Dividends and Stock Valuation:
A Study From the Nineteenth to the Twenty-First Century

The study considers how economic factors influence the values of stocks by investigating how changing economic conditions have impacted the relationship between the dividends paid by firms in the Standard & Poors Composite Index and the overall value of the Index. The study reviews the S&P data for the 1871 to 2003 period.

The study determines the equity values which would be expected from anticipated future dividend payments and compares these values to the actual values of the index over time. The analysis attempts to give an understanding of how investors value firms by focusing on the role of dividends on value and how this role changes as economic conditions change.

The expected equity values are calculated using two dividend based valuation methods, the dividend discount model and the Gordon Growth Model. The dividend discount model values stocks by determining the present value of anticipated future dividends. The Gordon Growth model is a variation of the dividend discount model.

The study finds that the dividend-based valuation models perform relatively well at explaining the actual historical prices for the S&P Composite index over time. Where there are variations they apparently relate to changing economic conditions. The study demonstrates empirically the conclusion that in periods of economic expansion equity purchasers require a lower rate of return, and therefore a lower cost of equity, than they do in a period of contraction. Another finding is that, since the 1945, capital gains have taken over a higher percentage of the total return from stocks which is offset by a declining dividend return component.

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First Version: February 26, 2004
Current Version: May 28, 2005

Abstract

Using fundamental valuation techniques to determine the expected value of equities, we provide new insights into how economic factors influence actual and expected equity values. Specifically, we investigate how changing economic conditions have impacted the relationship between the dividends paid by firms in the S&P Composite Index and the value of the Index from 1871 to 2003. Since the use of fundamental valuation techniques requires assumptions related to the cost of equity and dividend growth rates, we also evaluate the sensitivity of these key assumptions to different economic conditions. We find systematic differences in how investors value expected future dividend payments over time and across economic conditions. Our results provide a new perspective for how changing economic conditions influence the factors at the heart of how investors value assets.

JEL Codes: G21, G35

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1. Introduction

Long horizon historical studies allow researchers to understand how firm and investor behaviors have changed over time and across economic conditions. In this study, we investigate the changing role of dividends from the 1870s to 2003. This period allows us to consider how the role of dividends in the valuation of equity has changed as equity markets in the U.S. have matured and economic conditions changed. Since firms typically pay dividends as a means of returning profits to their providers of equity capital, the fundamental value of a firm's equity should be related to its expected future dividend payments. The motivation for this is well-expressed in the following quote from Williams (1938):

> *"... a stock is worth the present value of all the dividends ever to be paid upon it, no more, no less... Present earnings, outlook, financial condition, and capitalization should bear upon the price of a stock only as they assist buyers and sellers in estimating future dividends."*

Building on this concept, several studies have investigated the ability of changes in dividends to explain changes in asset prices (e.g., Shiller (1979 and 1981) and Cooley and LeRoy (1981)). Because the results of such tests have been mixed, researchers have proposed a wide variety of asset pricing models to try to empirically understand how different factors influence equity prices.

The goal of this study is to improve our understanding of how investors value firms by focusing on the role of dividends and how this role changes as economic conditions change. This differs from the standard research in asset pricing which focuses on the ability of diverse economic risk factors to explain the observed returns for various financial securities. Because our study focuses on the fundamental value of equities provided by dividends, we obtain new insights into what factors influence how investors value securities. We begin by comparing actual equity values to those predicted using two of the most commonly used fundamental valuation methods – the basic dividend discount model (DDM) and the constant growth version also referred to as the Gordon growth model (GGM). Studying the differences between the actual and expected prices over time and over different economic conditions provides us with insight into the roles of different economic factors in how investors value assets. The second stage of the analysis considers how changing economic conditions impact the relationships between the estimated and implied values for the discount rate and dividend growth rate used in our fundamental valuation methods across periods characterized by several different economic regimes.

Our study makes three main contributions to the literature. First, we provide a detailed comparison of the relationship between the valuation one would have obtained using fundamental valuation methods and the actual price for equity over a long period of time. Using a long time series allows us to study how investors' valuations change with economic factors. This allows our study to complement the growing work in empirical asset pricing which focus on the relationship between asset returns and economic factors. Second, we investigate several of the assumptions used in our fundamental valuation methods. Specifically, these models require an estimate of the cost of equity and dividend growth rate at each point in time, so we investigate how these have changed over time and across economic conditions. This allows our study to provide new insights into the required rates of return and levels of growth which are at the heart of work in empirical asset pricing. Third, we combine these results to characterize how changes in the way investors value dividends are related to changes in economic conditions.

In our analysis we consider the actual prices and dividend payments for the S&P Composite Index over the period from 1871 to 2003. Using these data, we calculate the prices that one would have rationally expected using fundamental valuation methods and the expected future dividend payments. We then compare the actual and expected prices, as well as the estimated discount rates to the implied values based on the actual prices and dividend payments over the sample. Using commonly considered economic factors such as the default premium, term structure of interest rates, price momentum and price/earnings multiples at each point in time, we determine the conditions under which the valuation models can best explain observed prices.

We find that our dividend-based valuation methods perform relatively well at explaining the actual prices for the S&P Composite Index over our sample period. When considering the differences between the actual price levels for the Index and the expected prices obtained using the DDM and the GGM, we find that these differences are frequently and systematically related to changes in economic conditions. In particular, we find that the expected price appears to under-estimate the actual price in periods of economic contraction but the opposite occurs during economic expansions. Because these results could be related to either our underestimation of the future dividends in periods of economic contraction or our over estimation of the cost of equity at these times, we consider this more carefully. Specifically we explore the role of our economic factors in explaining the equity risk premium and dividend growth rates at the heart of the DDM and GGM. Because of the use of historical information to estimate the cost of equity, we find that our estimated cost of equity does not react as quickly to changes in economic conditions as the implied cost of equity used to equate the actual price and the expected price using the DDM and GGM. These results therefore suggest that economic conditions play an important role in how investors appear to set the required return for equity – as economic conditions worsen, investors require a higher return and this is captured in the implied cost of equity.

As a consequence our analysis provides some new insights into how the economic factors used in most empirical asset pricing tests may be related to how investors value equity investments. The paper is organized as follows. Section 2 provides a review of the dividend-related literature relevant for our study. Section 3 presents our models and describes our hypotheses. Our data are described in section 4. Results are presented in section 5. Finally, conclusions are presented in section 6.

2. Background

In this section we discuss some of the literature on how investors value assets. We start with the valuation models based on dividends. Since one of the key inputs into these models is the discount rate, we follow this with a review of some of the literature on the market or equity premium and its relationship to the work in asset pricing .

2.1 Investor Valuation of Dividends

The most intuitive means for determining the value of the equity of a firm is the DDM. This model states that the present value of an asset can be measured as the discounted value of all of the future expected dividend payments. Building on this intuition, Gordon and Shapiro (1956) and Gordon (1962) present a special case of the general model, the GGM, whereby the value of the firm's equity can be represented as a growing perpetuity based on next period's expected dividend. Even though our discussion focuses on these models, we recognize that there are many alternative models such as multi-stage growth models. Since these models are based on the fundamental idea that an asset is worth the discounted value of all of the future cashflows it can generate, these models are the most commonly used by both academics and practitioners.

Since these models imply that changes in dividends should explain changes in asset prices, several studies have considered how well changes in dividends can explain changes in the volatility of asset prices (e.g., Shiller (1979 and 1981) and LeRoy and Porter (1981)). These tests build on the intuition that since asset prices are determined by the discounted value of future dividends, prices and dividends should have similar volatility. Because they find that prices are excessively volatile when compared to the implied prices based on dividends, the results of these tests have cast doubt on the role of dividends in explaining the value of equity. However, the results from subsequent studies which have relaxed several of the assumptions used in the original tests have been more favorable and suggest that dividends do play a significant role in determining the value of equity (e.g., Bollerslev and Hodrick (1995)).

Several studies have tried to explain the negative findings of the studies such as those of Shiller and LeRoy and Porter. Poterba and Summers (1988), for example, study the risk premium but find that the magnitudes and variability in the implied risk premiums necessary for prices to be related to dividends are too large to be consistent with any rational, fundamental asset pricing model. On the other side of the debate, Fama and French (1988) find that the variation in dividend yields explains a large proportion of multi-year return predictability. Although many subsequent studies continue to find evidence in support of the predictive ability of dividends for equity returns, studies using longer time series of data bring the generalizability of these results into question – the predictive ability of the dividend ratio appears to be specific to a few time periods (e.g. Goyal and Welch (2003)). As a result, there is uncertainty regarding the importance one should give to dividends in the valuation of equities over time.

Similar to the mixed evidence regarding the predictive power for the dividend yield, researchers have struggled to estimate the growth rate of dividends. Arnott and Bernstein (2002), for example, provide an interesting historical perspective on the differences in how investors in the early 1900s viewed dividends as compared to how they are viewed today. To handle some of these differences, dividend growth rates have been modeled using a variety of different econometric models. For example, Bollerslev and Hodrick (1995) and Donaldson and Kamstra (1996) use time-series models to predict dividend behavior and find that a number of models do a reasonable job of explaining both changes in dividends and changes in prices.

Despite the mixed evidence surrounding the value of the dividend-based valuation models and the estimates of the dividends and their growth rates, empirical asset pricing models continue to include these factors in their set of fundamental economic risk factors. This suggests that researchers continue to believe these factors play a significant role in explaining the risk valued by investors. By studying what influences the level and growth rate of dividends within the context of their relationship to the value of the asset using dividend-based valuation techniques, our study provides new insights into what economic risk factors should be included in asset pricing models.

2.2 Discount Rates and the Equity Premium

Previous studies have proposed a series of explanations for the relatively poor ability of asset pricing models to explain the expected returns for equities. One of the most commonly proposed reasons is the possible presence of a time-varying risk premium in the equities markets. To address this concern, studies have employed a wide variety of different approaches. The approaches range from using GARCH models to capture the time varying conditional volatility in betas within a CAPM framework (e.g., Bollerslev, Engle and Wooldridge (1988)) to using conditioning information to scale the estimated betas in a multi-factor asset pricing model (e.g., Cochrane (1998)). Studies using these results have provided evidence that the expected return for an asset changes over time as a result of changes in the market risk premium and/or changes in the beta or sensitivity of the asset to systematic risk.

We approach this issue from a slightly different perspective. Since the fundamental valuation techniques require one to discount future expected dividends, we use the actual prices to derive the implied discount rate used by investors. We therefore study how the implied discount rate has changed over time and how this compares to what investors would have rationally expected at each point in time. Studies such as Fama and French (2000), Jagannathan, McGratten and Scherbina (2000), Pastor and Stambaugh (2000), Welch (2000), Claus and Thomas (2001), and Arnott and Bernstein (2002) use various techniques to estimate the expected equity premium and suggest the equity premium has changed over time and it is unlikely that one could have used information available at the beginning of the twentieth century to predict how large it turned out to be throughout the latter part of the century. Consistent with this, Welch (2000) provides interesting evidence suggesting that many financial economists currently believe the equity premium to be even larger than empirical evidence suggests it is. This discrepancy between what investors would rationally have believed the equity premium would be and the actual premium could have a significant impact on valuation (for an interesting discussion see Arnott and Bernstein (2002)).

Building on the research areas discussed above, our study helps to address a couple of important gaps in the literature. First, we perform a detailed investigation of changes in how investors value dividends and the impact of these changes on prices over time. Using fundamental valuation methods we are able to study how changes in dividends impact the expected prices and compare these to the observed prices. By understanding how these relationships change over time, we provide insight into some of the potential sources of concern for the performance of different asset pricing models. Second we consider how changes in the cost of equity (one of the most important inputs in our fundamental valuation models and in empirical asset pricing models) impact the valuation of assets over time. Understanding how the cost of equity changes over time and across market conditions may provide us with insight into the directions future work in asset pricing should consider.

3. Empirical Models and Hypotheses

In this section we examine the techniques we use to investigate how different factors influence investors' valuation of equity over time. We start by considering how the relationships change over time. We compare the results from the overall period from 1871 to 2003 to three arbitrary periods: 1871-1913 (to the start of World War I), 1914-1945 (to the end of World War II) and 1946-2003.[1] This leads to our first hypothesis:

Hypothesis 1: There is no difference in firms' dividend policies and the impact of dividends on equity valuation across the pre- and post-World War II periods.

3.1 Fundamental Value of Dividends

To formally investigate how investors use the cashflow obtained from dividends to determine the price at which they are willing to buy or sell shares, we assume investors use fundamental analysis. The first model we consider is the DDM which is based on the standard relationship in financial economics:

$$E_t[\mathrm{P1}_t] = \sum_{i=t+1}^{\infty} E_t\left[\mathrm{D}_i\right]/(1+r_t)^{i-t} \tag{1}$$

where $E_t[P1_t]$ is the expected, intrinsic value or price that one would expect to pay for the asset in a given year t based on information available in year t, D_i is the nominal annual dividend paid on the stock in year i, and r_t is the discount rate or the rate of return required by the investors[2] at time t. Investors are concerned with total returns and we only have a finite time series of data, so we decompose the total returns into the returns from dividends and the capital gains portion to implement this model:

$$E_t[\mathrm{P1}_t] = \sum_{i=t+1}^{T} E_t\left[\mathrm{D}_i\right]/(1+r_t)^{i-t} + E_t\left[\mathrm{P}_T\right]/(1+r_t)^{2003-t} \tag{2}$$

[1] These three sub-periods are chosen to correspond with the two World Wars. Since we know that the economy in the U.S. changed after each of the World Wars these provide reasonable cut-offs. This is consistent with the periods studied in other work considering long time series of financial data (e.g., Skinner (2004)).

[2] Note: Throughout the paper we interchangeably refer to this discount rate as the required return, cost of equity or simply the discount rate.

In this representation the price can be seen to depend explicitly on the expectation for the future dividends as well as the capital gains through the value from selling/liquidating the asset at the terminal date of our study, P_T. In an efficient market, this fundamental or intrinsic value should equal the current price.

Since we have the actual dividend payments and terminal price, we start by assuming our investors have perfect foresight of both future dividends and the terminal price (an assumption we relax in subsequent tests). Under the assumption of perfect foresight, the only remaining input we need is the discount rate, r_t. We estimate the required return (or cost of equity) using a simple version of the CAPM:

$$r_t = r_{f,t} + \beta\ (MRP_t) \qquad (3)$$

where $r_{f,t}$ is the yield on a long-term U.S. government bond at time t, β is assumed to be 1.0 since we are considering a measure of the overall market, and MRP_t is the estimated market risk premium at time t calculated as the U.S. market return less the yield on a long-term U.S. government bond on either a rolling 30-year basis or using all of the information available from the start of our sample to time t (Note: for both methods it is on a cumulative basis for the first 30 years). For both of our methods, we estimate the market risk premium using only information that would have been available to the investors at the time (i.e., at time t).

We compare the theoretical prices obtained using equations (2) and (3) to the actual price at each time t to get a "pricing error" or the unexpected portion of the current price as a fraction of the current price:

$$UP1_t \equiv (E_t[P1_t] - P_t) / P_t \qquad (4)$$

where $UP1_t$ is the unexpected portion of the price in period t, P_t is the actual price and $E_t[P1_t]$ is the expected valuation based on *perfect foresight of future dividends and the terminal price.* Since UP1 represents the percent difference between the expected value of shares using "perfect foresight" dividends (e.g., the *actual* dividends) discounted at the *estimated* cost of equity, one interpretation of the deviation is the magnitude of misestimation of the cost of equity. This gives rise to the following:

Hypothesis 2: There is no difference in the actual price series, P_t, and the estimated price series based on the dividend discount model, $E_t[P1_t]$.

Our next model relaxes the assumption of perfect foresight of dividends. The GGM contains several simplifying assumptions relative to the previous model. Namely it is based on the assumption of a growing perpetuity, that the dividend growth rate is constant and the discount rate will remain stable over time. The model is as follows:

$$E_t[P2_t] = E_t[D_{t+1} / (r_t - g_t)] \quad (5)$$

where r_t is the discount rate at time t and g_t is the anticipated constant dividend growth rate at time t. The dividend for year t+1, D_{t+1}, is the perfect foresight dividend, the discount rate is estimated using the CAPM from equation (3) and the anticipated growth rate is estimated using past information. Since a standard assumption in corporate finance is that dividends can grow, at most, at the expected growth rate of the economy, we use the nominal growth rate in the economy using the historical GNP to estimate the growth rate of the dividends paid by the firms in the S&P Composite Index over time. The argument is that firms' growth rate is constrained by the growth rate of the economy and long-term dividend payouts should grow at a rate similar to or lower than the growth rate of the economy.

The theoretical prices obtained using equations (3) and (5) are then compared to the actual price at each time t to get a "pricing error" or the unexpected portion of the current price:

$$UP2_t \equiv (E_t[P2_t] - P_t) / P_t \quad (6)$$

where $UP2_t$ is the unexpected portion of the price in period t, P_t is the actual price and $E_t[P2_t]$ is the expected valuation based on *an estimated constant growth rate*. This gives rise to the following hypothesis:

Hypothesis 3: There is no difference in the actual price series, P_t, and the estimated price series based on estimates using the constant growth or Gordon growth model, $E_t[P2_t]$.

Because hypothesis 2 can be considered to be a measure of the mis-estimation of the discount rate and hypothesis 3 a measure of the mis-estimation of both the discount rate and the growth rate, we also consider the relative performance of the two different models by investigating the differences between their pricing errors:

$$UP3_t \equiv UP1_t - UP2_t \quad (7)$$

UP3 can loosely be interpreted as an investigation of the mis-estimation of "g", the annual dividend growth rate. In this representation, as our forecasted growth rate for dividends falls below the actual growth rate (e.g., we are under-estimating the value for g), we expect to see smaller (or possibly more negative) pricing errors for UP2 than for UP1 and therefore an increase in UP3. Thus our hypothesis is:

Hypothesis 4: There is no difference between the two estimated price series, $E_t[P1_t]$ *and* $E_t[P2_t]$.

3.2 Cost of Equity

Since both of these valuation methods require us to make certain assumptions to estimate the value of equity, we need to consider the quality of our estimates for these inputs and thus the legitimacy of our assumptions. The future dividends and terminal value we use in our fundamental valuation models are the actual dividends between time t and the end of our sample, T or 2003. The assumption of perfect foresight means that we assume investors are able to rationally forecast what actually happened. For the cost of equity, we estimate the value using both the rolling average of the difference between the total return in the U.S. market and a long-term government bond over the past 30 years and the overall average differences since the start of our sample (referred to as the cumulative technique). Both of these methods provide us with estimates for the cost of equity based on historical information that would have been available to investors at a given point in time.

As a source of comparison we use the observed prices to back out the implied discount rate being used by investors. Specifically, the implied cost of equity is obtained as the discount rate that equates the actual current price with i) the discounted value of the actual future dividends from that time until the end of the sample plus the terminal price (e.g., equation (2)) and ii) the discounted value of the next period's dividend and the actual growth rate in dividends observed from that time until the end of the sample (e.g., equation (5)). The implied discount rates are determined assuming our investors are perfectly rational and therefore would have accurately forecasted the future dividends and terminal price.

To determine how well our methods perform at predicting the discount rate, we compare the implied discount rates at each period, r^*_t, to the estimated discount rate obtained using either the rolling or cumulative historical data. The unexpected part of the current discount rate is therefore defined as:

$$URI_t \equiv (r_t - r^*_t)/ r^*_t \quad (8)$$

where r_t is the discount rate estimated using the CAPM and either the rolling 30 year historical total returns (I=1) or the cumulative historical total returns (I=2) and r^*_t is the imputed discount rate from the DDM. Using the GGM and the perfect foresight growth rate to estimate the implied cost of equity, we obtain the models with I=3 and 4, respectively.

3.3 The Role of Economic Factors

The final stage of our study considers how a number of key economic factors influence the differences between our expected and actual values. We start by studying how our observed pricing deviations (the differences between the actual prices and the prices we would have expected using the DDM or GGM) are impacted by changing economic conditions:

$$UPI_t = a + \Sigma b_j * F_{jt} + e_t \quad (9)$$

Where I = 1, 2, or 3 and UP1, UP2 and UP3 are defined as above, "F_{jt}" is the value of economic factor j in period t, "b_j" is the sensitivity of the pricing errors to factor j, "a" is the intercept term, and "e_t" is the error term.[3] The economic factors we consider were selected to capture the current economic conditions as well as the market's expectations for the future economic conditions. Thus these factors should capture which factors influence how investors are currently valuing equity investments. The factors we use to examine the impact of expected changes in economic conditions are the default premium, PREM, and the term structure of interest rates, TERM. We also consider measures related to trends in market valuation: a momentum factor, MOM, and the price/earnings ratio, PE. Finally, to compensate for

[3] We also run regressions based on a "centered" version of equation (9) (see Morrison (1983)). The value of each factor j in period t is subtracted from its mean value over the entire period of interest. This procedure has no impact on the estimated betas but it allows us to test hypotheses 2, 3, and 4 directly since the intercept is interpreted as the average "pricing error."

differences which may occur as a result of changes in inflation over time, we also include the change in the level of the consumer price index (i.e., the rate of inflation), D_CPI.

PREM is estimated as the yield on a long-term AAA corporate bond less the yield on a long-term government bond. This measure should capture changes in the business cycle. For example, when the economy is doing poorly there should be greater market uncertainty and a higher default premium. Consequently we might expect investors to be pessimistic and underestimate future dividends and/or growth of dividends at this time. Thus we would expect this variable to be positively related to both UP1 and UP2 (i.e., the actual market price may be “too low” thus increasing the UPs at these times). TERM is defined as the yield on long-term government bonds less the yield on short-term government bonds. This measure is also designed to capture business cycle effects. A positive TERM or upward-sloping yield curve is generally associated with economic expansion. Thus when the economy is doing poorly (a lower or negative premium), we might expect investors to be pessimistic and underestimate future dividends and/or the growth rate of dividends. Consequently we might expect this variable to be negatively related to both UP1 and UP2 (i.e., the actual market price may be “too low” thus increasing the UPIs at these times).

MOM is measured as the current price relative to the price five years previously. It is designed to capture trends in the pricing of stocks. Consequently it should capture mis-pricings based on momentum rather than fundamentals. When momentum is high, the actual prices may have become inflated so we would expect this variable to be negatively related to both UP1 and UP2 (i.e., the actual market price may be higher or above the “theoretical” prices thus decreasing the UPs). Finally, we consider the PE ratio under the assumption that this measure will allow us to capture changes in how investors value earnings over time. Studies of the changing value of the equity premium over time have suggested that one of the major reasons for the dramatic changes in the value of the equity premium over the twentieth century is a result of changes in how investors value earnings (e.g. Arnott and Bernstein (2002)). The expected price may be too low at the times when the PE ratio is increasing and thus investors are valuing earnings more than they had before so we might expect this variable to be negatively related to both UP1 and UP2 (i.e., actual price might be "too low" thus increasing the UPIs).

Finally, D_CPI is measured as the log change in the year-over-year level of the CPI for the US. This measure allows our model to capture potential changes in how investors value assets as the level of inflation changes. In periods of high inflation, we assume that investors require dividends to be increasing at a higher rate than in the past – a higher growth rate in dividends is required to offset the loss of value from inflation. As a result we would expect the actual price to decrease more than the expected price as inflation is increasing. Increasing inflation should also result in an increase in the cost of equity and the dividend growth rates.

As with the pricing errors, we also investigate how these economic factors are able to capture the differences between the expected/estimated cost of equity and the implied cost of equity (URI). Specifically, for the differences between the estimated and implied cost of equity:

$$URI_t = a + \Sigma b_j * F_{jt} + e_t \quad (10)$$

Previous studies which have calculated implied equity premiums (e.g. Jagannathan, McGratten and Scherbina (2000), Pastor and Stambaugh (2000)) suggest a possible role for macroeconomic factors and other economic factors in the apparent deviations between the implied cost of equity and the estimated cost of equity. Specifically, we expect that the implied cost of equity will be greater than the historically calculated cost of equity when our economic factors suggest a future upswing in economic performance. The forward looking implied cost of equity will capture the investors' perception that future conditions are improving and thus equity prices should be improving in the future.

Since it is possible that the differences between our estimated and implied costs of equity are the result of changes in one or the other of these measures, we also study the impact of our economic factors on each measure separately. This means we estimate models for our costs of equity and growth rates individually:

$$y_t = a + \Sigma b_j * F_{jt} + e_t \quad (11)$$

where y_t is either r_t, r^*_t, g_t or g^*_t representing the estimated cost of equity, implied cost of equity, estimated growth rate and actual growth rate of dividends respectively.

4. Data

Our main data series is the aggregate S&P Composite Index data obtained from Robert Shiller's website (http://aida.econ.yale.edu/~shiller/data.htm). These data include information on the price of the index as well as the annual dividend payments and earnings for each year back to 1871. We chose this series because the Standard & Poor's Composite Index (*S&P stocks*) is the most commonly used benchmark portfolio. Before 1957, this index covered 90 companies; since March 1957, it has covered 500. The S&P Index is a market-value weighted index designed to provide a benchmark for total U.S. equity market performance[4].

For the other factors we consider, the data on interest rates and stock market returns are from the Global Financial Database (details on the sources from which they obtained the data are available at http://www.globalfindata.com/articles/Global.doc). The factors that we consider are the U.S. 10-year government bond yields, the AAA corporate bond rates and the total market returns for the U.S. We supplement this with information on the PE Ratio and inflation in the U.S. also obtained from Shiller. For the historical data on the nominal U.S. GNP we use data from the U.S. Department of Commerce and U.S. Bureau of Economic Analysis.

5. Results

5.1 Preliminary Investigation

[4] Naturally there are several issues with such a long historical data series. There have been documented concerns associated with the S&P data before 1926. Specifically, Standard and Poor's does not publish dividend or earnings series before 1926 so most studies use information from the Cowles Report (Cowles (1939)) to supplement the S&P data. An issue is that Cowles does not have earnings data for many of the stocks in the Standard and Poor Index. The absence of earnings data for some stocks may influence the accuracy of the earnings series with the largest discrepancies occurring in the earliest years of the sample. Wilson and Jones (1987) examine the Cowles data for accuracy and find some apparent errors in the earnings and dividend series but they conclude that the overall impact should be minimal.

If dividends are valued by investors as hypothesized in our discounted cashflow based models (equations (2) and (4)), we should find a relationship between changes in the levels of dividends and the current value of the Index. Examining how the prices and dividends change over our sample period (Figure 1a) we see the dividends and prices move in a similar manner. As a result, it is not unreasonable for us to assume that the dividend discount model, or versions of it, may describe how investors value equity.

Looking more carefully at dividend payments, we see that the dividend yield over the entire period is, on average, about 4.5%, but there are several trends over time (Figure 1b). The yields were higher over the initial part of the sample decreasing during the poor economic times in the late 1800s, increasing as the economy improved in the early part of the 1900s, decreasing again around the Great Depression and increasing after World War II. Since 1955 the dividend yields have been decreasing, especially since the early 1980s. This is consistent with the findings in Fama and French (2000) who assert that dividends have decreased in importance over time.

The dividend payout ratios in Figure 1c also demonstrate some interesting changes after World War II. We see that the payout ratios were consistently above 60% until the early 1970's, after which they seem to have become both less volatile and lower. This suggests that dividend policies have changed significantly over time, especially since the end of World War II given the decline in the volatility of payout ratios since that time. It appears that managers are much more focused on maintaining a stable dividend payout ratio since that time. Since the return to investors depends on the payout ratio, we expect changes in the payout ratio to impact the valuation attached to equity.

Figure 1d compares the level of dividends per share to the earnings per share. The series move closely together with earnings appearing to be more volatile and leading dividends. Not surprisingly earnings are the most volatile between about 1916 and 1942 with very large earnings declines in 1921 and the early 1930s. There is a clear covariation between dividends and earnings before World War II, but the dividend series becomes much smoother, both in absolute terms and relative to earnings, after World War II. These results provide part of the motivation for our definition of the three sub-periods we consider in our analysis. These series demonstrate a very clear break in the pattern of earnings and dividends per share following the end of World War II. Before World War II changes in dividends were more common and in both directions whereas after World War II dividend policy appeared to become increasingly smooth and conservative – evidenced by the gradual widening of the gap between dividends and earnings per share.

In results not presented, we compare stock returns to the dividend yield. Not surprisingly, we find that the stock returns are much more volatile than the dividend yields. We also find evidence suggesting that there are increases in returns when the dividends increase, but the changes in dividends are too small to explain the large returns. Decomposing the market return into dividends and capital gains, we find that the periods during which there were substantial capital gains correspond to the periods during which there were lower dividend yields. This suggests that at these times firms were providing investors with relatively stable total returns, but this was being done in different ways. This is consistent with the argument of Baker and Wurgler (2004a and 2004b) who suggest that there are trends in how investors value dividends and thus when firms are more likely to provide value to their investors through either dividends or capital gains.

To more formally characterize our data series, we present summary statistics and tests in Table 1. The values are similar to those obtained by studies also using this historical data series (e.g., Skinner (2004)). Each row presents the means and standard deviations for changes in dividends, changes in earnings, dividend payouts, dividend yields, capital gains, total returns, and price-earnings ratios, respectively. The columns present the values over different sub-periods. To investigate how these values change over time we consider the overall period 1871-2003, as well as the three sub-periods: 1871-1913, 1914-1945 and 1946-2003. The final portion of the table presents p-values for tests of equality of the values across adjacent sub-periods (e.g., the values in 1871-1913 being equal to those in the sub-period from 1914-1945).

Examining the mean annual changes in dividends over our different sample periods we see that since 1871 the annual growth rate has been about 3.23%. We find that there is a small growth in dividends over period 1 (1871-1913); an even smaller growth rate in period 2 (1914-1945) but a much higher growth in dividends in period 3 (1946-2003). The differences between periods are not significant across either periods 1 and 2 or periods 2 and 3. This is likely due to the high variability in the results, especially in the first two periods clearly demonstrating how the volatility of dividends has changed over time, decreasing significantly in the post World War II period where we see persistent, small increases.

We also see that earnings generally grew at a slightly faster rate than dividends across all periods. We also find a much higher standard deviation for earnings than dividends. Coupled with the lower changes in dividends than in earnings, these findings suggest a reluctance of managers to change dividends in response to changes in earnings; in other words, a stickiness in dividend policy. This is consistent with our observations from Figure 1 – the changes in the dividends are much smaller but coincided with changes in earnings before 1900; post-World War II the changes in dividends are smaller and more frequent but no longer appear to follow the changes in earnings. The dividend payout ratios are high in both periods 1 and 2 (about 70% in both periods) but decrease significantly in the period 3 (50%). A t-test rejects the null hypothesis of the equivalence of the means between periods 2 and 3 (the p-value is less than 0.001) but not between periods 1 and 2.

In Table 1 we also find information from an investor's perspective. We see that the dividend yield contributes a substantial portion of the total return: almost 40%. Although the dividend yield is significantly lower in the latter period, consistent with other studies, it is clear that dividends continue to have a major impact on total equity returns. Capital gains for the index are consistent over the first two sub-periods (as were the dividend yields) but they increase substantially in the more recent 1946-2003 period. In this period, capital gains dominate the total returns making up about 68% of the total returns. These results suggest that, more recently, either investors value capital gains more than dividends, or firms more actively pursue growth strategies and are therefore re-investing more funds as opposed to paying them out to shareholders in the form of dividends. We cannot reject the null hypothesis of no difference in the total returns before and after World War II but we do reject the null hypothesis of no difference in the dividend yields over these periods. The final characteristics we consider is the P/E ratio.

This ratio, somewhat surprisingly, has remained relatively stable across our sub-periods. We see that it declines between periods 1 and 2 then increases between periods 2 and 3. It is interesting to see that the average P/E ratio is similar in sub-periods 1 and 3, but the volatility is much higher in period 3. This is likely due to the rapid increase in the P/E ratios in the latter part of the third period.

These results suggest that there are definite trends in the dividend payout policies over time and thus we reject hypothesis 1 of no differences in these series over time. There is an especially noteworthy break in the patterns before and after World War II. If investors do value dividends and thus the payout ratio is an important measure of the return being provided to investors, we would expect to see changes in how investors value these firms in the periods before and after World War II.

Since much of our analysis investigates the role played by economic conditions in how investors value equity, Figure 2 characterizes our economic factors over our sample period. In each graph we compare each of the factors to the year-over-year changes in the U.S. nominal GNP to allow us to study the relationships between the changes in each factor and the state of the economy. The default premium in Figure 2a gradually decreases over the latter part of the nineteenth century as the U.S. economy was gradually strengthening and becoming the center of global trade. To study how the default premium changes around downturns in the U.S. economy, we look at how it changes around the start of World War I, the Great Depression, the oil crisis in the early 1970s and the recessions in the 1980s and 1990s. The default premium appears to increase at the start of each of these major economic downturns. The term structure, on the other hand, appears to decrease before the economic downturns begin and therefore the tern structure appears to lead the changes in the default premium around these events (comparing Figures 2a and 2b). After the initial decline in the term structure following the start of the economic downturn, we see that the term structure gradually starts to increase until the economy has recovered. For the changes in CPI in Figure 2c we see increases in inflation precede the economic downturns. Finally in Figure 2d we see that the P/E multiples appear to increase as the economy improves and fall as it contracts.

We extend the graphical analysis by considering the summary statistics for our variables in Table 2. The results in this table illustrate the large variation within each of these factors over our sample period. This significant variation allows us to use these factors to try to explain our valuations. Table 3 presents the correlations between our factors. Interestingly, we find that the default premium is negatively correlated with the term structure. Since the default premium and term structure are both believed to increase as the economic risk increases, this result suggests that these factors may react to changes in economic conditions at different rates, consistent with our graphical results. As discussed earlier it appears that the changes in the term structure (default premium) lead (follow) the changes in the economy as measured by the GNP. The changes in the level of the CPI, on the other hand, appear to closely follow the economy – falling as GNP falls and rising as GNP rises.

5.2 The Dividend Discount Models

In this section we investigate the ability of valuation techniques using expected future dividends to determine the actual value of the S&P Composite Index. The analyses in the previous section suggest a possible relationship between dividends and prices, so we now explicitly investigate the role of expected future dividends in determining how investors determine share prices. If dividends are valued by investors, we should be able to use expected dividends to determine the current value of equities. We do this using the DDM. Since we have a long series of dividends, we have an ideal situation within which to test how well this model works in practice. We employ two forms of this model: a model which discounts each of the future expected dividends as in equation (2), and a model which assumes a constant growth rate to determine the future expected dividends, as in equation (5), the GGM.

Before formally examining the prices estimated by each model, Figure 3a illustrates how the expected prices obtained from the DDM perform at explaining the actual prices over our sample. We can see that the DDM appears to perform reasonably well at estimating the true prices over the sample regardless of the methodology used to estimate the cost of equity. It does appear that the expected prices calculated using the cost of equity estimated using the cumulative returns performs slightly better in general. In the subsequent analysis we use the cost of equity using the cumulative market returns.[5] Figure 3b presents the results for the expected price obtained from the GGM using the estimated historical nominal growth rate in the GNP as our estimate of the future dividend growth rate. This is arguably a more accurate estimate for the expected future dividend growth rate for a perpetuity than the alternative measure of the average historical dividend growth rate. This model performs well at explaining the actual prices with a much lower variance around the actual price than using a dividend growth rate obtained as the moving average of the past actual dividend growth rates. Consequently, we use the growth rate based on the GNP in our subsequent analysis.

To formally study what factors appear to influence the differences between the expected and actual prices, Table 4 presents the results for the regressions of the unexplained price differences (UP1, UP2 and UP3) and our economic factors using equation (9). The results in the first panel of Table 4 are for the UP1 regressions. Over the entire sample period the results demonstrate that our measures related to the outlook for the economy (the default premium and the term structure) are both positively related to the difference between the expected and the actual prices. This suggests that the expected price obtained using the fundamental valuations are higher than the actual prices as the default premium and term structure increase. If we assume the default premium increases as the risk in the economy is increasing (BBB rated firms are required to pay a higher premium to borrow as the economy is performing worse) and the term structure increases as the economy is becoming riskier (the short-term interest rate falls as the economy enters a downward cycle), these results suggest that our fundamental valuation over-estimates the price of the stock as the economy is entering a downturn. Since the fundamental valuation relies on assumptions to estimate the expected dividend stream and the cost of capital, this finding suggests that either the cost of equity used in our model is too low going into this period (it does not adequately reflect the increased risk that the market is going to be facing during the downturn) or actual dividends are higher than one would have been able to predict at this time so the dividends reflected in the

[5] Note: we also consider a moving average of the past 30 years as an alternative means of calculating the market risk premium and thus the cost of equity. Because the results are not qualitatively different from those using the cumulative returns, to conserve space only one is presented.

actual price are lower than the future dividends actually were. As a consequence these results suggest that the market observes the beginning of the economic downturn and investors anticipate a decline in the level of dividends that was more than actually occurred or the cost of equity investors required at this time rises more than our estimated value.

The changes in the U.S. CPI are negatively correlated with the difference between the expected and actual prices. If the CPI is increasing when the economy is in an upward phase, this relationship suggests that the expected price is lower than it should be when the economy is in a growth phase. This is similar in nature to the results for the default premium and term structure which find evidence of a fundamental over-valuation (under-valuation) going into economic downturns (recoveries).

We also find a negative relationship for the P/E multiples. This suggests that the fundamental price is too low when the P/E multiple is rising. Assuming the P/E ratio increases as the economy starts to perform better, this result suggests that the actual prices are lagging the market performance. There is also a weakly negative relationship between expected and actual prices when momentum increases. There appears to be overpricing as the market prices increase. This appears to indicate that there is a tendency for the market to allow prices to run up more than they should.

The results for our subperiods demonstrate that the relationships are relatively stable over time. The major difference across our sub-periods is the period between 1914 and 1945. In this period we find that the difference between the expected and actual prices falls as the default premium increases. Unlike in other periods this finding suggests that as the level of risk increases (as measured by the default premium) either the expected price falls or the actual price increases or some combination of the two. Because this sub-period includes the Great Depression, it is possible that the expected price is lower than it should be at this time. The high risk at this time could have lead to a very high estimated cost of equity which would have lead to a decreased expected price or the factors for the expected price did not change as rapidly as investors views, so the actual price was higher than fundamentals would have suggested.

The second panel in Table 4 presents the results for the regressions of UP2 considering the ability of the GGM to predict the actual price for the S&P Index. In this case, we find many of the relationships are the same as those for UP1. The only difference is a lower level of statistical significance. We even find similar patterns in the results for the second sub-period where the relationships between UP2 and the default premium and term premium are negative. As a consequence it appears that using either the DDM or the GGM, the pricing errors are related to similar issues and economic conditions.

The final panels in Table 4 are for UP3. The results using UP3 are designed to capture differences in how the growth rate is estimated across models. If UP1 > UP2 we have a positive value for UP3. We find that $E_t[P1] > E_t[P2]$ when the default premium and term structure are increasing. This suggests that our estimate for the growth rate is too low when the economy is entering an economic contraction. This type of over-reaction to bad news should not be surprising, especially since it is unlikely that investors could have estimated how well markets would perform over the entire sample. We find similar results for the changes in the CPI and the P/E multiples.

Overall these results suggest that there are relationships between the differences in the expected and actual prices that are related to changing economic conditions. Consequently these commonly used factors do play an important role in asset pricing, even when we use a different methodology than has been used in most of the existing literature. Unfortunately, we cannot clearly identify the source of the differences between the actual and expected prices. The differences can generally be attributed to either a change in the actual price or a change in the expected price. In the next section we investigate the role of some of the assumptions we make when implementing the fundamental valuation models and how they may be influencing these results.

5.3 The Implied versus Estimated Cost of Equity

We examine the differences between our estimated cost of equity and the imputed cost of equity that equates the actual and theoretical values. In Figure 4 we see how the imputed costs of equity obtained from the perfect foresight DDM and the GGM are related to the cost of equity obtained by using the cumulative history of equity returns and the CAPM. The imputed cost of equity is lower than the historically obtained cost during periods of economic uncertainty than in periods of economic expansion.

This is consistent with our historical measures not adequately incorporating people's expectations – they are backward looking and thus not necessarily capturing investors' current expectations regarding the future. Although caution must be exercised in interpreting the implied cost of equity from 1980 onward due to the short time period being used, it does suggest that investors were incorporating an increasingly large equity premium into prices over this period. This could be due to potentially unrealistic expectations for how equity prices would be increasing going forward (this is consistent with the results from Welch (2000) who finds that investors have unrealistically high expectations regarding the equity premium).

Tables 5 and 6 present descriptive statistics for the estimated and implied costs of equity as well as the actual and estimated growth rates. In Table 5 we see that the differences between the actual and estimated costs of equity can be substantial over time with an average difference of roughly 0.7% for the moving average estimation and almost 2% for cumulative estimation. In Figure 4 we see that much of this difference stems from the cost of equity estimated using the moving average being consistently higher than the cumulative technique especially in the latter period and this comparing more favorably with the implied cost of equity. Interestingly, the implied cost of equity using the DDM is much higher than that from the GGM with the growth rate estimated using the GNP. The actual growth rate in dividends is much smoother than the growth rate estimated using the GNP though the two have very similar overall averages of 4.3% and 4.7% respectively over the entire period. Table 6 presents the pair-wise correlations for these measures. We find significant correlations in the differences between the estimated and implied costs of equity in Table 6a. This is consistent with the observed similarities in these measures. Not surprisingly the correlations between the estimated and implied costs of equity in Table 6b are very high, especially among the estimated costs. It is interesting to note that the implied costs of equity for the DDM and GGM models are not as highly correlated with the estimated values as they are with each other.

Although these statistics suggest very strong relationships between the estimated and implied costs of equity over the entire sample period, we investigate how these values change over time and across economic conditions. In Table 7 we present the results from the regression of our economic factors and the differences between the implied and actual costs of equity. The first panel considers the differences in the estimated cost of equity using the rolling estimate and the implied costs of equity obtained using the DDM. We find that the estimated cost of equity is lower than the implied cost of equity when the default premium, and term structure are increasing (negative coefficients). This suggests that as the economy is entering a rough spot either the implied cost of equity is increasing faster than the estimated or the estimated cost of equity is falling faster. The most likely explanation is that the implied cost of equity is falling faster since the estimated cost of equity is not able to react very rapidly due to the means by which it is calculated.

Interestingly, we find that as the CPI increases the estimated cost of equity is falling faster than the implied. This suggests that as inflation is increasing, the implied cost of equity increases to offset this change more rapidly than our estimated values are able to. We also find a positive relationship for the P/E ratio suggesting that as the valuations for firms are rising (i.e., as P/E ratios increase), the implied cost of equity is falling. Therefore the required return for equity holders appears to fall as the level of risk for the economy is felt to be decreasing. We see that as the economy is slowing down (i.e., the default premium and term structure are increasing) this leads to an increase in the implied cost of equity.

The results using the implied cost of equity obtained from the GGM are very similar. The only difference between the results for the implied cost of equity obtained using the DDM and that using the GGM is that the relationship with the term structure is positive. We also find that the P/E ratio is significant when the implied cost was obtained using the GGM (it had not been for the DDM case). This suggests that the implied cost of equity decreases as the P/E ratio increases (as investors are valuing earnings more highly). This is consistent with a decrease in risk at these times. This suggests that the growth rate being used in the GGM allows our fundamental valuation model to capture some of the changes in the economy more rapidly than is possible in the DDM – the changes must be incorporated into the cost of equity and this only occurs gradually. This also helps to provide some insight into the differences in the cost of equity we see in Tables 5 and 6. The implied costs of equity do appear to change as economic conditions change and our different models capture this in different ways and thus have different strengths and weaknesses.

The previous results suggest that there are differences between the estimated and implied costs of equity which may change over time because the implied cost of equity is able to react more rapidly to changing economic conditions. In Table 8a we study the results from the regressions of our economic factors on the implied costs of equity. For the implied costs of equity using the DDM and GGM (the first and second panels respectively), we find that the implied cost of equity using the DDM is more sensitive to our economic factors than is the cost of equity estimated using the GGM – the directions of the relationships are all the same, it is only the magnitudes which are smaller for the GGM. This is likely due to the fact that the cost of equity estimated using the GGM is already, at least somewhat, corrected for changes in the economy through the use of the GNP as our estimate for the future expected growth rate. For the implied cost of equity we find that it increases as our measures of economic performance suggest a future decline in the performance of the economy (i.e,, as the default premium, term structure and CPI all increase).

We also find that the implied costs increase as the momentum factor increases. This suggests that the implied cost of equity increases following a run up in equity prices – it could be related to the prices being lagged in the momentum factor and thus signaling a future turnaround in the economy so that the cost of equity will start to increase going forward. Finally, the P/E ratio is negatively related to the implied cost of equity. This suggests that as investors are starting to more highly value earnings, this is an indicator that the economy is expected to perform well in the future and therefore the required return on equity investments is able to decline at these times.

The other major input into our fundamental valuation models that we need to estimate and assume specific values is the expected growth rate for dividends. In Table 8b we consider how the estimated and actual growth rate of dividends depend on economic conditions. The actual growth rate in dividends is negatively related to the default premium and the momentum factor. This suggests that as the default premium is increasing and thus the economy is viewed to be starting a bad stage, the dividends do start to decrease, as one would expect. If we assume that momentum increases throughout an economic upswing, we expect momentum to still be increasing as we are approaching a future downturn and thus a future decline in the dividends. We find a positive relationship between the term structure and the growth rate. This suggests that the term structure may not be capturing the same relationship with the economy that we were expecting or that there is more to the term structure. A decline in the short-term interest rates may be a signal that the economy is currently in a bad state but the low short-term interest rates actually signals a future increases in the economy and therefore future increases in the level of the dividends.

For the growth rate as estimated using the growth rate in GNP we find fewer significant relationships. We find that the growth rate appears to increase as the CPI increases and the momentum factor increases. The growth rate increasing as the CPI increases could be both related to the fact that we are using the nominal GNP so that it is merely related to the increase in inflation. Similarly the relationship to momentum could simply be that momentum captures the trends in the economy and this is exactly what the GNP is measuring as well. Finally the negative relationship with the P/E ratio is interesting because it suggests that the trends in how investors are valuing earnings is negatively correlated with the trends in the growth rate of the economy.

6. Conclusions

In this study we make several contributions to our understanding of how investors value financial assets. By comparing the valuation one would have obtained using fundamental valuation methods and the actual price for equity over a long period of time, our study complements the work in empirical asset pricing which focuses on the relationship between asset returns and economic factors. Since the fundamental valuation methods require an estimate of the cost of equity and dividend growth rate at each point in time, our study is able to investigate how these have changed over time and across economic conditions.

We consider the actual prices and dividend payments for the S&P Composite Index over the period from 1871 to 2003. We find that our dividend-based valuation methods perform relatively well at explaining the actual prices for the S&P Composite Index over our sample period. When considering the differences between the actual price levels for the Index and the expected prices obtained using the DDM and the GGM, we find that these differences are frequently related to changes in economic conditions. In particular, we find that the expected price appears to under-estimate the actual price in periods of economic expansion but the opposite occurs during economic contractions. Because these results could be related to either our underestimation of the future dividends in periods of economic expansion or our over estimation of the cost of equity at these times, we consider this more carefully.

Specifically we explore the role of our economic factors in explaining the equity risk premium and dividend growth rates at the heart of the DDM and GGM. Because of historical information used to estimate the cost of equity, we find that our estimated cost of equity does not react as quickly to changes in economic conditions as the implied cost of equity used to equate the actual price and the expected price using the DDM and GGM. These results further suggest that economic conditions play an important role in how investors appear to set the required return for equity – as economic conditions worsen, investors require a higher return and this is captured in the implied cost of equity. As a consequence our analysis provides some new insights into how the economic factors used in most empirical asset pricing tests may be related to how investors value equity investments.

References

Aharony, Joseph and Itzhak Swary, 1980, "Quarterly Dividend And Earnings Announcements and Stockholders' Returns: An Empirical Analysis," *Journal of Finance 35* (1), 1-12.

Aliber, R, 1984, "International Banking: A Survey", *Journal of Money, Credit and Banking*, Vol. 16, No. 4, Part 2: Bank Market Studies , 661-678.

Allen, Franklin, and Roni Michaely, 2002, "Payout Policy" North-Holland Handbook of Economics edited by George Constantinides, Milton Harris, and Rene Stulz; North-Holland.

Asquith, Paul and David W. Mullins, Jr., 1983, "The Impact Of Initiating Dividend Payments On Shareholders' Wealth," *Journal of Business, 56* (1), 77-96.

Baker, Malcolm and Jeffrey Wurgler, 2004a, "A Catering Theory of Dividends," *Journal of Finance*, forthcoming.

Baker, Malcolm and Jeffrey Wurgler, 2004b, "Appearing and Disappearing Dividends: The Link to Catering Incentives," *Journal of Financial Economics*, forthcoming.

Bank of Montreal, 1917, "The Centenary of the Bank of Montreal: 1817-1917", The Herald Press and Advertising Agency.

Benartzi, S., R. Michaely and R. Thaler, 1997, "Do changes in dividends signal the future or the past*?", Journal of Finance* 52, 1007-1034.

Bhattacharya, S., 1979, "Imperfect Information, dividend policy and the bird in the hand fallacy", *Bell Journal of Economics* 10, 259-270.

Bollerslev, T. and R. Hodrick, 1995, "Financial Market Efficiency Tests", The Handbook of Applied Econometrics I – Macroeconomics, edited by M. Pesaran and M. Wickins.

Booth, L, 2001, "Equity Market Risk Premiums in the U.S. and Canada" *Canadian Investment Review* 14-3, 34-43.

Brav, Alon John R. Graham, Campbell R. Harvey, and Roni Michaely, 2003, "Payout policy in the 21st century", Working Paper Duke University.

Brealey, Richard and Stuart Myers, 2003, Principles of Corporate Finance, McGraw-Hill Irwin.

Cowles, Alfred, III and Associates. 1939. Common Stock Indexes, 2nd Edition, Bloomington, IN: Principia Press.

DeAngelo, Harry, Linda DeAngelo, and Douglas Skinner, 2000, "Special dividends and the evolution of dividend signaling," *Journal of Financial Economics, 57*, 309 -354.

DeAngelo, H., L. DeAngelo and D. Skinner, 2004, "Are Dividends Disappearing? Dividend Concentration and the Consolidation of Earnings" *Journal of Financial Economics 72*, 425-456.

Donaldson, R.G. and M. Kamstra, 1996, "Using Dividend Forecasting Models to Reject Bubbles in Asset Prices: The Case of the Crash of 1929" *Review of Financial Studies*, 9, 333-383.

Fama, Eugene and Harvey Babiak, 1968, "Dividend Policy: An Empirical Analysis", *Journal of the American Statistical Association* 63, 1132-1161.

Fama, E. and K. French, 1988, "Dividend Yields and Expected Stock Returns", *Journal of Financial Economics* 22, 3-25.

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

Friend, Irwin and Marshall Puckett, 1964, "Dividends and Stock Prices", *American Economic Review* 44, 656-682.

Gordon, M. J., 1962, The Investment, Financing and Valuation of the Corporation, R. Irwin, Homewood Ill.

Gordon, M.J. and E. Shapiro, 1956, "Capital equipment analysis: the required rate of profit", *Management Science* 3, 102–110.

Grullon, G., R. Michaely and B. Swaminathan, 2002, "Are dividend changes a sign of firm maturity?", *Journal of Business* 75, 387-425.

Hopkins, J. Castell, 1910, "Historical Sketch of the Bank of Montreal", reprinted in "The Canadian Annual Review of Public Affairs, 3-20.

Jensen, Michael C. and William H. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, 3 (4), 305-360.

John, Kose and Joseph Williams, 1985, "Dividends, Dilution, and Taxes: A Signaling Equilibrium," *Journal of Finance* 40 (4), 1053-1070.

LeRoy, S. and R. Porter, 1981, "The Present-Value Relation: Tests Based on Implied Variance Bounds", *Econometrica* 49, 555-574.

Lintner, J., 1956, "Distribution of Incomes or corporations among dividends, retained earnings and taxes", *American Economic Review* 46, 97-113.

Marsh; T and R. Merton, 1987, "Dividend Behavior for the Aggregate Stock Market", *Journal of Business* 60, 1-40.

Michaely, Roni, Richard H. Thaler and Kent Womack, 1995, "Price Reactions to Dividend Initiations and Omissions: Overreaction or Drift?," *Journal of Finance* 50, 573-608.

Miller, Merton, 1977, "Debt and Taxes", *Journal of Finance* 32, 261-275.

Miller, M. and F. Modigliani, 1961, "Dividend policy, growth and the valuation of shares", *Journal of Business* 34, 411-433.

Miller, M. and K. Rock, 1985, "Dividend policy under asymmetric information", *Journal of Finance* 40, 1031-1051.

Modigliani, Franco, and Merton Miller, 1958, “The cost of capital, corporate finance and the theory of investment”, *American Economic Review* 48, No. 3, 261 -297.

Modigliani, Franco, and Merton Miller, 1959, “The cost of capital, corporate finance and the theory of investment: a reply”, *American Economic Review* 49, 655-669.

Morrison, Donald, 1983, Applied Linear Statistical Methods, Prentice-Hall, Englewood Cliffs, New Jersey.

Poterba, J., and L. Summers, 1988, "Mean reversion in stock prices: evidence and implications", *Journal of Financial Economics 22*, 27-59.

Shaffer, S, 1993, “Test of Competition in Canadian Banking”, *Journal of Money, Credit and Banking*, Vol. 25, No. 1. (Feb., 1993), 49-61.

Shiller, R., 1979, “The Volatility of Long-Term Interest Rates and Expectations Models of the Term Structure”, *Journal of Political Economy* 87, 1190-1219.

Shiller, R., 1981, “Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?”, *American Economic Review* 71, 421-436.

Skinner, Douglas, 2004, “What Do Dividends Tell Us About Earnings Quality?”, Working Paper University of Chicago.

Sorensen, Eric H. and David Williamson, 1985, “Some Evidence on the Value of Dividend Discount Models”, *Financial Analysts Journal*, 41 (6), 60-70.

Vuolteenaho, T., 2002, “What drives firm level stock returns?”, *Journal of Finance* 57, 233-264.

Watts, Ross, 1973, “The Information Content of Dividends, *Journal of Business* 46, 191-211.

Williams, John, 1938, The Theory of Investment Value, North Holland Publishing.

Wilson, J.W., and C.P. Jones. 1987. "A Comparison of Annual Common Stock Returns 1871–1925 with 1926–1985," *Journal of Business* 60, 235–258.

Table 1: Summary Statistics for the characteristics of the S&P Composite Index

Means (and standard deviations below) for annual dividends, earnings, returns, and valuation measures. Annual dividend, earning, and price changes are based on logarithmic changes. S&P data start in 1871. Mean differences are t-tests; standard deviation differences are F-tests. Period 1 is 1871-1913, period 2 is 1914-1945, and period 3 is 1946-2003.

					Tests (p-values)	
	1871-2003	1871-1913	1914-1945	1946-2003	1 vs 2	2 vs 3
change in dividends	3.23%	1.51%	1.00%	5.74%	0.8958	0.1616
	12.46%	*11.67%*	*18.31%*	*5.48%*	0.0182	0.0000
change in earnings	3.40%	2.45%	1.32%	6.23%	0.8855	0.4829
	24.51%	*22.89%*	*37.02%*	*17.44%*	0.0120	0.0000
Dividend payout	62.69%	70.09%	72.65%	50.95%	0.6471	0.0001
	19.64%	*16.95%*	*25.92%*	*8.82%*	0.0257	0.0000
Dividend yield	4.56%	4.46%	5.66%	3.64%	0.0004	0.0000
	1.60%	*0.75%*	*1.58%*	*1.37%*	0.0002	0.3557
capital gain	4.15%	2.35%	2.40%	7.10%	0.9920	0.3244
	17.54%	*14.62%*	*24.43%*	*14.56%*	0.0075	0.0007
total return	8.71%	6.80%	8.05%	10.75%	0.7981	0.5536
	16.80%	*14.06%*	*23.18%*	*14.46%*	0.0090	0.0020
price/earnings ratio	15.13	15.82	13.50	16.38	0.0299	0.0318
	5.94	*3.14*	*4.86*	*7.64*	0.0223	0.0078

Table 2: Summary Statistics for Economic Factors, 1867-1992

The economic factors are the default premium (defulev), the term structure of interest rates (tsulev), changes in the consumer price index or, equivalently, the inflation rate (d_cpius), a momentum factor for the price of the S&P Index over the past 5 years (mom5_us) and the P/E multiple for US firms (us_PE).

Variable	Mean	Std dev	min	max
defulev	1.0248	0.60932	-0.08	3.276
Tsulev	-0.44347	1.61286	-4.8767	2.93
d_cpius	0.02287	0.05089	-0.10825	0.20438
mom5_us	0.41683	0.3654	-0.6736	1.29019
us_PE	13.97814	4.18191	5.633	26.563

Table 3: Pair-wise Correlations for Economic Factors, 1867-1992

	defulev	tsulev	d_cpius	mom5_us	us_PE
defulev	1	-0.54999	-0.28763	-0.18686	-0.10525
Tsulev	-0.54999	1	0.11828	0.06551	0.11069
d_cpius	-0.28763	0.11828	1	0.10775	-0.24164
mom5_us	-0.18686	0.06551	0.10775	1	-0.04767
us_PE	-0.10525	0.11069	-0.24164	-0.04767	1

Table 4: Regressions for UPI and Economic Factors
The regressions are based on model (9) and the UPIs are defined as earlier. The prices are estimated using the cost of equity estimated using the rolling CAPM and the growth rate for the GGM is estimated using the year-over-year growth rate of the nominal GNP.

UP1	Intercept	Defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.33286	0.83946	0.23856	6.74782	0.90307	0.08034	0.1518
	2.83	3.49	2.01	-1.82	-1.58	-1.76	
pre1914	3.00352	4.76781	1.33336	-47.1623	-3.68965	-0.4749	0.2951
	2.97	2.14	1.36	-1.34	-1	-1.56	
1914-1945	0.47257	-1.12856	-0.03737	1.33894	-0.94069	-0.01963	0.4068
	4.57	-2.08	-0.35	0.8	-4.06	-0.74	
1945-1992	-0.06895	0.37801	0.12839	1.8343	0.14157	-0.05714	0.7104
	-2.27	4.86	4.22	2.14	1.16	-8.17	

UP2	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.07643	0.19276	0.05478	1.54945	0.20736	0.01845	0.2161
	1.71	4.69	-0.44	0.78	-0.85	-1.33	
pre1914	0.82547	1.89198	0.54078	24.96466	-0.74734	-0.08112	0.4151
	4.28	4.45	2.89	3.71	-1.06	-1.4	
1914-1945	0.06578	-0.5837	-0.18703	2.35625	-0.31122	-0.00773	0.5786
	1.47	-2.49	-4.03	3.26	-3.1	-0.67	
1945-1992	-0.4145	0.07989	0.05714	0.29284	0.12534	-0.03695	0.6662
	-22.96	1.73	3.16	0.57	1.73	-8.89	

UP3	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.31301	0.7894	0.22434	6.34545	0.84922	0.07554	0.1127
	2.6	2.57	2.25	-2.13	-1.47	-1.55	
pre1914	2.17805	2.87583	0.79258	-72.1269	-2.94231	-0.39378	0.2864
	2.29	1.37	0.86	-2.17	-0.85	-1.38	
1914-1945	0.40678	-0.54486	0.14966	-1.01732	-0.62947	-0.0119	0.4057
	4.38	-1.12	1.56	-0.68	-3.03	-0.5	
1945-1992	0.34556	0.29812	0.07125	1.54146	0.01623	-0.02019	0.499
	13.81	4.65	2.85	2.18	0.16	-3.5	

Table 5: Summary Statistics for Costs of Equity and Growth Rates, 1867-1992

The differences between the estimated cost of equity using the implied cost of equity obtained from the DDM and the rolling CAPM (d_ke_ma_ddm) and the cumulative CAPM (d_ke_cum_ddm), the estimated cost of equity using the rolling method (ke_ma30), the cumulative method (ke_cum), the implied cost of equity using the DDM (SP_ke_imp_ddm), the implied cost of equity obtained using the GGM and the GNP growth rate (SP_ke_imp_ggm_gnp_g) and the growth rate as the actual growth rate from the observed data (SP_actual_g) and the growth rate estimated using the US GNP growth rate (SP_g_gnp_ma).

	Mean	Std dev	min	max
d_ke_ma_ddm	-0.00723	0.02737	-0.077	0.0498
d_ke_cum_ddm	-0.01976	0.02308	-0.0841	0.0258
ke_ma30	0.09968	0.02356	0.0591	0.1502
ke_cum	0.08715	0.01181	0.0591	0.1042
SP_ke_imp_ddm	0.10307	0.02847	0.0637	0.1873
SP_ke_imp_ggm_gnp_g	0.08743	0.0145	0.027	0.1332
SP_actual_g	0.04386	0.00759	0.0225	0.0573
SP_g_GNP_ma	0.04703	0.03997	-0.1737	0.1259

Table 6a: Correlations for Differences between Estimated and Implied Costs of Equity, 1867-1992

	Ma ddm	Cum ddm	Ma ggm	Cum ggm
d_ke_ma_ddm	1	0.86731	0.61311	0.52042
d_ke_cum_ddm	0.86731	1	0.24332	0.33426
d_ke_ma_ggm_gnp	0.61311	0.24332	1	0.89616
d_ke_cum_ggm_gnp	0.52042	0.33426	0.89616	1

Table 6b: Correlations for Estimated and Implied Costs of Equity and Growth Rates, 1867-1992

	Ke_ma30	Ke_cum	ddm	Ggm gnp	gact	ggnp
ke_ma30	1	0.91363	0.438	0.00658	0.41754	0.5077
ke_cum	0.91363	1	0.56981	0.01713	0.25124	0.52381
SP_ke_imp_ddm	0.438	0.56981	1	0.43808	0.31743	0.5595
SP_ke_imp_ggm_gnp_g	0.00658	0.01713	0.43808	1	0.09445	0.49114
SP_actual_g	0.41754	0.25124	0.31743	0.09445	1	0.28998
SP_g_GNP_ma	0.5077	0.52381	0.5595	0.49114	0.28998	1

Table 7: Regressions for UKI and Economic Factors

Difference between the estimated cost of equity using the 30 year moving average and the implied cost of equity obtained using the DDM.

	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.00273	0.0074	0.00171	0.05043	0.00666	0.000576	0.1993
	-3.67	-3.65	-4.49	-2.24	-0.65	1.08	
pre1914	0.00913	0.02246	-0.00175	-0.10996	0.000521	-0.00259	0.3225
	1.52	1.93	-0.55	-0.79	0.05	-2.82	
1914-1945	-0.01131	0.06612	0.00328	-0.11992	0.01447	-0.00025	0.5044
	-3.66	4.09	1.02	-2.41	2.09	-0.31	
1945-1992	-0.00591	-0.04165	-0.01399	-0.18612	-0.03952	0.00216	0.5641
	-1.79	-4.93	-4.24	-1.99	-2.98	2.84	

Difference between the estimated cost of equity using the 30 year moving average and the implied cost of equity obtained using the GGM with the growth rate obtained using the year-over-year GNP growth rate.

	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.00283	0.00767	0.00177	0.05228	0.0069	0.000597	0.1147
	2.7	-2.25	1.71	-0.49	0.25	1.72	
pre1914	-0.0013	0.00382	-0.0004	-0.1465	-0.00334	-0.00146	0.0823
	-0.26	0.4	-0.16	-1.29	-0.41	-1.95	
1914-1945	-0.00019	0.04385	0.01022	-0.17346	0.00505	-0.00058	0.4391
	-0.06	2.62	3.09	-3.37	0.71	-0.71	
1945-1992	0.0307	-0.01079	-0.00805	-0.09121	-0.02852	0.00308	0.5663
	13.45	-1.85	-3.52	-1.41	-3.11	5.86	

Table 8a: Regressions for the costs of equity and growth rates

Regressions for Estimated and Implied Costs of Equity with Economic Factors.

The level of the implied cost of equity for the S&P Composite Index obtained using the DDM.

	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.00208	0.00564	0.0013	0.03842	0.00507	0.000439	0.545
	50.83	2.29	9.23	3.76	3.65	-2.12	
pre1914	0.06974	-0.01686	0.000971	0.11644	-0.00136	0.001	0.4991
	28.14	-3.51	0.75	2.03	-0.33	2.64	
1914-1945	0.1006	-0.03123	0.00371	0.04084	0.000146	-0.00014	0.4792
	47.11	-2.8	1.68	1.19	0.03	-0.25	
1945-1992	0.12754	0.03322	0.00879	0.13079	0.02441	-0.00138	0.5121
	49.98	5.08	3.44	1.81	2.38	-2.35	

The level of the implied cost of equity for the S&P Composite Index obtained using the GGM with the growth rate being estimated using the year-over-year growth in the nominal GNP.

	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.00113	0.00307	0.000711	0.02094	0.00276	0.000239	0.4176
	77.66	1.01	1.85	2.72	4.5	-5.57	
pre1914	0.08017	0.00177	-0.00037	0.15299	0.0025	-0.00013	0.0886
	22.83	0.26	-0.2	1.88	0.43	-0.24	
1914-1945	0.08948	-0.00897	-0.00323	0.09438	0.00957	0.000198	0.4167
	47.56	-0.91	-1.66	3.12	2.27	0.41	
1945-1992	0.09093	0.00236	0.00284	0.03587	0.01341	-0.00231	0.5918
	67.76	0.69	2.12	0.95	2.49	-7.46	

Table 8b: Regressions for Growth Rates and Economic Factors

The observed growth rate in dividends from the S&P Composite Index.

	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.000617	0.00167	0.000387	0.01141	0.00151	0.00013	0.3683
	69.88	-5.01	3.52	1.32	-2.35	-0.89	
pre1914	0.0374	-0.0043	9.52E-05	0.0206	-7.3E-05	0.000181	0.267
	46.44	-2.75	0.23	1.11	-0.05	1.47	
1914-1945	0.04623	-0.00803	0.00251	0.00225	0.000715	2.19E-05	0.6536
	72.03	-2.39	3.78	0.22	0.5	0.13	
1945-1992	0.04765	-0.0086	-0.0004	0.01273	-0.01104	-0.00024	0.2693
	49.67	-3.5	-0.42	0.47	-2.87	-1.1	

The estimated growth rate using the moving average of the year-over-year growth rate in the nominal GNP.

	Intercept	defulev	tsulev	d_cpius	mom5_us	us_PE	adj R-sq
1886-1992	0.00326	0.00884	0.00205	0.06026	0.00795	0.000688	0.2902
	15.35	0.19	1.5	2.33	4.29	-3.21	
pre1914	0.04814	0.02625	-0.00044	0.11154	0.01392	-0.00168	0.3572
	9.38	2.64	-0.17	0.94	1.63	-2.14	
1914-1945	0.02459	0.00154	0.000973	-0.06563	0.02388	-0.00366	0.1156
	3.92	0.05	0.15	-0.65	1.7	-2.28	
1945-1992	0.07831	0.01311	0.004	0.16283	0.00704	-0.00253	0.6367
	48.2	3.15	2.46	3.54	1.08	-6.77	

Figure 1a: Graph of the prices versus dividends for the S&P Composite Index.

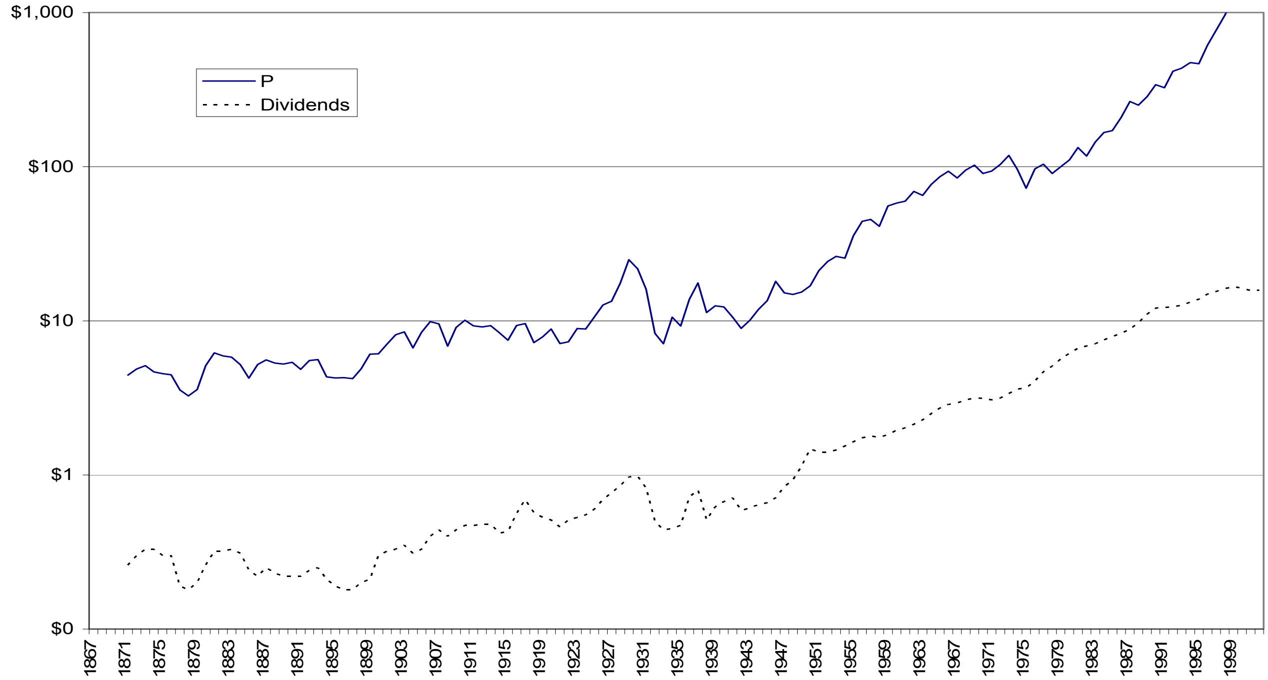

Figure 1b: Graph of the dividend yield for the S&P Composite Index.

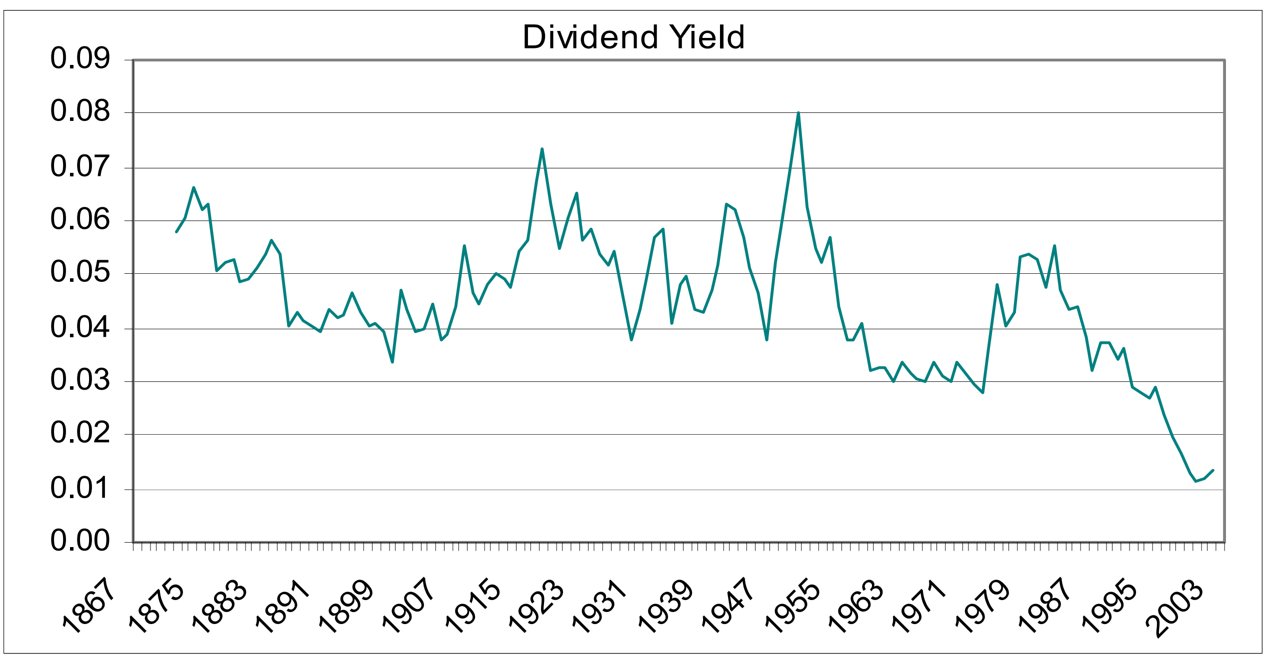

Figure 1c: Graph of the Dividend Payout Ratio for the S&P Composite Index.

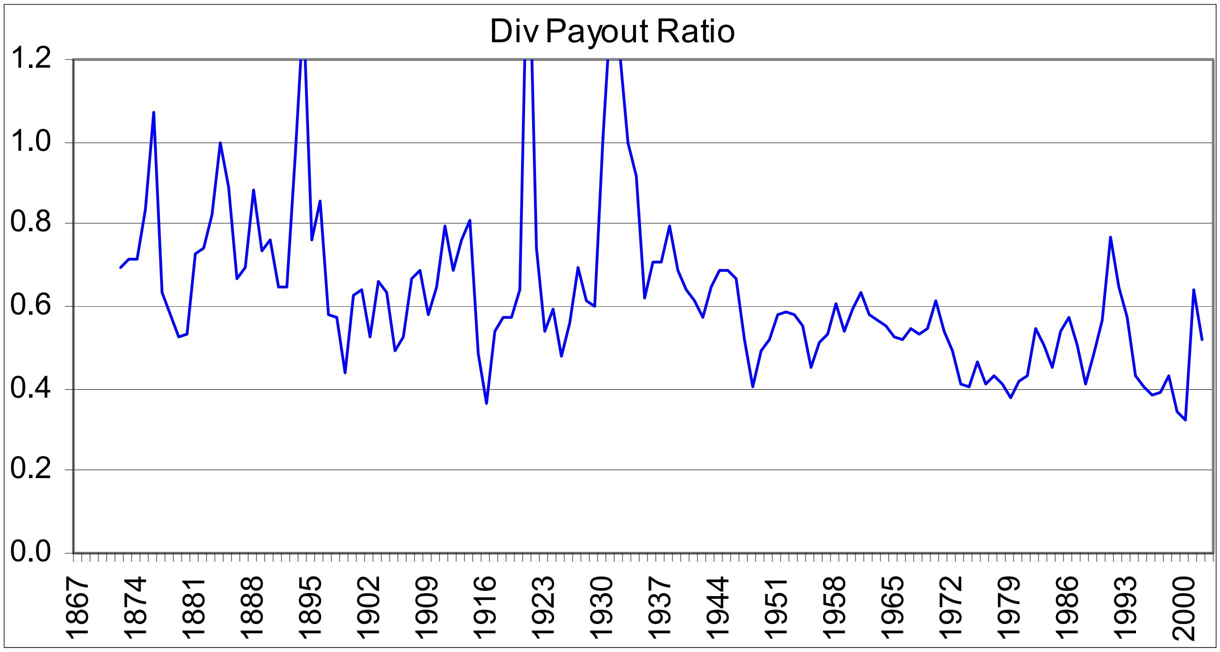

Figure 1d: Graph of the dividends paid on the S&P Composite Index versus earnings for the S&P Composite Index.

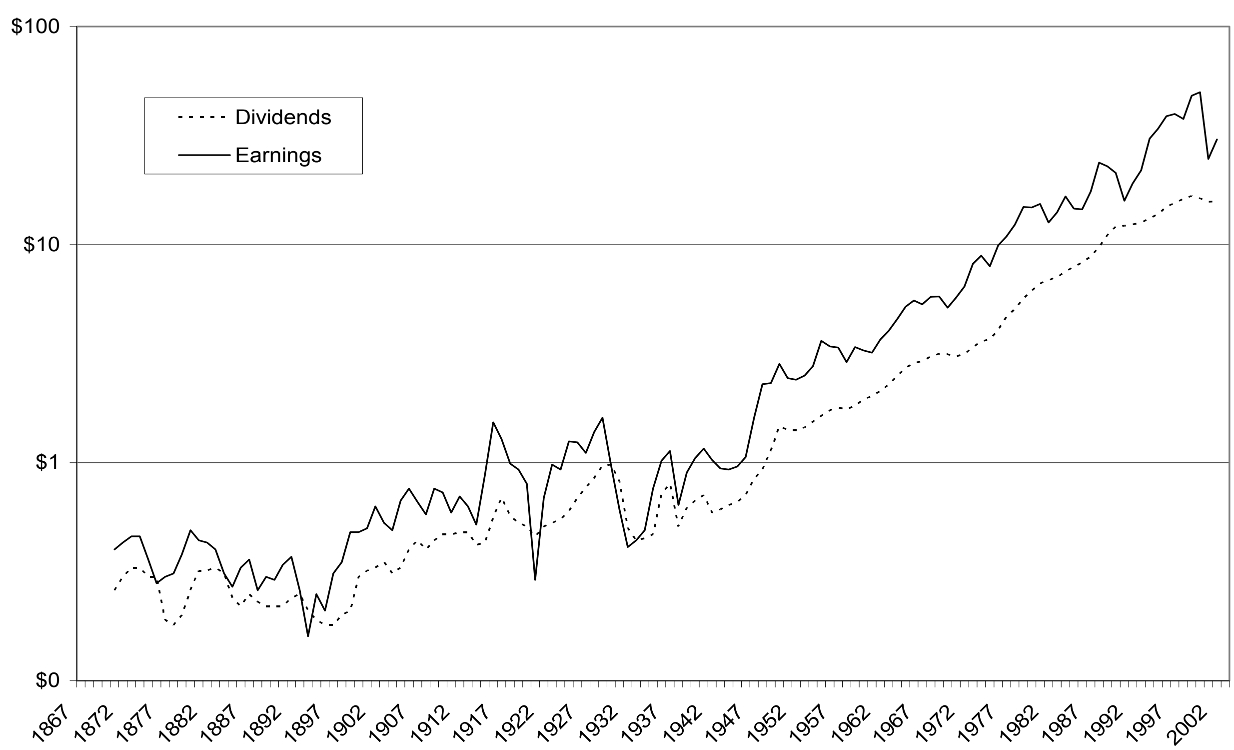

Figure 2a: Graph of the level of the default premium measured as the difference between a a AAA-rated bond and a long-term government bond (defulev) and the year-over-year change in the US nominal GNP (GNPUCH)

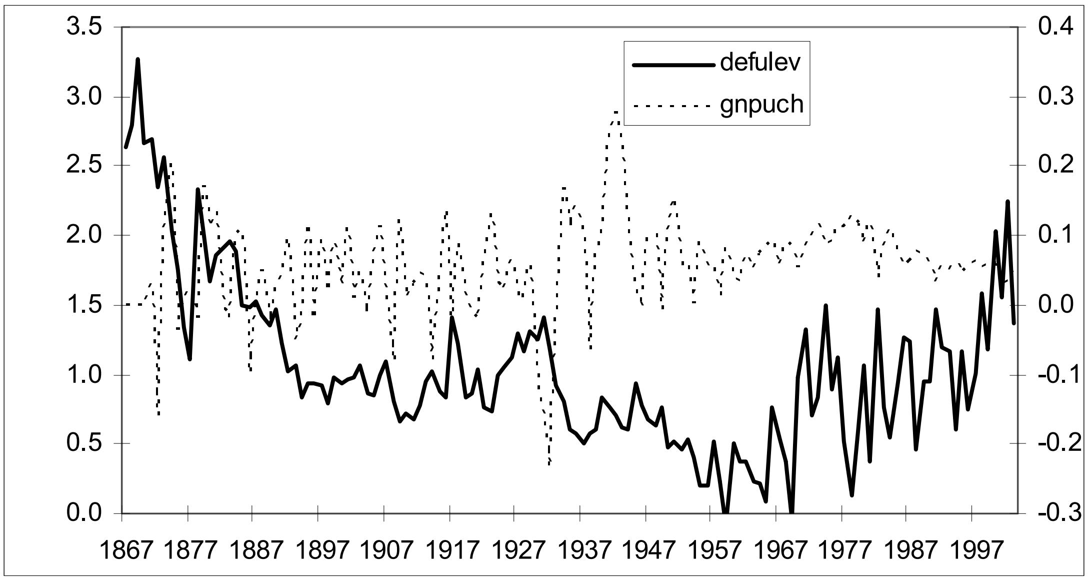

Figure 2b: Graph of the year-over-year change in the term structure of interest rates (tsulev) and the year-over-year change in the US nominal GNP (GNPUCH)

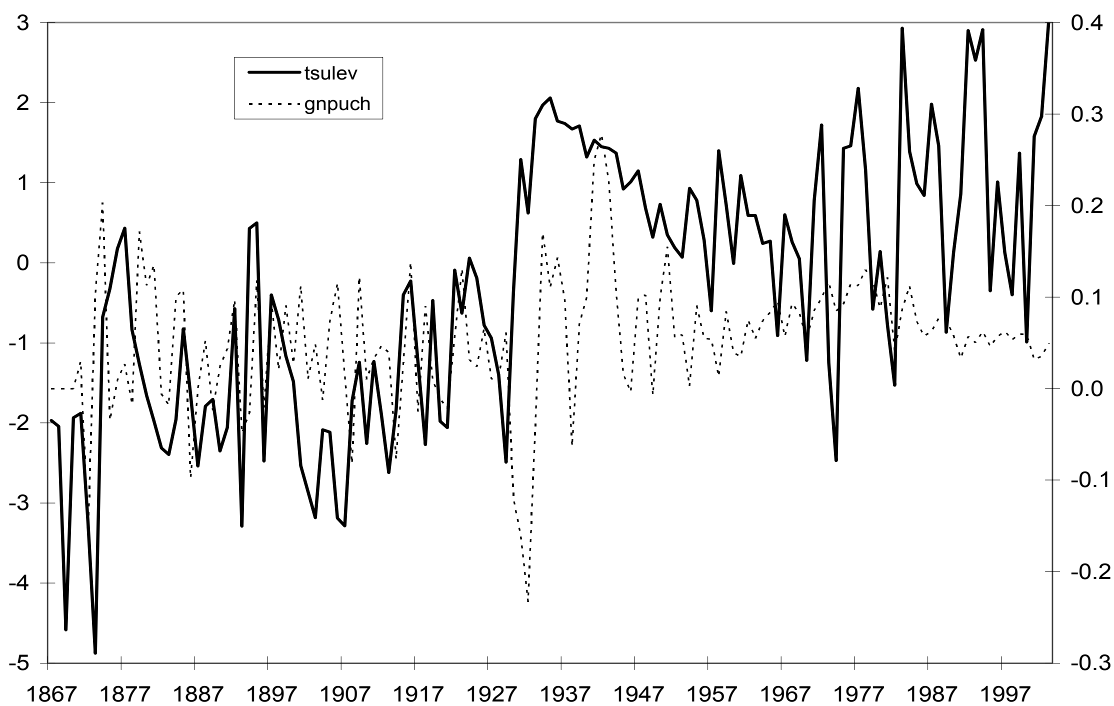

Figure 2c: Graph of the year-over-year change in the CPI (d_cpi) and the year-over-year change in the US nominal GNP (GNPUCH)

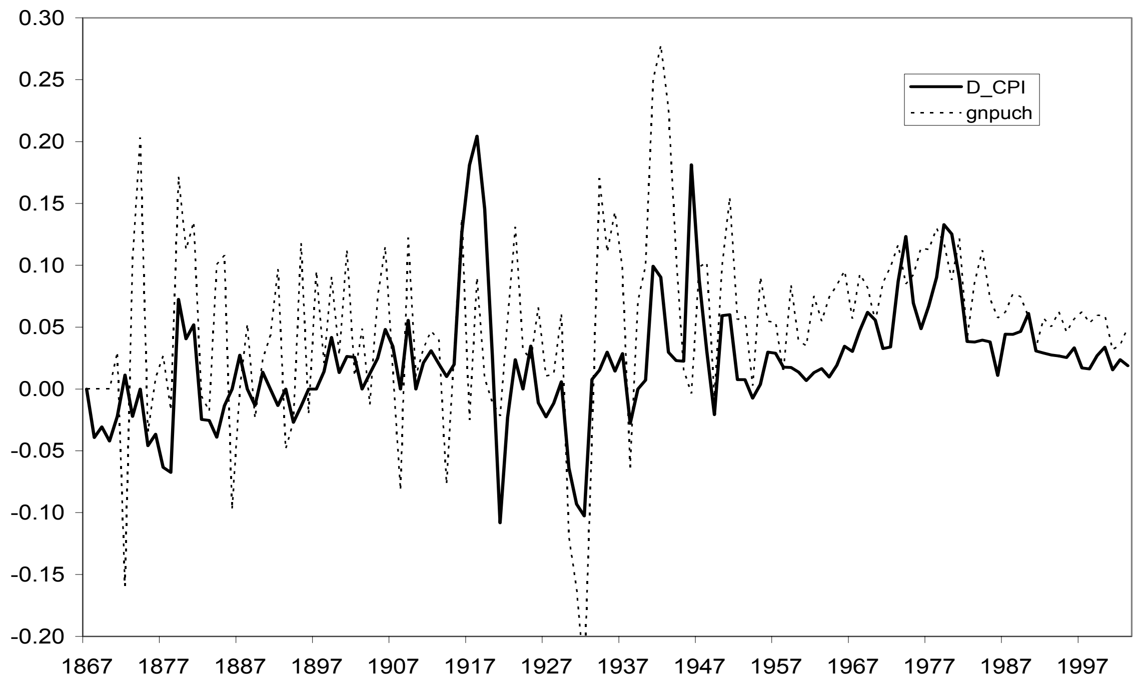

Figure 2d: Graph of the year-over-year change in the US nominal GNP (GNPUCH) and the average P/E multiple in the US divided by 100 (US_PE/100)

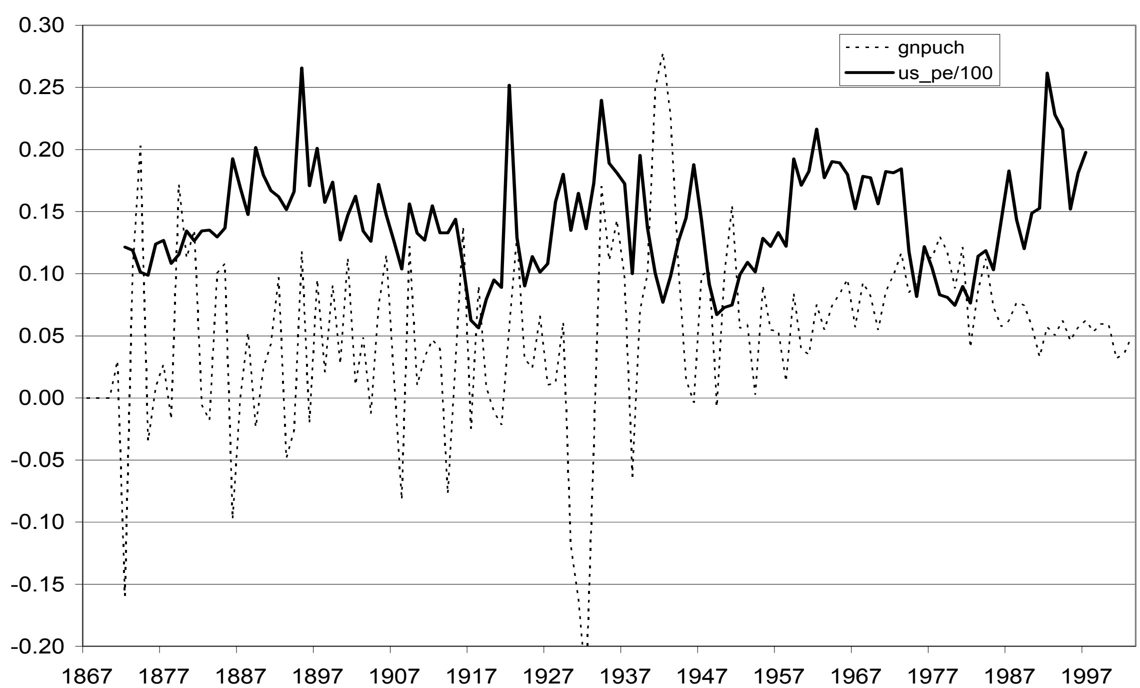

Figure 3a: Graph of the actual price of the S&P Composite Index and the expected prices calculated using the DDM (equation (2)) and the cost of equity estimated using a moving average of the past 30 years and estimated using the cumulated data from the start of our data set.

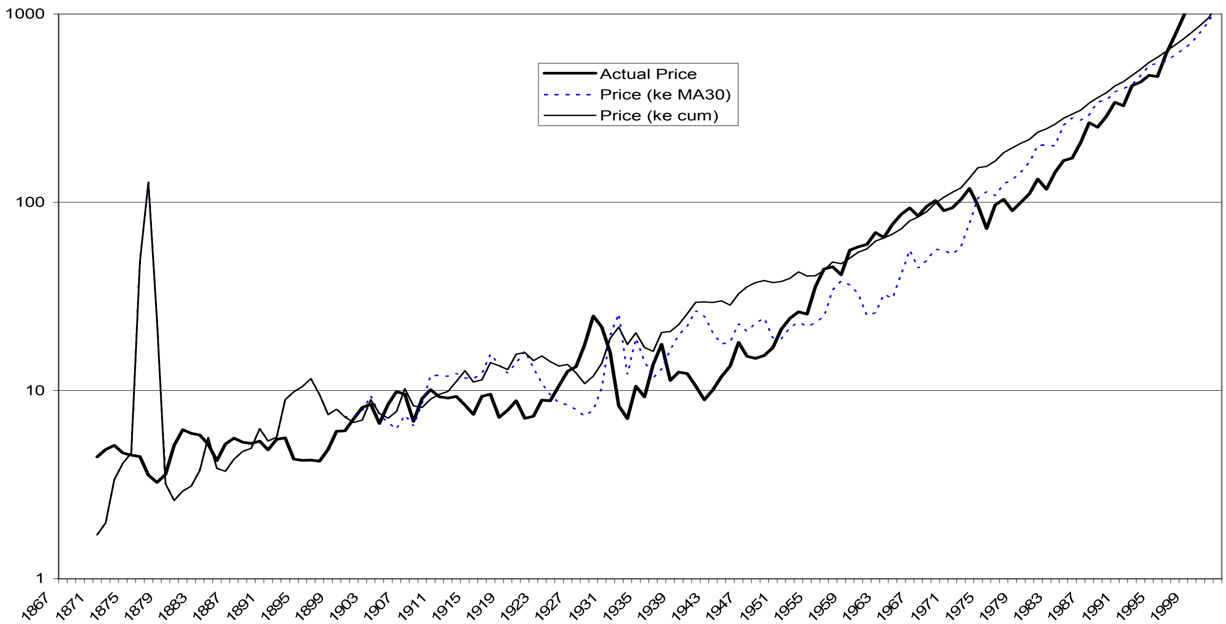

Figure 3b: Graph of the actual price of the S&P Composite Index and the expected prices calculated using the GGM (equation (5)) and the cost of equity estimated using a moving average of the past 30 years and estimated using the cumulated data from the start of our data set and the growth rate estimated from the growth rate of the economy GNP.

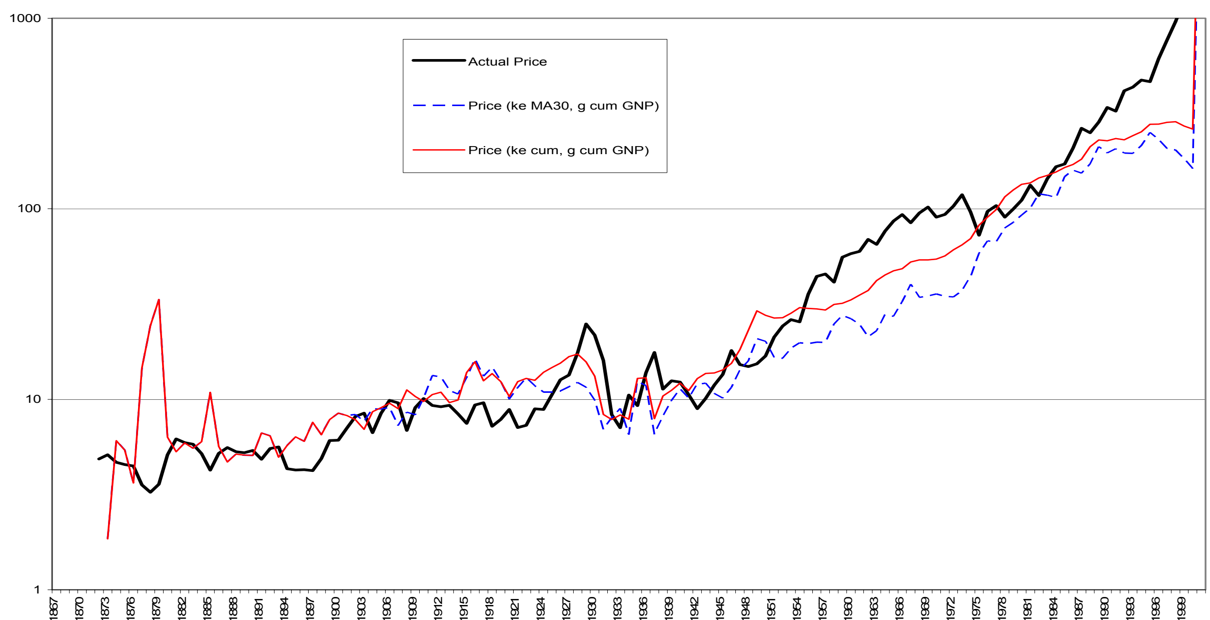

Figure 4: Graph of the implied cost of equity from the DDM and GGM as well as the cost of equity estimated using the moving average of the past 30 years (MA30) and the aggregation of all of the past data (cum).