The Supply of Stock Market Returns

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ABSTRACT

We estimate the forward-looking long-term equity risk premium using a combination of the historical and the supply side approaches. 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. We examine each of the factors and their relationship with the long-term supply side framework. There are several key findings: First, the growth in corporate productivity as 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 fully attributed to the increase in the P/E ratio. Fourth, despite the record earning growth, the dividend yield and payout ratio declined sharply in the 1990s, which renders dividend growth alone a poor measure of corporate profitability and future growth. We then forecast the equity risk premium through supply side models using this historical information. Contrary to several recent studies 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 pure historical return estimate. The long-term equity risk premium 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 different approaches to estimating expected returns on stocks over bonds. These 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 (Ibbotson and Sinquefield (1976a,b)). The second group adopts supply side models. The supply side models use fundamental information such as earnings, dividends, or overall economic productivity to measure the expected equity risk premium (e.g., Diermeier, Ibbotson, and Siegel (1984), Shiller (2000), Fama and French (2000), and Arnott and Ryan (2001)). The third group adopts demand side models that derive equity's expected returns through the payoff demanded by investors for bearing the risk of equity investments. This group includes the Capital Asset Pricing Model (Sharpe(1964) and Lintner (1965)), the Arbitrage Pricing Theory (Ross (1976)), and the Ibbotson, Siegel, and Diermeier (1984) demand framework. The fourth group relies on opinions of financial professionals through broad surveys (e.g., Welch (2000)).

In this paper, we adopt a combination of the first and second approaches. We link historical equity returns with 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 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 earning 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. 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 earning 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-thru, 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 earning data used in this study are obtained from Wilson and Jones (2001).[1] The average compounded annual return for 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). Equity risk premium and real risk-free rate for year t, ERP_t and RRf_t , is 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.[2] The compounded averages 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.[3] 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:

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

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 and 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.

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

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 in 1932, while the lowest (7.26) was recorded in 1979. The average year-end P/E ratio is 13.76.[4] 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

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

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.

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

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

We substitute dividend growth and payout ratio growth for the earning 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 earning 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.

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

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

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

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.[5] The average ROE growth per year is calculated to be 0.31% during the same time period.

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

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:

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

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 GDP per capita, earnings, and dividends initialized to unity at the end of 1925. In the early 1930s, earnings, dividends, and GDP per capita level dropped significantly. Overall, GDP per capita slightly outgrew earnings and dividends, but 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.

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

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 earning growth (including inflation and real earning 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 earning 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.

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 dividends model, and the GDP per capita model (Method 3, Method 4, and Method 6 in section II). 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.

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

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)".

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

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

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

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 show 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.

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

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

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

There are essentially three differences between the earnings model (3F) and the dividends model (4F). All of these differences are reconciled in the right bar (4F') in Figure 8. These differences relate to the decrease in the historical payout ratios, the low current payout ratio, and the high current P/E ratio.

First, the earnings model uses the historical earning growth to reflect the growth in productivity, while the dividends model uses historical dividend growth. Historical dividend growth underestimates historical earning 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 second difference is also due to the lowered payout ratio as reflected in today's current yield. This 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% to give the 2.05% shown in the figure.

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 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.[6]

The third 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 earning growth.

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.

Method 6F – Forward-Looking GDP Per Capita Model

The idea behind the forward-looking GDP per capita model is that equity returns are related to overall economic productivity. This model estimates the stock market return expectation justified by the macroeconomic performance. Specifically, we use the growth of GDP per capita as the measure of sustainable growth of the stock market. The supply side GDP per capita model is defined here.

$$SR_t = \left[(1+CPI_t)\times(1+Rg_{GDP/POP,t})-1\right]+Inc_t+Rinv_t \quad (25)$$

This model implies the long run supply of stock returns should be in line with the productivity of the overall economy. And the long-term growth rate of the stock market should be in line with the growth of the overall economical productivity. In other words, the growth of the equity market cannot persistently under- or out-perform the overall economy. A similar approach can be found in Diermeier, Ibbotson, and Siegel (1984), which proposed using the growth rate of the overall economic as a proxy for the growth rate in aggregate wealth in the long run. In this study, we use the GDP per capita growth rate as a proxy for the supply growth of the stocks. The long-term supply estimate of stock return can be calculated from

$$\begin{aligned}\overline{SR} &= \left[(1+\overline{CPI})\times(1+\overline{Rg_{GDP/POP}})-1\right]+\overline{Inc}+\overline{Rinv}\\ 9.66\% &= \left[(1+3.08\%)\times(1+2.04\%)-1\right]+4.28\%+0.20\%\end{aligned} \quad (26)$$

The equity risk premium based on the GDP per capita model is calculated to be 4.25%.

$$\overline{SERP} = \frac{(1+\overline{SR})}{(1+\overline{CPI})\times(1+\overline{RRf})}-1 = \frac{1+9.66\%}{(1+3.08\%)\times(1+2.05\%)}-1 = 4.25\% \quad (27)$$

The equity risk premium from the GDP per capita model is slightly higher than the estimates from the earnings model. Figure 9 shows estimates of the supply of equity returns from the two supply side models that we recommend. The differences among the two equity return (and the equity risk premium) estimates are due to the measures used to proxy the growth of the corporations' productivity, specifically, the earnings growth and GDP per capita growth. We believe that earnings growth and GDP per capita growth are more reliable than dividend growth, since they are not affected by the changes in dividend payout decisions. We find that dividend growth does not accurately reflect the growth of companies' productivity (measured by earnings), especially during the past decade. Overall, the dividend growth underestimated the increase in earnings by 0.51% per year from 1926 to 2000. This is reflected in the difference of the estimated supply side returns between the earnings model and the dividends model. The earnings model and the GDP per capita model are preferred to the dividends model in estimating the supply of returns.

To summarize, the long-term supply of equity return is estimated to be around 9.37% and 9.66% (6.09% and 6.38% after inflation, respectively). The compound supply side equity risk premium is estimated to be around 3.97% and 4.25%.

Geometric vs. Arithmetic

The estimated equity returns (9.37% and 9.66%) and equity risk premiums (3.97% and 4.25%) 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:

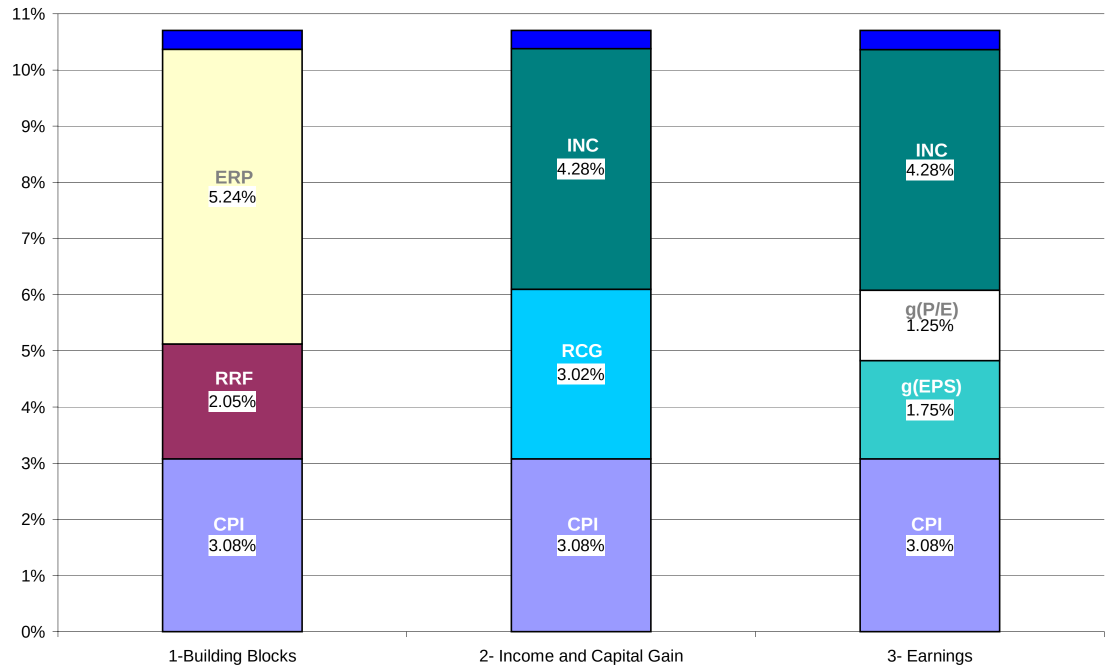
$$R_A = R_G + \frac{\sigma^2}{2}, \qquad (28)$$

where R_A is the arithmetic average, R_G is the geometric average, and σ^2 is the variance. The standard deviation of returns from Table 1 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 around 6% (5.90% for the earning model and 6.18% for the GDP per capita model).

IV. CONCLUSIONS

We adopt a combination of historical and supply side approaches 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 Table 2. 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 about 4% in geometric terms and 6% 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. 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).

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.

Figure 2: P/E Ratio 1926-2000

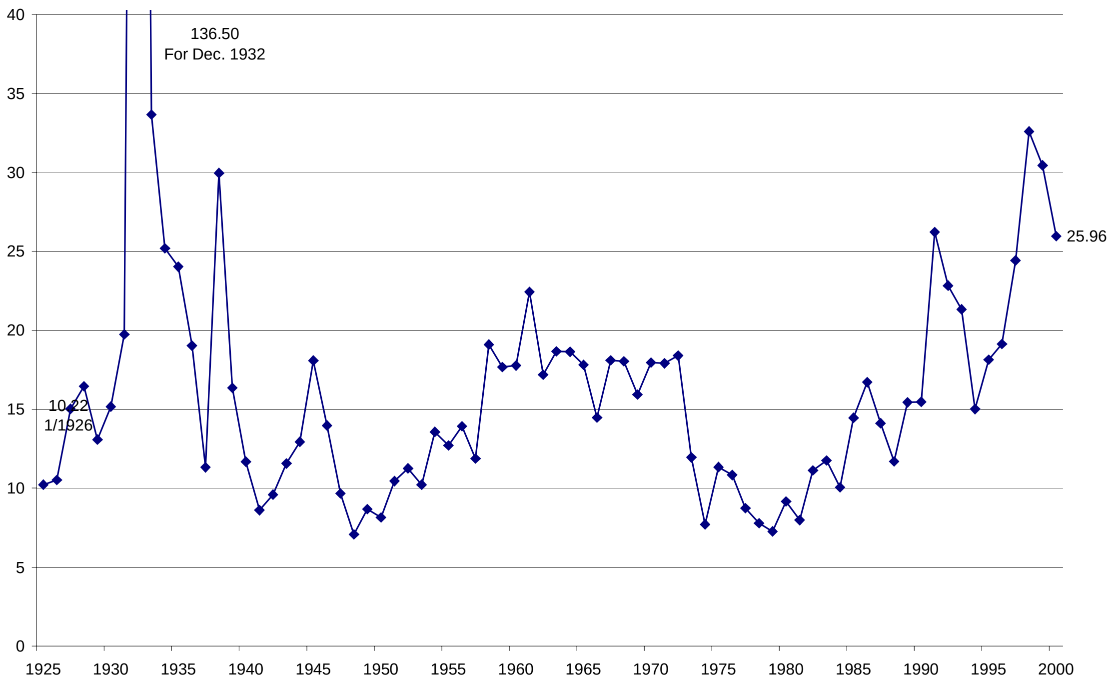


Figure 3: Income Return (Dividend Yield) % 1926-2000

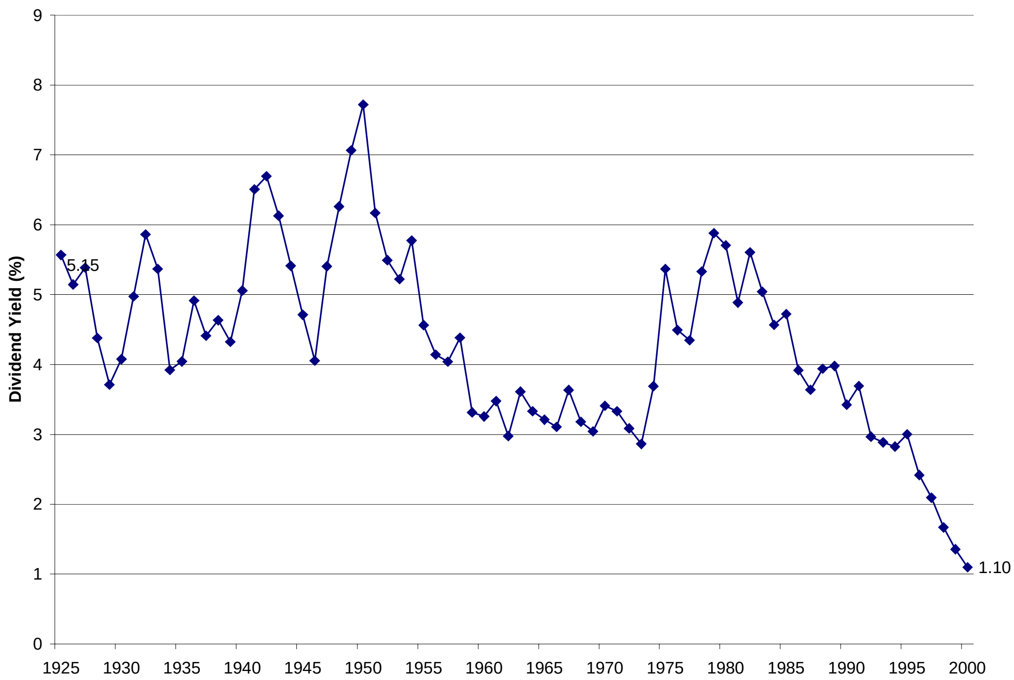


Figure 4: Dividend Payout Ratio % 1926-2000

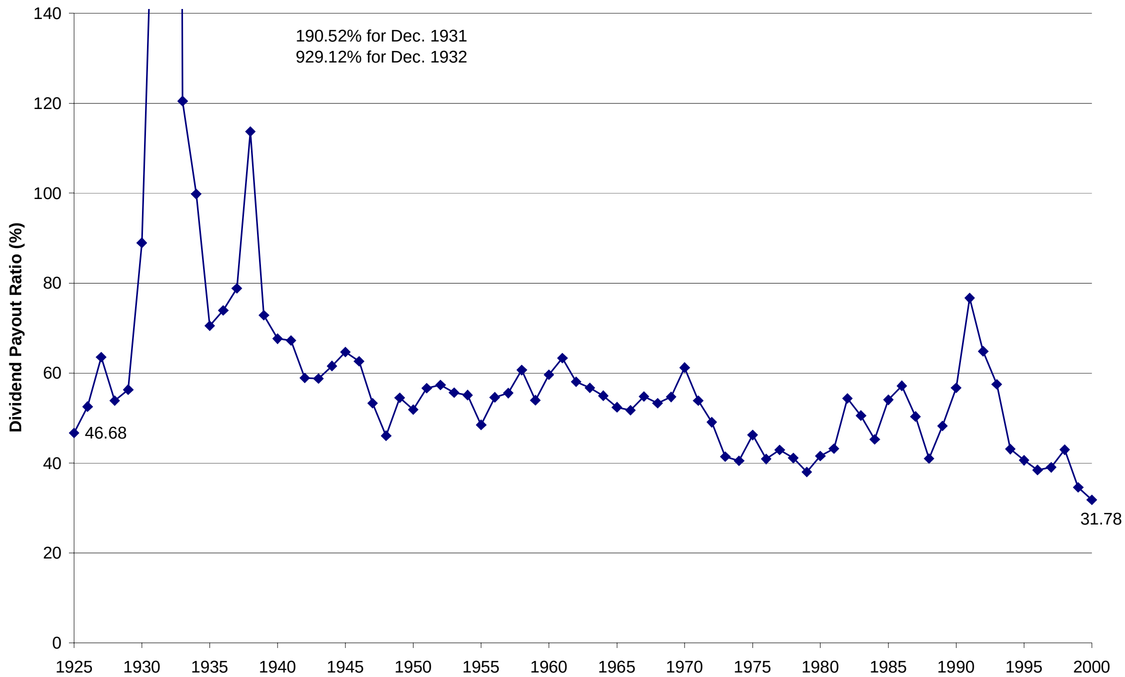


Figure 5: Growth of $1 at the beginning of 1926
1926-2000

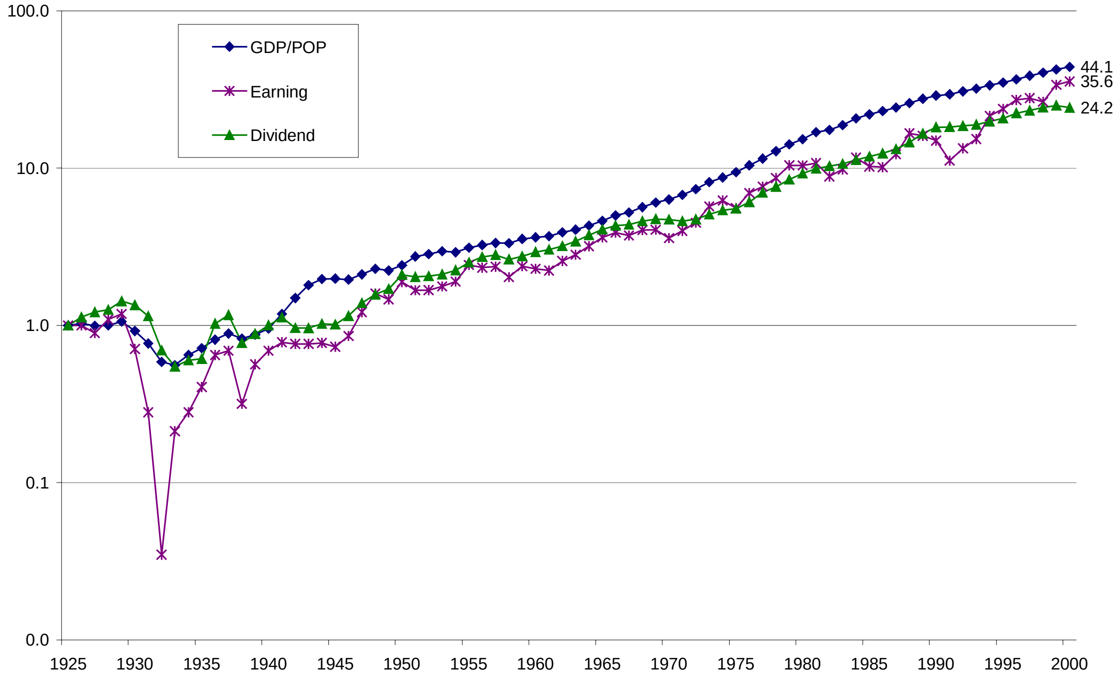
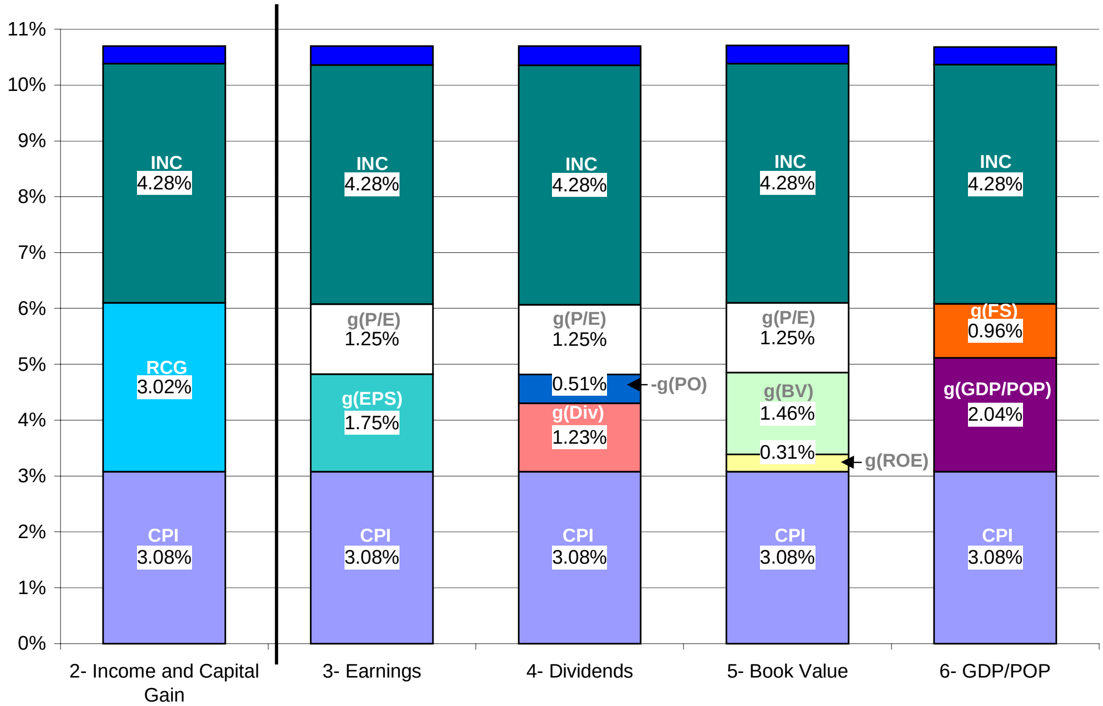


Figure 6: Decomposition of Historical Equity Returns 1926-2000



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)

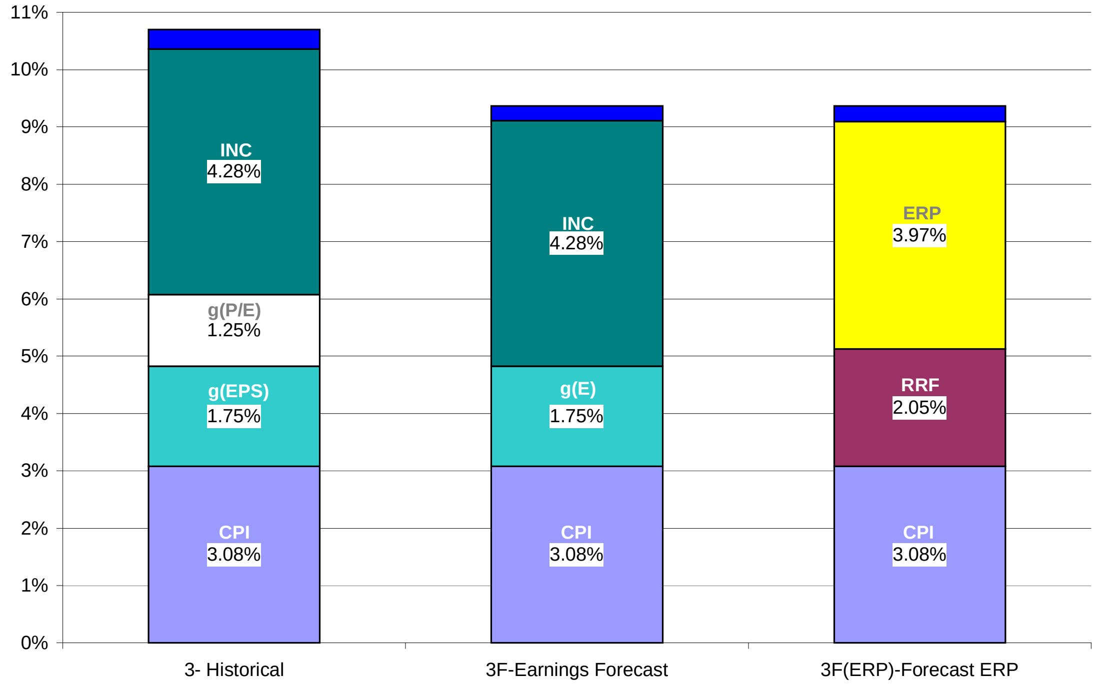
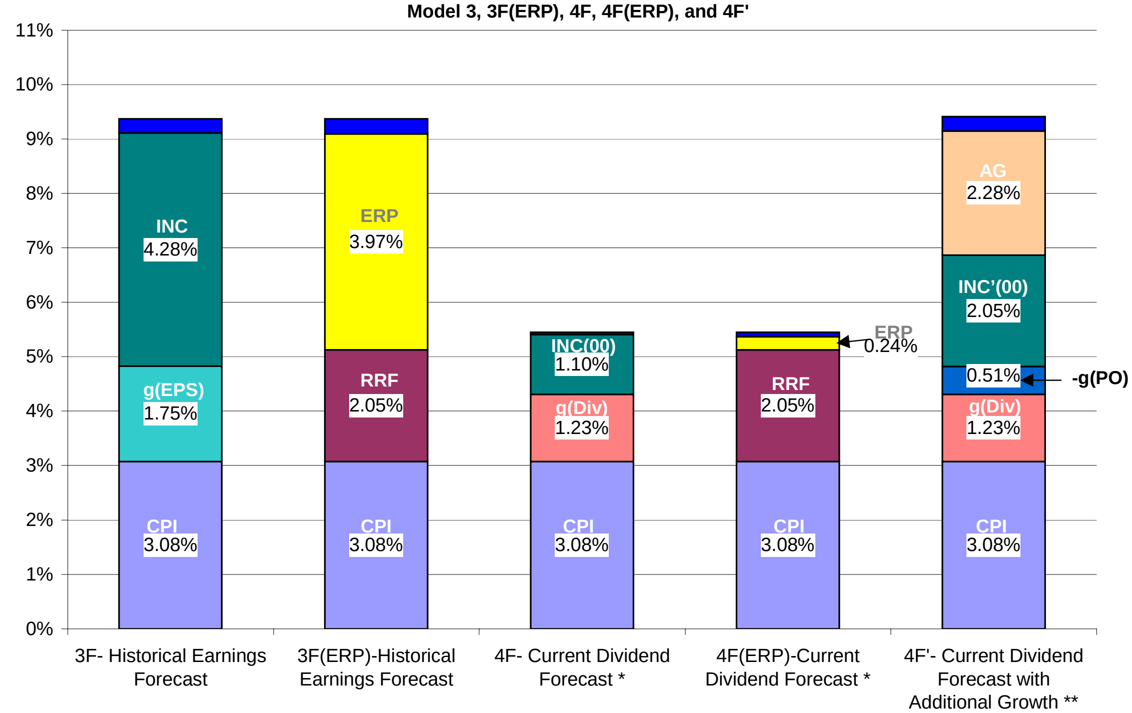


Figure 8: Historical vs. Current Dividend Yield Forecasts Based on Earnings and Dividend Models: Model 3, 3F(ERP), 4F, 4F(ERP), and 4F'



INC(00) is the dividend yield in the year 2000. INC'(00) is the dividend yield in the year 2000 assuming the dividend payout ratio equal the historical average of 59.20%. It is calculated to be 2.05%. AG is the additional growth.
*Violates Miller & Modigliani (1961), since low current dividend yields are matched with historical earnings growth when dividend yields were high.
** Model 4F' attempts to corrects the error in model 4F: a) use growth rate of earnings instead of growth rate of dividends; b) adjust the dividend yield to 2.05% assuming the historical average dividend payout ratio; and c) add the additional growth implied by the high market P/E ratio.

Figure 9: Forecasted Equity Returns Recommended: Model 3F & 6F

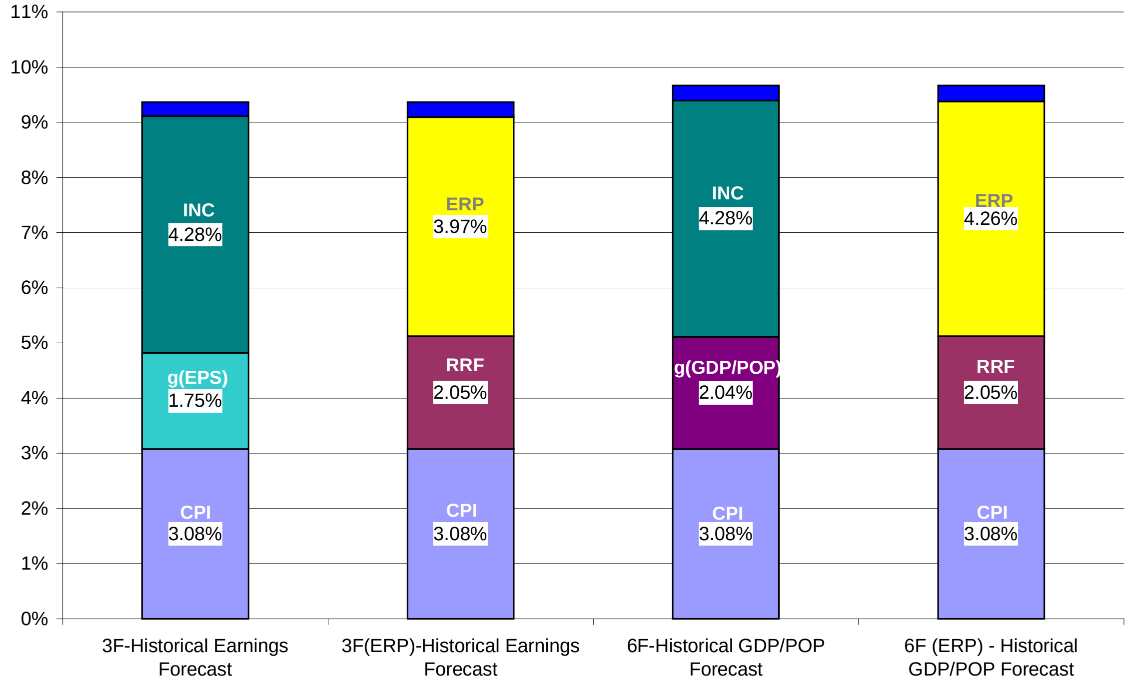


Table 2 Historical and Forecasted Equity Returns – All Models (Percent).

	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(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%
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			4.28	0.33	
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

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[1] We updated the series with data from Standard & Poors to include the year 2000.
[2] Some other studies, including Ibbotson & Sinquefield (1976a,b), used U.S. Treasury Bills as the risk free rate. We chose the income return of U.S. long-term government bonds as the long-term risk-free rate in this study.
[3] 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.
[4] The average P/E ratio is calculated by reversing the average E/P ratio from 1926 to 2000.
[5] 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.
[6] The current tax codes provide 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 paid that of distributing dividends.