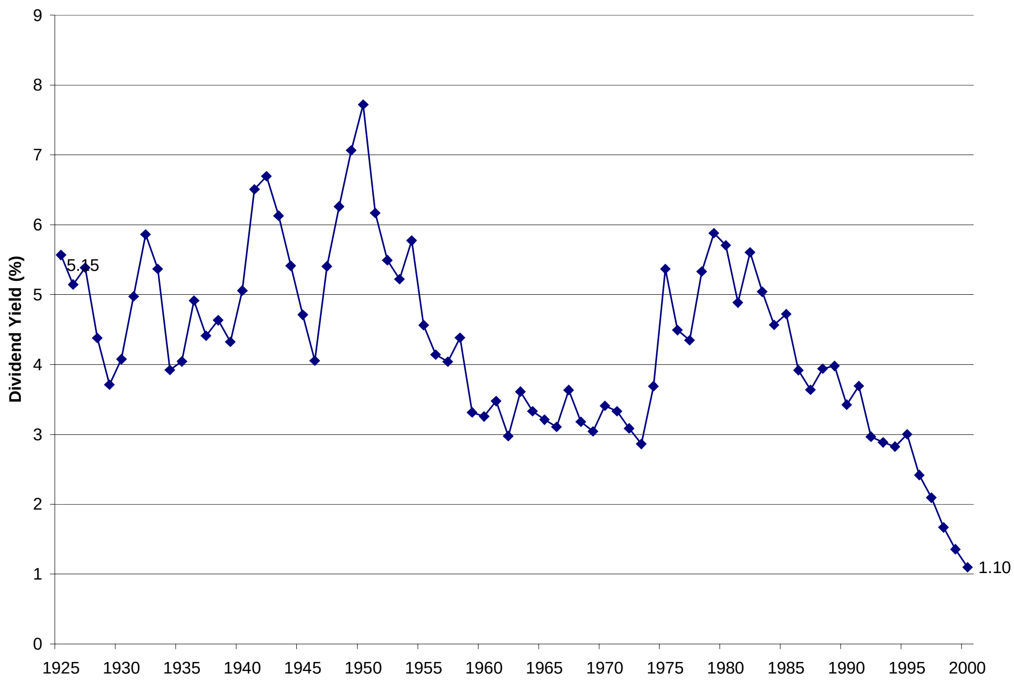


Figure 4: Dividend Payout Ratio % 1926-2000

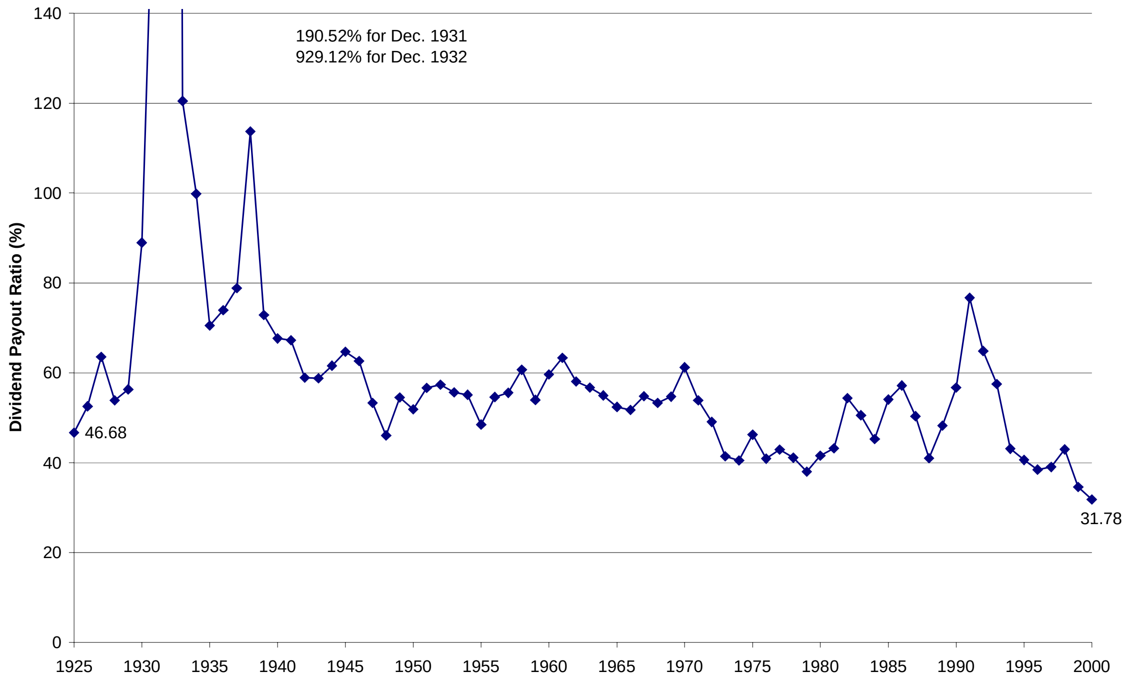


Figure 5: Growth of $1 at the beginning of 1926
1926-2000

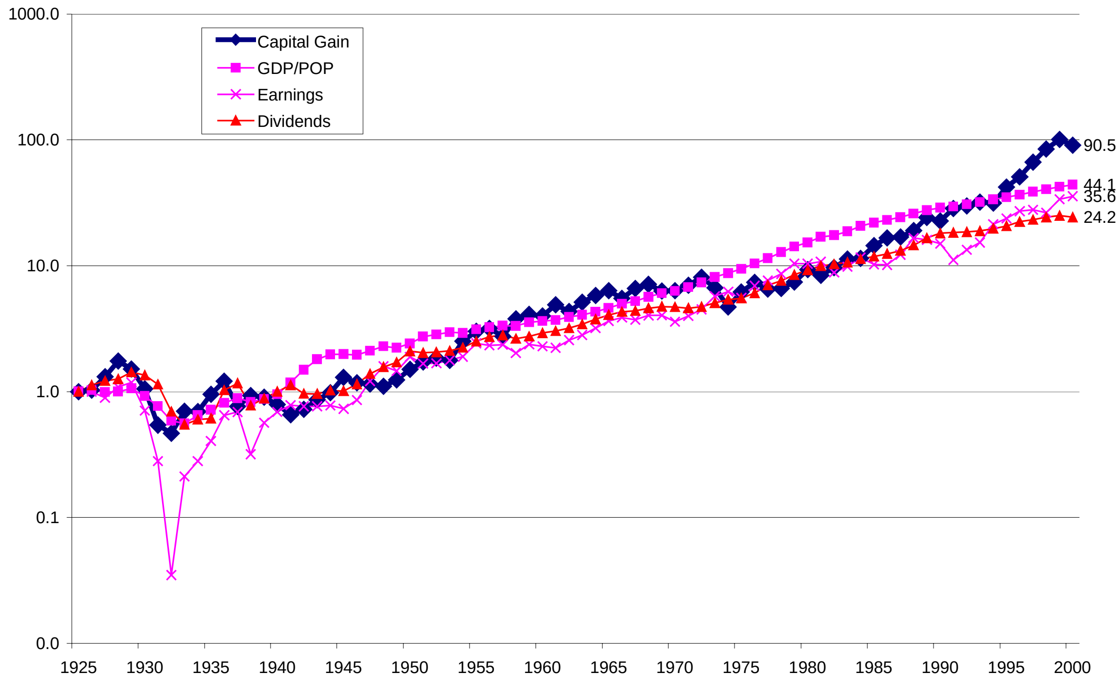
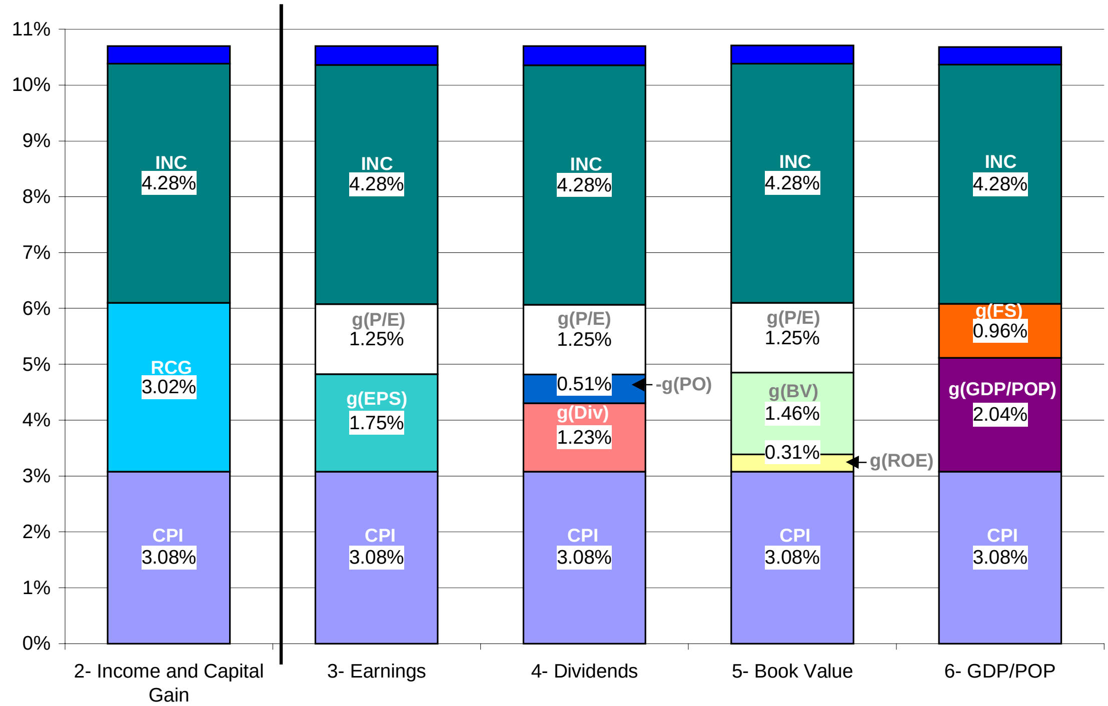


Figure 6: Decomposition of Historical Equity Returns 1926-2000



g(PO) is growth rate of dividend payout ratio, g(Div) is growth rate of dividend, g(BV) is the growth rate of book value, g(ROE) is the growth rate of return on book equity, g(FS) is the growth rate of equity factor share, and g(GDP/POP) is the growth rate of GDP per capita.

Figure 7: Historical Earnings and Forecasted Equity Returns Based on Earnings Models: Model 3, 3F, & 3F(ERP)

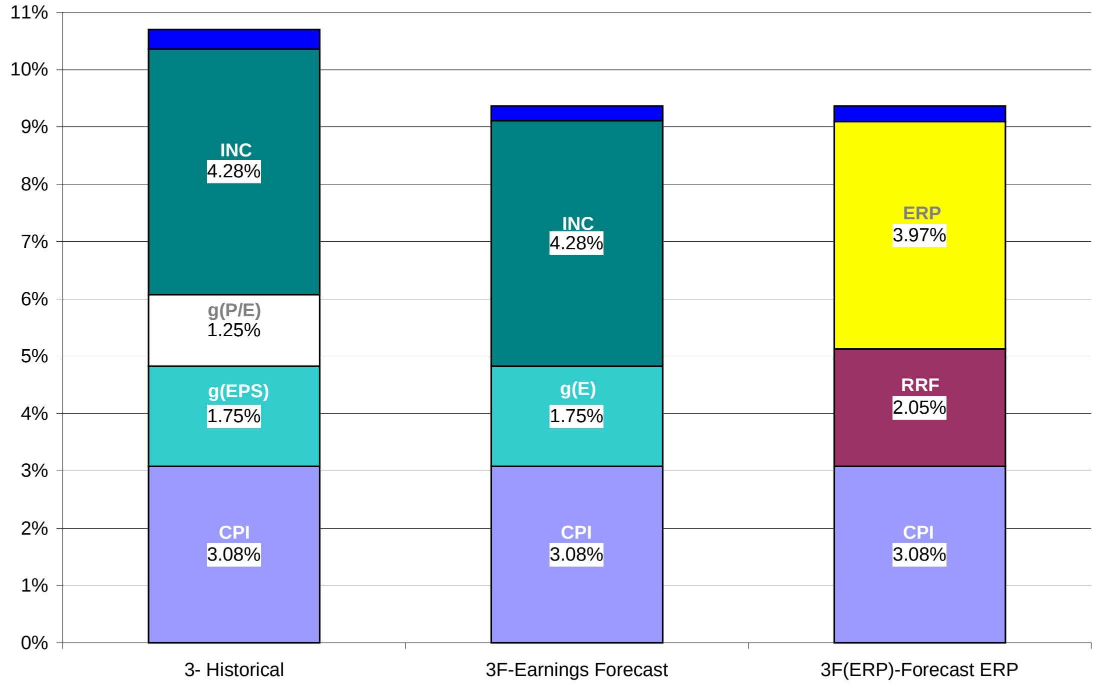
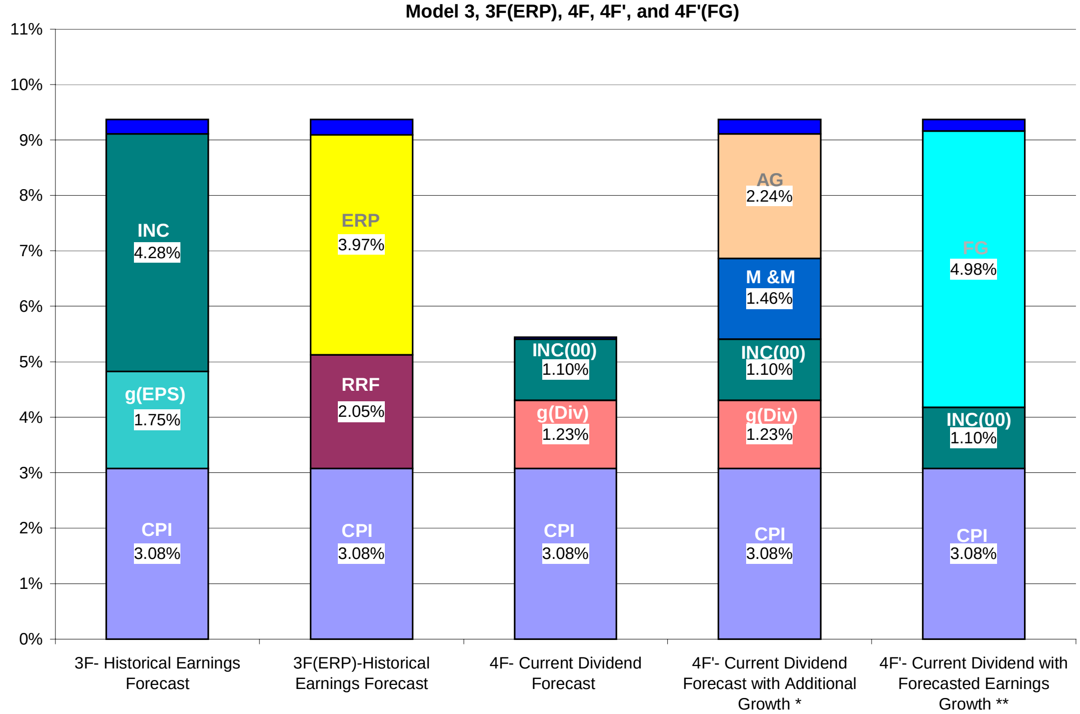


Figure 8: Historical vs. Current Dividend Yield Forecasts Based on Earnings and Dividend Models: Model 3, 3F(ERP), 4F, 4F', and 4F'(FG)



INC(00) is the dividend yield in the year 2000.

* Model 4F' attempts to correct the errors in model 4F: a) add 1.46% to correct Miller and Modigliani (M&M) violations; b) add the additional growth (AG), 2.24%, implied by the high current market P/E ratio.
** Based on Model 4F', we forecast the real earnings growth rate (FG) will be 4.98%.

Appendix

Table 1 Historical and Forecasted Equity Returns – All Models (Percent).

	Sum (%)	Inflation =3.08%	Real Risk-Free Rate=2.05%	Equity Risk Premium=5.24%	Real Capital Gain=3.02%	g(Real EPS)=1.75%	g(Real Div)=1.23%	- g(Div Payout Ratio)=0.51%	g(BV)=1.25%	g(ROE) = 0.31%	g(P/E)=1.25%	g(Real GDP/POP)=2.04%	g(FS-GDP/POP)=1.96%	Income Return=4.28%	Reinvestment + Interaction	Additional Growth =2.28%	Forecasted Earnings Growth =4.98%
Historical																	
Method 1	10.70	3.08	2.05	5.24											0.33		
Method 2	10.70	3.08			3.02									4.28	0.32		
Method 3	10.70	3.08				1.75					1.25			4.28	0.34		
Method 4	10.70	3.08					1.23	0.51			1.25			4.28	0.35		
Method 5	10.70	3.08							1.25%	0.31%	1.25			4.28	0.31		
Method 6	10.70	3.08										2.04	0.96	4.28	0.32		
Forecast with Historical Dividend Yield																	
Method 3F	9.37	3.08				1.75								4.28	0.26		
Method 3F (ERP)	9.37	3.08	2.05	3.97											0.27		
Method 6F	9.67	3.08										2.04		4.28	0.27		
Method 6F (ERP)	9.67	3.08	2.05	4.25											0.29		
Forecast with Current Dividend Yield																	
Method 4F	5.44	3.08					1.23							1.10*	0.03		
Method 4F (ERP)	5.44	3.08	2.05	0.24											0.07		
Method 4F’	9.37	3.08					1.23	0.51						2.05**	0.21	2.28	
Method 4F’ (FG)	9.37	3.08												1.10*	0.21		4.98

*2000 dividend yield

** Adjust the 2000 dividend yield up 0.95% assuming the historical average dividend payout ratio.

REFERENCES

Ang, Andrew and Geert Bekaert. 2001. "Stock Return Predictability: Is It There?" *Columbia University and NBER Working Paper.*

Arnott, Robert D. and Ronald Ryan. 2001. "The Death of the Risk Premium: Consequences of the 1990's," *Journal of Portfolio Management*, vol. 27, no. 3 (Spring): 61-74.

Arnott, Robert D. and Peter L. Bernstein. 2002. "What Risk Premium is 'Normal'?" *Financial Analyst Journal*, vol. 58, no. 2 (March/April): 64-84.

Campbell, John Y. and Robert J. Shiller. 2001. "Valuation Ratios and the Long Run Stock Market Outlook: An Update", *NBER Working Paper*, No.8221.

Diermeier, Jeffrey J., Roger G. Ibbotson, and Laurance B. Siegel. 1984. "The Supply for Capital Market Returns," *Financial Analyst Journal*, vol. 40, no. 2 (March/April): 2-8.

Fama, Eugene F., and Kenneth R. French. 2001. "Disappearing dividends: Changing firm characteristics or lower propensity to pay," *Journal of Financial Economics*, vol. 60, no.1 (April): 3-43.

Fama, Eugene F. and Kenneth R. French. 2002. "The Equity Risk Premium," *Journal of Finance*, vol. 57, no. 2 (April): 637-659.

Graham, John R. and Campbell R. Harvey. 2001. "Expectations of Equity Risk Premia, Volatility and Asymmetry from a Corporate Finance Perspective," *Working Paper, Fuqua School of Business, Duke University*, August 3, 2001.

Green, Richard C. and Burton Hollifield. 2001. "The Personal-Tax Advantages of Equity," *Carnegie Mellon University Working Paper*, January 2001.

Gordon, Myron. 1962. *The Investment Financing and Valuation of the Corporation*, Irwin: Homewood, Illinois.

Goyal, Amit and Ivo Welch. 2001. "Predicting the Equity Premium with Dividend Ratios" *Yale School of Management and UCLA Working Paper.*

Ibbotson Associates. 2001. *Stocks, Bonds, Bills, and Inflation 2001 Yearbook*, Ibbotson Associates, 2001.

Ibbotson, Roger G., Jeffrey J. Diermeier, and Laurance B. Siegel. 1984. "The Demand for Capital Market Returns: A New Equilibrium Theory," *Financial Analyst Journal*, vol. 40, no. 1 (January/February): 22-33.

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

Ibbotson, Roger G., and Rex A. Sinquefield. 1976b. "Stocks, Bonds, Bills, and Inflation: Simulations of Future (1976-2000)," *The Journal of Business*, vol. 49, no. 3 (July): 313-338.

Mehra, Rajnish, and Edward Prescott. 1985. “The Equity Premium: A Puzzle,” *Journal of Monetary Economics*, vol. 15, no. 2, 145-161.

Miller, Merton, and Franco Modigliani. 1961. “ Dividend policy, Growth and the Valuation of Shares,” *Journal of Business*, vol. 34, no. 4 (October): 411-433.

Shiller, Robert J. 2000. *Irrational Exuberance*, Princeton University Press, Princeton, NJ.

Siegel, Jeremy J. 1999. “The Shrinking Equity Risk Premium,” Journal of Portfolio Management, vol. 26, no. 1 (Fall):10-17.

Vuolenteenaho, Tuomo. 2000. “Understanding the Aggregate Book-to-Market Ratio and Its Implications to Current Equity-Premium Expectations. *Harvard University Working Paper*.

Welch, Ivo. 2000. "Views of Financial Economists on the Equity Premium and Other Issues." *The Journal of Business,* vol. 73, no. 4 (October): 501-537.

Wilson, Jack W. and Charles P. Jones. 2002. “An Analysis of the S&P 500 Index and Cowles' Extensions: Price Indexes and Stock Returns, 1870-1999,” *Journal of Business,* vol. 75, no. 3 (July).

[1] In our study, we define the equity risk premium as the difference between the long-run expected return on stocks and the long-term risk free (U.S. Treasury) yield. We do all of our analysis in geometric form, then convert at the end so the estimate is expressed in both arithmetic form and geometric form. Some other studies, including Ibbotson & Sinquefield (1976a,b), used the short-term U.S. Treasury Bills as the risk free rate.

[2] It is sometimes difficult to compare estimates from one study with another, due to changing points of reference. The equity risk premium estimate can be significantly different simply due to the use of arithmetic vs. geometric, or long-term risk free rate vs. short-term risk free rate (Treasury Bills), or the bond's income return (yield) vs. the bond's total return, or long-term strategic forecast vs. short-term market timing estimate. A more detailed discussion on arithmetic vs. geometric can be found in section III.

[3] Welch's (2000) survey reported a 7% equity risk premium measured as the arithmetic difference between equity and U.S. Treasury bill returns. To make an apple to apple comparison, we converted the 7% number into a geometric equity risk premium relative to the long term U.S. Government bond income return, which gives an estimate of almost 4%.

[4] Each per share quantity is per share of the S&P 500 portfolio. Hereafter, we will merely refer to each factor without always mentioning per share, for example, earnings instead of earnings per share.

[5] There are many theoretical models that suggest that the equity risk premium is dynamic over time. However, recent empirical studies (e.g. Goyal & Welch (2001)) and Ang & Bekaert (2001)) show there is no evidence of long-horizon return predictability by either earnings or dividend yields. Therefore, instead of trying to build a model for a dynamic equity risk premium, we assume that the long-term equity risk premium is constant. This provides a benchmark for analysis and discussion.

[6] We updated the series with data from Standard & Poor's to include the year 2000.

[7] The 5.24% is the compounded average of the historical equity risk premium. The arithmetic average is 7.02%. Unless specified, we use geometric averages in the calculations for the entire study.

[8] The average P/E ratio is calculated by reversing the average E/P ratio from 1926 to 2000.

[9] Book Values are calculated based on the book-to-market ratios reported in Vuolenteenaho (2000). The aggregate book-to-market ratio is 2.0 in 1928 and 4.1 in 1999. We use the book value growth rate calculated during 1928 to 1999 as the proxy for the growth rate during 1926 to 2000. The average ROE growth rate is calculated from the derived book value and the earnings data.

[10] We decided not to use model 1, 2, and 5 in forecasting, because the forecast of model 1 & 2 would be identical to the historical estimate reported in section II. The forecast of model 5 would require more complete book value and ROE data than we currently have available.

[11] The current tax code provides incentives for firms to distribute cash through share repurchases rather than through dividends. Green and Hollifield (2001) find that the tax savings through repurchases are on the order of 40-50% of the taxes that would have been paid by distributing dividends.

[12] Contrary to the efficient market models, Shiller (2000) and Campbell and Shiller (2001) argue that the price to earnings ratio appears to forecast the future stock price change.

[13] We could use the GDP Per Capita model to estimate the long-term equity risk premium as well. The GDP Per Capita model implies the long run stock returns should be in line with the productivity of the overall economy. The equity risk premium estimated using the GDP Per Capita model would be slightly higher than the ERP estimate from the earnings model. This is because the GDP Per Capita grew slightly faster than corporate earnings. A similar approach can be found in Diermeier, Ibbotson, and Siegel (1984), which proposed using the growth rate of the overall economy as a proxy for the growth rate in aggregate wealth in the long run.