The Equity Premium:

101 Years of Empirical Evidence from the UK.

Andrew Vivian*

Corresponding Author:

School Of Economics, Finance and Business

University of Durham

23-26 Old Elvet

Durham

DH1 3HY

Tel: 0191-334-6335

Email: a.j.vivian@durham.ac.uk

25th July 2005

Keywords: Equity Premium; Expected Returns; Dividend Growth Predictability

JEL Classification Codes: C52, C53, F30, G10, G12

* We especially thank Tony Antoniou, Robert Sollis and seminar participants at the University of Durham for many helpful comments. We also thank Barclays Capital for assistance with the main data sample. All remaining errors and omissions are our own.

The Equity Premium:

101 Years of Empirical Evidence from the UK.

Abstract:

We examine the UK equity premium over more than a century using dividend growth to estimate expectations of capital gains employing the approach of Fama and French (2002). Since 1951 estimated equity premia implied by dividend growth have been much lower than that produced by average stock returns for the UK market as a whole; a finding corroborated by almost every industry sub-sector. Our empirical analysis suggests this is primarily due to a declining discount rate, during the latter part of the 20th Century, which would rationally stimulate unanticipated equity price rises during this period. Thus, we conclude that historical stock returns over recent decades have been above investors' expectations.

1. INTRODUCTION

'The Equity Premium is perhaps the single most important number in financial economics' remarks Welch (2000, p. 501). The Equity Premium, the reward in terms of the extra return that investors demand for holding risky assets rather than risk-free assets, has numerous applications in finance from investment appraisal to portfolio asset allocation and from cost of capital estimation to investment performance evaluation. Nevertheless, Welch (2000) notes there is no consensus upon how the equity premium should be estimated. Probably the most popular method of estimating the equity premium is to use historical realised excess returns observed ex-post. However, the magnitude of this ex-post equity premium of 6% p.a. cannot be reconciled with the theoretical prediction of less than 1% p.a. from the Consumption Capital Asset Pricing Model as demonstrated by Mehra and Prescott (1985). Hence an equity premium of the enormity observed historically is deemed to be a puzzle.

A weakness of using ex-post returns is that it relies upon the assumption that investors' expected returns in the long run and on average will equal realised returns. This assumption has been challenged, specifically with regard to the Equity Premium; perhaps the expectations of investors might not be adequately described by the observed return series. Rietz (1988) asserts that historical data fails to account for the probability of economic catastrophes or disaster scenarios which would be incorporated into rational investors' expectations. Whereas Brown et al. (1995) point out that since the US market didn't experience a significant interruption during the 20th Century unlike many other financial centres, historical risk estimates in the US are biased downwards. However, since bondholders appear to suffer as much if not more than equityholders during such scenarios these hypotheses fail to provide an adequate explanation for the equity premium puzzle.

An alternative method to estimate equity premia and to examine expected returns more directly is to use fundamentals such as dividends in order to estimate the expected return investors' could anticipate (Jagannathan et al., (2001) and Fama and French, (2002)).

Jaganathan et al. (2001) using the Gordon discounted dividend model[1] claim that since 1970 the expected equity premium has only been about 0.7% p.a, defining the premia as equity returns in excess of long-term government bonds. Fama and French (2002) also use a dividend-based model that implies an expected equity premia over commercial paper of about 2.5% for 1951-2000 rather than the 7.5% average historical return received during this period. These empirical analyses suggest that in the US, realised returns have been substantially above the expected returns implied by fundamentals during the latter part of the 20th Century. An implication of this is that the *ex-ante* equity premium may be considerably smaller than the 6% indicated by *ex-post* returns. However, there appears to be a second puzzle. Why have realised returns been so far above the expected returns implied by these dividend growth models?

The motivation of this study is threefold. Firstly, we provide estimates of the expected UK equity premia implied by fundamentals using data covering the entirety of the 20th Century. We use the dividend growth model approach outlined by Fama and French (2002) to derive this estimate of expected returns and compare our results with the historical ex-post returns received by investors. This paper contributes to the literature examining the equity premium outside of the US market spanning the whole of the 20th Century, for which there is currently a dearth of empirical research. A notable exception is Dimson et al. (2003) who focussing purely on realised returns provide some international evidence. In contrast, our focus is on expected returns and any discrepancy between realised returns and expected returns.

We extend our analysis to consider the industry dynamic of realised and expected returns, an aspect that seems to have been overlooked in previous studies. The importance of industry-level data is that it can give an indication of how widely observed and representative the market results are. Although we are restricted by data availability to a post-1965 analysis of industry returns, we do they find they lend considerable and widespread support to our main findings at the market level that historical returns have been above investors' expectations.

---

[1] The Discounted Dividend Model and the Fama-French Dividend Growth model are identical but are stimulated from different frameworks.

Our method of estimating expected returns, the Fama-French dividend growth model, we propose can be more appropriately applied in the context of the UK market than the US. This is because American corporations seem to have made substantial changes to their dividend payout policy, which could affect the model results. Recent research by Grullon and Michaely (2002) has documented that since the 1970's: a) The US dividend payout ratio has declined substantially and b) Share repurchases by US firms have become an increasingly important means to distribute funds to shareholders. Such changes in payout policy could induce a downward bias upon equity premia estimates implied by dividend growth. However, these trends do not appear to have been mirrored in Britain. Rau and Vermaelen (2002) present evidence that until the late 1990's share repurchases by UK firms were negligible, while Ap Gwilym et al. (2004) document that the UK aggregate payout ratio in December 2001 was above its historical average for 1962-2001. Consequently, the UK market is particularly well suited for the implementation of the dividend growth model.

In light of this we examine in the context of more than 100 years of UK data if there is a disparity between the historical realised equity premium and the equity premium implied by dividends. The finding in this study that realised returns have been above expected returns implied by fundamentals raises important issues as to its source. Campbell (1991) demonstrates that any deviations of realised returns from expectations can be prescribed to either a change in expected dividend growth or a change in expected returns or both.

Secondly and consequently, the predictability of dividend growth is an important issue. Revisions in expectations of future dividend growth could potentially provide an explanation for the discrepencies between expected returns and realised returns uncovered by our investigation of the equity premium in Section 3. Dividend growth predictability has received relatively little attention in the literature, notable exceptions in the context of the US market are Ang (2002) and Lettau and Ludvigson (2005). We firstly establish which factors are related to UK dividend growth in-sample, before extending our analysis to consider out-of-sample forecasting. However, we find very little evidence that future dividend growth can be expected to be above its historical average.

Finally we examine if there has been a permanent shift in the time-series of expected returns. Several recent articles have posited that future expected returns for the early 21st Century are lower than past realised returns (see e.g. Claus and Thomas, 2001 and Arnott and Bernstein, 2002). We provide additional evidence on this issue by investigating if there has been a structural break in the market and industry dividend-price ratios. The dividend-price ratio not only contains important information regarding the income yielded by portfolios. Moreover, it has also been an important variable for predicting future returns and thus capital gains as first documented by Fama and French (1988) and Campell and Shiller (1988). Thus, we contend our findings of a downward shift in the dividend-price ratio are indicative that expected returns have fallen.

2. METHODOLOGY AND DATA DESCRIPTION

(i) Data Description

Our data covering the sample period 1900-2002 is taken from the Barclays Equity-Gilt Study, hereafter referred to as Barclays data. It covers firms listed on the London Stock Exchange. The Barclays equity index for the period 1900-1962 comprises the 30 largest shares by market capitalisation in each year and is rebalanced annually. From 1962-2002 the data is derived from the FTSE All-Share Index. The Barclays equity-price index is value-weighted with the weights of constituent companies being proportional to their market capitalisation. The income yield on the index is derived from all the dividends actually paid by companies during the relevant year divided by the year end price (D_t/P_t). In this study we refer to this ratio as the dividend-price ratio. We define the dividend yield as the dividend paid during the current year expressed as a proportion of the prior years price (D_t/P_{t-1}). In addition to the equity price index and income yield, we also collected by hand from the same source the treasury bill index and cost of living index. We use the cost of living index as a proxy for the consumer price index when calculating inflation on the Barclays dataset.

We supplement our Barclays dataset with data gathered from Datastream which is available from 1966. The Datastream Market index is a value-weighted index that covers the largest 550 firms quoted on the LSE[2]. These 550 firms are split into separate industries and we collect data from the 8 broad industry subsets of the market. These industries cover a vast array of diverse sectors be it services, consumer goods, primary resources or industrial products and also encompasses cyclical and non-cyclical sectors. Consequently our industry dataset is comprehensive and rich, providing us with a broad cross-section for us to make our empirical investigations. Data on the UK consumer price index and treasury bill rate is from the IMF's International Financial Statistics database courtesy of Datastream.

In this study we examine the data in real terms, although our methodology is equally applicable to nominal values. Our preference for real terms stems from the basic tenet of financial theory that investors' primary objective in investing is to transfer consumption from one time period to another; we are not primarily concerned with the nominal monetary value of our assets but rather the consumption stream that this monetary income will entitle us to.

(ii) Methodology for Estimating Returns

We employ the approach of Fama and French (2002) to derive estimates of average stock returns and expected average stock returns. Equation 1 gives the average return model, where $A(\ )$ is the arithmetic average, D_t is real dividend payments during the current time period t, P_{t-1} is the real price index at the previous time period t-1 and D_t / P_{t-1} is the dividend yield. GP_t[3] is the proportional capital gain in time t. Thus, the average stock return is simply the average dividend yield plus the average capital gain:

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

[2] We can report the Datastream market index and the Barclays price index are almost perfectly positively correlated, with a correlation co-efficient of 0.99.

[3] $GP_t = (P_t - P_{t-1}) / P_{t-1}$

If the dividend-price ratio (D_t / P_t) has a constant mean then over extended periods of time the proportional change in equity prices must be matched by an almost equivalent proportional change in dividends. Since a constant mean is one condition that stationary variables must satisfy, it follows that if we have a stationary dividend-price series then dividend growth will give us an estimate of the expected growth of the share price. Consequently, we can obtain estimates from fundamentals of expected capital gains.[4] In fact, if the valuation ratio is approximately the same at the sample beginning and end then the average equity premium yielded by each method would be almost identical.

The Fama-French Dividend Growth Model is defined in (2) as the return of the dividend model (RD_t) being given by the average dividend yield (D_t /P_{t-1}) plus the average real dividend growth rate (GD_t)[5]:

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

This model is equivalent to the classic Gordon (1962) Dividend Growth model but is motivated and derived in a very different manner. The main assumption made in the Fama-French model is that the ratio of dividends to price is stationary. If the valuation ratio is non-stationary then dividend growth might provide a poor approximation of capital gains. However, even if the series are not stationary, Fama and French (2002) claim their approach can still be employed provided the weaker condition that the series is mean-reverting or mean-reverting during each regime. They make the case that one can rationally expect there to be different regimes in the valuation ratios if there are permanent changes in factors determining asset prices.

For example, if there is an unforeseen permanent increase in the dividend growth rate then prices would rationally shift upwards permanently perhaps causing the appearance of a non-stationary section in the dividend-price ratio. Fama and French (2002) suggest that when

---

[4] Similar intuition applies to any other variable that is in a long-term stable relationship with prices. Other possible suitable candidate variables might be earnings or consumption. However reliable data, especially for earnings dating back to 1900 is unavailable for the UK market. Hence we only consider the dividend growth model outlined in (2).

[5] $GD_t = (D_t - D_{t-1})/D_{t-1}$

there are such rational price shifts which could not be foreseen then fundamentals are a superior way to estimate expected equity returns. Since, the increase in the dividend growth rate was unexpected, investors' actual returns are inflated due to the equity price rise that is simply due to good fortune in terms of unanticipated favourable economic news. However, this still poses a challenge for the researcher to demonstrate that their use of the dividend model in the place of any non-stationarities in the data can be justified on the basis of rational price adjustment.

(iii) Unit Root Tests

Stationarity, is a central issue for our dividend growth model, as outlined in Section 2.(ii). The model relies upon the ratio of the dividends to price being mean-reverting during regimes in order for dividend growth to give appropriate estimates of the capital gain of the share index. More generally, stationarity is an important issue since it is a pre-requisite for regression analysis in order to avoid the possibility of generating spurious regression results (Granger and Newbold, 1974).

[INSERT FIGURE 1: AROUND HERE]

Our sample covers a period of more than 100 years during which there has been substantial changes to the economic environment within which firms operate. Given the importance of this issue for our model, we utilise a rolling unit root procedure as suggested by Banerjee et al. (1992) to examine the stationarity of the Barclays market dividend-price ratio within sub-periods of our overall sample. Since the dividend-price ratio mean-reverts slowly, we use a rolling 40-year sample window[6] to conduct the Augmented Dickey Fuller test.

[INSERT FIGURE 2: AROUND HERE]

The unit root test statistic values and critical values are plotted through time in figure 2A. We find that the dividend-price ratio exhibits stationarity during almost all sample periods.

[6] This seems an appropriate length of time, since the dividend-price ratio appears to mean-revert slowly.

For any 40-year sample period, except that ending in 1974, the Dickey-Fuller test always rejects the null hypothesis of a random walk at the 5% significance level. The rolling unit-root tests provide strong general support for the dividend-price ratio being stationary, as we can report was indicated by the test of the whole sample[7].

A difficulty with unit root tests, particularly the Dickey-Fuller test is that outlying observations that quickly mean-revert inflate the test statistic increasing the likelihood of a stationary inference. Figure 1 reveals spikes in the Barclays market dividend-price ratio in 1915, 1919 and 1921 corresponding to World War 1 and its immediate aftermath and in 1974 due to the 1st OPEC oil crisis and subsequent UK market crash. The impact of these outliers are neutralised by estimating a dividend series (DPDUM) that uses zero-one spike dummy variables to control for their impact. The dividend-price ratio is regressed on a constant, four dummy variables (where 1915D 1919D, 1921D and 1975D are dummy variables) and a random error term. For example 1915D corresponds to a dummy variable that is 1 in 1915 and 0 in all other years.

$$\begin{aligned} D_t / P_t &= \alpha + \beta_1.(1915D) + \beta_2.(1919D) + \beta_3.(1921D) + \beta_4.(1974D) + \varepsilon_t \\ DPDUM &= D_t / P_t - \beta_1.(1915D) - \beta_2.(1919D) - \beta_3.(1921D) - \beta_4.(1974D) \end{aligned} \quad (3)$$

The results of the rolling unit root tests using the DPDUM series are illustrated in figure 2B. Even with the outlying observations controlled for the pre-1990 data provides support for the data being stationary in all sub-periods. The main differences in the rolling stationarity test results are for periods ending after 1997. Before controlling for the 1974 dividend-price observation we found the data clearly rejected the null at the 5% significance level. However, when the effects of this outlier is controlled for we find evidence that samples ending in 1998 or later are deemed to be non-stationary at the 5% significance level. Thus, the very end of the sample appears to exhibit some behaviour consistent with a random walk. This has perhaps

[7] Stationarity tests for the full sample period reveal that the Barclays and all Datastream industry dividend-price ratios are stationary. All other variables used in regression analysis were also stationary. The full results are available from the authors upon request. Throughout the appropriate lag length for the ADF test is determined by the minimum AIC criterion. The Datastream indices are not analysed using a rolling unit root technique since fewer than 40 observations are available.

been brought about by the gradual transition of the dividend-price ratio to a new mean in the late 1990's, an issue investigated in Section 4.(iii).

Overall, apart from perhaps the post-1997 data, we find strong evidence that the Barclays market dividend-price ratio is stationary. Given dividends and prices appear to be in a stable long-term relationship, this implies that dividend growth is an appropriate proxy for capital gains and provides confirmation that the Fama-French dividend growth model derived in (2) can be justifiably applied to our dataset.

3. EQUITY RETURN AND PREMIA ESTIMATES

[INSERT TABLE 1: AROUND HERE]

Perhaps the most striking feature of our results is that the UK equity premium from the overall UK market 1951-2002 based on average realised returns was 7.79%, which is more than 65% larger than the estimate of 4.60% from the Dividend Growth model. Over the period 1901-1950, the dividend growth model estimate of the annual UK equity premium of 4.22%, was similar to the 3.49% premium given by the average returns model. Thus both fundamentals and historical returns indicate that the expected equity premium from the turn of the twentieth century to 1950 was about 4% per annum.

Our results indicate that the dividend growth estimate of the equity premium has been relatively stable, being 4.22% p.a. in the first half of the 20th Century compared with 4.60% p.a. since 1951. While, in contrast, the equity premium from average returns has increased substantially from 3.49% pre-1950 to 7.79% post-1950. Thus, there is a large gap between the dividend growth model estimate and the average return estimate over the second half of the 20th Century.

[INSERT TABLE 2: AROUND HERE]

Table 2 indicates that since 1966 the dividend growth model equity premia estimate has been substantially below that from average returns in all industry subsets, apart from cyclical consumer goods where both estimates are similar. This illustrates that this divergence between the equity premia estimates doesn't appear to be due to unusual behaviour in any particular industry. In contrast, this phenomenon seems to be fairly widespread across almost every broad industry category, which suggests that perhaps a common factor is at work across industries and the market as a whole. Furthermore, in industries where there is a discrepancy the divergence between the equity premium estimates is economically substantial being at least 2.90% p.a. This provides further support for ex-post equity returns having been high since 1966 across a range of economic sectors.

Our two main findings that a) both models yield similar estimates of the equity premium for the pre-1950 era and b) the equity premium from average returns increased substantially in the second half of the 20th Century are entirely consistent with the Fama and French (2002) study of S&P 500 firms. Table 1 shows that the US equity premium estimates for 1872-1950 are almost identical being 4.40% for the average return model and 4.17% dividend growth model. These figures are both around the 4% p.a. level found in this study. They also found the average return model estimate rose dramatically to 7.43% for the post 1951 sample from 4.40% for the earlier period, which is comparable with our results.

However, in one vital aspect our results are different from Fama and French's. In the US the dividend growth model of the equity premium declined substantially in the second half of the 20th century to 2.55% from 4.17% for their earlier sample. In contrast, we find that this figure remains almost unchanged in the UK being 4.22% for 1901-1950 increasing modestly to 4.60% during 1951-2002. Why are there these differences between the two markets?

Perhaps, this is due to changes in American corporations payout policy which has not been fully mirrored in the UK. Fama and French (2001) demonstrate that the proportion of US firms that pay dividends at all declined substantially in the 1980's and 1990's, whilst Grullon and Michaely (2002) provided evidence that share repurchases have become an important means of distributing funds to shareholders besides dividends. Both these factors could cause US dividend model estimates to be biased downwards.

However, in the UK there is little evidence to support changes in payout policy similar to those witnessed in the US. Ap Gwilym et al. (2004) provide evidence that the UK payout ratio was 52.1% in December 2001, their sample end date, which was actually marginally above the average payout ratio of 51.4% for their full sample 1962-2001. Furthermore, share repurchases by British firms have been a far less popular and important mechanism for distributing resources to stockholders in comparison to the US; firstly share repurchases were illegal until the mid-1980's and even since then Rau and Vermaelen (2002) found share repurchase activity in the UK comprised only a very small proportion of total payout until the late 1990's. Dimson and Marsh (2001, p. 23) comment 'Until the late 1990s (UK) share buybacks were negligible.' Thus, we intimate that there has been little change in the payout policy of British firms. We suggest that any change in payout policy there may have been is unlikely to have anything other than a slight influence upon our UK dividend growth model results.

An important advantage of the UK dividend growth model is that it does provide a more precise estimate of the equity premium since the variance of the dividend model is considerably smaller than that generated by average returns especially since 1950. Furthermore fundamentals are less affected by structural shifts in the economic environment than asset prices themselves[8]. Hence, we contend that the implied equity premia derived from these models provide us with better estimates of expected returns than average historical returns. If this is the case then our results suggest that the equity premium puzzle is considerably smaller than generally cited in financial literature. Average historical returns indicate equities have delivered a premium over treasury bills of approaching 8% p.a. since World War 2, however, the dividend growth model intimates the true expected equity premium is closer to 4.5% p.a.

Could investors in 1950 really have anticipated that stocks would outperform treasury bills by almost 8% p.a. for the rest of the century or expected capital gains to be more than 4% p.a.? Would they have then decided that the risks involved with stocks were too great? If not, then a good deal of realised stock returns are simply due to good luck, that is they were unexpected. In Section 4 we tackle the question of what has caused our actual returns to

[8] This point is explained in detail in Section 2.(ii)

diverge so far from the expected returns implied by fundamentals during the second half of the 20th Century. The contention is that a large portion of these substantial capital gains was unanticipated at the beginning of the sample period. Valuation theory, states that this can be caused by either: a) the expected future growth of fundamentals being unusually high, b) faster growth of fundamentals than expected during the sample period or c) a decline in expected unconditional stock returns during the sample period.

4. EXPLAINING UK EQUITY RETURNS

(i) Are Post-2000 Expected Dividend Growth Rates Unusually High?

It has been argued that we have entered a new economic era, which has enabled higher rates of economic growth to be attained. One claim is that the ever increasing pace of technological developments has facilitated more rapid productivity growth (Jagannathan et al., 2001). An alternative argument is that increasing globalisation as witnessed by growing moves towards a truly globally integrated economic system in which resources can be allocated more efficiently due to previous barriers being removed and in which companies are able to locate production internationally in order to minimise costs. A final assertion is that substantial declines in inflation during the latter part of the 20th Century in many developed economies has set the footing for higher economic growth in the future, economic policymakers have argued. These three factors – technological improvements, globalisation and declining inflation – have lead to hopes that higher levels of economic growth can be achieved and sustained long into the future.

However, if these higher future expected growth rates had not been anticipated at the beginning of our sample period then this would lead to unexpected capital gains being realised by investors as the potential for extended periods of high economic growth became known to investors and incorporated into their expectations. This hypothesis can be tested empirically by examining the in-sample predictability of dividend growth. If a robust relationship between a predictor variable and dividend growth is discovered then we can generate predictions for end of sample dividend growth and assess if these are unusually large.

Firstly, we examine the predictability of the dividend growth rate from variables known in advance in a similar manner to Fama-French (2002). We first select variables which have been documented in the literature to have explanatory power over future returns and which are available for our whole sample. These are: i) the lagged dividend-price ratio (D_{t-1}/P_{t-1}), ii) prior returns (R_{t-1}) and iii) the short-term interest rate (F_{t-1}). We also include prior dividend growth rates (GD_{t-1}). Here we assess if they are able to predict future growth rates of dividends using (4).

$$\begin{aligned} GD_t &= \alpha + \beta_1.(D_{t-1}/P_{t-1}) + \beta_2.GD_{t-1} + \beta_3.GD_{t-2} \\ &+ \beta_4.GD_{t-3} + \beta_5.R_{t-1} + \beta_6.R_{t-2} + \beta_7.R_{t-3} + \beta_8.F_{t-1} + \varepsilon_t \end{aligned} \tag{4}$$

We split our dataset into the pre-1950 and post-1951 sub-samples. The rationale behind this is that we are trying to uncover the difference in the behaviour of the equity premium over the first half of the 20th century when dividend growth and average returns provided similar equity premium estimates and the second half of the 20th century when these methods provided divergent estimates of stock returns.

[INSERT TABLE 3: AROUND HERE]

Panel A of Table 3 demonstrates that equation 4 can account for approximately 28% of the variation in one-year dividend growth during both sub-samples. However, the individual co-efficients for all variables (except the 1 year lagged return for post 1950) are deemed to be statistically insignificant by the t-test. Similar results with very few individually statistically significant variables are also reported for two-year average dividend growth[9]. We also examine five-year average dividend growth[10]. We find that for the pre-1950 period none of the variables are found to be statistically significant and R^2 is only 16%. However, for the

[9] 2 year average dividend growth $GD2_t = [(D_{t+1} - D_{t-1})/D_{t-1}]/2$

[10] 5 year average dividend growth $GD5_t = [(D_{t+4} - D_{t-1})/D_{t-1}]/5$

post 1950 period the regression is able to explain 33% of the variation in dividend growth. Furthermore both the lagged dividend price ratio and one period lagged return are statistically significant from zero at the 1% significance level. However, the dividend-price ratio has a positive sign contrary to our expectation that dividends should help move the dividend-price ratio towards its mean value.

The moderate R^2 values obtained but few statistically significant co-efficients is symptomatic of multi-collinearity between some of the predictor variables, which would bias downwards the t-statistics. Consequently we extend our analysis to consider bi-variate regressions using (5), which should give us a much clearer indication of whether or not a relationship between the variables actually exists. We now focus individually on the dividend-price ratio and the one period lagged dividend growth[11].

$$\begin{aligned} &GD_t = \alpha + \beta.(X_{t-1}) + \varepsilon_t \\ &\text{where } X_{t-1} \text{ is } D_{t-1}/P_{t-1} \text{ or } GD_{t-1} \end{aligned} \tag{5}$$

In contrast with previous regression results, when we use (5) we find some statistical evidence of predictability using the dividend price ratio. Table 3 Panel B indicates for 1904-1950 there is a statistically significant negative relationship between the lagged dividend-price ratio and dividend growth at both one year and two year horizons. This is consistent with present value model and suggests that dividends do help the dividend-price ratio revert to its mean. What is more this parsimonious model can explain approximately 15% of the variation in dividend growth rates during this period. However, the predictive ability of the dividend-price ratio evaporates at longer horizons. For five-year future dividend growth, the dividend-price ratio becomes statistically insignificant is unable to explain any more than 2% of the subsequent variation in dividend growth between 1904-1950.

Since 1951 the dividend-price ratio appears to have lost any predictive ability over dividend growth; the t-statistics become insignificant at all horizons and the co-efficient of

[11] We also investigated the ability of lagged returns to predict future dividend growth, but the results which are available from the author upon request are similar to those reported for lagged dividend growth and thus in the interests of brevity have been omitted. Higher order lags of both dividend growth or returns also added little explanatory power and individual co-efficients were insignificant.

determination (R^2) tends to zero. However, contrary to our expectations, at the two year and five year horizons the co-efficient on the dividend-price ratio is positive but insignificant. Thus, we find that over the past fifty years the dividend-price ratio and future dividend growth are essentially unrelated.

Our results from Panel A of Table 3 did indicate that perhaps lagged dividend growth might be able to predict future dividend growth. Furthermore the field research of Lintner (1956) suggests a positive autoregressive process since dividends seem to partially adjust each year towards an optimal level. Table 3 Panel C reveals that over 1951-2002, this model performs well at both the 1 year and 2 year horizon. The *B* co-efficient was significant and positive, indicating that there is some persistence in the dividend growth rate as implied by the Lintner model. The model can account for a reasonable portion of dividend growth variability for 1951-2002, especially at the one year horizon. Although the five year horizon results indicate that this element of predictability disappears at longer horizons. In contrast, we find no evidence of in-sample predictability over the earlier sample period, 1901-1950. The lagged dividend growth model performs extremely poorly with a tiny R^2 and insignificant co-efficients on the independent variable. Consequently, the pre-1950 data doesn't support there being any link between lagged dividend growth and future dividend growth.

[INSERT TABLE 4: AROUND HERE]

Panel A of Table 4 reveals that at the industry level pooled regressions reveal there is no statistically significant relationship between the dividend-price ratio and future dividend growth at any horizon post-1966[12]. In fact, the model is unable to explain almost any of the fluctuation in the dividend growth rate. These findings are consistent with those found for the market as a whole reported in Table 3 Panel B. However, Panel B of Table 4 indicates that at the industry level there is a significant positive relationship between lagged dividend growth and future dividend at the two-year and five-year horizons. Nevertheless, lagged dividends are unable to predict more than 2% of the variation of future dividend growth at any horizon.

[12] We can report that within groups estimation of the panel data yielded similar results to those presented here.

Overall, our results indicate that at longer horizons of five-years or more dividend growth is essentially unpredictable. Individually, neither the lagged dividend-price ratio nor lagged dividends are able to explain a substantive proportion of future dividend growth at the five-year horizon. In this case it would appear that the historical average rate of dividend growth is likely to be the best predictor of future dividend growth. Since 1951, we know this has averaged 1.39% p.a., which is not exceptionally high and we find no evidence to suggest that future long-term dividend growth is liable to be extraordinarily rapid.

Even at shorter horizons, where we do detect a significant in-sample relationship between dividend growth and lagged dividend growth, this model does not indicate that future dividend growth is anticipated to be high. At the market level, dividend growth was below its historical average during the sample end years of 2000, 2001 and 2002, consequently extrapolating into the future using the regression results from (5) would imply future dividend growth was anticipated to be below average[13]. Our evidence indicates that the outlook for dividend growth in December 2002 can at best be expected to equal the historical average dividend growth rate. However, in the short-term rational agents might anticipate dividend growth to be even below the historical average. Therefore, we find no evidence whatsoever to support the hypothesis that future UK dividend growth is expected to be exceptionally high. Consequently, we suggest that the deviation between expected returns implied by dividend growth and average returns must have been caused by a factor other than the anticipation of extraordinarily rapid dividend growth in the post 2002 period.

(ii) Is Dividend Growth 1951-2002 Unexpectedly High?

If dividend growth in the second half of the 20th Century had been above expectations formed in 1950 then this would lead to an unanticipated rise in equity prices. However, even if in-sample growth had been extraordinarily large then the expected return estimates from

[13] We can report that end-of-sample forecasts from lagged returns at either the one or two year horizon prove to be negative as well for 2000-2002, further supporting a poor outlook for short-run future dividend growth in 2002.

fundamentals would also have been large and prices would have responded to this. Had the dividend-price ratio been the same in 2002 as in 1951 (or 1901) the estimates of both models would have been almost equal.

In the UK, we find that dividend growth showed an increase during the latter part of the 20th century. Real dividend growth was 0.56% over the period 1901-1950, increasing to an average rate of 1.39% from 1951-2002. However, the magnitude of the increase is sensitive to the inclusion of 1901 in the pre-1950 sample. Between 1902-1950 the real dividend growth rate was 1.18%, just a modest 0.21% below the rate observed post-1950. How much of this increase in dividend growth could have been expected? This is an important issue which can be tested directly and analysed in much more detail through out-of sample forecasting tests.

Out of sample forecasting is useful if we are concerned with investors' expectations at a particular point in time during the sample. For example, an investor in 1950 only has pre-1950 information at his disposal in which to forecast dividend growth for 1951. Consequently, out of sample tests also allow us to examine if the dividend growth element of estimates of the equity premium 1951-2002 are close to what investors could have reasonably expected in 1950. In this respect the out of sample tests act as a robustness check for the accuracy of our equity premia estimates.

Out of sample tests will also provide an opportunity to test the claims made by Fama and French (2002, p. 651) that the 'historical mean growth rate (of dividends) is a near optimal forecast of future growth.' We test if these claims made by Fama and French hold for the UK market by investigating the out-of-sample forecasting power of the average historical dividend growth rate compared to the dividend-price ratio and lagged dividend growth[14]. We conduct out-of-sample forecasts for both one-year real dividend growth (GD_t) and two-year average real dividend growth ($GD2_t$) at the market level, since this was the only evidence of in-sample predictability discovered in Section 4.(i). Throughout, our analysis is based purely on data available to the investor at time t.

[14] A lagged return model and a random-walk model were also examined. The return model results are similar to the lagged dividend growth model. The results for both these models are available from the authors upon request.

The historical growth rate model simply expects that next periods dividend growth rate is equal to the mean of all previous dividend growth rates: $E(GD_{t+1}) = \overline{GD_t} \quad t = 1902,....,T$

For the dividend-price and lagged dividend models we use a two-step process to generate out-of-sample forecasts. Firstly, we estimate the time-varying co-efficients of the model using a rolling regression technique given by (6). A window length covering twenty years of annual data is employed to enable credible estimations of α_t & β_t to be derived[15]. The earliest co-efficient estimation is for 1903-1922; we then use (7) to produce forecasts of dividend growth for each year from 1923.

$$\begin{aligned}
&GD_t = \alpha_t + \beta_t(X_{t-1}) + \varepsilon_t \quad \text{estimated for } t=t\text{-}19,....,t \\
&\text{where } (X_{t-1}) \text{ is } (D_{t-1}/P_{t-1}) \text{ or } (GD_{t-1}). \\
&GD2_{t-1} = \alpha_t + \beta_t(X_{t-2}) + \varepsilon_t \quad \text{estimated for } t=t\text{-}19,....,t \\
&\text{where } (X_{t-2}) \text{ is } (D_{t-2}/P_{t-2}) \text{or } (GD_{t-2}).
\end{aligned} \tag{6}$$

$$\begin{aligned}
&GD_{t+1} = \alpha_t + \beta_t(X_t); \;\; \text{where } (X_t) \text{ is } (D_t/P_t) \text{ or } (GD_t) \\
&GD2_{t+1} = \alpha_t + \beta_t(X_t); \;\; \text{where } (X_t) \text{ is } (D_t/P_t) \text{ or } (GD_t)
\end{aligned} \tag{7}$$

Our estimation equation (6) reveals that there is in fact substantial time-variation in β from both models, which is illustrated graphically in figure 3. The dividend-price ratio should be negatively related to future dividend growth. If the dividend-price ratio is above its mean then future dividend growth should be below average to guide it back to equilibrium. At both the one year and two year horizon, we find that β on the dividend-price ratio does tend to be negative as predicted by theory, particularly up until the mid-1950's[16]. However, β tends to move towards 0 as the sample period progresses, indicating that the relationship between the lagged dividend-price ratio and dividend growth weakens over the sample period. At the one year horizon though β remains negative until 1998. However, at the two year horizon since the late-1950's β often has a perverse sign if of small magnitude.

[15] Consequently our datastream sample is a little too short to effectively assess the forecasting power of various models and we thus focus purely on the Barclays market data.

[16] Our in-sample results found B_t on D_t/P_t to be significantly negative for the 1902-1950 period.

[INSERT FIGURE 3: AROUND HERE]

Previous dividend growth should be positively related to future dividend growth. Dividends tend to adjust only slowly over time and managers only tend to increase dividends at a rate they believe to be sustainable (Lintner, 1956). Figure 3A indicates that prior to 1940, β on dividend growth was negative at both the one year and the two year horizon contrary to our expectations. At the one year horizon β on dividend growth was positive in each sample ending period since 1940, whereas at the two-year horizon β tends to be small and close to zero during the period 1940-1980. However, at both horizons β is clearly positive and most persistent from the mid-1980's onwards.

[INSERT TABLE 5 AND TABLE 6: AROUND HERE]

For the whole sample period 1923-2002, we find that the mean error for all models was positive. This demonstrates that these forecasting tools suggest that average annual dividend growth was lower than our models predicted and could have been expected to be up to 0.57% p.a. higher than it actually was! Considering that average dividend growth only averaged 0.98% p.a. for 1901-2002, this is quite a substantial amount. This suggests that rather than being phenomenally high, dividend growth was actually lower than expected during 1923-2002.

In terms of actual forecasting accuracy at the one year horizon, we find that the historical average model provides the most accurate forecasts over the full sample period of 1923-2002. It has the lowest mean-squared error and the lowest mean absolute error of 55.60% and 5.92% respectively. The regression based forecasting models had very similar performance in terms of overall accuracy. In terms of mean-squared error the dividend-price model fared best with 61.47% followed by the dividend model with 63.99%, whilst in terms of mean absolute error both had very similar accuracy[17].

However, when we split the sample into two sub-periods a slightly different picture emerges. For 1923-1950, the dividend-price model provides the most accurate one step ahead

[17] A random walk model was also estimated but performed poorly. Results are available from the author upon request.

dividend growth forecasts. It's mean squared error of 53.82% is much smaller than that of the other models and its mean absolute error of 6.20% is also the lowest. The historical average model is second best whilst the dividend model produces relatively poor forecasts. Over 1951-2002, the historical average model provides the lowest forecast errors in terms of both mean squared error and mean absolute error. The dividend model follows closely behind, although it is perhaps surprising that the historical average model performs so well relative to the dividend model, when this regression model had demonstrated in-sample predictability over the 1951-2002 period. The dividend-price model provides the worst forecasts in terms of both mean squared error and mean absolute error for 1951-2002.

A crucial remaining issue is identifying if the forecasting accuracy of a particular model is statistically distinguishable from that of any other? This can be tested now by the Diebold-Mariano test (1995) developed under the null hypothesis that forecast a and forecast b are equally accurate forecasts. Our two sets of forecast errors e_{at} and e_{bt} provide the same quality of forecasts if E| d_t | = 0, where $d_t = e_{at}^2 - e_{bt}^2$ under the mean-squared error criterion. The test statistic is $S_1 = [\hat{V}(\bar{d})]^{-1/2}\bar{d}$, which follows a standard normal distribution. Harvey, Leybourne and Newbold (1997) advocate modifying the Diebold-Mariano test to improve its finite sample performance. Their modification improves the estimation of the variance of $\bar{d}$, proposing the new test statistic $S_1^* = \frac{n+1-2h+n^{-1}h(h-1)}{n} S_1$, where h is the number of steps ahead that are forecast. This new statistic, which follows the t-distribution, is confirmed by monte-carlo simulations to perform better than the original Diebold-Mariano statistic.

We use Harvey et al.'s (1997) modified Diebold-Mariano test for which results are reported in Panel A of Table 6. These tests indicate that at the one-year horizon the historical average model, which had the lowest mean-squared error, provides statistically significantly better forecasts than the dividend model for the full sample and for 1923-1950. However, the dividend-price model is found to provide forecasts that are statistically as accurate as the historical average, both for the full sample period and for 1923-1950 but are inferior for 1951-2002. The dividend-price model provides better forecasts than the dividend model for 1923-

1950, but the dividend model provides better forecasts than the dividend-price model for 1951-2002.

At the one-year horizon our results indicate that firstly there is statistically no better forecaster than the historical average model in any sample period. Secondly that investors in 1951 would know that the dividend growth model provides worst forecasts than the other models and thirdly it should have become clear to market participants by 2002 that the dividend-price ratio is no longer a useful forecaster of future dividend growth.

At the two-year horizon, Panel B of Table 5 reveals that the historical average model has the smallest mean-squared error and also the lowest mean absolute error both in the full sample and in the two sub-samples. On both criteria the dividend model is second best for the full sample and 1951-2001, although in terms of the mean-squared errors the dividend-price model is better than the dividend model over 1923-1950.

Panel B of Table 6 shows that in terms of the modified Diebold-Mariano tests over 1923-1950 all models are found to produce equally accurate forecasts at the two-year horizon. However, the historical average model is found to produce statistically superior forecasts to the dividend-price and dividend models for both the full sample period and 1951-2001. These results suggest that investors' looking to forecast dividend growth over the medium to long-term in 2001 should use the historical average model because it produces statistically better forecasts than the other models.

Our results support the hypothesis that there is no better forecaster of future dividend growth than its historical average. For forecasts of dividend growth at both the one year and two year horizon over the full sample the historical average model had the lowest mean-squared error and mean absolute error. Even during sub-periods, such as for 1923-1950 forecasts of one year dividend growth when the dividend-price model provided the lowest performance statistics, the statistical test of equal performance failed to reject the null that both the dividend-price and the historical average model provided forecasts of equal quality. Consequently our results broadly support Fama and French's supposition that the historical average is the best forecaster of future dividend growth.

The historical average market dividend growth rate stood at 1.2% p.a. in 1951, it was almost unchanged in 2002 nudging marginally higher to 1.3% p.a. The growth rate for 1951-2002 was 1.4% p.a. Thus, although the actual dividend growth rate might have been above investors' expectations, it was only by a negligible amount. This also suggests that the contention of our model that ex-post dividend growth estimated from 1951-2002 data was very close to what investors' would have reasonably expected in 1950. Thus we find further support for our dividend growth model (2) and its assertion that the true ex-ante equity premium was considerably below the ex-post equity premium over 1951-2002.

(iii) Have Expected Stock Returns Fallen During 1951-2002?

There are a number of reasons to suggest that the cost of equity capital has fallen over recent decades. For example, increasing openness and integration of international financial markets has perhaps enabled investors to seriously consider investing in countries they would've been reluctant to supply funds to 30 or 40 years ago (Stulz, 1999). In addition, greater opportunities for portfolio diversification also now exist due to developments in futures and derivatives markets. Bansal and Lundblad (2002) provide evidence that there has been a decline in the conditional volatility of global real cashflow growth rates indicating that the ex ante risk premium on the global market portfolio has dropped considerably. Another factor which may affect expected returns is the decline in transaction costs as pointed out by Aiyagari and Gertler (1993) and Jones (2000), which has effectively lowered the rate of return demanded by investors.

We examine dividend-price ratios to assess if, in fact, there has been any permanent change in the level of expected returns. Figure 1 shows that there does appear to have been a declining trend in the UK Barclays Dividend-price ratio since the 1980's. In every year since 1992 the UK Barclays dividend-price ratio has been below its historical average of 4.42%, reaching a post-war low of 2.06% in 1999. However, the decline in the UK dividend-price ratio does not appear to be as clearly prevalent or severe as the decline of the US dividend-price ratio. For example, Fama and French's sample finished in 2000, at which point the S&P 500 dividend-price ratio was at an all-time minima of 1.1% and even by the end of 2002 it had remained below 1.5%. Our conjecture is that part of the decline in the US dividend-price ratio can be assigned to a change in the payout policy of American firms that has not been paralleled by their British counterparts[18]. Nevertheless, it appears that since the early 1990's both the UK and the US dividend-price ratio have been fluctuating around a lower mean value. This is indicative that, in fact, the discount rate has fallen.

To test if there has been a permanent fall in the UK dividend-price ratio, we employ the Andrews-Quandt structural stability test. The Andrews-Quandt test assumes the break date is unknown, and calculates the Chow test for every possible break date[19], selecting the break date that maximises the F-test statistic. The null hypothesis is that there is no structural break, which for our application we are testing if there is any change in the mean of the dividend-price ratio.

As alluded to in section 2.(iii) there are several outlying observations in the Barclays dividend-price ratio. Outliers can seriously damage the ability of structural break tests to correctly detect the true date of the change. Therefore the dividend-price series which has the effects of these outliers neutralised (DPDUM), as outlined in (3) is used in our structural break tests. For our industry data we also correct for the 1974 outlier, induced by the first OPEC oil price shock using the same method as in (3).

[INSERT TABLE 7: AROUND HERE]

[INSERT FIGURE 4: AROUND HERE]

Panel A of Table 7 reveals that the Andrews-Quandt test fails to detect a significant break in the mean of the dividend-price ratio during the period 1902-1951. However, over the period 1952-2002, 1992 is selected as the break date with a p-value of 0.00, indicating that there has been a permanent decline in the mean of the dividend-price ratio series. Inspection of figure 4, demonstrates the line of best-fit given by (11) for the Barclays dividend-price

[18] This issue is discussed in more detail in Section 3

[19] The first and last 15% of observations are excluded in order that erroneous breaks are not found.

series fits the data well. This evidence lends support to the hypothesis that expected returns have fallen. The break tests indicate a downward shift in the mean of the dividend-price ratio by approximately 1.5% (the value of *B*), which is economically substantial particularly given the previous mean of the dividend-price ratio was about 4.5%.

$$\begin{aligned}&DPDUM = \alpha + \beta 1993DU + \varepsilon_t \\ &\text{Dividend-price ratio with 1993 break} = \alpha + \beta 1993DU \\ &1993DU \text{ is 0 for t } \leq \text{ 1992 and 1 for t } \geq \text{ 1993.}\end{aligned} \tag{8}$$

This finding is consistent with the study of Carlson, Pelz and Wohar (2002) who find support for a single break in the US quarterly dividend-price ratio during the early 1990's. Since the timing of the breaks in both markets coincide almost exactly this is suggestive that perhaps there were common factors at work in both markets that lead to such shifts.

[INSERT FIGURE 5: AROUND HERE]

Panel B of Table 7 suggests the timing of the downward mean break of the Datastream market dividend-price ratio is almost exactly the same as that using the Barclays Data being just one year later in 1993. We also find support for a statistically significant downward mean break in a majority of the industry dividend-price ratios. In four of the eight industries this occured in 1992 or 1993, while the non-cyclical consumer goods industry had a statistically significant downward break after 1984, a little before the market as a whole.

$$\begin{aligned}&\text{Dividend-price ratio with 1994 break} = \alpha_i + \beta_i 1994DU \\ &1994DU \text{ is 0 for t } \leq \text{ 1993 and 1 for t } \geq \text{ 1994.}\end{aligned} \tag{9}$$

In figure 5 we plot the industry dividend-price ratios with fitted lines given by (12) which impose a downward mean break following 1993. The timing is chosen to coincide with the break date of the Datastream market dividend-price ratio. In all industries the break is downward as expected. Only in the cases of general industries and cyclical consumer goods does visual inspection of figure 5 suggest that they haven't moved to a lower mean by the end of the sample period, particularly when compared to the 1970's and 1980's. However, only the behaviour of the general industries sector is erroneous since the finding of no clear break in the cyclical consumer goods dividend-price ratio is precisely what we should expect given that this was the single industry for which the dividend growth and average return model produced similar return estimates.

Our evidence broadly supports the notion that future cashflows are being discounted by investors at a lower rate. This case is strongest for the market indices as a whole, however we generally find support for this supposition at the industry level as well. If the discount rate has fallen then rationally valued equities would witness a run-up in prices during the late 20th Century, due to factors not anticipated by investors[20]. Consequently realised historical returns could be substantially above investors expectations and the true *ex-ante* equity premia might be considerably below the 6-8% estimates based upon historical average returns.

We propose this fall in expected returns could potentially be attributed to several factors: greater openness of international financial markets, increased opportunities for portfolio diversification or declining transaction and information costs. We leave the avenue open for further research to attempt to pinpoint the exact cause of the decline in expected returns. Our main conclusion is purely that there is good reason to believe that expected stock returns have declined towards the end of the 20th Century. Such a decline in expected returns could rationally explain why stock prices rose so rapidly during the 1990's and why realised returns over the period 1951-2000 have exceeded investors' expected returns as proxied for by the dividend growth model.

5. CONCLUSION

The empirical work in this paper suggests that the annual expected market equity premium was most likely to be in the region of 4.60%, our estimate of the dividend growth model rather than the 7.79% investors' actually received. We document for the overall market that the pace of capital gains has been dramatically higher since 1951 than the period prior

[20] Since if there is a fall in expected returns then future payoffs are discounted at a lower rate meaning that the price of the asset must rise. If the fall in expected returns is unanticipated; the price rise is simply good fortune caused by the decline in expected returns.

preceding 1950. Our industry data also indicates that capital gains have been high since 1966 across economic sectors, with 6 of the 8 industries reporting an annual rate of capital gain of above 4%. Such large capital gains are thought to have been largely unanticipated by economic agents and certainly it cannot be justified by in-sample growth of dividends over the latter part of the 20th Century.

We contend that the average stock return over the latter part of the 20th Century was above investors' expectations and investigate if this was due to either a) expectations of higher growth rates of fundamentals post-2002 or b) a decline in the discount rate. Some evidence of in-sample dividend growth predictability at one or two year horizons is discovered. Since 1951, lagged dividend growth is found to be significantly and positively related to dividend growth at the market level. However, since 2000 dividend growth has been below its long-run average; thus, this model suggests investors should expect lower than average dividend growth in the future. At the industry level pooled regressions indicate only a tiny portion of future dividend growth can be predicted in-sample. Out-of-sample the historical dividend growth rate is the best forecaster of future dividend growth, especially since 1951 and especially for horizons longer than one year. Since the historical dividend growth is the best forecaster then investors should expect dividend growth rates to be approximately the same as in the past. In short, we find no evidence whatsoever to support the view that future dividend growth should be any higher than its historical average.

We do find support for the hypothesis that expected returns have fallen. There does appear to have been a permanent decline in the market dividend-price ratio as identified by the structural stability tests. Our evidence also suggests that this occurred across a range of economic sub-sectors, rather than simply being confined to or caused by extraordinary behaviour in a single industry. This indicates that the expected unconditional equity return has fallen. We propose that this is the primary cause of the high level of capital growth witnessed in recent decades, which we believe to have been largely unanticipated by potential investors. An important implication is that unless UK investors believe that valuation ratios will fall substantially again, they should expect lower returns in the future.

REFERENCES

Aiygari, S. and M. Gertler (1991), ‘Asset Returns with Transaction Costs and Uninsured Individual Risk’, *Journal of Monetary Economics,* Vol. 27, No.3 (June), pp.311-31.

Ang, A. (2002), ‘Characterizing the Ability of Dividend Yields to Predict Future Dividends in Log-Linear Present Value Models’, Working Paper (Columbia University).

Ap Gwilym, O., J. Seaton and S. Thomas (2004), ‘Dividends, Earnings, the Payout Ratio and Returns: A Century of Evidence from the US and UK’, Working Paper (University of Southampton, January).

Arnott, R. and P.Bernstein (2002), ‘What Risk Premium is ‘Normal’?’, *Financial Analysts Journal*, Vol.58, No.2 (March/April), pp.64-85.

Banerjee, A., R. Lumsdaine and J. Stock (1992), ‘Recursive and Sequential Tests of the Unit-Root and Trend-Break Hypotheses: Theory and International Evidence’, *Journal of Business and Economic Statistics*, Vol.10, No.3 (July), pp.271-87.

Bansal, R. and C. Lundblad (2002), ‘Market Efficiency, Asset Returns, and the Size of the Risk Premium in Global Equity Markets’, *Journal of Econometrics*, Vol.109, No.2 (April), pp.195-237.

Black, F. (1993), ‘Estimating Expected Return’, *Financial Analysts Journal*, Vol. 49, No.5 (September / October), pp.36-8.

Bond, T., M. Capleton, F. Cleary and S. Kochugovindan (2003), Barclays Equity Gilt Study 2003 (48th Edition), London.

Brown, S., W. Goetzmann and S. Ross (1995), ‘Survival’, *Journal of Finance*, Vol.50, No.3 (July), pp.853-73.

Campbell, J. and R. Shiller (1988), ‘Stock Prices, Earnings and Expected Dividends’, *Journal of Finance*, Vol.43, No.3 (July), pp.661-76.

Campbell, J. (1991), ‘A Variance Decomposition for Stock Returns’, *Economic Journal*, Vol.101, No.2 (March), pp.157-79.

Carlson, J., E. Pelz and M. Wohar (2002), ‘Will Valuation Ratios Revert to Their Historical Means? Some Evidence From Breakpoint Tests’, *Journal of Portfolio Management*, Vol.28, No.4, (Summer), pp.23-35.

Claus, J. and J. Thomas (2001), ‘Equity Premia as low as Three Percent? Evidence from Analysts’ Earnings Forecasts for Domestic and International Markets’, *Journal of Finance*, Vol.56, No.5 (October), pp.1629-66.

Cochrane, J. (1994), ‘Permanent and Transitory Components of GNP and Stock Prices’, *Quarterly Journal of Economics*, Vol. 109, No.1 (February 1994), pp.241-65.

Diebold, F. and R. Mariano (1995), ‘Comparing Predictive Accuracy’, *Journal of Business and Economic Statistics*, Vol.13, No.3 (July), pp.253-63.

Dimson, E. and P. Marsh (2001), ‘U.K. Financial Market Returns 1955-2000’, *Journal of Business*, Vol.74, No.1 (January), pp.1-31.

Dimson, E., P. Marsh and M. Staunton (2003), ‘Global Evidence on the Equity Risk Premium’, *Journal of Applied Corporate Finance*, Vol.15, No.4 (Fall), pp.27-38.

Fama, E. and K. French (1988), ‘Dividend Yields and Expected Stock Returns’, *Journal of Financial Economics*, Vol.22, No.1 (October), pp.3-27.

Fama, E. and K. French (2001), ‘Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?’, *Journal of Finance Economics*, Vol.60, No.1 (April), pp.3-44.

Fama, E. and K. French (2002), ‘The Equity Premium’, *Journal of Finance*, Vol.57, No.2 (April), pp.637-59.

Granger, C. and P. Newbold (1974), ‘Spurious Regressions in Econometrics’, *Journal of Econometrics*, Vol. 2, No.2 (July), pp.111-120

Grullon, G. and R. Michaely (2002), ‘Dividends, Share Repurchases and the Substitution Hypothesis’, *Journal of Finance*, Vol.57, No.4 (August), pp.1649-84.

Harvey D, S. Leybourne and P. Newbold (1997), ‘Testing the Equality of Prediction Mean Squared Errors’, *International Journal of Forecasting*, Vol.13, No.2 (June), pp.281-91.

Jagannathan, R., E. McGrattan and A. Scherbina (2001), ‘The Declining US Equity Premium’, Working Paper (National Bureau of Economic Research, Washington)

Jones, C. (2000), ‘A Century of Stock Market Liquidity and Trading Costs’, Working paper (Columbia University)

Jorion, P. and W. Goetzmann (1999), ‘Global Stock Markets in the 20th Century’, *Journal of Finance*, Vol.54, No.3 (June), pp.953-80.

Lettau, M. and S. Ludvigson (2005), ‘Expected Returns and Expected Dividend Growth’, *Journal of Financial Economics*, Vol.76, No.3 (June), pp.583-626.

Lintner, J. (1956), ‘Distribution of Incomes of Corporations Among Dividends, Retained Earnings and Taxes’, *American Economic Review*, Vol.46, No.2 (May), pp.97-113.

Mehra, R. and E. Prescott (1985), ‘The Equity Premium: A Puzzle’, *Journal of Monetary Economics*, Vol.15, No.2 (March), pp.145-61.

Morgan, G. and S. Thomas (1998), ‘Taxes, Dividend Yields and Returns in the UK Equity Market’, *Journal of Banking and Finance*, Vol.22, No.4 (May), pp.405-23.

Rau, P. and T. Vermaelen (2002), ‘Regulation, Taxes, and Share Repurchases in the United Kingdom’, *Journal of Business*, Vol.75, No.2 (April), pp.245-82.

Rietz, T. (1988), ‘The Equity Risk Premium: A Solution?’, *Journal of Monetary Economics*, Vol. 22, No.1 (July), pp.117-31.

Stulz, R. (1999), ‘Globalization, Corporate Finance and The Cost of Capital’, *Journal of Applied Corporate Finance*, Vol.12, No.3 (Fall), pp.8-25.

Welch, I. (2000), ‘Views of Financial Economists On the Equity Premium And Other Issues’, *Journal of Business*, Vol.73, No.4 (October), pp.501-37.

Table 1: UK & US Market Estimates of Equity Premia and Related Statistics

Panel A: UK Market Estimates of Equity Premia and Related Statistics

UK Data	Variable	Inf_t	F_t	D_t / P_{t-1}	GD_t	GP_t	RD_t	R_t	RXD_t	RX_t
1901-2002	Mean	4.21	1.18	4.62	0.98	2.25	5.60	6.87	4.41	5.68
	St. Dev	6.96	6.54	1.21	16.12	19.80	16.41	20.47	17.37	21.02
1901-1950	Mean	2.20	0.82	4.48	0.56	-0.17	5.03	4.31	4.22	3.49
	St. Dev	8.07	8.49	0.98	22.00	14.43	22.34	14.93	23.70	15.27
1951-2002	Mean	6.14	1.53	4.75	1.39	4.57	6.14	9.33	4.60	7.79
	St. Dev	5.06	3.89	1.39	7.04	23.77	7.28	24.56	7.59	25.34
1966-2002	Mean	6.97	2.09	4.60	0.49	4.28	5.09	8.88	3.00	6.79
	St. Dev	5.44	3.95	1.54	6.82	24.69	7.04	25.57	7.20	26.56

Panel B: US Market Estimates of Equity Premia and Related Statistics

US Data	Variable	Inf_t	F_t	D_t / P_{t-1}	GD_t	GP_t	RD_t	R_t	RXD_t	RX_t
1872-2000	Mean	2.16	3.24	4.70	2.08	4.11	6.78	8.81	3.54	5.57
	St. Dev	7.51	8.48	1.39	12.37	17.83	12.56	18.03	13.00	18.51
1872-1950	Mean	0.99	3.90	5.34	2.74	2.96	8.07	8.30	4.17	4.40
	St. Dev	9.11	10.63	1.12	15.28	18.48	15.41	18.72	16.02	19.57
1951-2000	Mean	4.00	2.19	3.70	1.05	5.92	4.74	9.62	2.55	7.43
	St. Dev	3.11	2.46	1.17	5.09	16.77	5.21	17.03	5.62	16.73

Notes:
All values reported are annual percentages. Panel A covers UK Data from the Barclays Equity-Gilt Study. Panel B covers US Data reported in Fama & French (2002). Inf_t is the rate of inflation for year t, $(CPI_t / CPI_{t-1}) - 1$. F_t is the real return on Treasury Bills. d_t and p_t are nominal dividends and prices at time t. D_t / P_{t-1} is the real dividend yield, defined as: $(d_t / p_{t-1})*(CPI_{t-1} / CPI_t)$. GD_t is the real growth of dividends for t, $(d_t / d_{t-1})*(CPI_{t-1} / CPI_t) - 1$. GP_t is the real capital gain for t, $(p_t / p_{t-1})*(CPI_{t-1} / CPI_t)$. RD_t is the dividend growth model estimate of equity returns for t, $(D_t / P_{t-1}) + GD_t$. RXD_t is the dividend growth model estimate of the equity premium for t, $RD_t - F_t$. R_t is the realised return at time t, $(D_t / P_{t-1}) + GP_t$. RX_t is the realised equity premium at time t, $R_t - F_t$.

Table 2: UK Industry estimates of Equity Premia and Related Statistics 1966-2002

Industry	**Variable**	**Inf_t**	**F_t**	**D_t / P_{t-1}**	**GD_t**	**GP_t**	**RD_t**	**R_t**	**RXD_t**	**RX_t**
Total Market	Mean	7.03	1.61	4.62	1.22	5.00	5.84	9.62	4.24	8.02
	St. Dev	5.41	3.89	1.32	6.56	24.55	6.63	25.27	6.08	26.10
Resources	Mean	7.03	1.61	5.15	2.28	7.10	7.43	12.25	5.82	10.64
	St. Dev	5.41	3.89	1.81	15.93	31.95	16.33	32.88	16.38	33.65
Basic Industries	Mean	7.03	1.61	5.31	-1.31	2.18	4.00	7.49	2.39	5.89
	St. Dev	5.41	3.89	1.31	9.77	26.95	9.51	27.69	8.81	28.60
General Industrials	Mean	7.03	1.61	4.42	0.56	4.20	4.98	8.63	3.37	7.02
	St. Dev	5.41	3.89	1.47	7.15	27.81	6.82	28.71	6.59	30.08
Cyclical Consumer goods	Mean	7.03	1.61	5.64	0.86	0.64	6.51	6.28	4.90	4.67
	St. Dev	5.41	3.89	2.15	14.37	30.73	14.58	31.64	14.82	32.25
Non-Cyclical Consumer goods	Mean	7.03	1.61	4.54	2.90	7.02	7.44	11.56	5.83	9.96
	St. Dev	5.41	3.89	1.40	6.68	25.83	6.60	26.45	5.86	26.95
Cyclical Services	Mean	7.03	1.61	4.25	0.52	4.24	4.78	8.50	3.17	6.89
	St. Dev	5.41	3.89	1.37	6.61	23.27	6.39	23.92	5.96	24.88
Non-Cyclical Services	Mean	7.03	1.61	3.37	8.00	12.25	11.37	15.62	9.77	14.01
	St. Dev	5.41	3.89	1.22	28.48	35.19	29.00	35.70	28.50	36.06
Financials	Mean	7.03	1.61	4.72	3.22	6.12	7.94	10.83	6.33	9.23
	St. Dev	5.41	3.89	1.30	5.86	26.10	5.72	26.70	4.64	27.29

Notes:
All values reported are annual percentages. Inf_t is the rate of inflation for year t, $(CPI_t / CPI_{t-1}) - 1$. F_t is the real return on Treasury Bills. d_t and p_t are nominal dividends and prices at time t. D_t / P_{t-1} is the real dividend yield, defined as: $(d_t / p_{t-1})*(CPI_{t-1} / CPI_t)$. GD_t is the real growth of dividends for t, $(d_t / d_{t-1})*(CPI_{t-1} / CPI_t) - 1$. GP_t is the real capital gain for t, $(p_t / p_{t-1})*(CPI_{t-1} / CPI_t)$. RD_t is the dividend growth model estimate of equity returns for t, $(D_t / P_{t-1}) + GD_t$. RXD_t is the dividend growth model estimate of the equity premium for t, $RD_t - F_t$. R_t is the realised return at time t, $(D_t / P_{t-1}) + GP_t$. RX_t is the realised equity premium at time t, $R_t - F_t$.

Table 3: In-sample Predictability of the Real Dividend Growth Rate Using Barclays Data

Panel A: Predicting Dividend Growth with all Potential Predictor Variables

Sample Period: Pre-1950

Y	Sample	Variable	Constant	D_{t-1} / P_{t-1}	GD_{t-1}	GD_{t-2}	GD_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	F_{t-1}	R^2	F
GD_t	1904-1950	Coefficient	0.14	-5.22	-0.17	-0.12	-0.31	0.17	0.24	0.07	0.03	0.28	1.81
		t-value	0.72	-1.17	-0.91	-0.63	-1.95	0.76	1.01	0.32	1.61		[0.105]
$GD2_t$	1904-1950	Coefficient	0.04	-1.07	-0.17	-0.24	-0.16	0.26	0.19	0.05	-0.08	0.26	1.64
		t-value	0.27	-0.33	-1.29	-1.74	-1.31	1.69	0.87	0.36	-0.20		[0.147]
$GD5_t$	1904-1950	Coefficient	-0.01	-0.42	-0.05	-0.07	-0.03	0.12	0.01	-0.04	0.01	0.16	0.88
		t-value	-0.15	-0.29	-0.82	-1.03	-0.52	1.74	0.17	-0.52	1.56		[0.539]

Sample Period: Post-1951

Y	Sample	Variable	Constant	D_{t-1} / P_{t-1}	GD_{t-1}	GD_{t-2}	GD_{t-3}	R_{t-1}	R_{t-2}	R_{t-3}	F_{t-1}	R^2	F
GD_t	1951-2002	Coefficient	-0.04	0.97	0.19	0.04	-0.10	0.13	0.07	0.01	0.00	0.28	2.13
		t-value	-0.73	0.99	1.15	0.28	-0.74	2.45	1.27	0.20	-0.78		[0.053]
$GD2_t$	1951-2001	Coefficient	-0.08	1.92	0.09	-0.09	0.04	0.14	0.07	0.03	0.00	0.25	1.77
		t-value	-1.70	2.08	0.60	-0.68	0.35	2.84	1.41	0.68	-0.81		[0.111]
$GD5_t$	1951-1998	Coefficient	-0.14	2.88	0.01	0.10	0.05	0.12	0.06	0.02	0.00	0.33	2.35
		t-value	-3.53	3.81	0.11	0.90	0.58	3.24	1.84	0.76	-0.04		[0.036]*

Notes:

The regression intercept is constant and t-value is the regression co-efficient divided by its standard error.

The nominal value of the equity price index and the nominal dividend paid at the end of year t are d_t and p_t. The price level at the end of year t is CPI_t.

The real one year dividend growth rate for year t is $GD_t = (d_t/d_{t-1})*(CPI_{t-1}/CPI_t)-1$.

The real two-year average dividend growth rate is $GD2_t = [(d_{t+1}/d_{t-1})*(CPI_{t-1}/CPI_{t+1})-1]/2$

The real five-year average dividend growth rate is $GD5_t = [(d_{t+4}/d_{t-1})*(CPI_{t-1}/CPI_{t+4})-1]/5$

D_{t-1} / P_{t-1} is the real dividend-price ratio at the end of period t-1. R_{t-1} is the realised return at time t-1. F_{t-1} is the real return on Treasury Bills during time t-1.

Table 3 (continued): In-sample Predictability of the Real Dividend Growth Rate Using Barclays Data

Panel B: Predicting Dividend Growth with the Dividend-Price ratio

Sample Period: Pre-1950

Y	Sample	Variable	Constant	D_{t-1} / P_{t-1}	R^2	F
GD_t	1904-1950	Coefficient	0.36	-7.95	0.15	8.78
		t-value	2.93	-2.96		[0.005]**
$GD2_t$	1904-1950	Coefficient	0.25	-5.32	0.14	7.50
		t-value	2.77	-2.74		[0.009]**
$GD5_t$	1904-1950	Coefficient	0.04	-0.97	0.02	1.15
		t-value	1.07	-1.07		[0.290]

Sample Period: Post-1951

Y	Sample	Variable	Constant	D_{t-1} / P_{t-1}	R^2	F
GD_t	1951-2002	Coefficient	0.04	-0.66	0.01	0.65
		t-value	1.15	-0.81		[0.423]
$GD2_t$	1951-2001	Coefficient	0.01	0.16	0.00	0.05
		t-value	0.24	0.23		[0.817]
$GD5_t$	1951-1998	Coefficient	-0.03	1.01	0.06	3.16
		t-value	-1.10	1.78		[0.082]

Panel C: Predicting Dividend Growth with lagged Dividend Growth

Sample Period: Pre-1950

Y	Sample	Variable	Constant	GD_{t-1}	R^2	F
GD_t	1904-1950	Coefficient	0.02	-0.18	0.03	1.52
		t-value	0.48	-1.23		[0.224]
$GD2_t$	1904-1950	Coefficient	0.01	-0.14	0.04	2.05
		t-value	0.51	-1.43		[0.159]
$GD5_t$	1904-1950	Coefficient	0.00	-0.04	0.02	0.73
		t-value	0.17	-0.85		[0.398]

Sample Period: Post-1951

Y	Sample	Variable	Constant	GD_{t-1}	R^2	F
GD_t	1951-2002	Coefficient	0.01	0.36	0.13	7.26
		t-value	0.939	2.69		[0.010]**
$GD2_t$	1951-2001	Coefficient	0.01	0.22	0.07	3.51
		t-value	1.43	1.87		[0.067]
$GD5_t$	1951-1998	Coefficient	0.01	0.12	0.03	1.54
		t-value	2.22	1.24		[0.221]

Notes:

The regression intercept is constant and t-value is the regression co-efficient divided by its standard error.

The nominal value of the equity price index and the nominal dividend paid at the end of year t are d_t and p_t. The price level at the end of year t is CPI_t.

The real one year dividend growth rate for year t is $GD_t = (d_t/d_{t-1})*(CPI_{t-1}/CPI_t)-1$.

The real two-year average dividend growth rate is $GD2_t = [(d_{t+1}/d_{t-1})*(CPI_{t-1}/CPI_{t+1})-1]/2$

The real five-year average dividend growth rate is $GD5_t = [(d_{t+4}/d_{t-1})*(CPI_{t-1}/CPI_{t+4})-1]/5$

D_{t-1} / P_{t-1} is the real dividend-price ratio at the end of period t-1. R_{t-1} is the realised return at time t-1. F_{t-1} is the real return on Treasury Bills during time t-1.

Table 4: In-sample Predictability of Real Dividend Growth Using Panel Industry Data

Panel A: Pooled OLS Regression of 8 Industries Predicting Dividend Growth with the Dividend-Price Ratio

Sample Period: Post-1966

Y	Sample	Variable	Constant	D_{t-1} / P_{t-1}	R^2
GD_t	1966-2002	Coefficient	0.02	-0.02	0.00
		t-value	2.31	-0.74	
$GD2_t$	1966-2001	Coefficient	0.02	0.03	0.00
		t-value	2.01	1.58	
$GD5_t$	1966-1998	Coefficient	0.03	-0.03	0.00
		t-value	1.81	-0.54	

Panel B: Pooled OLS Regression of 8 Industries Predicting Dividend Growth with lagged Dividend Growth

Sample Period: Post-1966

Y	Sample	Variable	Constant	GD_{t-1}	R^2
GD_t	1966-2002	Coefficient	0.02	-0.07	0.01
		t-value	2.52	-0.55	
$GD2_t$	1966-2001	Coefficient	0.02	0.14	0.02
		t-value	2.21	4.36	
$GD5_t$	1966-1998	Coefficient	0.02	0.11	0.02
		t-value	1.77	3.98	

Notes:
The regression intercept is constant and t-value is the regression co-efficient divided by its standard error. The nominal value of the equity price index and the nominal dividend paid at the end of year t are d_t and p_t. The price level at the end of year t is CPI_t. The real one year dividend growth rate for year t is $GD_t = (d_t/d_{t-1})*(CPI_{t-1}/CPI_t)-1$. The real two-year average dividend growth rate is $GD2_t = [(d_{t+1}/d_{t-1})*(CPI_{t-1}/CPI_{t+1})-1]/2$. The real five-year average dividend growth rate is $GD5_t = [(d_{t+4}/d_{t-1})*(CPI_{t-1}/CPI_{t+4})-1]/5$. D_{t-1} / P_{t-1} is the real dividend-price ratio at the end of period t-1. Rt-1 is the realised return at time t-1.

Table 5: Barclays Annual Data: Forecasting Dividend Growth

Panel A: Forecasting Performance of Models: One Year Dividend Growth

1923-2002

Statistic	Dividend-Price Model	Dividend Model	Historical Av. Model
Mean Squared Error	61.47%	63.99%	55.60%
Mean Error	0.57%	0.46%	0.31%
Mean Absolute Error	6.37%	6.27%	5.92%
Root Mean Squared Error	7.84%	8.00%	7.46%

1923-1950

Statistic	Dividend-Price Model	Dividend Model	Historical Av. Model
Mean Squared Error	53.82%	82.41%	67.17%
Mean Error	1.86%	1.63%	0.86%
Mean Absolute Error	6.20%	6.86%	6.55%
Root Mean Squared Error	7.34%	9.08%	8.20%

1951-2002

Statistic	Dividend-Price Model	Dividend Model	Historical Av. Model
Mean Squared Error	65.58%	52.90%	49.37%
Mean Error	-0.13%	-0.14%	0.01%
Mean Absolute Error	6.46%	5.86%	5.58%
Root Mean Squared Error	8.10%	7.27%	7.03%

Panel B: Forecasting Performance of Models: Two Year Dividend Growth

1923-2001

Statistic	Dividend-Price Model	Dividend Model	Historical Av. Model
Mean Squared Error	63.49%	47.16%	37.35%
Mean Error	0.46%	0.52%	0.22%
Mean Absolute Error	6.31%	5.46%	5.02%
Root Mean Squared Error	7.97%	6.87%	6.11%

1923-1950

Statistic	Dividend-Price Model	Dividend Model	Historical Av. Model
Mean Squared Error	50.31%	54.50%	39.62%
Mean Error	1.37%	1.44%	0.82%
Mean Absolute Error	6.04%	5.59%	5.06%
Root Mean Squared Error	7.09%	7.38%	6.29%

1951-2001

Statistic	Dividend-Price Model	Dividend Model	Historical Av. Model
Mean Squared Error	70.73%	43.12%	36.10%
Mean Error	-0.03%	0.01%	-0.11%
Mean Absolute Error	6.45%	5.39%	5.00%
Root Mean Squared Error	8.41%	6.57%	6.01%

Table 6: Barclays Annual Data: Forecasting Dividend Growth

Panel A: Modified Diebold Mariano Tests of Equal Forecast Accuracy: One Year Dividend Growth

Sample	Model 1	Model 2	Test Statistic	Critical Value	Inference
1923-2002	Historical	Dividend	-1.83	-1.67	Historical model is more accurate
1923-1950	Historical	Dividend	-1.70	-1.70	Historical model is more accurate
1951-2002	Historical	Dividend	-0.84	-1.70	Both models have equal accuracy

Sample	Model 1	Model 2	Test Statistic	Critical Value	Inference
1923-2002	Historical	Dividend-Price	-0.88	-1.67	Both models have equal accuracy
1923-1950	Historical	Dividend-Price	1.02	-1.70	Both models have equal accuracy
1951-2002	Historical	Dividend-Price	-2.25	-1.70	Historical model is more accurate

Sample	Model 1	Model 2	Test Statistic	Critical Value	Inference
1923-2002	Dividend	Dividend-Price	0.23	-1.67	Both models have equal accuracy
1923-1950	Dividend-Price	Dividend	-1.72	-1.70	Dividend-Price model is more accurate
1951-2002	Dividend	Dividend-Price	-1.77	-1.70	Dividend model is more accurate

Panel B: Modified Diebold Mariano Tests of Equal Forecast Accuracy: Two Year Dividend Growth

Sample	Model 1	Model 2	Test Statistic	Critical Value	Inference
1923-2001	Historical	Dividend	-2.37	-1.67	Historical model is more accurate
1923-1950	Historical	Dividend	-1.45	-1.70	Both models have equal accuracy
1951-2001	Historical	Dividend	-2.29	-1.70	Historical model is more accurate

Sample	Model 1	Model 2	Test Statistic	Critical Value	Inference
1923-2001	Historical	Dividend-Price	-2.13	-1.67	Historical model is more accurate
1923-1950	Historical	Dividend-Price	0.43	-1.70	Both models have equal accuracy
1951-2001	Historical	Dividend-Price	-2.82	-1.70	Historical model is more accurate

Sample	Model 1	Model 2	Test Statistic	Critical Value	Inference
1923-2001	Dividend	Dividend-Price	-0.40	-1.67	Both models have equal accuracy
1923-1950	Dividend-Price	Dividend	-1.63	-1.70	Both models have equal accuracy
1951-2001	Dividend	Dividend-Price	-1.81	-1.70	Dividend model is more accurate

Table 7: Andrews-Quandt Structural Break Tests

Panel A: Structural breaks in the Barclays Market Dividend-price ratio

Dependent Variable	Sample Period	Break Date	Test Statistic	p-value	Inference
Barclays DPDUM	1902-1951	1919	1.94	0.80	Structural Break is statistically insignificant
Barclays DPDUM	1952-2002	1992	20.45	0.00	Structural Break is statistically significant

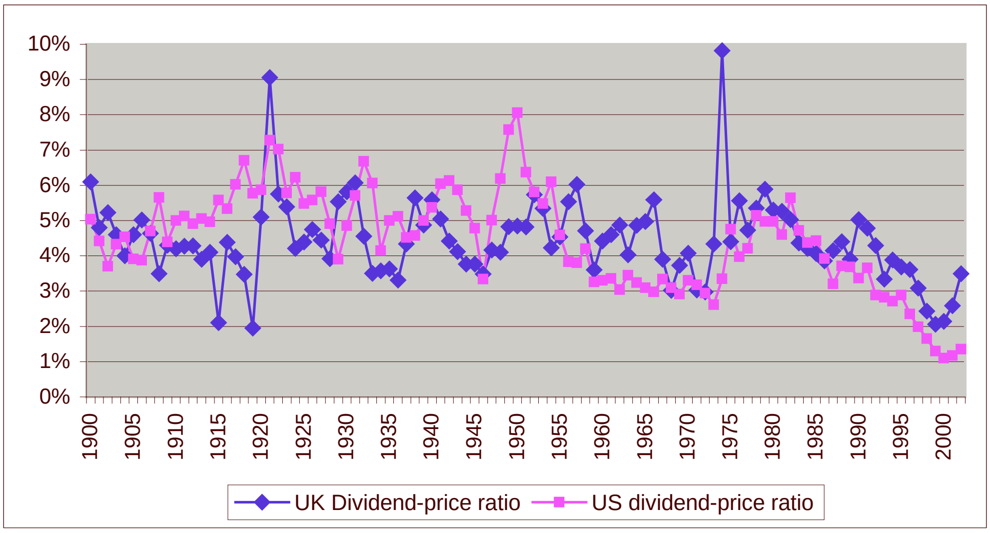
Panel B: Structural breaks in the Datastream Industry Dividend-price ratios

Dependent Variable	Sample Period	Break Date	Test Statistic	p-value	Inference
Total Market	1966-2002	1993	14.93	0.003	Structural Break is statistically significant
Resources	1966-2002	1993	11.98	0.010	Structural Break is statistically significant
Basic Industries	1966-2002	1993	4.76	0.274	Structural Break is statistically insignificant
General Industries	1966-2002	1993	4.89	0.259	Structural Break is statistically insignificant
Cyclical Consumer Goods	1966-2002	1992	7.51	0.082	Structural Break is statistically significant*
Non-cyclical Consumer Goods	1966-2002	1984	10.85	0.018	Structural Break is statistically significant
Cyclical Services	1966-2002	1992	15.22	0.002	Structural Break is statistically significant
Non-cyclical Services	1966-2002	1973	8.70	0.048	Structural Break is statistically significant
Financials	1966-2002	1993	10.93	0.017	Structural Break is statistically significant

* at the 10% significance level

Notes:
All series have been adjusted for the effects of outliers by inserting zero-one dummies for the specific dates.
In the case of the Industry dividend-price ratios they have a dummy for the 1974 stock market crash.
The Barclays series has dummies for 1915, 1919, 1921 and 1974.

Figure 1: The UK and the US Dividend-price ratio: 1900-2002



Notes: UK data is from Barclays equity-gilt study, US data is from Robert Shiller's website.

Figure 2: Plot of Dickey Fuller test statistics calculated using a 40 year rolling window

Figure 2A: Rolling 40 year Dickey Fuller Tests on the UK Dividend-Price Ratio

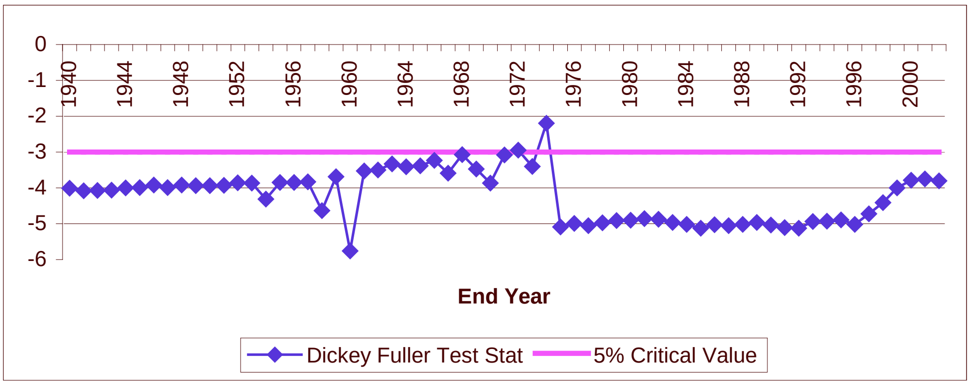


Figure 2B: Rolling 40 year Dickey Fuller Tests on Series DPDUM, the UK Dividend-Price Ratio adjusted by use of dummy variables to account for outlying observations in the series

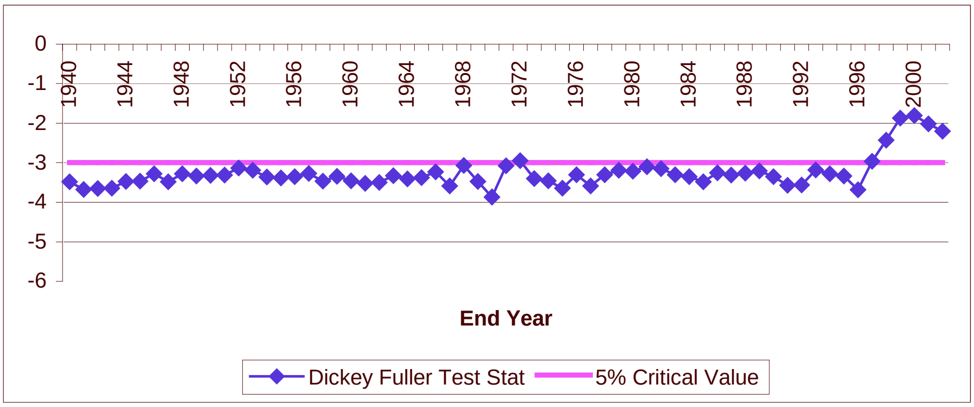


Figure 3: Time-variation in Beta Co-efficient.

Figure 3A: Forecasting 1 Year Dividend Growth: Time-variation in Beta.

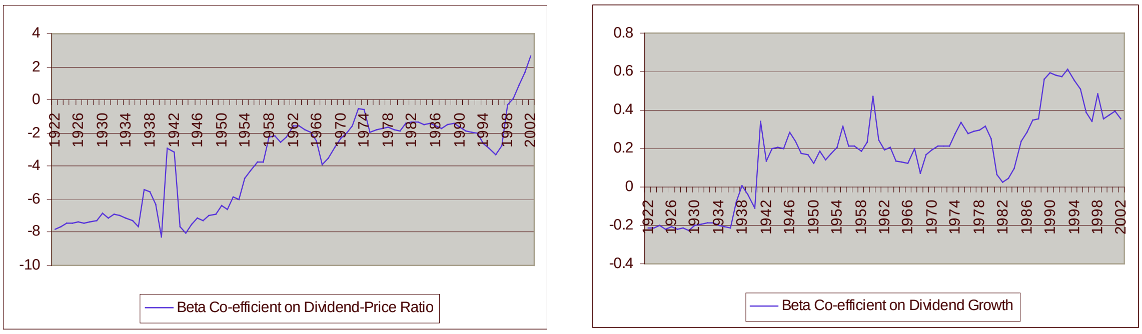
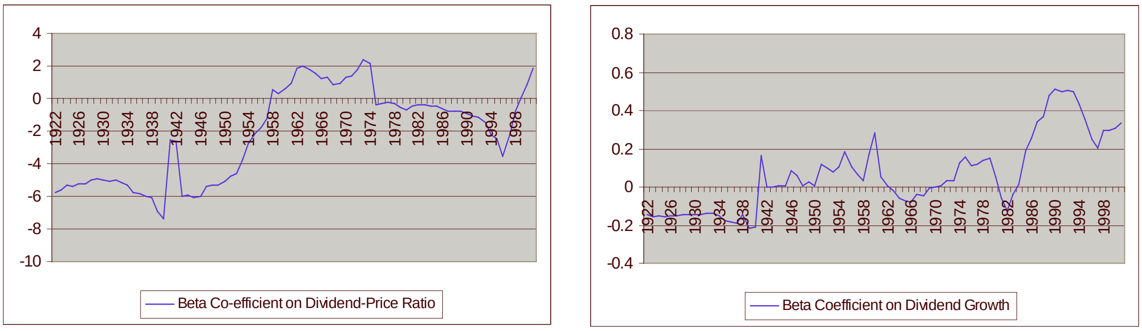
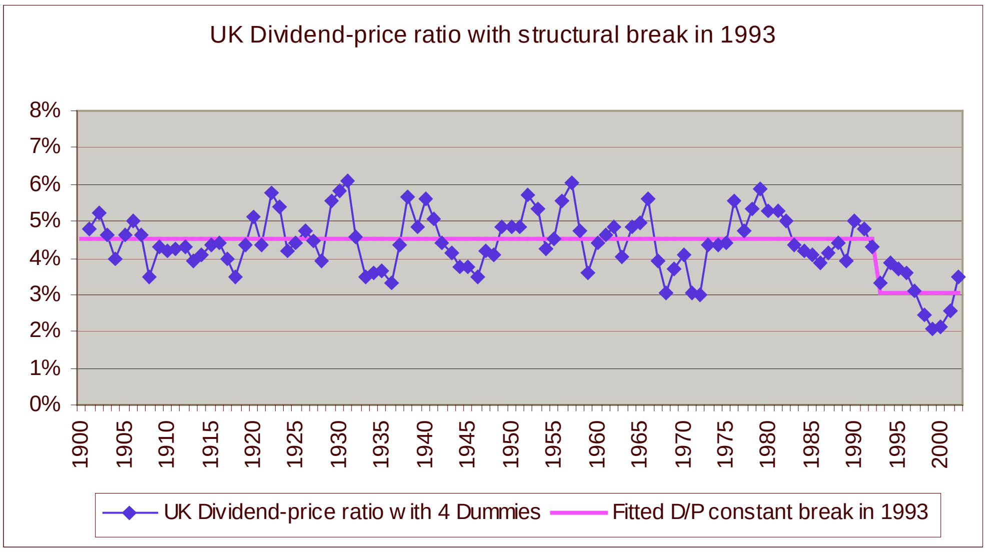


Figure 3B: Forecasting 2 Year Dividend Growth: Time-variation in Beta.



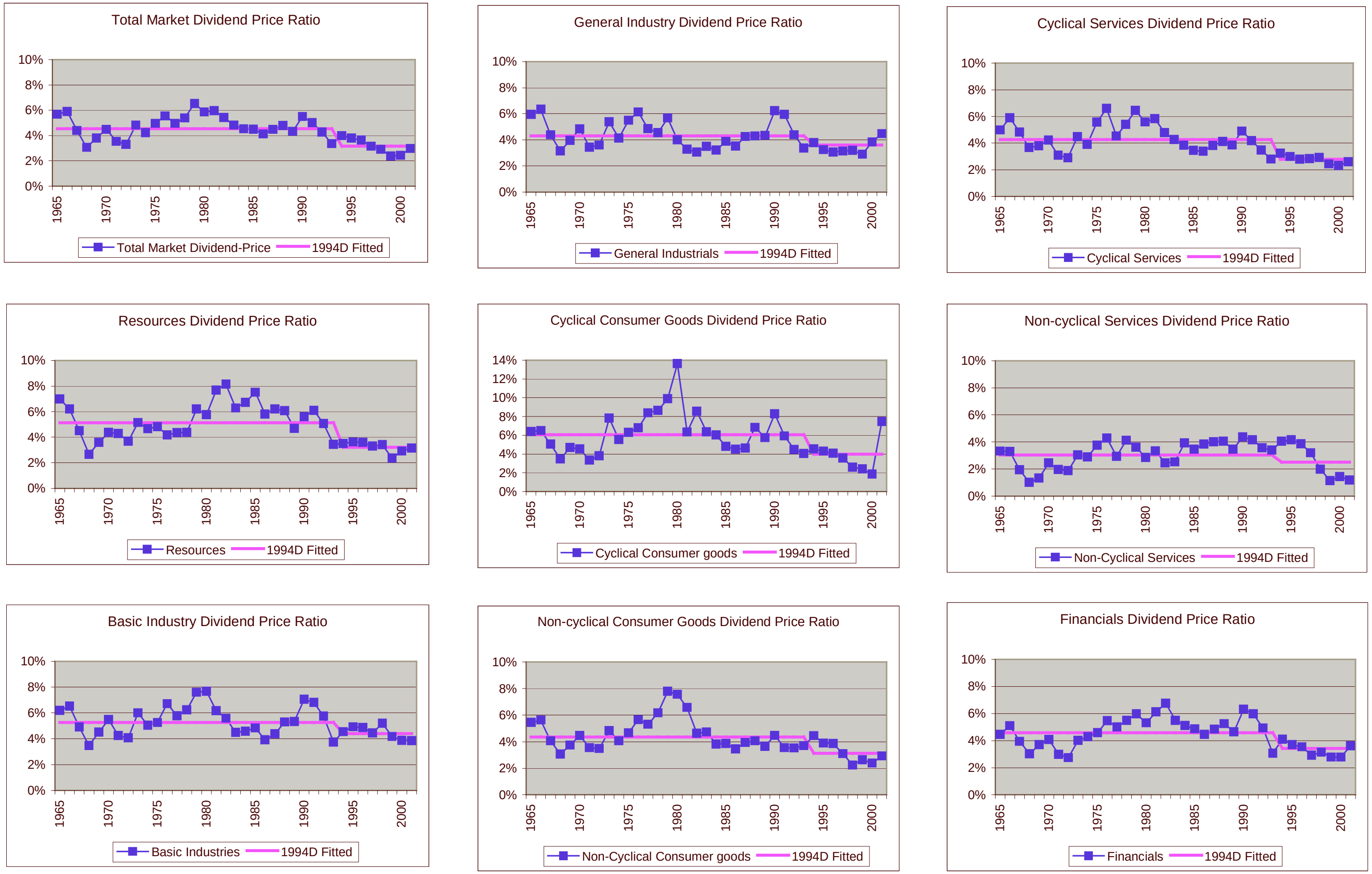
Notes:
Figure 3A plots the Beta co-efficient from the regression: $GD_t = \alpha_t + \beta_t(X_{t-1})$; where (X_{t-1}) is (D_{t-1}/P_{t-1}) or (GD_{t-1}).
Figure 3B plots the Beta co-efficient from the regression: $GD2_t = \alpha_t + \beta_t(X_{t-1})$; where (X_{t-1}) is (D_{t-1}/P_{t-1}) or (GD_{t-1}).

Figure 4: UK Dividend-Price Ratio and Best-Fit line with a permanent mean break in 1993.



Notes:
Best fit line is given by the equation $DPDUM = \alpha + \beta 1993D$, where 1993D takes the value 1 for t $\geq$ 1993 and 0 for t $\leq$ 1992.

Figure 5: Datastream Industry Dividend-Price Ratios and Best-Fit lines with a permanent mean break in 1994



Notes: The Dividend-price ratio shown (DPDUM) is adjusted for the 1974 outlier by use of a dummy variable. Fitted line is given by the equation: $DPDUM_i = \alpha_i + \beta_i 1994D$, where i is an industry subscript and 1994D takes the value 1 for t $\geq$ 1994 and 0 for t $\leq$ 1993