Dividend Yields, Business Conditions, and Expected Security Returns: A South African Perspective

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September 2003

Executive Summary

In their seminal paper "*Dividend yields and Expected Stock Returns*" Eugene Fama and Kenneth French (1988) stated: "There is much evidence that stock returns are predictable." Following this a series of papers were published including Keim and Stambaugh (1986), Campbell and Shiller (1988a, b) and Cutler, Poterba and Summers (1991) who report that fundamental measures such as dividend yield and price-earnings ratio explain 25% or more of the variation in stock returns measured over intervals spanning as long as four years. Furthermore, Balvers, Cosimano and McDonald (1990) and Fama (1990) present evidence that certain economic indicators such as industrial production also have predictive power for stock returns.

Academics such as Goetzmann and Jorion (1993,1995) have cautioned against the results of many of these studies, citing problems such as small sample and survivorship bias as issues that may affect the significance of these results. Goetzmann and Jorion (1995) raise the critical issue of survivorship bias that becomes obvious when one closely scrutinizes the work performed by Fama et al. (1988, 1989). Goetzmann et al. (1995) contend that the observed ex post relationship between dividends and prices is conditioned on the survival of the asset series. Furthermore they contend that the typical linear regression techniques used in these studies may understate the standard error estimate of the regression coefficients, thereby overstating the significance of the regression coefficient.

Nelson and Kim (1993) investigate the role of small sample bias and the possibility that small sample bias could play an important role in the inference that stock returns are predictable. On the surface, Nelson et al. (1993) results suggest that stock returns have been predictable from dividend yields over the past century in the United States and that the predictability increases with time horizon. However, Nelson et al. (1993) caution against hastily drawn conclusions. In their tests regressing S&P Returns, NYSE returns and Industrial Production Nelson et al. (1993) find that the t-ratios from these predictive regressions are subject to two small sample biases that both work in the direction of indicating that returns are more predictable than they actually are. Firstly, they find that that the regression coefficient will be biased if the predictor is jointly endogenous with the return variable. Secondly, they find that in the case of overlapping multiperiod returns, standard errors based on asymptotic theory tend to be too small in finite samples.

The analysis of this topic has continued to draw attention from academics such as Jensen, Johnson and Mercer (1996), Patelis (1997) and Booth and Booth (2001) who examine the results of Fama et al. (1988) under differing monetary policy regimes. Jensen et al. (1996) posit that monetary stringency affects investors' required rate of return, which is consistent with Fama et al.'s (1989) arguments that predictable variation in returns reflects rational variation in required returns. Patelis (1997) finds that monetary variables used in his analysis are marginally significant predictors of security returns across different time horizons, while Booth et al. (2001) find that measures of the stance of monetary policy contain significant explanatory information that may be used to forecast expected stock and bond returns.

This paper adds to the continuing debate over predictability of returns in world markets. It examines the behaviour of commonly used variables such as the dividend yield and term premium in the emerging market environment of South Africa, which intuitively track stock and bond performance.

The paper follows the methodology of Fama and French (1988,1989) and examines the effectiveness of two definitions of the dividend yield, D_t/P_{t-1} and the more timely D_t/P_t, in tracking nominal and real equity returns over the period 1925-2000. Furthermore, the paper examines the ability of the dividend yield (D_t/P_t) and term (maturity) premium[1] to forecast stock and bond returns over the period 1925-2000. In addition to the procedures applied by Fama et al. (1988, 1989) this paper analyses the data set subsequent to adjusting the data for the effects of serial correlation. Thus an objective point of departure is established to determine whether the conclusions drawn from the analysis of South African data are robust and can withstand close statistical scrutiny.

[1] Defined as the difference between the All Bond Index (as proxy for a portfolio of risky bonds with a medium to long term duration) and the money market rate (an effective proxy for the South African risk free rate [Firer and McCleod (1999)])

The results of the analysis that the predictive power of the dividend yield (in both its forms) and the term premium indicate that time variation in expected returns accounts for a small fraction of the variances of short horizon returns. Dividend yields typically explain less than 5% of the variances of the monthly, quarterly or annual returns. The results presented are similar to those presented by Fama et al. (1988) only in that time variation in expected returns accounts for more of the variation of long horizon returns. However, the percentage variation of returns over long horizon periods as explained by the dividend yields is not nearly as strong as those presented by Fama et al. (1988). Dividend yields only explain more than 15% of the variances of two- to four-year returns in the category 1979-2000. During time horizons 1925-1948 and 1960-1978 both definitions of the dividend yield result in negative regression slopes. This is in stark contrast to the results of Fama et al. (1988) who find that time variation in expected returns typically accounts for up to 25% of variation of long horizon returns. The results presented in this paper do require further analysis in order to determine whether the inconsistency in results may be the function of common characteristics of stock market data, such as serial correlation. Durbin-Watson statistics for each regression reveal a high incidence of serial correlation amongst the data set analysed. Once the data is adjusted for the effects of serial correlation only one of the regression slopes remains significant at the five percent level.

The term premium, which due to informational constraints captures the default spread as well as the spread of short versus long term bonds, is a widely accepted business conditions indicator, high when the economy is performing poorly and low when the economy is performing well. In contrast to Fama et al. (1989), this paper finds that the dividend yield is not correlated to the term premium. Thus the conclusion drawn by Fama et al. (1989) that the independent variables all track the same components of variable returns across asset classes does not hold when examining the South African data. The correlation between the term premium and dividend yield is close to zero across all periods examined. It can therefore be inferred that the dividend yield and term premium do not track similar components of expected returns across asset classes in the South African context. This is not easily explained and does not appeal to the economic intuition that if term spreads widen, so too should dividend yields rise as the firm's share price drops in response to a higher cost of capital.

The results of this paper have led to the conclusion that none of the null hypotheses posed may be rejected. Although the question *'what drives the prices of stock and bond markets in South Africa in the long term and short term?'* remains, this paper provides insight into the question, through the examination of the data set in a manner consistent with data analysis performed in the United States. Unfortunately a concrete answer to the questions posed by the discipline of economics is required before the results presented in this paper may be fully understood.

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1 Introduction

The proposition that stock returns are not predictable is constantly the subject of much debate in not only finance classrooms, but throughout a world of increasingly sophisticated market analysts and investors. Some would vigorously contest that stock returns are not predictable and that this is firmly established through empirical results in economics. This debate has continued over the years with renowned academics presenting evidence for and against the notion that stock returns are predictable. In their seminal paper "*Dividend yields and Expected Stock Returns*" Eugene Fama and Kenneth French (1988) stated: "There is much evidence that stock returns are predictable." Following this a series of papers were published, including Keim and Stambaugh (1986), Campbell and Shiller (1988a, b), Fama and French (1988) and Cutler, Poterba and Summers (1991) who report that fundamental measures such as dividend yield and price-earnings ratio explain 25% or more of the variation in stock returns measured over intervals spanning as long as four years. Furthermore, Balvers, Cosimano and McDonald (1990) and Fama (1990) present evidence that certain economic indicators such as industrial production also have predictive power for stock returns.

Academics such as Goetzmann and Jorion (1993,1995) have cautioned against the results of many of these studies, citing problems such as small sample and survivorship bias as issues that may affect the significance of these results. Furthermore they contend that the typical linear regression techniques used in these studies may understate the standard error estimate of the regression coefficients, thereby overstating the significance of the regression coefficient.

The analysis of this topic has continued to draw attention from academics such as Jensen, Johnson and Mercer (1996), Patelis (1997) and Booth and Booth (2001) who examine the results of Fama et al. (1988), under differing monetary policy regimes.

This paper attempts to add to the continuing debate over predictability of returns in world markets. Goetzmann and Jorion (1995) bemoan the lack of evidence in emerging markets for support of the conclusions drawn by those advocating the existence of a predictable component of stock returns. This paper provides the first building block towards examining the behaviour of commonly used variables, in emerging markets such as South Africa, which intuitively track stock and bond performance.

2. Research Objectives

2.1 Objective 1

H_0: *Dividend yields forecast share returns as measured by the value-weighted portfolio represented by the JSE Actuaries' All Share Index,*

H_1: *Dividend yields **do not** forecast share returns as measured by the value-weighted portfolio represented by the JSE Actuaries' All Share Index.*

The hypothesis that dividend yields forecast share returns has been accepted for some time by both American finance academics and practitioners alike [see for example Dow (1920) and Ball (1978)].[2] This hypothesis is intuitively explained by the 'efficient markets' version of the hypothesis – when discount rates and expected returns are high, share prices are low relative to dividends (and vice versa) so that the dividend yield varies with expected returns. However, no South African study has provided direct evidence relating to this intuitive hypothesis on the Johannesburg Stock Exchange.

[2] see Fama and French (1988) for details on these references

2.2 Objective 2

H_0: *Maturity (term) premiums forecast excess share returns as measured by the value-weighted portfolio represented by the JSE Actuaries' All Share Index and excess bond returns represented by the JSE Actuaries' Bond Index.*

H_1: *Maturity (term) premiums* ***do not*** *forecast excess share returns as measured by the value-weighted portfolio represented by the JSE Actuaries' All Share Index and excess bond returns represented by the JSE Actuaries' Bond Index.*

Fama and French (1989) provide evidence relating to the ability of the maturity and default premiums to explain variation in stock and bond returns traded on U.S capital markets. Furthermore, they attempt to relate the variation in excess stock and bond returns to prevailing business conditions and test whether these relations are consistent with intuition, theory, and existing evidence on the exposure of different asset classes to changes in business conditions.

It is interesting (but not surprising) to note that Fama et al. (1989) find that predictable variation in stock returns is tracked by the maturity and default premiums. This is a comforting result in that both spreads reveal much about the state of the economy and the changes in risk of different asset classes (including stocks). It follows that these changes in these variables should predict not only returns in the bond market but also in the stock market.

3. Review of prior studies

The research conducted in the area relating to the predictive power of indicators such as the dividend yield and maturity (term) premium has largely been aimed at assessing the impact these and other monetary and economic factors have on the real sector of the economy. However, there has been an expanding body of American research that has focussed on forecasting *security returns* using economic barometers such as the dividend yield and maturity (term) premium. It is the aim of this literature review to provide an overview of the most significant contributions made to this body of research. The review will help assess the impact that prior research may have on the study of these factors in relation to South African security returns.

3.1 Dividend yields and expected stock returns

Fama and French (1988) examine the power of dividend yields to forecast stock returns. Fama et al. (1988) are motivated by the need to add to literature already providing evidence that stock returns may be predictable. In their seminal paper *'Dividend yields and expected stock returns'* [3] Fama et al. (1988) attempt to explain whether there is a logical reason for predictable returns, underpinned by rational economic behaviour by rational market participants or whether it may be the work of animal spirits.

The tests conducted by Fama et al. (1988) use continuously compounded real and nominal returns on two market portfolios (value- and equal-weighted portfolios of NYSE stocks constructed by the Centre for Research in Security Prices [CRSP]) for return horizons of one month, one quarter and one to four years. The tests conducted on the monthly, quarterly and annual returns use non-overlapping data periods, while the tests made on two, three and four year horizon periods are conducted on overlapping periods. Linear regressions on future returns $r(t,t+T)$, are conducted on two measures of the time t dividend yield. Fama and French (1988) construct dividend yields from returns with and without dividends, provided by CRSP, resulting in dividend yields expressed as D(t)/P(t-1) and D(t)/P(t). The dividend yields are annual yields, used in order to avoid problems associated with possible seasonality in dividend payments.

[3] Journal of Financial Economics, 22 (1988), 3-25

Fama et al. (1988) perform regression analysis using both forms of the dividend yield, *D(t)/P(t)* and *D(t)/P(t-1)*. Fama et al. (1988) use the ordinary least squares (OLS) regression technique to regress value- and equal-weighted portfolio returns *r(t,t+T)*, on their yields, *D(t)/P(t-1)* and *D(t)/P(t)*. The results are split arbitrarily into thirty-year periods starting from 1927 until 1986.

Fama et al. (1988) find that, with the exception of the thirty-year period 1927-1956, regressions of equal-weighted nominal returns on *D(t)/P(t-1)*, provide strong evidence of the dividend yield's forecasting power. The reason cited by Fama et al. (1988) for the weak results during the period 1927-1956 is that a high variability of returns existed in the early years of the sample. Value-weighted nominal returns regressed against *D(t)/P(t-1)* also indicate strong forecasting power of the dividend yield across the entire time horizon [Fama et al. (1988)]. Regressions of value- and equal-weighted nominal returns against the more timely *D(t)/P(t)* concur with the results regressed against *D(t)/P(t-1)*. This is especially true during the periods 1941-1986 and 1957-1986 where slopes for D(t)/P(t) are more than 2.5 standard errors from 0 for both value- and equal-weighted portfolios and for all return horizons. This is in contrast to regressions against *D(t)/P(t-1)* where standard errors from 0 were more varied and not as significant as those found in the regression of returns against *D(t)/P(t)*. Fama et al. (1988) regress value- and equal-weighted real returns against both forms of the dividend yield. These tests reveal similar results to those found in the regressions involving nominal returns.

Fama et al. (1988) examine the behaviour of the regression slopes and find that in the regressions of nominal or real returns *r(t,t+T)* on *Y(t)* the slopes increase with return horizon *T*. The increase in the slopes is approximately proportional to T for horizons to one year, but less than proportional to T for two to four year returns when *D(t)/P(t-1)* is the explanatory variable. Fama et al. (1988) find that for the more timely explanatory variable *D(t)/P(t)* the regression slopes increase roughly in proportion to T for the periods one to four years but more slowly thereafter.

Fama et al. (1988) expose their results to further scrutiny, by using the regressions to forecast out-of-sample returns. The reason Fama et al. (1988) do this is because of the uncertainty about the bias of the regression slopes. This is because the effect of changes in the discount rate may cause estimates of r(t,t+T) to overstate the variation of expected returns. Fama et al. (1988) explain how the uncertainty regarding the bias of the slopes arises as follows:

'*...negative correlation between shocks to returns and yields* [For example an increase in the discount rate without a corresponding increase in dividend growth rates will result in an unexpected fall in P(t). This results in an unexpected increase in Y(t) producing the aforementioned negative correlation and a tendency to produce upward biased regression slopes] *produces positive bias in the slope estimates for dividend yields...*'

This observation leads to the next logical conclusion – that the possible bias Fama et al. (1988) are concerned with, may result in the in-sample R^2 overstating the regression's explanatory power. The out-of-sample forecast power is negatively affected by the upward bias present in the regression slopes, therefore out-of-sample tests may provide a better understanding of the true forecast power of the dividend yields. In contrast, yields contain noise that tend to cause estimates of r(t,t+T) to understate the variation of expected returns. Fama et al. (1988) note that this noise reduces the forecast power of both in-sample and out-of-sample estimates alike, and that out-of-sample tests do not correct for this.

Fama et al. (1988) proceed to forecast returns for the twenty-year period 1967-1986. For the sake of clarity, the forecast of a one year return is calculated using coefficients from regressions of r(t,t+T) on Y(t) for the preceding thirty year period – resulting in the estimation periods beginning in 1937. The same mathematical procedure is followed for all return horizons T. The forecast period of 1967-1986 was chosen by Fama et al. (1988) because of evidence that returns and yields behave differently during the first ten years of the sample.

The results presented by Fama et al. (1988) show that for horizons up to two years, out-of-sample forecasts using both forms of Y(t) are close to those of in-sample forecasts for the period 1957-1986. The only set of results showing what seems to be a significant difference in forecasting ability of in-sample versus out-of-sample groups, is the value-weighted three- and four year real returns. Fama et al. (1988) defend this outcome on the basis that the results for longer return horizons are less reliable because they involve fewer independent returns during the twenty year forecast period. Fama et al. (1988)

conclude on the evidence provided by the out-of-sample tests that regressions of r(t,t+T) on either D(t)/P(t) or D(t)/P(t-1) do not produce strongly biased slopes and thus biased estimates of explanatory power. However, Fama et al. (1988) also conclude that the out-of-sample forecasts confirm that using the less timely D(t)/P(t-1) to avoid false positive conclusions about forecast power produces regressions that understate the variation of expected returns.

Fama et al. (1988) pose the following critical question in an attempt to explain their results:

Why do the same yields capture more return variance for longer time horizons as shown by the increasing R^2 in the case of both in- and out-of-sample test groups?

Fama et al. (1988) answer this question through closer examination of the components of r(t, t+T). Fama et al. (1988) explain this observed phenomenon algebraically – R^2 increases with return horizon because the variance of the fitted values grows more quickly than the horizon, whereas the variance of residuals generally grows less quickly than the horizon. The results produced show that the variance of the fitted values grows in proportion to the square of the regression slope out to one or two years and then taper off. This type of behaviour by the variances of the fitted values suggests not only that autocorrelation exists, but that some form of mean reversion occurs and becomes evident in the results for T greater than 2 years. The existence of mean reversion causes the variance of the longer time horizons to grow more than in proportion to the return horizon. The second half of Fama et al.'s (1988) algebraic explanation is that the variance of residuals generally grows less than proportionally to return horizon. This is evident from the results, which show that residual standard errors never come close to twice the standard errors for time horizons of one year. Algebraically, the residual in the regression of a four year return horizon should equal the sum of the one year returns on Y(t). Fama et al. (1988) note that if this is not the case then the correlations of the residuals from the one-year regressions must on average be negative. Fama et al. (1988) conclude the explanation by stating that the negative correlation of residuals together with the persistence of expected returns provides a more complete picture of the predictability of long horizon returns.

A further explanation offered by Fama et al. (1988) in answering the question posed earlier, is the so-called discount rate effect. The following scenario illustrates the workings of the discount rate effect. Suppose there is a shock at t+1 that increases expected returns. The fact that the shock occurs after the yield Y(t) is set, means that the fitted values from the regressions of r(t+1, t+2),...,r(t+T-1,t+T) on Y(t) will tend to underestimate returns after t+1, and the residuals will tend to be positive. Fama et al. (1988) present further tests for the discount rate effect that will not be elaborated upon in this paper. However, the findings of these tests do suggest that, on average, the expected future price increases implied by higher expected returns (as postulated in the first objective of this paper) are just offset by the immediate price decline due to the workings of the discount rate effect. Thus, positively autocorrelated expected returns (the expected future price increases) generate mean reverting components of prices due to the discount rate effect. This explains the fact that time variation of expected returns (the lengthening of time horizons T) gives rise to mean reverting or temporary components of prices.

These two explanations provide a simple, yet effective theory on the reasons for the ability of the dividend yields to explain more than 25% of the variances of two to four year horizons out, whereas they typically explain less than 5% of the variances of monthly and quarterly returns. These explanations are best summarised by Fama et al.'s (1988) concluding paragraph:

'The persistence (high positive autocorrelation) of expected returns causes the variance of expected returns, measured by the fitted values in the regression of returns on dividend yields, to grow more than in proportion to the return horizon. On the other hand, the growth of the variance of the regression residuals is attenuated by a discount rate effect: shocks to expected returns are associated with opposite shocks to current prices. The cumulative price effect of an expected return shock and the associated price shock is roughly zero. On average, the expected future price increases implied by higher expected returns are just offset by the immediate decline in the current price. Thus the time variation of expected returns gives rise to mean-reverting or temporary components of prices.'

3.2 In support of Fama and French

Campbell and Shiller (1988b) raise the question *"What accounts for the variation through time in the dividend-price ratio on corporate stocks?"* They attempt to provide insight into the question through an examination of the time variation in corporate stock prices relative to dividends. Campbell et al. (1988b) propose a dividend ratio model expressing the log dividend-price ratio as the rational expectation of the present value of future dividend growth rates and discount rates. Campbell et al. (1988b) make use of vector autoregression techniques to break down the movements in the log dividend-price ratio into three distinct components:

i) expected future dividend growth rates

ii) expected future discount rates

iii) unexplained factors

Campbell et al.'s (1988b) findings are threefold. Firstly, they find evidence that the log dividend-price ratio does move with rationally expected future growth in dividends. The log dividend-price ratio causes real dividend growth in all the systems estimated by Campbell et al. (1988b). Secondly, the various measures of short term discount rates used by Campbell et al. (1988b) – namely, short term interest rates, consumption growth, and the volatility of stock returns – do not necessarily explain stock price movements. Thirdly, Campbell et al. (1988b) find substantial unexplained variation in the log dividend-price ratio. In order to expand upon the third result Campbell et al. (1988b) explain that their results show that the long term expected real return on stock is highly variable and does not move in parallel with the short-term interest rates.

Campbell et al. (1988b) note an interesting parallel between their research and that performed by Fama et al. (1988). Campbell et al. (1988b) posit that while Fama et al. (1988) find that stock returns are more predictable when measured over several years than when measured over one year, their dividend-ratio model can be seen as a way to compute the effects of single period predictability of returns when they are cumulated over infinite time. Campbell et al. (1988b) find that moderate predictability of one-year stock returns can have significant implications for the log dividend-price ratio. Campbell et al. (1988b) state, in closing, that the log dividend price ratio has a standard deviation that is at least 50 percent higher than it would be if stock returns were unpredictable.

Keim and Stambaugh (1986) approach the question as to whether returns on risky assets are predictable through the examination of observable variables that reliably predict ex post risk premiums defined as rates of returns in excess of the short term interest rate. Keim et al. (1986) set two objectives:

i) the construction of variables that might proxy roughly for levels of asset prices and to see whether the chosen variables predict risk premiums on a wide range of assets;

ii) given the apparent seasonality in expected returns in many asset classes (for example the well documented January effect where average returns on stocks and bonds have been significantly higher in January than they have been in other months of the year) Keim et al. (1986) investigate whether seasonality is important in determining estimated expected returns conditional on asset prices.

Keim et al. (1986) construct three variables used to examine the objectives expressed above as follows:

i) a bond market variable which is the spread between yields on the low grade corporate bonds and one month T-Bill yield;

ii) the first stock market variable is minus the logarithm of the ratio of the real S&P Index to its previous historical average;

iii) the second stock market variable is minus the logarithm of share price, averaged across NYSE firms in the quintile of smallest market value.

Keim et al. (1986) conclude that the three variables predict ex post risk premiums on common stocks of NYSE-listed firms of various sizes, long term bonds of various default risks, and U.S. Government bonds of various maturities. Keim et al. (1986) find that the same variables predict differences between returns on assets of the same type, such as small stocks versus large stocks, low-grade versus high-grade bonds, and long term versus short-term bonds.

Campbell and Shiller (1988a) present estimates indicating that data on accounting earnings, when averaged over many years help to predict the present value of future dividends. Campbell et al. (1988a) claim that this result holds even when stock prices are taken into account. The data series used in the study are the S&P Composite Index and its associated dividend and earnings series for the period 1871-1987. Campbell et al. (1988) introduce earnings measured annually or as an average over a number of years as a variable in a vector autoregressive (VAR) framework. This approach reveals that stock returns and dividend price ratios are too volatile to be accounted for by news about future dividends. Campbell et al. (1988a) state that they believe that this excess volatility is closely related to the predictability of multiperiod returns. Campbell et al. (1988a) find that by using the VAR framework, the rejection of the hypothesis that one-period returns are not forecastable was much less strong than the their rejection of the hypothesis that the dividend-price ratio equaled the theoretical dividend price ratio given the present value model. Campbell et al. (1988a) state that this is essentially the same result as noted by Fama et al. (1988) where it was noted that the one-period return is much less forecastable than the multiperiod return. Campbell et al. (1988a) argue that Fama et al.'s (1988) excess return regression is essentially their test that the stock price equals the expected present value of future dividends. It is because of this statement that Campbell et al. (1988a) argue that excess volatility and predictability of multiperiod returns are not two separate phenomena but one.

Kothari and Shanken (1992) examine the extent to which aggregate stock return variation is explained by variables chosen to reflect revisions in expectations of future dividends. The method used by Kothari et al. (1992) to perform the examination is a decomposition of realized dividend growth into expected and unexpected components using information in aggregate investment, dividend yield and future return indicators. Kothari et al. (1992) find that a simple model accounts for 72% of annual return variation, with returns significantly related to dividend changes as far as three years into the future. Furthermore, they state that given the simplicity of the proxies for shocks to expected dividends, the true explanatory power of the model is greater. In addition, Kothari et al. (1992) find that the marginal explanatory power of growth rates of industrial production is negligible in the presence of the chosen dividend variables.

In the second part of their paper, Kothari et al. (1992) conduct a cross sectional experiment using portfolios based on the basis of return performance in a given year, and find that nearly 90% of the cross-sectional variation in portfolio returns can be explained by dividend and expected return variables. Of particular interest, Kothari et al. (1992) find that the extreme performance portfolios experience substantial dividend changes in the predicted direction over the return year and the following three years.

3.3 Goetzmann and Jorion present a dissenting view

Goetzmann and Jorion (1993) re-examine the ability of dividend yields to predict long horizon stock returns. Goetzmann et al. (1993) warn that there are a number of reasons why the results of Fama and French (1988)[4] should be regarded with caution. Goetzmann (1993) state that given the persistent and stable nature of dividend payments, movements in the dividend yields are dominated by movements in prices. This persistence introduces biased forecasting regressions because of independent variables that are correlated with lagged dependent variables, instead of being pre-determined as assumed by the statistical models used in these papers.

Goetzmann et al. (1993) base their work on Fama et al.'s (1988) work where they contend that if long-term market returns are predicted by the dividend yield, the following regression should produce a significant coefficient and R^2:

$$R_{t,t+T} = \alpha_T + \beta_T Y_t + e_{t,t+T}$$

where $R_{t,t+T}$ is the compound total stock return from month t to month t+T, and Y_t is the ratio D_t / P_t, the annual dividend up to time t divided by the stock price at time t.

Similarly to Fama et al. (1988), Goetzmann et al. (1993) perform all tests using overlapping observations. In order to correct for the moving average process in the errors caused by the overlapping observations, Goetzmann et al. (1993) use the method proposed by Hansen and Hodrick [Goetzmann et al. (1993)] in which the autocovariances are estimated from the data, with a modification due to White [Goetzmann et al. (1993)] and Hansen [Goetzmann et al. (1993)] that allows for conditional heteroskedasticity. Goetzmann et al. (1993) refer to these estimators as 'Generalized Method of Moments' (GMM) estimators. Goetzmann et al. (1993) find that during the process of determining the GMM estimators that there are situations where the variance-covariance matrix of the estimated coefficients is not positive definite. Therefore, standard errors are also reported using a correction due to Newey and West [Goetzmann et al. (1993)] that ensures that the matrix is positive definite.

Goetzmann et al. (1993) present long-horizon forecasts for the returns on the S&P 500 index over the period 1927 to 1990, and two sub periods of equal length, 1927 to 1958 and 1959 to 1990. The results presented seem to suggest strong predictive ability for dividend yields. The slope coefficients are positive for each horizon presented (1, 12, 24, 36 and 48 months) and increase as the horizon lengthens. The ordinary least square (OLS) t-statistic increases uniformly with the time horizon together with the related R^2. Goetzmann et al. (1993) note that these OLS t-statistics and R^2's are biased upward because of overlapping observations. This is evident from the adjusted GMM and Newey-West t-statistics presented which are significantly deflated but still indicate predictability. Goetzmann et al. (1993) find that upon analysis of the two sub periods of equal length the predictive power is consistently stronger over the shorter sample periods. Goetzmann et al. (1993) suggest that the small sample bias may improve the significance of the results.

Goetzmann et al. (1993) conclude that prior studies supporting the hypothesis that stock returns may be predicted to a greater or lesser degree using dividend yields have failed to recognize the biases arising from regressions on lagged dependent variables. To illustrate the pitfalls associated with the bias Goetzmann et al. (1993) use bootstrapping techniques modeling the null hypothesis that returns conform to a random walk while preserving the actual patterns of dividends. Their results show that in a scenario where no linear relationship between future returns and the dividend price ratio exists, the OLS regression with standard errors corrected for overlapping data often yields results that suggest that stock returns may not conform to a random walk. Goetzmann et al. (1993) state that while the coefficients, t-statistics and R^2's from such regressions show strong significant results these statistics are shown to be misleading in that they are generated by data conforming to the null hypothesis [that there is no relation between $R_{t,t+T}$ and Y_t (dividend yield)]. Goetzmann et al. (1993) interpret their findings as saying that researchers must exercise caution when interpreting or drawing inferences from the

[4] Other papers supporting the results of Fama and French (1988) are Flood, Hodrick and Kaplan (1987)

usual regression statistics without a thorough understanding of their underlying distributions.

3.4 The effect of survivorship of data series

Goetzmann and Jorion (1995) raise a critical issue that becomes obvious when one closely scrutinizes the work performed by Fama et al. (1988, 1989). Goetzmann et al. (1995) contend that the observed ex post relationship between dividends and prices is conditional on the survival of the asset series. Goetzmann et al. (1995) explain this concept by stating that while long price and dividend series are available for major markets such as the United States and the United Kingdom, few data are available for the Japanese and German markets prior to 1940 or for the Russian market prior to the advent of communism. Goetzmann et al. (1995) explore the implications of relying solely on survived series (i.e. series with continuous price and dividend records) for drawing inferences about dividend yield regressions. They do this by performing dividend yield tests on two new historical series – the first being a monthly series of returns and dividend yields for the New York Stock Exchange (NYSE) dating back to 1872. The second is an annual UK Stock exchange return and yield series that begins in 1872.

Goetzmann et al. (1995) liken the survivorship effects on the dividend yield regressions to the foreign exchange market where forward rates appear to be systematically biased forecasts of future spot rates. This is because the forward exchange rates incorporate a probability greater than zero that devaluation may occur and that devaluation is not observed in the test sample period. Goetzmann et al. (1995) observe that this may be indicative of a failure in the application of econometrics. This observation implies that unusual events with an extremely low probability of occurrence, which have severe effects on market prices, such as war or political upheaval, may not be represented in samples and may be omitted from survived series. Goetzmann et al. (1995) imply through the preceding statements that the power of yields to forecast returns is strongly conditioned on survival.

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and Campbell and Shiller (1988)

Because of the extension of the data set to 121 years Goetzmann et al. (1995) state that they expect much stronger rejections of the hypothesis of no predictability than reported before. Goetzmann et al. (1995) report empirical marginal significance levels using a fixed dividend procedure and a VAR (vector autoregression framework) with stochastic prices and dividends. They report similar findings across the two procedures.

Goetzmann et al. (1995) find that the monthly NYSE data provides only marginal evidence of the predictability of long horizon returns via dividend yields. Similar results are reported for the UK data with the exception of the subperiod from 1926-1992. During this subperiod Goetzmann et al. (1995) find strong evidence of predictability of long horizon returns. However, the qualification attached to their results is that they observe significant but negative coefficients. Goetzmann et al. (1995) offer the explanation that, due to stability of returns in the time periods where no statistical significance was found, dividend yields will be stable. Therefore, as returns are more stable the direction of possible market movements is more subtle and does not reveal itself obviously through an analysis of dividend yields. As returns become more variable (as was the case in the UK data during the subperiod 1926-1992) dividend yields become more useful predictors.

Alternatively, Goetzmann et al. (1995) explain the results in terms of survivorship of the data series. Goetzmann et al. (1995) state that the evidence of predictability for the post 1926 UK data appears to hinge on an outlier (1974) when there was a real possibility that capitalism would disappear in Britain. Goetzmann et al. (1995) concede that the significance of their results hinges on whether there was a positive probability of disruption in the UK equity price series post 1926. Goetzmann et al. (1995) state that if the chances of the market disappearing where zero the predictability found in the UK data is consistent with the market overreaction hypothesis.

3.5 The question of the effect of overlapping observations in time series analysis

In their paper 'Tests of Financial Models in the Presence of Overlapping Observations' Richardson and Smith (1991) develop a general approach to testing serial dependence restrictions implied by certain financial models. The restrictions discussed include joint serial dependence restrictions imposed by random walk, market microstructure and rational expectations models. For example, the random walk theory of stock prices implies that stock returns will be serially uncorrelated. In addition, rational expectations models impose the restriction that forecast errors will be orthogonal to anything in the agent's information set which imposes a form of serial independence. Richardson et al. (1991) are concerned with the use of multiperiod forecast errors to test asset-pricing models. Richardson et al. (1991) propose a statistical procedure that incorporates more information in the data by explicitly modeling the dependencies induced by the use of overlapping observations. This is important because the use of overlapping observations can greatly improve the properties of test statistics. Richardson et al. (1991) develop an analytical approach to adjust for problems inherent in the analysis of observations of overlapping data that avoids the problems associated with traditional sampling estimation techniques. The advantages to the analytical approach developed by Richardson et al. (1991) are listed briefly as follows:

i) where long lags in data are used for analytical purposes standard procedures would require estimation of many autocorrelations to take account of the overlap, whereas the developed approach reduces the problem of estimation to only a few unknown parameters,

ii) explicit asymptotic power comparisons between different test statistics is made. This work may have potential use in application to the analysis of small samples,

iii) the benefit of using overlapping observations is quantified. Richardson et al. (1991) show that using overlapping observations leads to a reduction in the variance of the multiperiod serial correlation estimator of about one third.

Boudoukh and Richardson (1994) compare commonly used approaches for estimating the relation between long horizon returns and a variable X_t such as dividend yields. Boudoukh et al. (1994) examine four types of regression against X_t as follows:

i) non overlapping multiperiod returns on X_t;

ii) overlapping multiperiod returns on X_t;

iii) single period returns on multiperiod X_t; and

iv) single period returns on X_t and its implied long-horizon coefficient.

Boudoukh et al. (1994) investigate the claim that the use of overlapping observations in calculating long-horizon regressions is more efficient than using nonoverlapping observations. As described above, Richardson et al. (1991) manage to quantify the benefit when the regressor is a lagged value of the dependent. Boudoukh et al. (1994) quantify the efficiency of using overlapping data. They provide support for their results via simulation evidence. Their defining result is that this efficiency is directly related to the dynamic structure of the regressor. Boudoukh et al. (1994) posit that with highly autocorrelated regressors, which is often the case with financial time series, overlapping observations does not result in increased efficiency. An illustration of the effect of this statement is made by considering a regression of five-year stock returns on its dividend yield using monthly data over a sixty-year period. Boudoukh et al. (1994) quantify the benefit of using overlapping observations as the ratio of the variance of the regression coefficient for the nonoverlapping versus the overlapping case. The ratio calculated by Boudoukh et al. (1994) to illustrate the example is 1.44. Boudoukh et al. (1994) interpret this as the use of approximately 60 times the number of data points (overlapping vs non-overlapping) creates a variance that is only 30.6% tighter. Boudoukh et al. (1994) find similar results for finite samples demonstrated via simulations. They suggest that researchers should be cautious in the interpretation of the results of studies making use of long horizon time series and should not be deceived by the apparently large number of observations available through the use of overlapping data.

Boudoukh et al. (1994) provide new evidence relating to the benefits and drawbacks of using long-horizon regression versus a short horizon regression approach. Boudoukh et al. (1994) state that recent research suggests that calculating implied long horizon coefficients from short-horizon regressions of returns on predetermined variables might be preferred to estimating analogous coefficients from regressions of long-horizon returns on the same predetermined variables.

Boudoukh et al. (1994) quantify the benefit of using the short-horizon approach specified above. Their main result is that the short-horizon method can often provide gains in terms of efficiency. However, these gains in terms of efficiency are only marginally beneficial for observations that are highly auto correlated.

Hodrick (1992) examines the statistical properties of three alternative methods for drawing inference from and measurement of long-horizon forecasting experiments with an application to dividend yields as predictors of stock returns. Hodrick's (1992) research revolves around providing further evidence on the debate as to whether research supporting the predictability of returns at horizons of one year or more has sound statistical foundations. Hodrick (1992) examines the statistical properties of the three methodologies in Monte Carlo experiments and provides evidence on the bias of the various approaches and on their power to reject the null hypothesis of no expected return variability. The first methodology employed by Hodrick (1992) is that of Fama et al. (1988). Hodrick (1992) re-examines the asymptotic distribution theory of the ordinary least squares estimator in long-horizon forecasting situations and demonstrates how to formulate an alternative estimator of the standard errors that impose the null hypothesis of no serial correlation in returns, but does not impose an assumption of conditional homoskedasticity. Hodrick's (1992) second methodology is built on that used by Jegadeesh (1990) [Hodrick 1992] who reformulated the methodology used by Fama et al. (1988) in order to assess the statistical significance of the regression forecasts. The third methodology employed by Hodrick (1992) recognizes that long horizon linear predictions can be generated by iterating one step ahead linear predictions from a vector autoregression (VAR). The VAR characterizes the autocovariances of the time series and Hodrick (1992) explores how it can be used to generate implicit long-horizon statistics without actually measuring data over a long horizon. Hodrick's Monte Carlo experiments indicate that substantial bias can arise in test statistics in long horizon forecasting. After correcting for the noted bias, Hodrick (1992) states that inference across the different procedures is quite similar. Hodrick (1992) concludes that the vector autoregressive (VAR) technique supplies long horizon statistics that appear to be unbiased measurements and thus emerges as the preferred technique. The VAR tests provide strong evidence of the predictive power of one-month ahead returns at least for the sub period 1952 to 1987 (the entire sample period is January 1926 to December 1987) and provides an alternative way to calculate long horizon statistics. The estimates and Monte Carlo result support Hodrick's (1992) conclusion that changes in dividend yields forecast significant persistent changes in expected stock returns.

3.6 The effect of small sample bias

Nelson and Kim (1993) investigate the role of small sample bias and the possibility that small sample bias could play an important role in the inference that stock returns are predictable from their underlying fundamentals due to the estimates of the degree of predictability. Small sample bias in asymptotic standard errors in the context of overlapping observations on multi-period returns has received attention in a number of papers including that of Richardson et al. (1991) and Boudoukh et al. (1994). However, Nelson et al. (1993) present further evidence relating to the effect of small sample bias in the regression coefficient.

Nelson et al. (1993) regress real and excess returns on the lagged value of the log of the dividend yield using annual data for the S&P's Composite Index for the years 1871 to 1987. One-year returns are accumulated forward over horizons of three and ten years to form overlapping multiyear returns. Nelson et al. (1993) find that for all return horizons (one, three and ten year) that the regression slope is positive in each case, implying that the expected return is low when the dividend yield is low. Furthermore, Nelson et al. (1993) find that the t-ratio and the R^2 increase with return horizon, suggesting that the strongest evidence of predictability is found at long horizons. On the surface, Nelson et al. (1993) results suggest that stock returns have been predictable from dividend yields over the past century in the United States and that the predictability increases with time horizon. However, Nelson et al. (1993) caution against hastily drawn conclusions.

In their tests regressing S&P Returns, NYSE returns and Industrial Production Nelson et al. (1993) find that the t-ratios from these predictive regressions are subject to two small sample biases that both work in the direction of indicating that returns are more predictable than they actually are. Firstly, they find that that the regression coefficient will be biased if the predictor is jointly endogenous with the return variable. Secondly, they find that in the case of overlapping multiperiod returns, standard errors based on asymptotic theory tend to be too small in finite samples.

The method adopted by Nelson et al. (1993) to study the above biases is to model the variables as a VAR (vector autoregression) under the null hypothesis and then generate artificial histories of them using the estimated VAR and randomized sequences of the historical residuals. Nelson et al. (1993) repeat the regressions for the artificial histories in order to obtain an empirical sampling distribution. In addition, they investigate four versions of standard errors designed to account for serial correlation in regression errors introduced by overlapping of multiperiod returns. Three of these versions accommodate heteroskedasticity.

Nelson et al.'s (1993) main finding is that both sources of small sample bias are important. They also find that the sources of small sample bias are large enough to mitigate evidence that the lagged value of the dividend yield is a predictor of stock returns. Nelson et al. (1993) also find that, using annual returns for 1872 to 1986, that one tail p-values estimated from the empirical distributions are substantially larger than what would be implied if the t-distribution were appropriate. In addition, monthly return data, while offering a larger sample size than annual data, does not result in the mitigation of regression bias. Nelson et al. (1993) conclude that the important factor in determining small sample bias is not the number of observations per se, but the length of the historical record.

Nelson et al. (1993) conclude that valid inferences cannot be drawn from predictive regressions using conventional methods appropriate in the case of regression. Furthermore, they state that it would seem that the researcher is obliged to develop the empirical distribution of the statistic under the null hypotheses using simulation models prior to drawing inferences.

3.7 A further examination of security return patterns – is there a connection between stock and bond returns?

Fama and French (1989) offer further evidence supporting the view that security returns are predictable. Their evidence centers on the possible link between variation in stock and bond returns and the business conditions existing during that time. Fama et al. (1989) pose two questions central to their follow on paper *to 'Dividend Yields and*

Expected Stock Returns'[5] entitled *'Business Conditions and Expected Returns on Stocks and Bonds'*[6]:

i) Do expected returns on stocks and bonds move in tandem? Furthermore, are there common variables that forecast stock and bond returns?

ii) Is the variation in expected stock and bond returns related to business conditions and are the relationships consistent with intuition, theory and existing research on exposure of differing asset classes to changes in business conditions?

The tests used by Fama et al. (1989) in an effort to answer these questions centre on regressions of future *excess* stock and bond returns on a common set of variables. These variables are the dividend yield, default (difference between yield on market portfolio of corporate bonds and the yield on Aaa bonds) and maturity (term spread – difference between the Aaa yield and one-month T-bill rate) premiums. The return horizons are constructed in the same manner as was done in Fama et al. (1988). The only difference being that *excess* stock and bond returns are used. This means that excess returns for quarterly and one- to four-year returns are obtained by cumulating monthly excess returns, as was the case in Fama et al. (1988). The monthly, quarterly and annual excess returns are overlapping. The two- to four-year returns are overlapping annual observations.

Fama et al. (1989) find that expected *excess* returns (calculated using returns net of one month Treasury bill rate) on corporate bonds and stocks move together. Furthermore, Fama et al. (1989) find that dividend yields forecast both stock and bond returns. In turn, Fama et al. (1989) find that default and maturity premiums track the predictable variation in stock returns. Fama et al. (1989) note that both the dividend yield and the default spread reveal similar variation in expected stock and bond returns. Both variables forecast low returns when business conditions are strong and vice versa when business conditions are weak. Fama et al.'s (1989) analysis reveals that the movements in these variables, and the expected returns that they track, seem to be related to long-term periods of business activity spanning a number of business cycles. The maturity (term) spread – and the portion of expected return it tracks – is found to be high around troughs

[5] Journal of Financial Economics, 22 (1988), 3-25
[6] Journal of Financial Economics, 25 (1989), 23-49

in the shorter term business cycles identified by the National Bureau of Economic Research (NBER) and low around cyclical peaks.

Fama et al. (1989) find clear patterns across asset classes when examining the slopes from regressions of excess stock and bond returns on the forecasting variables. The slopes for the maturity (term) spread are found to be positive and similar in magnitude for all stock and long term bond portfolios examined. Fama et al. (1989) suggest that the spread tracks a maturity premium in expected returns that is similar for all long-term assets. Fama et al. (1989) rationalise this as the logical outcome supporting the widely held view that the premium compensates for exposure to discount rate shocks that affect both stocks and bonds held over the long term, in the same manner.

In their examination of slopes for the default spread and the dividend yield, Fama et al. (1989) find that the slopes for both explanatory variables increase from high-grade to low-grade bonds and then again from bonds to stocks. Fama et al. (1989) suggest that the default spread and the dividend yield track components of expected returns that vary with business conditions risk. The pattern exhibited by the slopes as the asset classes progress from least to most risky corresponds to what Fama et al. (1989) call '*the intuition about the business risk of the assets, that is, the sensitivity of their returns to unexpected changes in business conditions.*'

In similar fashion to Fama et al. (1988), Fama et al. (1989) make a more in depth examination of their results by making use of out-of-sample forecasts. The reason for this examination is a statistical issue that will not be elaborated on in this paper, suffice to say that Stambaugh (1986)[7] shows that if the yield, Y(t), is positively autocorrelated, the ordinary least squares (OLS) slope will be upward biased, thus overestimating forecast power of the independent variable. Fama et al. (1989) apply Stambaugh's (1986) bias-adjustment procedure to their excess return regressions and conclude that the OLS slopes for D(t)/P(t) and the default premium are slightly upward biased, but the slopes for the term premium are downward biased.

[7] in Fama and French (1989)

In addition, Fama et al. (1989) calculate R^2 for out-of-sample forecasts conducted over a 21 year period (1967-1987) using rolling 30-year regression estimates that start in 1937. For the sake of clarity – to forecast the first one-year return (1967), Fama et al. (1989) make use of coefficients estimated with the thirty returns for 1937-1966. For the one- to four-year return horizons, the estimation period rolls forward in annual increments. For monthly and quarterly return horizons, the 30-year estimation period rolls forward in monthly or quarterly increments. The out-of-sample R^2 are found to be smaller than the in-sample R^2 for the period 1967-1987, but the differences between the two tend to be fairly insignificant. The significant finding, however, is not the differences between the in- and out-of-sample R^2, but rather their similar behaviour. The shorter-term forecast power of the maturity (term) premium is found to be more important than the longer term forecast power of the default premium when examining higher grade bond portfolios (the less risky of the asset classes under examination). The longer-term forecast power of the default premium and dividend yield is found to be more important and accurate for predicting low-grade bond and stock returns (the more risky of the asset classes). This supports the view presented by Fama et al. (1989) earlier, that the dividend yield is correlated with the default spread and moves in a similar way with long term business conditions, while the term spread is related to shorter-term business cycles.

In conclusion, Fama et al. (1989) offer possible explanations for the fact that the three explanatory variables forecast stock and bond returns. This fact implies that the variation in expected returns is largely common across securities, and is negatively related to long- and short-term variation in business conditions. Fama et al. (1989) use consumption smoothing as a possible explanation for the results of their paper. The idea of consumption smoothing is not a new economic concept. Many asset-pricing models predict that consumption depends on wealth rather than current income. For example, when income is high in relation to wealth, investors will smooth consumption into the future by saving more. These actions by investors will result in lower expected security returns, ceteris paribus. This is because if investment opportunities are considered relatively fixed in the shorter term and investors need such opportunities to invest their savings, the market clears at lower levels of expected returns. If income is low in comparison to wealth, investors will want to save less to maintain their current living standards. If investment opportunities remain relatively constant and there is less investment because of lower savings levels, the market will clear at higher levels of expected returns.

Fama et al. (1989) find that expected excess returns on stocks and bonds are inversely related to business conditions proxies. Chen (1989) [Fama et al. (1989)] finds that consumption smoothing does predict expected excess returns varying in opposition to prevailing business conditions. However, more literature[8] concludes that consumption smoothing models predict that expected real returns vary opposite to business conditions. Fama et al. (1989) proceed to test whether the dividend yield, default and maturity (term) premiums track expected real returns. In brief, the regressions for real returns show that, like expected excess returns, expected real returns move opposite to business conditions.

Fama et al. (1989) do not confine their explanation for the variation in expected returns to consumption smoothing. Fama et al. (1989) hypothesize that the risks for which the dividend yield, default and maturity premium are proxies are higher when business conditions are strong and lower when business conditions are weak. Fama et al. (1989) use as an example the expected return variation tracked by the maturity spread. Chen (1989) formally documents the positive relationship between the maturity premium and future real activity. Since the maturity spread is low near business cycle peaks and high near troughs, Chen's (1989) [Fama et al. (1989)] results show poor prospects for future real activity and therefore investment near business peaks may help explain low expected returns around these peaks. The converse applies when, after troughs in business conditions, good prospects for future real activity and thus investment are found. This may contribute to high expected returns found around troughs.

Fama et al. (1989) conclude by arguing that their results identify variation in expected returns. They offer a number of theories (that were expanded upon earlier) that postulate the possible reasons for the variation in expected returns and how this variation may be split between changes in risk. However, they do acknowledge that the evidence they provide relating to long- and short-term economic conditions requires complex analysis. The complexity inherent in their paper is captured in their closing paragraph,

[8] Hansen and Singleton (1983) and Breeden (1986) in Fama and French (1989)

'What economic forces drive the economy between long- and short-term, good and bad times? Invention? Change in tastes for current versus uncertain future consumption? Government and fiscal policies? These are of course the largely unanswered questions of macroeconomics.'

3.8 The effect of discount rate changes on security returns

It is a well-known fact that financial markets respond to changes in the discount rate. The markets focus on the announcements made by the Reserve Bank because they signal the future intentions of the Reserve Bank with regard to monetary policy and provide information regarding the money base and credit growth within the economy.

Papers written on this subject in the United States have focussed on the immediate reaction of security prices to changes in the discount rate announced by the Federal Reserve. Waud (1970) [Jensen and Johnson (1995)] concludes that a decrease in the discount rate results in positive returns on the U.S. stock markets, while increases in the discount rate results in negative returns. The effects of announcements of changes in the discount rate is identified in non-U.S. security markets by Baker et al. (1980), Brown (1981) and Batten and Thornton (1985) [Jensen and Johnson (1995)]. A number of other U.S. studies [Sellon (1980), Smirlock and Yawitz (1985)] discuss related areas of effects changes in the discount rate have on bank lending and security prices. Sellon (1980) [Jensen and Johnson (1995)] discusses how bank lending and security prices may be altered because of discount rate changes. For example, bank lending may increase following a decline in the discount rate as more borrowing at the margin takes place. Smirlock and Yawitz (1985) [Jensen and Johnson (1995)] examine two possible means by which a discount rate change may affect security returns. They discuss the fact that an increase in the discount rate may reduce the firm's profitability as a result of the increase in the cost of debt. In addition, changes in the discount rate influence interest rate forecasts and thus investors required rates of return. This will translate into a change in the cost of capital – the rate at which firm cash flows are discounted.

Jensen and Johnson (1995) re-examine the performance of U.S. financial markets following changes in the discount rate. The distinguishing feature of this research in comparison to prior studies is the focus on the long-term relationship between changes in the discount rate and returns on stocks and bonds. Jensen et al. (1995) examine the period 1962-1991. During this period there were 78 discount rate changes, 39 increases and 39 decreases. Jensen et al. (1995) study three stock market indices and two interest rate indices. The stock market indices are the CRSP equal- and value-weighted indices and an index constructed of financial firms. The finance index is used to determine whether interest rate sensitive stocks behave differently to other stocks. The effect of a discount rate change on interest rates is gauged by examining two bond indices. The effect on the short-term debt market is examined by analysing changes in the 3-month Treasury Bill index, while the impact on the long-term debt market is measured by the 10 year Treasury Bill index.

Jensen et al. (1995) employ two different types of methodology in examining the effect of discount rate changes on the stock and bond markets. The first is an event window methodology where returns are examined for the 15 days before and after a "two-day" announcement period. The second methodology uses an announcement-to-announcement holding period i.e. a holding period equal to the period in between consecutive announcements regarding changes in the discount rate. Jensen et al. (1995) conclude the following from examining the results of the event window methodology:

i) The pre-announcement returns suggest that the market anticipates changes in the discount rate, as both the stock and bond indices move several days prior to the change. The finance index experiences the strongest pre-announcement movement.

ii) The results suggest that the bond and stock market behave similarly prior to a rate change.

The significant reaction in returns observed in the analysis of both the short and long-term debt market suggests that the information impounded in a discount rate change is not specific to either the short or long term debt market.

The mean-adjusted returns during the post-announcement period suggest a positive drift in stock returns following rate decreases. This drift does not seem to be mirrored when discount rates decrease. Interest rate indices do not experience a post-announcement drift. Jensen et al. (1995) state that the absence of any pattern during the post-announcement period for interest rate indices suggests that the assimilation of information by the bond market with regards to changes in the interest rate happens quickly.

The announcement-to-announcement period results can be summarised as follows:
The mean stock return following rate increases is significantly less than the mean return following rate decreases. This is true for each stock index examined. The stock return volatility is significantly higher following rate increases. Jensen et al. (1995) find that in the case of each stock index the return variance following a rate increase is at least 1.5 times the variance of returns after a rate decrease. The analysis of bond return indices indicates that long-term rates are significantly higher following discount rate decreases, while short-term rates are higher following discount rate increases. This is in contrast to the results of studies using the event window methodology.

i) There is no clear pattern in interest rate movements following changes in the discount rate.
ii) The volatility of interest rates (both long and short term) increases following discount rate increases.

Jensen et al. (1995) conclude that stock performance patterns cannot be explained by interest rate movements. Furthermore, Jensen et al. (1995) state that their findings are consistent with those of Fama et al. (1990). This link is made because Fama et al. (1990) find that stock returns are related to real activity and several variables that proxy for expected returns. Jensen et al. (1995) note that this link is not unfounded because Fed announcements regarding changes in the discount rate are likely to be related to the same variables since Fed policy is to some extent endogenous and reflects business conditions. It is for this reason that Jensen et al. (1995) conclude that inferring that discount rate changes actually cause the pattern in stock returns may be incorrect.

3.9 A new dimension – business conditions and expected security returns examined under prevailing monetary conditions

Jensen, Mercer and Johnson (1996) build on the research of Fama et al. (1988, 1989) and Jensen et al. (1995) with the purpose of presenting new evidence regarding the joint role of the monetary sector and business conditions in tracking expected security returns. This paper is the natural progression in previous work done by Fama et al. (1988, 1989) and Jensen et al. (1995). Jensen et al. (1996) note that the evidence presented by Jensen et al. (1995) suggesting that monetary stringency affects investors' required rate of return is consistent with Fama et al.'s (1989) arguments that predictable variation in returns reflects rational variation in required returns. Jensen et al. (1996) formulate the topic of their investigation, posing the question: do monetary conditions affect risk premiums, and therefore the relations between business-conditions proxies and expected security returns?

Jensen et al. (1996) examine three areas of primary interest. These areas are encapsulated in the following questions:

i) Does the monetary sector capture some of the variation in returns or do changing business conditions alone account for the variation in expected security returns?

ii) Do the structural relationships between the three proxies [dividend yield, maturity premium and default premium used by Fama et al. (1989)] and security returns change across differing monetary environments?

iii) Fama et al. (1989) presume that the structural relationships between their chosen proxies are consistent over the business cycle – do these structural relations shift with a changing monetary environment?

In order to address these issues, Jensen et al. (1996) re-examine the evidence provided by Fama et al. (1989) and investigate the impact of monetary conditions on security returns, given the structure developed by Fama et al. (1988, 1989). Jensen et al. (1996) analyse expected stock and bond returns over monthly and quarterly return horizons for the period February 1954 to December 1992. The period under examination includes 99 discount rate changes, 49 increases and 50 decreases. Jensen et al. (1996) emphasise that there are only 23 rate-change series (12 decreasing and 11 increasing). A rate-change series is defined as a period of time over which changes in the discount rate are only in one direction. The reason Jensen et al. (1996) consider rate-change series is that the Fed is assumed to be operating under the same fundamental monetary policy (i.e. expansive when the discount rate is lowered consecutively and restrictive when an increase in the discount rate is announced consecutively) until a change in the discount rate in the opposite direction occurs. In order to examine the effect of monetary policy stance on stock and bond returns, returns are classified as falling either within restrictive or expansive monetary policy periods. Jensen et al. (1996) examine several macroeconomic variables across decreasing and increasing rate-change series in order to support the proposition that the rate-change series are indicators of prevailing monetary policy. The macroeconomic variables used by Jensen et al. (1996) represent monetary aggregates, interest rates and banking activity. The variables used, more specifically, are the seasonally adjusted money supply, the seasonally adjusted adjusted-monetary-base, seasonally adjusted adjusted-Fed-credit, excess reserves and the federal funds premium (the federal funds rate less the three-month T-Bill rate).

The tests conducted by Jensen et al. (1996) on the aforementioned macroeconomic variables provide evidence confirming the proposition that rate-change series are indicators of monetary policy stance. The tests show significant differences exist between the median levels of each of the economic variables across periods classified either as expansive or restrictive monetary environments. In addition, Jensen et al. (1996) find that growth rates in all of the variables, with the exception of the excess reserves variable, are significantly different across the two monetary periods.

Jensen et al. (1996) use variables in their analysis that are consistent with those employed by Fama et al. (1989). A discount rate change variable is added as an explanatory variable. This variable is a directional rate-change dummy variable that assumes a value of one if the previous change in the discount rate was an increase and a value of zero if the previous change in the discount rate was a decrease.

Jensen et al. (1996) present sample means of the monthly variables across the full period and expansive-versus-restrictive monetary policy periods.

3.10 A refinement of the methods employed by Jensen, Mercer and Johnson

Booth and Booth (2001) examine the stance of monetary returns on security returns. They find that both the measures of the stance of monetary policy, namely the federal funds rate and an index based on the change in the discount rate, contain significant explanatory information that may be used to forecast expected stock and bond returns. Booth et al. (2001) find that an expansive (restrictive) monetary policy stance decreases (increases) returns of large and small stock portfolios, and in some cases, corporate bond portfolios. In addition, the measures used to indicate the stance of monetary policy are able to add further explanatory power beyond that of the business conditions proxies.

Booth et al. (2001) expand on previous research within the realm of monetary policy and its effect on security returns in various ways. Booth et al. (2001) construct measures of the business conditions proxies to test the strength of the findings related to the predictability of stock returns. Booth et al. (2001) then use two measures of monetary policy actions, the first developed by Jensen et al. (1996) related to the directional change of the discount rate. The second measure used by Booth et al. (2001) is the federal funds rate. These two indicators are used to determine whether the stance of monetary policy has a direct effect, via the monetary sector, on stock and bond returns. Finally, Booth et al. (2001) investigate the possibility that either business conditions or a tight monetary policy have a different impact on firms of different sizes. Booth et al. (2001) point to the notion that smaller firms may be more directly affected by changes in monetary policy because of their greater dependence on bank financing. Booth et al. (2001) explain that, similarly to earlier research on business conditions, monetary policy and its effect on security returns, the default spread, dividend yield and the term spread are all important indicators in explaining expected returns on both groups of stock portfolios and on a portfolio of corporate bonds. Booth et al. (2001) conclude that both measures of monetary policy[9] actions have explanatory power for expected excess stock returns on both the large and small stock portfolios in monthly returns. The discount rate change as the measure of change in stance of monetary policy is found to have

[9] Jensen et al.'s (1996) measure of directional change in the interest rate and the federal funds rate

explanatory power for the expected excess returns on corporate bonds. Contrary to Jensen et al.'s (1996) findings, Booth et al. (2001) find that the interaction of the discount rate change index with the business conditions proxies shows that the effect of monetary policy is direct and does not work through business conditions proxies. A finding of particular interest is that monthly returns of large and small stock portfolios and in some cases those of corporate bonds is lowered by a restrictive monetary stance.

Booth et al. (2001) offer a number of reasons for the differing results when compared to those of Jensen et al. (1996). The first being that business conditions proxies used by Booth et al. (2001) play substantially differing roles, depending on monetary policy at the time, in explaining variations in expected stock and bond returns. Booth et al.'s (2001) conclusions do not support those of Jensen et al. (1996) who concluded that business conditions proxies only contain significant explanatory power for stocks and bonds when the monetary stance is restrictive. This difference in findings is possibly attributable to the differences in definitions of the business conditions proxies or to differences in stock and bond portfolios examined. Booth et al. (2001) note that if this is the case, they suggest that earlier findings may not be robust to different ways of measuring business proxies, or they may be sensitive to particular stock and bond portfolios under examination.

Booth et al. (2001) conclude that monetary policy actions contain significant information that may be useful when attempting to forecast expected stock and bond portfolio returns. In addition, Booth et al. (2001) find that information contained in the federal funds rate reflects more than the informational content reflected by the discount rate changes. Booth et al. (2001) submit that this information can be used to forecast stock and bond returns beyond that contained in proxies for the business cycle.

3.11 Patelis examines the stance of monetary policy and its effect on stock returns

Patelis (1997) examines whether changes in the stance of monetary policy can account for the predictability in excess stock returns. He uses the same empirical methods employed by Fama et al. (1989) elaborated on earlier. Furthermore, Patelis (1997) employs an alternative to the use of long-horizon regressions used by Fama et al. (1989), which is the inferral of long-term behaviour of expected returns from short-horizon vector autoregressions (VARs). Patelis (1997) focuses on long-horizon predictability of future security returns and whether it can be explained by monetary policy alone.

Patelis (1997) observes that the monetary variables used in his analysis are marginally significant predictors of security returns across different time horizons and candidate variables. As an example of his findings he sites a higher federal funds rate, that indicates tighter monetary conditions, predicts lower expected returns over the short run but higher expected short-horizon returns further into the future. Furthermore, Patelis (1997) uses exclusion tests (i.e. the exclusion of either the monetary or financial variable sets), to test the hypothesis that excess security returns are unpredictable if either monetary or financial variables are used and the hypothesis is strongly rejected. This means that both the financial and monetary variables remain significant when used in isolation to predict security returns. Therefore, there is predictive power in the financial variables that are independent of the predictive power of monetary variables and vice versa. Patelis (1997) contemplates the reason for such a result as follows:

i) monetary policy represents significant explanatory power of asset return predictability, *or*

ii) the stance of monetary policy is not adequately captured by the monetary variables used in the analysis, thus the financial variables provide additional explanatory power, *or*

iii) there may be another force driving both monetary and financial variables.

The R^2 and adjusted R^2 for biennial data both show that more than forty percent of future variability in excess returns can be predicted using monetary and financial variables. The constant expectations hypothesis is thus clearly rejected.

Patelis (1997) tests the model developed for misspecification under the interpretation of the dividend yield. From this test Patelis (1997) finds that the set of variables used to describe time variance in expected returns is not sufficiently specified. Patelis (1997) surmises that there must still be economic or financial variables not yet uncovered by econometricians or theorists that can help predict future expected returns and dividend growth and that their effect is captured by the strong statistical significance of the dividend yield.

Patelis (1997) goes on to use an alternative modelling strategy to the long horizon regressions that imputes long-horizon statistics from short-horizon VARs. This method has the advantage of avoiding small sample biases inherent in long-horizon, overlapping regressions and allows for feedback from stock returns to forecasting variables.

This method provides alternative estimates of the coefficients of long-horizon Fama and French regressions by using a short-horizon VAR, thus verifying his prior results. In addition, Patelis (1997) decomposes unexpected stock returns into three components related to future expectations of unexpected returns, dividend growth and real interest rates. Finally, Patelis (1997) examines the portion of the variance of unexpected stock returns that can be attributed to changes in monetary policy conditions.

The analysis of the results of this investigation shows that monetary policy variables account for only 3.14 percent of unexpected asset return variance, while 86.26 percent of the same variance is explained by the financial variables. Patelis (1997) finds this result is driven solely by the dividend yield. It follows that shocks to this variable account for most of the variance in unexpected asset returns. Patelis (1997) uses two reasons to explain the importance of the dividend yield as an integral component of unexpected security returns:

i) the persistence of the effect of a change in the dividend yield i.e. a small shock to the dividend yield persists for a much longer period than a shock to other variables.

ii) changes in future excess return expectations dominate unexpected security returns, which the dividend yield predicts well.

Patelis (1997) draws the observation that the above results are problematic for theories that try to link asset return predictability to the business cycle because the dividend yield is much more persistent than the former. Furthermore, Patelis (1997) observes that the predictive power of the dividend yield has not been absorbed by the inclusion of the macroeconomic variables, thus making security return predictability even more difficult because it is driven by the dividend yield variable, which is relatively unrelated to the business cycle.

3.12 Thorbecke on stock market returns and monetary policy

Thorbecke (1997) examines the question surrounding the neutrality of monetary policy by examining how security return data responds to monetary policy shocks. Thorbecke (1997) measures monetary policy by innovations in the federal funds rate and non-borrowed reserves. In addition, Thorbecke (1997) conducts an event study of the U.S. Federal Reserve policy changes and examines various narrative indicators together with changes in the Federal funds rate using regression techniques in an attempt to establish whether changes in monetary policy are neutral. Thorbecke (1997) examines the relationship between monetary policy and security returns through the theoretical link that security prices should equal the present value of all the firm's future cash flows. Therefore, evidence that shows that monetary policy shocks increase or decrease real cash flows or real discount factors is evidence of possible real effects of changes in monetary policy.

In order to test the theoretical link, Thorbecke (1997) uses the following empirical techniques:

i) impulse-response functions from a vector autoregression.

ii) variance decompositions from a vector autoregression.

iii) a generalized method of moments estimation of monetary expansion.

The first two techniques indicate that there is a large and statistically significant relationship between either negative shocks to the U.S. federal funds rate or positive shocks to non-borrowed reserves and subsequent increases in stock returns. The third technique employed by Thorbecke (1997) shows that increases in stock returns are strongly correlated to the estimation of monetary expansion.

Thorbecke (1997) expands his analysis of the data to include an event study of the changes by the Federal Reserve in its federal funds rate target. This event study provides further evidence that security returns increase during periods where the Federal Reserve has implemented expansionary monetary policies.

Thorbecke's (1997) study revolves around the question of money's neutrality within the economy. He addresses this question by examining how stock return data responds to monetary policy shocks. Using several measures of monetary policy and a variety of empirical techniques as explained above, Thorbecke (1997) presents evidence that monetary policy exerts large effects on both ex-ante and ex-post stock returns. This implies that monetary policy has real effects on real variables. Thorbecke (1997) qualifies this statement by stating that monetary policy also affects inflation and at the same time this does not imply that lax monetary policy is a necessarily better because of the distorting effect inflation may have on prices within the economy.

3.13 Concluding remarks

The majority of the evidence presented in the literature review emanates or has its origin of thought in the theories posited and analysis performed by Fama et al. (1988, 1989). Not all of the research performed supports the statistical or theoretical approach taken by Fama et al. (1988, 1989). However, in order to decide on an appropriate methodology, the evidence for and against that employed by Fama et al. (1988, 1989) must be examined.

The significant volume of research subsequent to that performed by Fama et al. (1988, 1989) provides credence to their work performed and establishes the work as groundbreaking within its theoretical domain. In addition, papers written afterwards, such as Campbell et al. (1988a) chose to align their findings with those of Fama et al. (1988), by stating that Fama et al.'s (1988) excess return regression is essentially similar to their test that the stock price equals the expected present value of future dividends. It is because of this statement that Campbell et al. (1988a) argue that excess volatility and predictability of multiperiod returns are not two separate phenomena, but one.

In contrast, Goetzmann (1993) state that, given the persistent and stable nature of dividend payments, movements in the dividend yields are dominated by movements in prices. This persistence introduces biased forecasting regressions because of independent variables that are correlated with lagged dependent variables, instead of being pre-determined as assumed by the statistical models used in their papers.

Furthermore, Goetzmann et al. (1995) explore the implications of relying solely on survived series (i.e. series with continuous price and dividend records) for drawing inferences about dividend yield regressions. Goetzmann et al. (1995) imply that the power of yields to forecast returns is strongly conditioned on survival. However, even during the course of their investigation into the effect of survivorship Goetzmann et al. (1995) still find that the monthly NYSE data provides evidence of the predictability of long horizon returns via dividend yields. Even more damaging to their claims is that in the results reported for the UK data for the period 1926-1992, Goetzmann et al. (1995) find strong evidence of predictability of long horizon returns.

A statistical construct employed by Fama et al. (1988, 1989) in the course of their research is the use of overlapping observations. This methodology has been the subject of much scrutiny over a number of years. Boudoukh et al. (1994) give perhaps the most critical report on the use of overlapping observations as they posit that with highly autocorrelated regressors, which are often the case with financial time series, overlapping observations do not result in increased efficiency. They suggest that researchers should be cautious in the interpretation of their results as the large number of observations available through the use of overlapping data resulting from the use of long horizon time series can be deceptive.

This critique immediately leads to the consideration of the role of small sample bias if it is considered inappropriate to make use of a sample containing overlapping observations. Nelson et al. (1993) conclude that the important factor in determining small sample bias is not the number of observations per se, but the length of the historical record. Nelson et al. (1993) do not offer an estimate as to the length of history required in order to eliminate this problem. It is submitted that while their point may have foundation, this should not inhibit an attempt to analyse the data series available.

The major critique of Fama et al.'s (1988, 1989) research is whether the correct statistical procedures were implemented to analyse the data. While there is often merit in the commentary resulting from the critique, it is submitted that no critique leveled at the methodology used by Fama et al. (1988, 1989) has resulted in it being discredited. The critique leveled at the original study has had the effect of refining the methodologies used over time and provided further insight into original hypotheses posed. It is for this reason that this paper follows Fama et al.'s (1988, 1989) methodology, that is, in order to provide a consistent basis for comparison of the studies and to facilitate further future research in this area within the South African context.

4 Research Methodology

The methodology employed in evaluating the data is based on the approach used by Eugene Fama and Kenneth French in their seminal papers *'Dividend yields and expected stock returns'*[10] and *'Business conditions and expected returns on stocks and bonds'*[11]. The methodology is revisited in the context of South African security returns and events peculiar to the South African financial markets. The use of Fama et al.'s (1988, 1989) methodology is done to facilitate a comparative study. Although the consistent application of methodology may facilitate comparison between the papers, cognisance must be taken of the differences that exist between the two countries (both financial and non-financial) when comparing the results.

4.1 Sample Period

The purpose of this research is to identify possible long-term relationships between stock returns and commonly used indicators of capital market performance. It is important to be able to establish the nature of these relationships over periods of time spanning not only several business cycles, but also during periods of inflation and deflation, and differing political climates. Even though history will not repeat itself exactly, it is important to test the predictive nature of these variables over as many different periods as possible, thus allowing varying inferences to be made regarding the reliability of these variables under different circumstances.

A starting point for research on South African financial markets is commonly understood to be 1960. The most probable (and practical) reason for this is the fact that two papers that track historical returns of South African capital markets had as their starting date 1960. The first such paper is one published by Floquet (1998) of Fleming Martin Securities Ltd that has been updated on an annual basis. The first year of this study was 1960. The second such paper published was by Hamman, Gear and Smit (1996) that covered the years 1961-1993.

[10] Journal of Financial Economics 22 (1988), 3-25
[11] Journal of Financial Economics 25 (1989), 23-49

Research by Firer and McLeod (1998) resulted in the systematic collection of reliable data on South African equities, bonds and money markets from 1925 onwards. This has made it possible for this paper to examine the predictive power of key financial market indicators, such as the dividend yield and maturity premium, in explaining variation in share and bond returns on the JSE over the period commencing 1925 to the present day.

4.2 Variables

4.2.1 Return variables

4.2.1.1 Equity returns

The JSE-Actuaries All Share Index is the definitive index of the South African equity market [Firer and McLeod (1998)]. It is calculated as the market capitalisation weighted arithmetic average of the official daily closing prices on the exchange. The income portion of the All Share Index is the dividend yield. Currently, information on dividends payable are updated as each company makes them public. However, in order to construct an All Share Index before October 1978 (the official starting date of the JSE-Actuaries All Share Index) a dividend yield was used by Firer et al. (1998). Firer et al. (1998) contend that the historical accuracy given by using actual dividends paid instead of the dividend yield does not justify the enormous effort that would be required to collect such data. Instead, Firer et al. (1998) use 1/12 of the dividend yield as the income receipt per month.

In order to interpret the results following the tests conducted on the JSE-Actuaries All Share Index, it is important to elaborate on the sources of information and method used by Firer et al. (1998) in establishing a reliable index prior to October 1978. The equity price index data compiled by Firer et al. (1998) can be divided into two distinct series – the first running from January 1925 to December 1948 and the second running from January 1949 to August 2001. The data making up part of the first series is collected from a study commissioned by the Bureau for Economic Research (BER) entitled "Industrial and Commercial Share Price Indices in South Africa 1910-1947" by Schumann and Scheurkogel of University of Stellenbosch. The reason for the use of the study is because the method of calculation of the index was broadly consistent with that of the current index – in that it was computed using market capitalisation weightings (Firer et al. 1998). The data from 1948 to 1959 is drawn from information held by Old Mutual (corroborative information was supplied by the South African Reserve Bank). The data from 1960 to October 1978 is provided by the Rand Daily Mail Industrial Index (known as the RDM100), which was weighted by market capitalisation. Firer et al. (1998) state that although the data prior to 1960 cover only industrial shares, this provides a reasonable proxy for equity investment during that period.

Monthly equity returns on the JSE-Actuaries' All Share Index are taken from the Firer McLeod (1998) paper[12]. The approach used by Firer and McLeod (1998) in determining monthly equity returns is based on the index "held" at the start of each month. The index is purchased at the beginning of the month at the Price index level at that time and sold using the index at the end of the month. Firer et al. (1998) assumes that dividend income is received halfway through the month and that the dividends emerge smoothly over the year. The dividend received is then reinvested at the average Price Index for that month. The value of this reinvested dividend at the end of the month is added to the value at the month end of the initial investment. Firer and McLeod (1998) illustrate this process mathematically as:

$PI_{(t)}$ = the Price Index at time (t)

$DY_{(t)}$ = the Dividend Yield at time (t)

$ap_{(t)}$ = the average price index for month (t) = $[PI_{(t-1)} + PI_{(t)}]/2$

$d_{(t)}$ = the dividend received for month (t) = $[DY_{(t-1)}PI_{(t-1)} + DY_{(t)}PI_{(t)}]/2400$

$r_{(t)}$ = the monthly performance for month (t)

$$= \frac{PI_{(t)}}{PI_{(t-1)}}\left[1+\frac{d_{(t)}}{ap_{(t)}}\right]-1$$

In order to obtain excess returns [used in Fama et al. (1989)] a proxy for the risk free rate is subtracted from $r_{(t)}$. The selection of a proxy for a risk free rate in South Africa is not a simple matter. A widely accepted benchmark for the provision of risk free returns in the U.S. markets is the 90-day Treasury Bill. However, in a number of studies by

[12] the data can be obtained from the author (courtesy Firer and McLeod) on request

Morgenrood[13] on the history of the Treasury Bill in South Africa between 1881 and 1981, he concluded that the T-Bill was not an appropriate measure for risk free returns within the South African economy. The major reason for this conclusion was the continual interference by the government in the financial markets. This interference included the holding of prescribed assets by certain financial institutions. The Banks Act, Act no 23 of 1965 was used to set a prescribed ratio of required liquid asset holdings to liabilities held by the affected financial institutions. This resulted in an artificial demand being created for T-bills, as they ranked as liquid assets for banks and building societies from 1965 and as prescribed investments for insurers and pension funds. In an attempt to find a reliable risk free rate for the South African economy Firer et al. (1998) held discussions with relevant money market authorities. These discussions resulted in the use of the fixed deposit rate being used over the period from 1925-1960 as a proxy for a money market rate. Over the period beginning 1960 until July 1966 the BA rate is used as the money market rate. Even though Bankers Acceptances formed part of the prescribed assets of financial institutions, the distortions created by the prescribed asset requirements over that period were not material [Firer and McLeod (1998)]. From July 1966 until 1989 the monthly NCD rates were used (provided by Securities Discount House) as they were not subject to the prescribed asset requirements and hence are not distorted. Data supplied by I-Net Bridge was used to cover the period from 1989 onwards. It is for the above reasons that the short-term money market rate is used as the risk free rate in South Africa.

4.2.1.2 Bond returns

Firer et al. (1998) trace the history of the South African bond markets with the help of a series of studies completed by Dr P Morgenrood. Firer et al. (1998) use a theoretical one-bond portfolio to develop an early measure of debt market performance in South Africa. This had to be done because of little secondary market activity in bonds prior to 1980. A single notional 20-year bond was created at the beginning of the period under examination – 1925, with a coupon level appropriate to long bonds at that date. The coupon level was revised whenever a long dated government bond was issued. Firer et al. (1998) use the methodology of the JSE-Actuaries Bond Performance Index that results in a separate Price Index and Interest Yield being obtained. Yield data was

[13] Morgenrood in Firer and McLeod (1998)

obtained from a number of differing sources over the period 1925-1998. Firer et al. (1998) collected yield and coupon data for the period 1927 to 1943 from the BER study conducted by Schumann and Scheurkogel in 1948. Yields for the two years (1925-1926) were set in conjunction with Dr. Morgenrood. The JSE-Actuaries Long Bond Yield was used to obtain yield data on long term bonds from 1941 to 1979. Firer et al. (1998) were thus satisfied that the price index and interest yield data were calculated on a consistent basis from 1925-1979. After 1979 it was no longer necessary to use a theoretical one bond portfolio because of the existence of the JSE-Actuaries Fixed Interest Index, which covered the period 1980-1985. This index proved slightly problematic, as it was not calculated in the same manner as the new JSE-Actuaries Bond Performance Index (used from 1986 onwards) or the index calculated prior to 1980. However, the advantage of using the JSE-Actuaries Fixed Interest Index is that the entire bond market is represented within the index.

In order to calculate monthly bond returns, the identical method employed to calculate monthly equity performance is used by Firer et al. (1998). The only difference being that the interest yield replaces the dividend yield in the formula. The only adjustment made by Firer et al. (1998) to the mathematical formulation of performance was when the JSE-Actuaries Fixed Interest Index was used. This was required because the index defined interest income differently to that of the JSE-Actuaries Bond Performance Index.

4.2.2 Explanatory variables

4.2.2.1 Dividend Yield

The dividend yield collected on an annual basis from 1925 to 1946 [from Firer et al. (1998)] is used. From 1946 until 1959 there is no record of dividend yield as the RDM100 over that period was recorded purely as a price index. Firer et al. (1998) use a constant dividend yield of 5% over this period. They justify the use of this arbitrary figure because the effect of changing the estimate slightly over the entire period under examination does not materially alter the return on the All Share Index. The JSE-Actuaries All Share Index Dividend Yield provides records of monthly dividend yields from 1960 to the present day.

4.2.2.2 Maturity Premium

The maturity premium used by Fama et al. (1989) was the difference between the time t yield on the Aaa bond portfolio and the one-month T-bill rate. Because of the non-existence of the corporate debt market in South Africa, it is proposed that the maturity premium be the difference between yield at time t on the JSE-Actuaries All Bond Index [as calculated in Firer and McLeod (1998)] and the money market rate (taken to be a reliable proxy as a risk free rate in South Africa). The use of a long-term Treasury bond yield as a substitute for the yield on the Aaa bond portfolio had little effect on the results of Fama et al. (1989). The results produced using the Treasury bond yield were not produced by Fama et al. (1989), but merely commented on. The reason Fama et al. (1989) use the yield on the Aaa bond portfolio was to avoid problems associated with the tax status of U.S. Treasury bonds in the early 1940s. It is submitted that the use of the yield on the All Bond Index will not affect the comparability of the two studies.

The reason for including the maturity spread as an explanatory variable is that it has been shown to forecast differences between long- and short-term bond returns[14]. In addition, the maturity (term) premium was found to track a time-varying premium in stock returns similar to that in long-term bond returns [Fama et al. (1989)]. The economic substance behind the inclusion is linked to evidence provided by the business cycles literature. Chen (1989)[15] documents suggestive evidence that investment opportunities play a role in the expected-return variation tracked by the term spread. Chen (1989) provides strong evidence positively linking the maturity premium to future real activity. Chen's (1989) results suggest that as the maturity premium is low near business cycle peaks (and vice versa), the poor prospects for future real activity near these peaks (in the form of investments) may help explain low expected returns around business cycle peaks.

[14] Fama and French (1989) reference the following articles – Fama (1976,1984,1986,1988), Shiller, Campbell and Schoenholtz (1983), Keim and Stambaugh (1986) and Fama and Bliss (1987)
[15] in Fama and French (1989)

4.3 Methodology

4.3.1 Objective one

The methodology used to test objective one is adopted from Fama and French (1988). Regression of future returns $r(t, t + T)$, calculated using the returns on the JSE-Actuaries All Share Index calculated by Firer and McLeod (1998), is performed on a measure of the time t dividend yield, $Y(t)$,

$$r(t,t+T) = \alpha(T) + \beta(T)Y(t) + \varepsilon(t,t+T).$$

4.3.1.1 Estimation problems and the definition of the dividend yield

Fama and French (1988) note the difficulties inherent in making the transition from the well known Gordon dividend growth model, based on discrete time periods within perfect certainty parameters, to a model that:

i) accounts for uncertain future dividends and discount rates, and

ii) exposes the corresponding behaviour of time-varying returns and discount rates.

These problems become apparent when the assumptions underlying the Gordon dividend growth model are examined. The model assumes that the dividend per share, D(t), for the time period t-1 to t grows at a constant rate g. The market interest rate that equates the future dividends to the share price P(t-1) at time t-1 is a constant r. Therefore, in the Gordon dividend growth model P(t-1) is,

$$P(t-1) = \frac{D(t)}{1+r}\left(1 + \frac{1+g}{1+r} + \frac{(1+g)^2}{(1+r)^2} + ...\right) = \frac{D(t)}{r-g}$$

Manipulating, the dividend yield is the interest rate less the dividend growth rate,

$$\frac{D(t)}{P(t-1)} = r - g$$

While this serves to illustrate the source of the problems illustrated above, the direct relationship between the dividend yield and the interest rate in the Gordon dividend growth model serves to illustrate that dividend yields are likely to capture some of the variation in expected share returns.

It is evident from the Gordon dividend growth model that the dividend yield is not a clean proxy in relation to expected returns as it clearly reflects perceptions regarding expected dividend growth. This may cause changes in the dividend yield, *Y(t)*, that are unrelated to the informational content about time-varying expected returns captured by the yield. Fama and French (1988) express any variation in *Y(t)* that is unrelated to variation in the expected return at time *t*, $E_t\, r(t,t+T)$, as noise that causes the regression of *r(t,t+T)* on *Y(t)* to miss some of the variation in expected returns, which is reflected in regression residuals.

Fama and French (1988) note that as expected returns vary through time, the discount rate effect can cause estimates of *r(t,t+T)* to overstate the variation of expected returns. To illustrate this point, suppose an expected return shock at time *t* increases discount rates. The certainty model given by the Gordon dividend growth model shows that unless the expected dividend growth rate increases by an equal amount the dividend yield will change. The signalling effect of dividend policies and the fact that changes in dividend policy are announced infrequently inevitably results in the discount rate shock translating into a dividend yield, *Y(t)*, shock, in this case increasing the dividend yield. The effect of an expected return shock is that, because of the discount rate effect, there is a negative correlation between unexpected returns and the resulting yield shock that tends to produce upward biased slopes in regressions of returns on yields. Fama and French (1988) conclude that this bias only arises when dividend yields track time-varying returns, but does not bias the tests toward false conclusions that yields have the ability to forecast returns.

The second problem arising from the definition of the dividend yield is that the quoted *Y(t)*, is defined as D(t)/P(t). This is because the informational content contained in *P(t)* includes investors' perceptions regarding future dividend payments. In order for this assumption to hold the market should at least conform to the semi-strong form of the efficient market hypothesis. A number of studies have tested the efficiency of the JSE.

Some examples of papers rejecting the semi-strong form of the efficient market hypothesis (EMH) on the JSE include Knight and Affleck-Graves (1983), Bhana (1987, 1989 and 1993) and Jacobson (1988). The studies supporting the EMH in the semi-strong form include Gilbertson and Roux (1977) and Husselman (1988). Philpott and Firer (1995) find that the JSE is not an efficient market, although they do conclude that there may be "pockets of efficiency" that exist on the JSE.

If the semi-strong form of the EMH is assumed to be true, because $P(t)$ is forward looking, $D(t)$ is old relative to the dividend forecasts contained in $P(t)$. The result of this mistiming regarding informational content of the dividend yield can be illustrated as follows – good news regarding future dividends at time t will result in a high price $P(t)$ relative to the current $D(t)$, translating into a low dividend yield $D(t)/P(t)$. Positive news regarding future dividend payments produces a high return $r(t-T,t)$ resulting in a negative correlation between the disturbance $e(t,t+T)$ and the time t shock to $D(t)/P(t)$ that tends to produce upward biased slopes in regressions of $r(t,t+T)$ on $D(t)/P(t)$.

Fama and French (1988) find that cross-correlations between one-year stock returns and dividend changes more than a year ahead are close to zero. Fama et al. (1988) conclude that their findings suggest that share prices do not forecast dividend changes more than a year in advance. Therefore, variation in the dividend yield caused by the price component that looks beyond the dividend in the numerator is substantially reduced when $Y(t)$ is defined as $D(t)/P(t-1)$ where $P(t-1)$ is the price at the beginning of the period covered by $D(t)$. The use of this definition of the dividend yield will avoid producing upward-biased slopes in regressions of $r(t,t+T)$ on $D(t)/P(t-1)$, if it is shown that share prices do not forecast dividend changes more than one year ahead.

The use of the dividend yield defined as $D(t)/P(t-1)$ is more conservative than $D(t)/P(t)$ when regressed against $r(t,t+T)$. Any upward biased slopes the regression may produce can be attributed to the discount rate effect, that is, only when expected returns vary through time. For this reason the regressions that use $D(t)/P(t-1)$ are more likely to avoid false conclusions that the dividend yields track expected returns. However, Fama et al. (1988) note that they may be too conservative. This is because the noise that causes deviation of $D(t)$ from its expected value at $t-1$ is noise that tends to cause regressions of $r(t,t+T)$ on $D(t)/P(t-1)$ to understate the variation of expected returns. Fama et al. (1988)

add that *D(t)/P(t-1)* is about a year out of date with respect to expected returns measured forward from *t* because *P(t-1)*, the denominator, can only reflect information about expected returns available at *t-1*. This can result in an understatement of the variation in expected returns because the use of the yield defined as *D(t)/P(t-1)* will not incorporate current shocks which may have a decaying effect on expected returns. It is for the aforementioned reasons that regressions are performed using both definitions of the dividend yield.

4.3.1.2 The mechanics of the methodology

The regression analysis is performed on equity returns – both nominal and real returns (the dependent variable) against the dividend yield, defined as D(t)/P(t) and D(t)/P(t-1).

The method employed in obtaining the results follows that of Fama and French (1988). Equity return data and dividend yields supplied by Firer and McLeod (1998) are used. The tests perform regressions of equity returns against dividend yields for return horizons T equal to one month, one quarter, and one to four years. The monthly, quarterly and annual returns are non-overlapping. The two- to four-year returns are overlapping annual (end-of-year) observations. The sample period for the returns is 1925-2000.

Expressing the preceding paragraph algebraically, the regressions are of the future returns r(t,t+T), on two measures of the time t dividend yield, Y(t),

$$r(t,t+T) = \alpha(T) + \beta(T)X(t) + \varepsilon(t,t+T).$$

Returns *r(t,t+T)*, provided by Firer and McLeod (1998) are regressed against dividend yields *Y(t)* defined as *D(t)/P(t)*. In addition, *Y(t)* defined as *D(t)/P(t)* is adjusted to reflect the more conservative estimate of *Y(t)* by the following manipulation,

D(t)/P(t) x P(t)/P(t-1) = D(t)/P(t-1)

This manipulation was made possible by the information collected by Firer and McLeod (1998) that include monthly price indices.

The results are classified according to distinct time periods. The time periods were chosen because of the source of information noted by Firer and McLeod (1998). The source of information is elaborated on earlier, but in order to provide clarity the following table is produced.

Time Period	Data source[16]
1925-1948	Bureau of Economic Research
1949-1959	RDM supplied by Old Mutual
1960-1978	RDM100
1979-2000	JSE-Actuaries Equity Index

Table 4.3.1.2a: Period split for analysis of results

The split may seem arbitrary, but certain information published by Firer et al. (1998) may not be reliable for the purposes of this particular study. An example of this is the use of a dividend yield of 5 percent by Firer et al. (1998), which was assumed to exist throughout the period 1949-1959. Although this may not materially affect the average return for the period ended 2000[17] it may have an effect on the ability of the results of this study to provide insight into the workings of South African capital markets, and more specifically the ability of the dividend yield to explain long term movements in the share index examined.

4.3.2 Objective 2

The methodology involved in testing objective two is almost identical to the methodology employed used in testing objective one, except for a few subtle differences. The methodology follows that of Fama et al. (1989).

The tests attempt to statistically capture variation in expected *excess* returns for return horizons *T* of one month, one quarter and one to four years. The use of expected excess returns and not simply expected returns is the major difference between the objectives. A one-month excess return is the difference between the one-month return on a stock or

[16] Firer and McLeod (1998)

[17] Firer and McLeod (1998) pg 9

bond and the one-month return on a money market instrument. These returns are calculated by Firer et al. (1998) as explained in section 4.2 of this paper. The excess returns for quarterly and one- to four-year returns are obtained by cumulating monthly excess returns. The monthly, quarterly and annual excess returns are non-overlapping. The two- to four-year returns are overlapping annual (end-of-year) observations.

The tests centre on the regression of future excess stock and bond returns, $r(t,t+T)$, on a common set of variables, $X(t)$, known at time t,

$$r(t,t+T) = \alpha(T) + \beta(T)X(t) + \varepsilon(t,t+T).$$

The first explanatory variable is the dividend yield, D(t)/P(t). Annual yields are used to forecast the returns, $r(t,t + T)$, for all return horizons. The annual yields are yields found at the turn of each year in the Firer et al. (1998) spreadsheet. The second explanatory variable is the maturity (term) premium – the difference between the time t yield on the JSE All Bond Index [Firer et al. (1998)] and the money market rate.

4.3.3 Serial Correlation

The assumption that errors corresponding to different observations are uncorrelated often breaks down in time series studies [Pindyck and Rubinfeld (1998)]. Serial correlation may occur in time series studies when the errors associated with observations in a given time period, t, are carried forward into future time periods t+1, ... ,t+k-1. Serial correlation affects the efficiency of ordinary least squares regression estimators, but it does not affect their unbiasedness or consistency [Pindyck et al. (1998)]. However, if the time series is subject to positive serial correlation, the loss of efficiency will be masked by the fact that the estimates of the standard errors obtained from the regression analyses will be smaller than the true standard errors. This will lead to the conclusion that the parameter estimates are more precise than they actually are, which may lead to an incorrect rejection of the null hypothesis when it is in fact true, a *Type I error*.

4.3.3.1 Corrections for serial correlation

It is assumed that each of the error terms in a linear regression model is drawn from a normal population with 0 expected value and constant variance but not assuming independent errors over time. The model can be represented as follows:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \ldots + \beta_k X_{kt} + \varepsilon_t \qquad (4.1)$$

$$\varepsilon_t = \rho \varepsilon_{t-1} + v_t \qquad 0 \leq |\rho| < 1 \qquad (4.2)$$

where v is distributed as $N(0, \sigma_v^2)$ and is independent of other errors over time and ε_t is distributed as $N(0, \sigma_\varepsilon^2)$ but is not independent of other errors over time. Pindyck et al. (1998) state that the error process as described in 4.2 is generated by a rule which states that the error in time t is determined by diminishing the value of the error in the previous period (multiplying by ρ) and then adding the effect of a random variable with 0 expected value. The formula for the first order serial correlation coefficient ρ is:

$$\rho = \frac{Cov(\varepsilon_t, \varepsilon_{t-1})}{\sigma_\varepsilon^2} \qquad (4.3)$$

Therefore, ρ measures the correlation coefficient between errors in time period t and errors in time period t-1. The procedure to obtain efficient parameter estimates involves the use of generalized differencing to alter the linear model into one in which the errors are independent. To express this procedure algebraically the following linear model described earlier holds for all time periods:

$$Y_{t-1} = \beta_1 + \beta_2 X_{2t-1} + \ldots + \beta_k X_{kt-1} + \varepsilon_{t-1} \qquad (4.4)$$

Multiplying the above equation by ρ and subtracting it from 4.1 the following transformation is obtained:

$$Y_t^* = \beta_1(1-\rho) + \beta_2 X_{2t}^* + \ldots + \beta_k X_{kt}^* + v_t \qquad (4.5)$$

where

$$Y_t^* = Y_t - \rho Y_{t-1} \qquad X_{2t}^* = X_{2t} - \rho X_{2t-1}$$

$$X_{kt}^* = X_{kt} - \rho X_{kt-1} \qquad v_t = \varepsilon_t - \rho \varepsilon_{t-1}$$

are the generalized differences of $Y_t, X_{2t},...,X_{kt}$ and ε_t. By construction the transformed equation has an error process which is independently distributed with 0 mean and constant variance. Thus the ordinary least-squares regression applied to equation 4.5 will yield efficient estimates of all the regression parameters. The intercept of the original model must be calculated from the estimated intercept found in equation 4.5.

The generalized differencing procedure is adopted if the Durbin-Watson statistic associated with the particular regression indicates serial correlation. This procedure has been performed for all of the objectives due to the indication of increasing serial correlation as the time horizon increases. This approach is used because the exact interpretation of the Durbin-Watson statistic is often difficult because the sequence of the error terms depends not only on the sequence of ε's but also on the sequence of all the X values [Pindyck et al. (1998)]. The approach allows the reader to draw his own inferences regarding the severity of the suspected serial correlation. The reader should note that shown in all tabulated results the colour schematic (green – no serial correlation, amber – result indeterminate and red – serial correlation present) applied to the Durbin-Watson statistics is indicative of the level of serial correlation which may exist in the various regression analyses. The table below indicates the method used to determine whether the Durbin-Watson statistic indicates that serial correlation is present in the regression analysis. The null hypothesis is set as: no serial correlation (negative or positive) exists within the set of observations. Throughout the paper the Durbin-Watson statistics are highlighted as indicated in column three.

Value of the Durbin-Watson (DW) statistic	Result	Colour indicating result
$4 - d_l < DW < 4$	Reject null hypothesis, negative serial correlation present	Amber
$4 - d_u < DW < 4 - d_l$	Result indeterminate	Blue
$2 < DW < 4 - d_u$	Accept null hypothesis	Green
$d_u < DW < 2$	Accept null hypothesis	Green
$d_l < DW < d_u$	Result indeterminate	Blue
$0 < DW < d_l$	Reject null hypothesis, positive serial correlation present	Red

5. Results and Findings

The results of the statistical analysis are presented in the following section. A detailed discussion and implications of the results is included.

5.1 Objective 1

5.1.1 Summary of statistics

The table 5.1.1a below presents the means and standard deviations of both the nominal and real equity returns over monthly, annual and four-year (overlapping) periods under examination.

Return Horizon T	Monthly returns		Annual returns		Four year returns	
	Mean	Std dev	Mean	Std dev	Mean	Std dev
	Nominal returns					
1960-2000	0.0155	0.0632	0.1992	0.2540	1.0258	0.8023
1925-1948	0.0112	0.0336	0.1544	0.2210	0.7561	0.6505
1949-1959	0.0024	0.0208	0.0329	0.1132	0.0890	0.1770
1960-1978	0.0123	0.0607	0.1526	0.2193	0.6332	0.3919
1979-2000	0.0183	0.0653	0.2394	0.2793	1.3649	0.9135
	Real returns					
1960-2000	0.0082	0.0626	0.0990	0.2283	0.4195	0.4707
1925-1948	0.0101	0.0342	0.1380	0.2123	0.6653	0.6394
1949-1959	-0.0005	0.0221	-0.0031	0.1147	-0.0642	0.1978
1960-1978	0.0074	0.0603	0.0894	0.2136	0.3604	0.4162
1979-2000	0.0088	0.0646	0.1073	0.2451	0.4705	0.5174

Table 5.1.1a: Means and standard deviations for monthly, annual and four-year nominal and real returns

The nominal returns exhibit similar mean returns and standard deviations within each time horizon *T*, except for the period 1949-1959. The effect of inflation is apparent when comparing real and nominal returns within the relevant time horizons, especially during the periods 1960-1978 and 1979-2000. The effect of inflation is serious – real returns are significantly lower, however the volatility indicated by the standard deviation shows little sign of abating. This is a comforting sign regarding the nature of the data as this should be the expected result. Inflation clouds the real return investors try to measure. Therefore more uncertainty exists as to the real return on investment. This uncertainty, in turn, causes more volatility in returns, as investors try to calculate their required real return in an environment ravaged by significant levels of inflation.

Period	Annual returns		Autocorrelations (k=1,2,3,4,5)				
	Mean	Std dev	1	2	3	4	5
	Nominal returns						
1960-2000	0.1992	0.2540	-0.02	-0.18	-0.12	-0.07	0.03
1925-1948	0.1544	0.2210	0.08	-0.11	-0.09	-0.43	-0.16
1949-1959	0.0329	0.1132	0.06	-0.50	0.45	0.67	0.22
1960-1978	0.1526	0.2193	0.06	-0.25	-0.42	-0.13	0.22
1979-2000	0.2394	0.2793	-0.21	-0.17	0.18	-0.03	-0.14
	Real returns						
1960-2000	0.0990	0.2283	0.04	-0.14	-0.26	0.13	0.07
1925-1948	0.1380	0.2123	0.10	0.33	0.10	0.08	0.02
1949-1959	-0.0031	0.1147	-0.07	0.72	0.46	0.13	-0.20
1960-1978	0.0894	0.2136	-0.03	-0.20	-0.30	-0.05	0.26
1979-2000	0.1073	0.2451	0.12	-0.12	-0.22	0.41	-0.17

Table 5.1.1b: Summary statistics for one-year nominal and real returns

Table 5.1.1b above shows summary statistics for one-year nominal and real returns. It also shows the correlation coefficients for nominal and real returns over a five-year forward period. In order to clarify this statement, consider the following explanation:
A regression is performed of return $r(t,t+1)$ against $r(t+k,t+k+1)$ where t is measured from time zero and k is as indicated in the table. This regression allows the analysis of correlations of returns one to five years out from the current period $t=0$. The autocorrelations reveal patterns in the data that are intuitively comforting. An examination of the first to fifth order correlations across every period shows a fairly high degree of second and third order autocorrelation, which decays across longer time lags. This decay across longer lags suggests that, although highly autocorrelated, the returns have a mean reverting tendency. A clear example of this tendency towards mean reversion is found during the periods 1960-1978 and 1979-2000.

When comparing the variability of returns, as measured by the standard deviation of returns, one cannot discern significant differences in share volatility. The period 1949-1959 does exhibit significantly lower volatility and mean returns. Real returns over this period are actually negative. This pattern of results continues into the regressions that are discussed at a latter stage.

Period	Means	Std dev	Autocorrelations				
			1	2	3	4	5
	D(t)/P(t-1)						
1960-2000	4.98	1.83	0.84	0.64	0.56	0.53	0.46
1925-1948	6.07	1.35	0.86	0.65	0.41	0.31	0.35
1949-1959	4.96	0.10	-0.02	0.23	0.35	0.29	0.17
1960-1978	5.54	1.65	0.76	0.38	0.14	0.21	0.28
1979-2000	4.40	1.88	0.87	0.76	0.80	0.84	0.71
	D(t)/P(t)						
1960-2000	4.92	1.84	0.84	0.62	0.54	0.52	0.46
1925-1948	6.04	1.21	0.85	0.64	0.40	0.28	0.31
1949-1959	5.00	0.00	-	-	-	-	-
1960-1978	5.52	1.66	0.75	0.34	0.10	0.19	0.28
1979-2000	4.32	1.87	0.89	0.72	0.67	0.71	0.55

Table 5.1.1c: Summary statistics for both versions of the dividend yields

The reason for the insertion of Table 5.1.1c is that it may provide a trace of how dividend policies may be changing during the examination period. This is important because changes in dividend policy can produce variation in yields that obscures information about the expected returns or may cause the relationship between expected returns and the yield to change over time [Fama et al. (1988)]. The dividend yields during the period 1949-1959 can be ignored because of the assumption made by Firer et al. (1998) that the yield [defined as D(t)/P(t)] was a constant 5%. The mean dividend yield has decreased from the period beginning 1925 (mean of around 6%) to the period beginning 1979 (mean of around 4.4%). This decline has been accompanied by an increase in volatility as measured by the standard deviations (from 1.21 to 1.87). No more can be said regarding the changes in dividend yields other than what is evident from Table 5.1.1c. This is because the change in yields and their volatility cannot easily be measured against the change in earnings (and earnings volatility) because of the lack of availability of such information. Unfortunately this means no conclusion can be reached as to whether dividend policies have actually become more stable relative to changes in earnings. Thus nothing can be said regarding the extent of the variation in yields and whether they do or do not obscure the information about expected returns.

The first order autocorrelations between both definitions of the dividend yields are large. If the yields do track expected returns then this high first order autocorrelation suggest persistence in expected returns. The decay of these autocorrelations over longer time lags (for all periods) in the more timely definition of Y(t)=D(t)/P(t) supports the conclusion made earlier that even though the returns may be highly autocorrelated, they do exhibit a mean-reverting tendency.

Finally, Table 5.1.1d tabulates the cross-correlations between one year returns and current and future one year changes in annual dividends. This can be expressed mathematically as Cor[r(t-1,t), D(t+j) – D(t+j-1)].

Period	Lead j				
	0	1	2	3	4
	Nominal returns				
1960-2000	-0.22	0.01	0.11	-0.19	0.02
1925-1948	0.18	-0.16	0.11	0.07	-0.19
1949-1959	-0.32	-0.57	0.07	0.04	-0.35
1960-1978	-0.04	0.07	-0.10	-0.12	0.20
1979-2000	-0.39	-0.02	0.31	-0.29	-0.17
	Real returns				
1960-2000	-0.20	0.03	0.12	-0.15	0.04
1925-1948	0.17	-0.16	0.10	0.09	-0.18
1949-1959	-0.28	-0.65	-0.05	-0.07	-0.36
1960-1978	-0.03	0.10	-0.07	-0.08	0.20
1979-2000	-0.38	-0.03	0.32	-0.24	-0.13

Table 5.1.1d: Cross-correlations between one-year returns and current and future one-year changes in annual dividends – Cor[r(t-1,t), D(t+i)-D(t+i-1)]

Table 5.1.1d provides statistical evidence on the theoretical problem discussed earlier in section 4.3.1.1 about the estimation problems and the definition of the dividend yield. Once again evidence presented over the period 1949-1959 can be ignored because of the Firer et al. (1998) assumptions.

The table shows that cross-correlations between one-year stock returns and dividend changes more than a year ahead are close to zero in the period 1960-2000. The correlations in the period 1960-1978 also do not exhibit high correlation. The period 1979-2000 does show wild fluctuations in opposing directions as the time period progresses. This may provide further support for the hypothesis proposed here – that changes in dividend yields may explain variation in expected returns.

The reason for presenting these means and standard deviations is to:

i) summarise the characteristics of equity returns over the periods under examination.

ii) obtain a sense of whether the ordinary least squares regression (OLS) method is an appropriate technique to use when examining this data set.

The fact that return variability is only significantly different in the period 1949-1959 is important when considering whether to use the OLS regression method. A weighted least squares (WLS) approach is used by statisticians when return variability in a data set changes over time. The WLS regression technique deflates the observations by estimates of return variability. When there is evidence of changing return variability this method may produce more efficient estimates of regressions of returns on the dividend yields. However, given the fairly constant nature of return variability over the period the OLS regression technique is used in this paper. The exception with regards to constant return variability is found during the period 1949-1959. The decision not to adjust for the return variability in this section of the data set arises from the fact that it may not form part of (for the purposes of this research) a reliable set of data, because of the assumption of a constant dividend yield throughout the period of 5%[18].

The following tables summarise the OLS regressions of the value weighted equity returns, *r(t,t+T)*, on their *ex ante* yields, *D(t)/P(t-1)* and *D(t)/P(t)*. The results of the regressions are shown in some detail because of their importance in the analysis that follows.

[18] Firer and McLeod (1998)

Return Horizon T	N	Nominal Returns									
		Y(t)=D(t)/P(t-1)					Y(t)=D(t)/P(t)				
		b	t(b)	R^2	s(e)	D-W	b	t(b)	R^2	s(e)	D-W
						1960-2000					
M	492	0.29	1.95	0.01	0.06	1.75	(0.26)	(1.78)	0.01	0.06	1.75
Q	164	0.44	0.86	0.00	0.12	1.97	(0.25)	(0.50)	0.00	0.12	1.97
1	41	1.28	0.59	0.01	0.26	2.03	0.44	0.20	0.00	0.26	2.03
2	41	3.58	0.94	0.02	0.43	1.18	2.59	0.68	0.01	0.43	1.17
3	41	9.80	1.78	0.08	0.59	0.86	8.64	1.55	0.06	0.59	0.85
4	41	19.46	2.64	0.15	0.75	0.79	18.14	2.43	0.13	0.76	0.78
						1925-1948					
M	288	0.27	1.81	0.01	0.03	1.37	(0.12)	(0.80)	0.00	0.03	1.75
Q	96	0.22	0.39	0.00	0.07	1.63	(0.36)	(0.64)	0.00	0.07	1.97
1	24	(0.40)	(0.11)	0.00	0.23	1.89	(1.50)	(0.43)	0.01	0.23	2.03
2	23	(1.00)	(0.17)	0.00	0.36	1.05	(2.48)	(0.42)	0.01	0.36	1.17
3	22	(4.72)	(0.51)	0.01	0.50	0.79	(6.55)	(0.72)	0.03	0.50	0.85
4	21	(11.94)	(0.90)	0.04	0.65	1.04	(14.05)	(1.07)	0.06	0.65	0.78
						1949-1959					
M	132	3.33	5.03	0.16	0.02	1.13					
Q	44	18.99	5.83	0.45	0.04	1.96					
1	11	91.90	3.77	0.61	0.07	1.57					
2	11	209.97	4.18	0.66	0.11	1.17					
3	11	270.48	3.23	0.54	0.12	1.05					
4	11	349.85	3.17	0.52	0.13	0.60					
						1960-1978					
M	228	0.32	1.32	0.01	0.06	1.76	(0.40)	(1.68)	0.01	0.06	1.76
Q	76	0.16	0.21	0.00	0.11	2.13	(0.57)	(0.73)	0.01	0.11	2.13
1	19	(1.02)	(0.31)	0.01	0.23	1.80	(1.65)	(0.51)	0.02	0.22	1.79
2	19	(1.40)	(0.25)	0.00	0.35	1.34	(2.28)	(0.42)	0.01	0.35	1.33
3	19	(2.88)	(0.41)	0.01	0.40	1.24	(3.74)	(0.53)	0.02	0.40	1.24
4	19	(2.14)	(0.26)	0.00	0.40	0.96	(2.94)	(0.35)	0.01	0.40	0.96
						1979-2000					
M	264	0.44	2.08	0.02	0.06	1.75	(0.13)	(0.61)	0.00	0.07	1.74
Q	84	1.05	1.42	0.02	0.13	1.91	0.24	0.33	0.00	0.13	1.91
1	22	4.60	1.46	0.10	0.27	2.15	3.56	1.10	0.06	0.28	2.16
2	22	10.86	2.11	0.18	0.44	1.26	10.02	1.89	0.15	0.44	1.26
3	22	22.59	3.49	0.38	0.55	0.83	22.01	3.28	0.35	0.56	0.83
4	22	34.94	4.65	0.52	0.65	1.32	34.59	4.45	0.50	0.66	1.31

Table 5.1.1e: Regression results of dividend yields Yt=Dt/Pt-1 and Yt= Dt/Pt against nominal equity returns

Return Horizon T	Real Returns										
	N	$Y(t)=D(t)/P(t-1)$					$Y(t)=D(t)/P(t)$				
		b	t(b)	R^2	s(e)	D-W	b	t(b)	R^2	s(e)	D-W
	1960-2000										
M	492	0.26	1.76	0.01	0.06	1.74	(0.29)	(1.96)	0.01	0.06	1.74
Q	164	0.33	0.68	0.00	0.12	1.97	(0.33)	(0.68)	0.00	0.12	1.97
1	41	0.75	0.38	0.00	0.23	2.10	0.02	0.01	0.00	0.23	2.10
2	41	2.01	0.67	0.01	0.34	1.25	1.27	0.42	0.00	0.34	1.24
3	41	5.90	1.55	0.06	0.41	0.97	5.17	1.35	0.04	0.41	0.97
4	41	10.87	2.49	0.14	0.44	0.90	10.21	2.31	0.12	0.45	0.90
	1925-1948										
M	288	0.39	2.61	0.02	0.03	1.38	0.01	0.03	0.00	0.03	1.40
Q	96	0.59	1.04	0.01	0.07	1.70	0.01	0.02	0.00	0.07	1.70
1	24	1.09	0.33	0.00	0.22	1.85	0.05	0.02	0.00	0.22	1.83
2	23	2.41	0.41	0.01	0.35	1.01	0.99	0.17	0.00	0.35	1.01
3	22	1.48	0.16	0.00	0.49	0.75	(0.30)	(0.03)	0.00	0.50	0.74
4	21	(0.91)	(0.07)	0.00	0.66	0.97	(3.05)	(0.23)	0.00	0.66	0.97
	1949-1959										
M	132	3.52	5.02	0.16	0.02	1.12					
Q	44	20.02	5.50	0.40	0.04	2.07					
1	11	88.39	3.33	0.50	0.08	1.33					
2	11	213.45	3.96	0.59	0.11	1.06					
3	11	316.04	3.57	0.54	0.13	1.02					
4	11	422.67	3.80	0.57	0.13	0.65					
	1960-1978										
M	228	0.27	1.12	0.01	0.06	1.74	(0.44)	(1.88)	0.02	0.06	1.75
Q	76	0.01	0.01	0.00	0.11	2.06	(0.72)	(0.94)	0.01	0.11	2.07
1	19	(1.70)	(0.54)	0.02	0.22	1.72	(2.30)	(0.74)	0.03	0.22	1.71
2	19	(2.89)	(0.56)	0.02	0.33	1.23	(3.70)	(0.72)	0.03	0.33	1.23
3	19	(4.59)	(0.67)	0.03	0.39	0.95	(5.41)	(0.80)	0.04	0.39	0.94
4	19	(4.04)	(0.46)	0.01	0.43	0.54	(4.89)	(0.56)	0.02	0.42	0.54
	1979-2000										
M	264	0.34	1.61	0.01	0.06	1.74	(0.22)	(1.06)	0.00	0.06	1.74
Q	84	0.71	0.99	0.01	0.13	1.91	(0.06)	(0.08)	0.00	0.13	1.91
1	22	2.81	0.99	0.05	0.25	2.21	1.89	0.65	0.02	0.25	2.23
2	22	5.90	1.46	0.10	0.34	1.19	5.23	1.27	0.07	0.35	1.18
3	22	12.28	2.68	0.26	0.39	0.75	11.86	2.52	0.24	0.40	0.76
4	22	17.41	3.67	0.40	0.41	1.14	17.17	3.52	0.38	0.42	1.14

Table 5.1.1f: Regression results of dividend yields Yt=Dt/Pt-1 and Yt= Dt/Pt against real equity returns

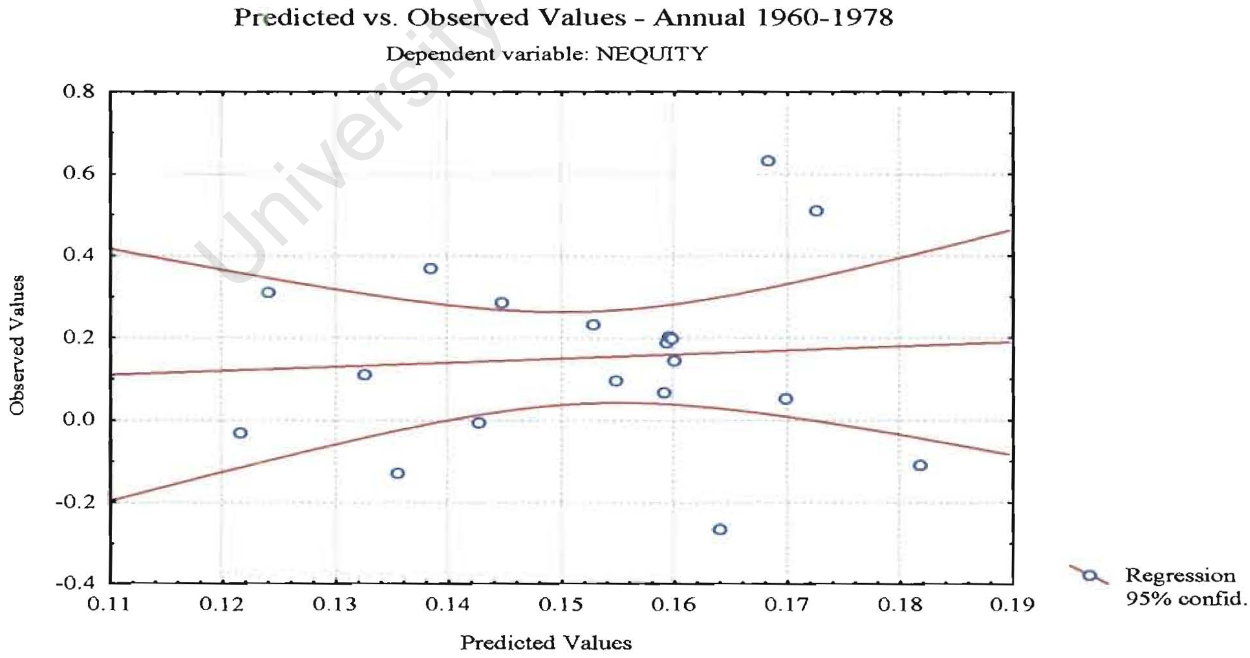
Return Horizon T	Nominal Returns										
	Y(t)=D(t)/P(t-1)						Y(t)=D(t)/P(t)				
	N	b	t(b)	R^2	s(e)	D-W	b	t(b)	R^2	s(e)	D-W
	1960-2000										
M	492	0.05	18.08	0.00	27.35	2.01	(0.01)	(2.79)	0.00	27.38	2.02
Q	164	(0.04)	(17.72)	0.00	42.84	2.02	(0.04)	(17.72)	0.00	42.84	2.02
1	41	(0.08)	(4.11)	0.01	10.40	2.02	(0.04)	(1.77)	0.00	10.43	2.03
2	41	(0.35)	(30.57)	0.12	12.33	2.29	(0.36)	(30.22)	0.13	12.31	2.28
3	41	0.15	10.23	0.02	7.42	2.15	0.15	10.24	0.02	7.41	2.15
4	41	0.25	12.14	0.06	3.94	2.28	0.16	7.73	0.03	4.02	2.30
	1925-1948										
M	288	0.04	135.04	0.00	161.52	2.00	0.00	6.37	0.00	161.64	2.01
Q	96	0.02	3.66	0.00	8.99	1.94	0.06	9.22	0.00	8.97	1.94
1	24	0.22	6.46	0.05	3.58	1.86	0.24	7.16	0.06	3.56	1.84
2	23	(0.20)	(3.71)	0.04	1.78	1.98	(0.21)	(3.81)	0.04	1.78	1.99
3	22	(0.29)	(4.97)	0.09	1.36	2.37	(0.31)	(5.19)	0.10	1.35	2.40
4	21	(0.32)	(10.89)	0.11	2.16	2.55	(0.29)	(9.58)	0.09	2.18	2.52
	1949-1959										
M	132	(0.03)	(2.68)	0.00	9.76	2.02					
Q	44	0.05	145.41	0.00	149.61	2.04					
1	11	0.05	7.98	0.00	4.86	2.32					
2	11	(0.02)	(2.46)	0.00	1.98	2.36					
3	11	0.33	242.35	0.11	6.55	2.17					
4	11	(0.02)	(3.62)	0.00	2.29	1.89					
	1960-1978										
M	228	0.08	24.21	0.01	23.47	1.99	0.03	11.92	0.00	23.53	2.01
Q	76	(0.06)	(33.43)	0.00	62.83	2.04	(0.06)	(33.77)	0.00	62.83	2.03
1	19	(0.14)	(3.76)	0.02	7.07	2.22	(0.13)	(3.38)	0.02	7.08	2.21
2	19	(0.37)	(38.56)	0.14	18.06	2.37	(0.37)	(37.52)	0.14	18.07	2.36
3	19	0.16	12.94	0.02	10.86	2.21	0.16	13.22	0.03	10.84	2.20
4	19	0.36	9.76	0.13	2.39	2.49	0.33	8.74	0.11	2.43	2.48
	1979-2000										
M	264	0.03	13.09	0.00	30.38	2.02	0.06	26.58	0.00	30.37	2.02
Q	84	0.01	0.56	0.00	5.34	1.97	(0.00)	(0.05)	0.00	5.34	1.97
1	22	(0.04)	(2.77)	0.00	12.93	1.99	0.05	3.66	0.00	12.93	2.05
2	22	(0.06)	(1.26)	0.00	2.22	1.80	(0.14)	(2.83)	0.02	2.21	1.83
3	22	(0.41)	(11.19)	0.17	1.76	2.18	(0.40)	(10.41)	0.16	1.77	2.16
4	22	(0.04)	(2.77)	0.00	12.93	1.99	(0.18)	(48.14)	0.03	5.08	2.27

Table 5.1.1g: Regression results of the first difference of dividend yields Yt=Dt/Pt-1 andYt= Dt/Pt against the first difference of nominal equity returns

The highlighted t-statistics are significant at the five percent level.

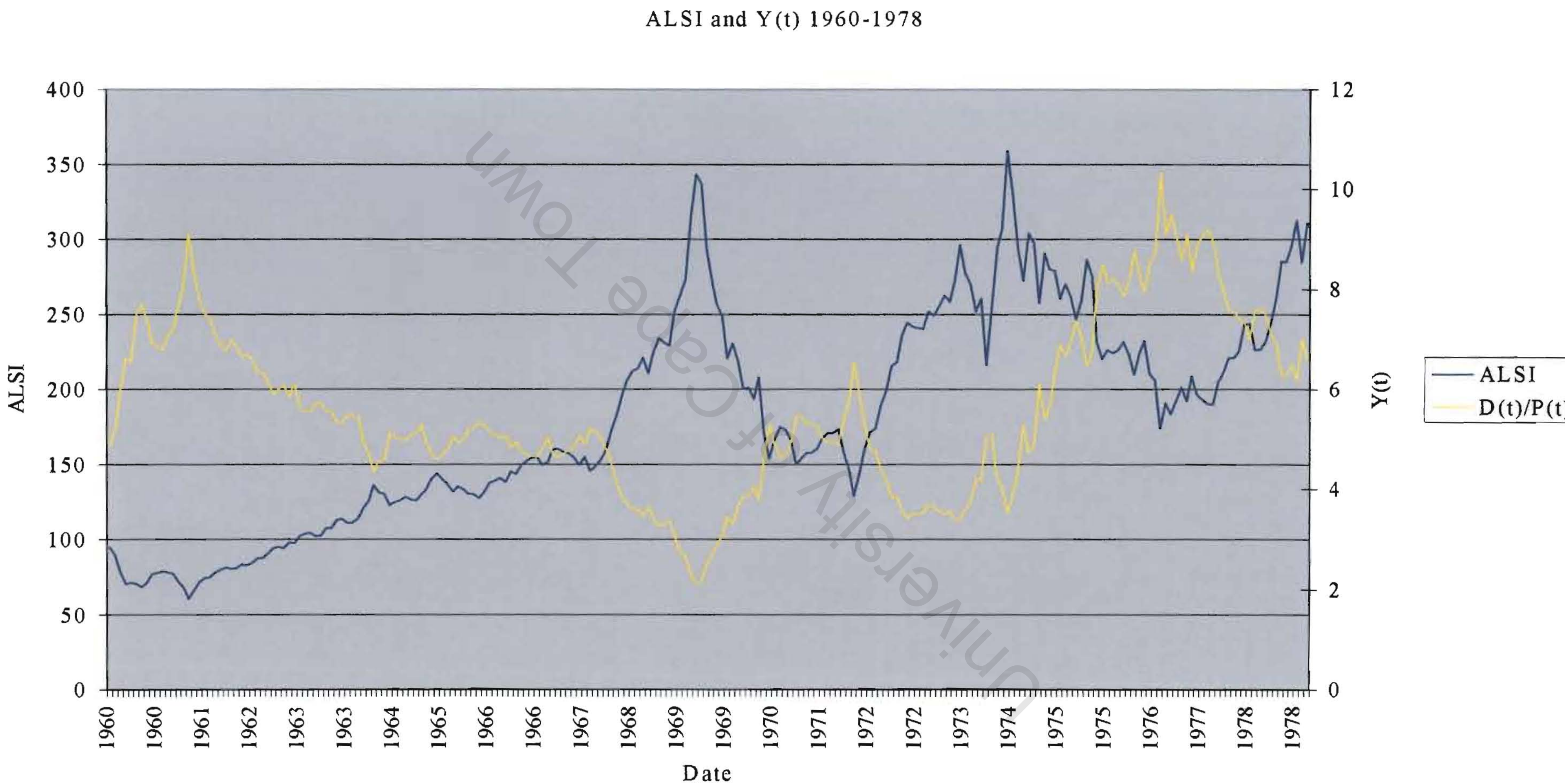
The initial analysis will centre around the period 1960-2000, breaking this period into 2 phases – 1960-1978 and 1979-2000. The reason for analysing this period is because of it commonly being cited as the "beginning" of South African capital markets. Many studies use 1960 as a starting point for research as data collated prior to the Firer et al. (1998) study was generally found to be reliable only from this date onwards.

The regression slopes over the period 1960-1978 are negative or close to zero and produce R^2 values that are close to zero. This is not surprising, given the example illustrated by the graph below, depicting predicted values plotted against observed values for annual equity returns regressed against *D(t)/P(t-1)*. None of the regression slopes for the period 1960-1978 are more than 1.8 standard deviations away from zero. The majority of the regression slopes fall within 0.5 standard deviations from 0. This is in keeping with the illustration provided by the scatterplot below. The commentary applies equally to nominal and real equity returns regressed against both definitions of Y(t).



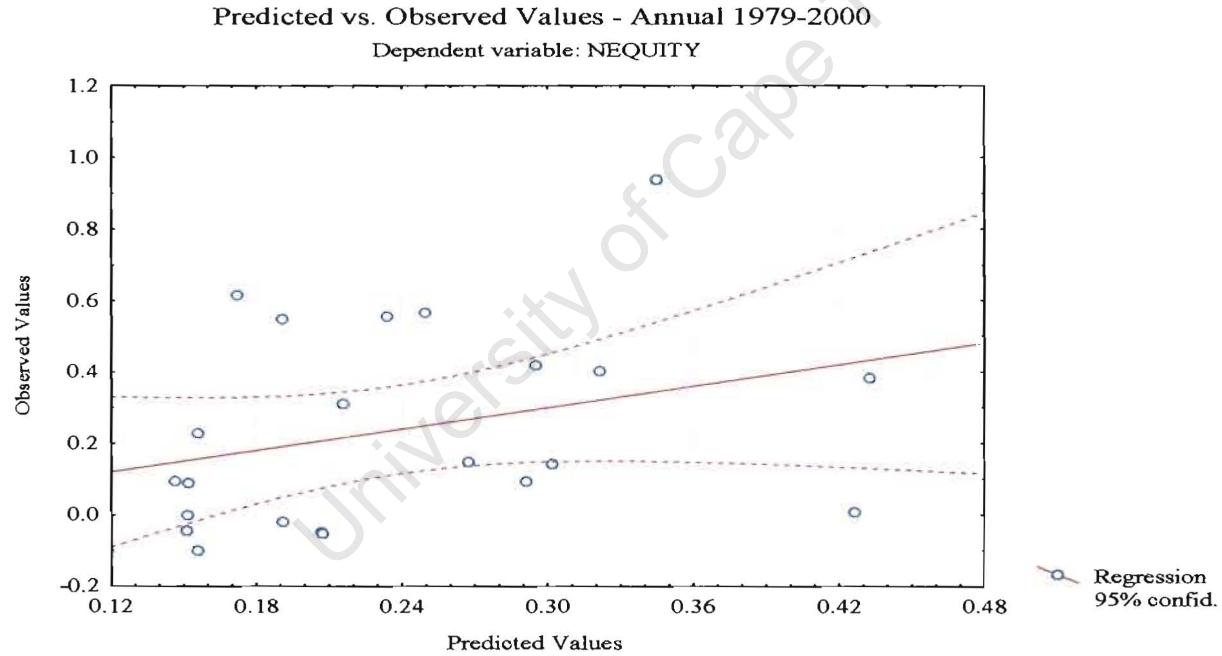
Graph 5.1.1a - Predicted versus observed values – annual 1960-1978

The graph below illustrates the movement of equity returns together with Y(t) over the period 1960-1978. The returns were not nearly as dramatic as those experienced during the period 1979-2000. The graph below shows a nominal return of 200% over the 19 year period while the period 1979-2000 shows a nominal return on an investment made in 1979 to be about 27 times that of the original investment if invested until December 2000. It is because of the relatively stable nature of returns during the period 1960-1978 that no causal link can be established between the movement of dividend yields and equity returns. However, the examination of the graph below serves to confirm the reason for this research, which is to examine the relationship between equity returns and dividend yields. The graph clearly illustrates the relationship discussed earlier, which is that dividend yields are high when expected future returns are low and vice versa. However, the high variability of returns has resulted in extremely weak regression results. Consequently, no statistical relationship between the dividend yield, in either of its two forms, and equity returns over this period can be substantiated.



Graph 5.1.1b – ALSI vs dividend yield over the period 1960 to 1978

The period 1979-2000 produces positive regression slopes in all but three cases of regression of nominal and real equity returns against both definitions of Y(t). The regression slopes for the more timely of the two definitions of Y(t), D(t)/P(t) are more than 1 standard deviation away from 0 in all but two cases for each of the regressions against nominal and real returns. The less timely Y(t), D(t)/P(t-1) produces regression slopes that are at least 1 standard deviation away from zero and in general are greater that 2 standard deviations from zero and slopes of more than 4 standard deviations from zero occur in time horizon periods of three and four years. The lower return variances, in comparison with the 1960-1978 period, result in stronger regression results than those found over the period 1960-1978. This is illustrated by the scatterplot depicting predicted against observed nominal annual equity returns over the period 1979-2000.



Graph 5.1.1c Predicted versus observed values – Annual 1979 -2000

The regression slopes of nominal and real equity returns r(t,t+T) on Y(t) over the period 1979-2000 increase with time horizon T. The slope of the T period regression of return r(t,t+T) on Y(t) is the sum of the slopes of the one period returns, r(t,t+1),..., r(t+T-1,t+T), on Y(t). The significance of this statement is evident on closer examination of the slopes during the 1979-2000 period. As time horizon T increases so do the regression slopes – proportionately to the increase in T up to a horizon of three or four years. This signals a high degree of autocorrelation, however the less than proportional increase in the longer time horizons may indicate mean-reversion in expected returns. The evidence of such a phenomenon occurring on the basis of the results presented here is not as convincing as those presented by Fama et al. (1988). The differences in statistical results between nominal and real equity returns regressed on Y(t) serve to illustrate the impact inflation has on the ability of market participants to assess their portfolios. The results are clouded by inflation, and although the results exhibit similar patterns, it serves to worsen autocorrelation problems inherent in examining equity returns over the long term.

The evidence provided by the regression results shows that for the period 1979-2000 every time horizon except the quarterly and annual results are significant at the 5% level. The quarterly and annual results are significant at the 15% level. In addition, the R^2 shown in the tables earlier indicate that the explanatory power of the regressions increase with the return horizons. The algebraic reason for this observation is that the regression R^2 increases because the standard deviation of the fitted values [s(e)] grows more than proportionately to the passage of time, whereas the variance of the residuals [s(beta)] grows less than proportionately to increase in the time horizon. This is illustrated in the following table 5.1.

Return Horizon T		Nominal Returns				Real Returns			
		Y(t)=D(t)/P(t-1)		Y(t)=D(t)/P(t)		Y(t)=D(t)/P(t-1)		Y(t)=D(t)/P(t)	
	N	s(e)	s(beta)	s(e)	s(beta)	s(e)	s(beta)	s(e)	s(beta)
	1979-2000								
M	264	0.0649	0.0613	0.0653	0.0617	0.0644	0.0615	0.0646	0.0616
Q	84	0.1308	0.1066	0.1323	0.1078	0.1266	0.1072	0.1273	0.1078
1	22	0.2721	0.2125	0.2780	0.2172	0.2452	0.2183	0.2485	0.2213
2	22	0.4358	0.2023	0.4438	0.2059	0.3414	0.2125	0.3455	0.2151
3	22	0.5504	0.1763	0.5627	0.1802	0.3891	0.1917	0.3954	0.1948
4	22	0.6488	0.1550	0.6636	0.1585	0.4100	0.1729	0.4168	0.1948

Table 5.1.1h - Standard deviation of the fitted values versus variance of the residuals for the period 1979-2000 for both definitions of the dividend yield

This phenomenon has an interesting economic implication. As noted earlier, the increase in regression slopes that is roughly proportional to the increase in the time horizon out to 2 years and the subsequent slowdown in growth suggests the presence of mean reversion in equity returns. The same observation is made when examining the standard deviation of the fitted values s(e). The growth in s(e) tapers off in time horizons T equal to 2-4. The above table reveals that residual standard deviations s(beta) does not grow in proportion to time horizons T and can even decrease over longer time horizons (as is evident in time horizons

T 3 and 4). This means that residual standard deviations growing less than proportionally to T must on average be negatively correlated. This provides evidence that, although short horizon returns are persistent, mean reversion in longer term equity returns is present and is identified by both forms of Y(t).

The results over the period 1925-1948 provide for similar reading to those found in the period 1960-2000. The reason for inclusion is purely for completeness. The lack of dividend yield data [dividend yields were only available on a yearly basis during this period – Firer and McLeod (1998)] prohibits an extensive commentary on this period. The period 1949-1959 cannot be examined as the dividend yield is assumed a constant 5%.

5.2 Objective 2

5.2.1 Business conditions and the behaviour of the forecasting variables

5.2.1.1 Autocorrelations

The term (maturity) premium and dividend yield are variables used to forecast returns on the equity and bond markets. The autocorrelation of the variables used to forecast such returns provide information about the behaviour of expected returns. Table 5.2.1a below describes the mean, standard deviation and autocorrelation for the nominal and real excess returns on equity (Nexequity and Rexequity), nominal and real term (maturity) spreads (Rterm and Nterm) and the dividend yield (Dt/Pt) over the 4 time periods examined.

Description	Mean	Standard deviation	Autocorrelations							
			1	2	3	4	5	6	7	8
1925-2000										
Rexequity	0.09	0.22	0.07	(0.14)	(0.10)	(0.20)	(0.05)	0.12	0.10	0.09
Nexequity	0.10	0.23	0.07	(0.13)	(0.10)	(0.20)	(0.05)	0.13	0.11	0.08
Rterm	0.01	0.09	(0.06)	(0.03)	(0.13)	0.17	0.01	0.06	0.16	(0.04)
Nterm	0.01	0.09	(0.07)	(0.05)	(0.14)	0.18	(0.00)	0.05	0.17	(0.05)
Dt/Pt	0.05	0.02	0.85	0.65	0.52	0.47	0.43	0.35	0.18	0.01
1960-2000										
Rexequity	0.08	0.24	0.03	(0.18)	(0.18)	(0.12)	0.00	0.21	0.11	(0.05)
Nexequity	0.09	0.26	0.03	(0.17)	(0.17)	(0.14)	(0.02)	0.20	0.14	(0.04)
Rterm	(0.00)	0.10	(0.15)	(0.11)	(0.25)	0.24	(0.06)	0.03	0.14	(0.22)
Nterm	(0.00)	0.11	(0.15)	(0.13)	(0.24)	0.24	(0.07)	0.02	0.15	(0.21)
Dt/Pt	0.05	0.02	0.85	0.64	0.55	0.52	0.46	0.33	0.10	(0.11)
1960-1978										
Rexequity	0.08	0.21	0.11	(0.46)	(0.45)	0.19	0.35	0.34	(0.45)	(0.49)
Nexequity	0.09	0.22	0.11	(0.46)	(0.46)	0.17	0.35	0.36	(0.45)	(0.49)
Rterm	(0.01)	0.08	0.08	(0.27)	(0.48)	(0.02)	0.48	0.28	(0.41)	(0.61)
Nterm	(0.01)	0.09	0.08	(0.27)	(0.46)	(0.04)	0.48	0.28	(0.42)	(0.59)
Dt/Pt	0.06	0.02	0.75	0.32	(0.01)	(0.10)	(0.14)	(0.38)	(0.73)	(0.83)
1979-2000										
Rexequity	0.08	0.26	(0.12)	(0.15)	0.11	(0.12)	(0.16)	0.31	0.23	0.00
Nexequity	0.09	0.30	(0.10)	(0.15)	0.12	(0.12)	(0.16)	0.31	0.27	(0.00)
Rterm	0.00	0.12	(0.27)	(0.04)	(0.15)	0.28	(0.19)	0.06	0.35	(0.24)
Nterm	0.00	0.14	(0.26)	(0.07)	(0.14)	0.28	(0.19)	0.05	0.35	(0.25)
Dt/Pt	0.04	0.02	0.87	0.75	0.78	0.83	0.70	0.76	0.89	0.72

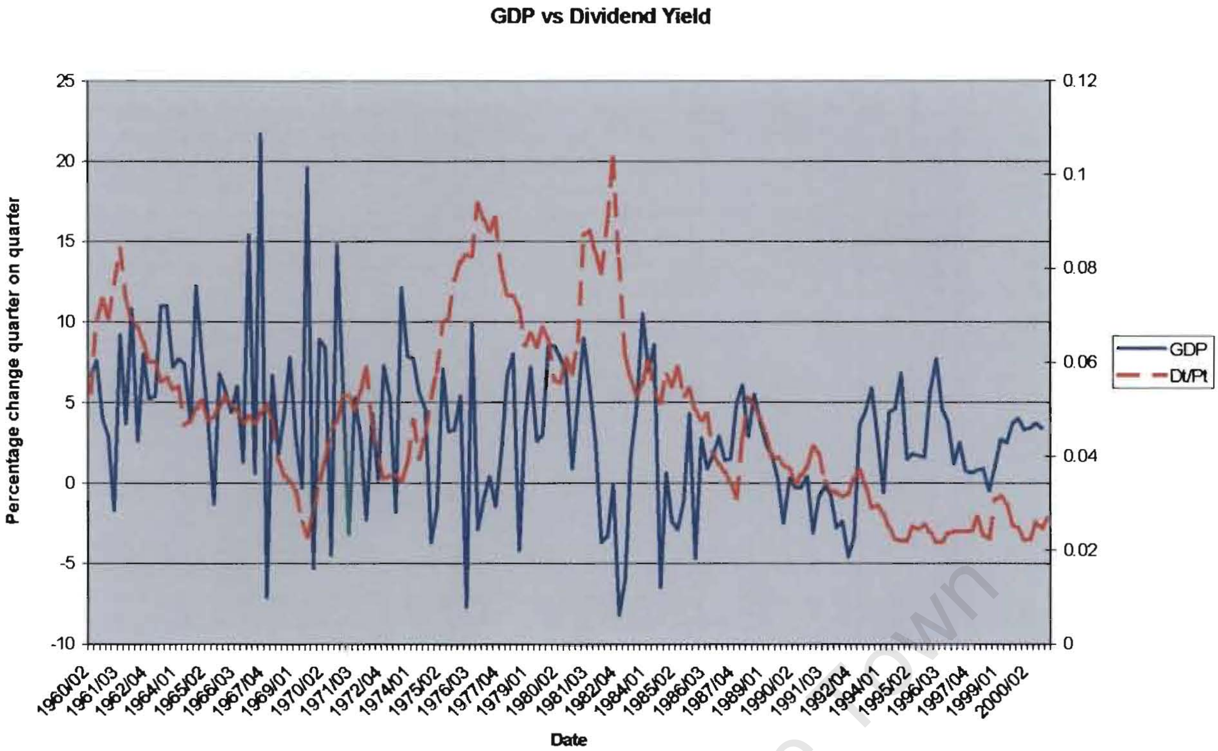
Table 5.2.1a Summary statistics for annual observations on one year excess returns on the equity index, the real and nominal term spreads and the dividend yield (Dt/Pt) (Rexequity - Real excess returns on equity, Nexequity – Nominal excess returns on equity, RTerm –real term maturity represented by the difference between the real all bond index and the real cash rate, NTerm – nominalterm maturity represented by the difference between the nominal all bond index and the nominal cash rate)

For each time period used in the regressions, the autocorrelations of the dividend yield (Dt/Pt) are large at the first order, but tend to decay for longer lags. This suggests that

Dt/Pt tracks a component of expected returns that are autocorrelated but show tendency towards mean reversion over the longer term. This observation is consistent with that made by Fama et al. (1989). The autocorrelations for Rterm and Nterm are low in the first order throughout each time period examined and are below 0.3 in each case except in the 1960-1978 period. This does not mean that a component of expected returns is not tracked by the term (maturity) premium, but simply that the component tracked is not as persistent as that tracked by the dividend yield. Fama et al. (1989) conclude that the less persistent autocorrelation of the term (maturity) spread is consistent with the proposition that the term premium tracks variation in expected returns in response to short term variation in business conditions, whereas the dividend yield tracks expected return variation that relates to more persistent aspects of business conditions. The autocorrelations of the term premium indicate that this variable tracks a similar short term variation in business conditions in the South African context as was found to hold in the American context.

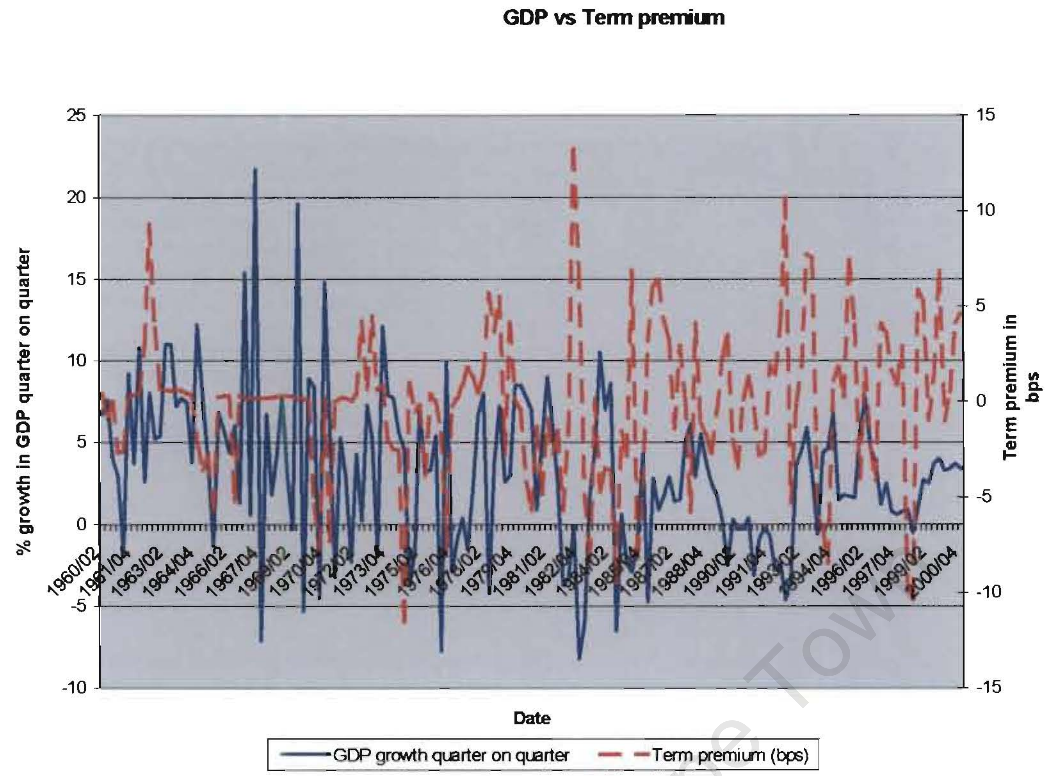
5.2.1.2 Analysis of forecasting variables

This paper attempts to measure the variation of expected returns using linear regressions of returns on the forecasting variables (dividend yields and term premium). In order intuitively capture the expected returns forecasted by these variables it is necessary to analyse the graphs below.



Graph 5.1.2.2a: Quarterly GDP year on year annualised growth (Reserve Bank Quarterly Bulletin Code KBP6006S. Source: www.resbank.co.za) versus quarterly dividend yield (annualised) for the period 1960-2000.

GDP growth shows radical swings during the period 1960 to the late 1980s. By contrast dividend yields do not exhibit the same level of dispersion and tend to follow upward or downward trends (as the case may be) over longer time frames. This figure may be interpreted as saying that the forecast power of the dividend yield reflects time variation in expected equity returns in response to aspects of business conditions that may persist beyond measured business cycles. The behaviour of the dividend yield is confirmed statistically by the high degree of autocorrelation displayed in section 5.1.2.1.



Graph 5.1.2.2b: Quarterly GDP year on year annualised growth (Reserve Bank Quarterly Bulletin Code KBP6006S. Source: www.resbank.co.za) versus quarterly term premium for the period 1960-2000.

Graph 5.1.2.2b depicts the term (maturity) premium (defined as the difference between the all bond index and the cash rate as explained in the methodology section) and quarter on quarter annualised GDP growth. If bonds and cash rates are rationally priced the variation in the term spread is more closely related to business cycles approximated by the gross domestic product. The complexity inherent in interpreting these graphs is because of the definition of the term premium used for the purposes of this paper. The term (maturity) premium is defined as the difference between yield at time t on the JSE-Actuaries All Bond Index [as calculated in Firer and McLeod (1998)] and the money market rate (taken to be a reliable proxy as a risk free rate in South Africa – similar in nature to a short term Treasury bill). This assumption was made due to restrictions placed on the study because of limited time series data availability. It is obvious that this data will capture some of the spread of lower grade (encapsulated in the All Bond Index) over high grade bonds. This default spread (assuming bonds and interest rates are set by rational market participants) indicates the default or credit spread associated with bonds of a lower credit quality at time t.

The fact that the term premium (as defined in this paper) captures a default premium in addition to the premium associated with the time horizon of the debt instrument complicates the interpretation of the spread at time t. It does not preclude us from noting that it is clear from the graphical representation that the term spread tends to be low near peaks in GDP growth and high near troughs. A closer examination of the data reveals interesting trends in South African financial markets. During the latter half of the 1960s the term premium remains virtually unchanged whereas GDP growth is fluctuating significantly. A plausible explanation for the fact that the term premium does not vary significantly during this period is that subsequent to a series of political riots during 1961, South Africa experienced relatively little political upheaval. During the 1980s the term premium reflects the political turmoil of the time. During 1986 Prime Minister P.W. Botha gave the infamous Rubicon speech, a speech that sent the South African economy into turmoil as foreign governments threatened economic sanctions over South Africa's political policies. The GDP growth figures reveal the effects of the speech as foreign investors began to disinvest in the South African economy.

During the 1990s the graph depicts the different pressures on the economy. South Africa was readmitted into the global community and faced economic pressures similar to those of other developing markets – a weakening currency, high balance of payments deficits and high inflation rates. This lead to the South African Reserve Bank taking on a increasingly tough monetary policy regime using short term interest rates as their tool of choice to combat the weakening of the currency and to lure foreign capital into the country. Hence, the graph shows that the term premium may have been determined by factors exogenous to the South African economy. This may explain the reason for the graph not depicting a strong relationship between GDP growth and the term premium.

The table depicts the correlation of the term premium and the dividend yield (based on annual time horizons) for four time periods analysed.

conditions. In contrast to the findings of Fama et al. (1989) it is clear that the dividend yield and term premium do not track similar predictable components of returns. This is in line with the conclusions of the analysis of objective one where the null hypothesis could not be refuted.

5.2.2 Analysis of regressions

The tables[19] below present the results of the various regressions performed on excess equity returns and bond returns. The results of the multiple regressions on excess equity returns for the shown in tables 5.2.2a and b are expressed mathematically as follows:

$$r(t,t+T) = a + bD(t)/P(t) + cTerm(t) + e(t,t+T)$$

The results of the regression on bond returns shown in table 5.2.2c may be expressed mathematically as follows:

$$r(t,t+T) = a + dD(t)/P(t) + e(t,t+T)$$

The t-statistics highlighted in blue indicate significance at the 10% level and those highlighted in red indicate significance at the 5% level. The Durbin-Watson statistics are highlighted as indicated under section 4.3.3.1.

No regression analysis has been performed using the excess bond returns as the dependent variable and the two forecasting variables as independent variables. This is due to informational constraints explained in the methodology section which led to excess bond returns being used as the proxy for term premium. Thus the regression analysis performed is limited to multiple regression of the forecasting variables (Dt/Pt and the term premium) against excess nominal and real equity returns and the regression of Dt/Pt against real and nominal bond returns (Table 5.2.3c).

[19] The regressions for T= one month (M), one quarter (Q) and one year use non-overlapping returns. The regressions for two to four years use overlapping annual observations. N is the number of observations for each regression.

Return Horizon T	Regression results of Y(t)=D(t)/P(t) against excess equity returns										
	Nominal excess equity returns						Real excess equity returns				
	N	b	t(b)	R^2	s(e)	D-W	b	t(b)	R^2	s(e)	D-W
	1960-2000										
M	492	(0.15)	(1.02)	0.08	0.06	1.73	(0.14)	(1.01)	0.08	0.06	1.73
Q	164	0.13	0.27	0.10	0.12	2.05	0.12	0.25	0.10	0.12	2.05
1	41	1.89	0.91	0.18	0.24	2.03	1.69	0.90	0.18	0.22	2.04
2	41	6.66	1.80	0.22	0.41	1.23	5.33	1.79	0.23	0.33	1.23
3	41	16.29	3.02	0.28	0.56	0.94	11.72	3.01	0.28	0.41	0.95
4	41	30.29	4.15	0.33	0.70	1.02	19.30	4.11	0.33	0.46	1.01
	1925-1948										
M	288	(0.15)	(1.10)	0.17	0.03	1.53	(0.15)	(1.10)	0.18	0.03	1.53
Q	96	(0.33)	(0.74)	0.41	0.06	1.77	(0.32)	(0.74)	0.42	0.06	1.78
1	24	(0.36)	(0.20)	0.75	0.12	1.71	(0.33)	(0.18)	0.74	0.12	1.70
2	23	(1.44)	(0.44)	0.73	0.19	0.72	(1.33)	(0.41)	0.73	0.19	0.71
3	22	(5.09)	(0.96)	0.70	0.29	0.58	(4.96)	(0.93)	0.69	0.29	0.57
4	21	(12.34)	(1.55)	0.69	0.39	0.86	(12.13)	(1.50)	0.66	0.40	0.89
	1960-1978										
M	228	(0.44)	(1.87)	0.02	0.06	1.77	(0.44)	(1.86)	0.02	0.06	1.77
Q	76	(0.66)	(0.87)	0.07	0.11	2.29	(0.65)	(0.87)	0.06	0.11	2.28
1	19	(2.49)	(0.91)	0.36	0.19	2.50	(2.37)	(0.92)	0.36	0.18	2.48
2	19	(5.37)	(1.47)	0.62	0.23	1.44	(5.03)	(1.51)	0.60	0.21	1.42
3	19	(9.56)	(1.73)	0.53	0.31	1.25	(8.61)	(1.76)	0.51	0.27	1.17
4	19	(11.34)	(1.35)	0.34	0.39	1.02	(10.04)	(1.34)	0.34	0.39	0.90
	1979-2000										
M	264	0.01	0.07	0.16	0.06	1.67	0.01	0.08	0.16	0.06	1.67
Q	84	0.66	0.91	0.13	0.13	1.92	0.62	0.89	0.13	0.12	1.92
1	22	4.86	1.47	0.20	0.28	1.92	4.24	1.44	0.19	0.25	1.95
2	22	14.29	2.47	0.29	0.47	1.31	11.06	2.44	0.29	0.36	1.30
3	22	31.35	4.36	0.52	0.57	1.11	21.85	4.32	0.52	0.40	1.10
4	22	50.69	5.90	0.65	0.66	1.76	31.36	5.75	0.64	0.42	1.71

Table 5.2.3a: Regression results of Y(t) = D(t)/P(t) against nominal and real excess equity returns

The regressions over different time periods reveal definite trends within the data examined. The periods 1925-1948 and 1960-1978 all have negative slopes indicating that excess equity returns seem to have inverse relationships with the dividend yield defined as D_t/P_t. This relationship is reversed over the period 1960-2000 and 1979-2000 where all observed regression coefficients are positive. The effect of higher stock returns in the latter half of the century clearly impacts the results of the regression analysis. The returns experienced in the periods 1960-1978 were not nearly as dramatic as those experienced during the period 1979-2000. Graph 5.1.1a under the analysis of the results of objective one clearly supports this statement as it depicts a nominal return of 200% over the 19 year period (1960-1978) while the period 1979-2000 shows a nominal return on an investment made in 1979 to be about 27 times that of the original investment if invested until December 2000. The regression coefficients are significant at the 5% level for the 2, 3 and 4-year time horizons for periods 1960-2000 and 1979-2000 (with the exception of period 1960-2000 for time horizon of 2 years which is significant at the 10% level). However, given the nature of returns experienced in the latter half of the century, that serial correlation of observed points must be taken into account when considering the significance of the results. It is clear from Table 5.2.3a that in the time period 1960-2000 the Durbin-Watson statistic indicates positive serial correlation for time horizons 2,3 and 4-years in length. The re-performance of regression analysis on the first difference of the dependent and independent variables is tabulated below in Table 5.2.3b. None of the regressions of the first difference exhibit any form of serial correlation as indicated by the Durbin-Watson statistics in Table 5.2.3a. The coefficients which were found to be significant in Table 5.2.3a for time horizons 1960-2000 and 1979-2000 are not significant under the first difference regression. This means that after correcting for serial correlation within the data the coefficients are no longer found to be significant. Based on the tabulated statistical evidence it is difficult to support the notion that stock returns may be predictable and that dividend yields may forecast stock returns. This is consistent with the findings of objective one.

Return Horizon T	Regression results of change in Y(t)=D(t)/P(t) against change in excess equity returns				
	Change in nominal excess equity returns				
	N	b	t(b)	R^2	D-W
	1960-2000				
M	492	40.94	0.67	0.00	2.00
Q	164	(5.33)	(0.74)	0.01	2.05
1	41	(12.38)	(2.18)	0.12	2.11
2	41	(6.83)	(1.65)	0.07	2.05
3	41	(2.19)	(0.47)	0.01	2.32
4	41	(29.44)	(1.15)	0.03	2.15
	1925-1948				
M	288	(8.44)	(0.02)	0.00	2.01
Q	96	19.03	0.18	0.00	2.03
1	24	(3.42)	(0.29)	0.33	1.68
2	23	1.35	0.09	0.03	1.98
3	22	(7.50)	(1.80)	0.18	2.25
4	21	(11.50)	(1.71)	0.16	2.34
	1960-1978				
M	228	77.34	0.57	0.00	1.99
Q	76	(0.01)	(0.87)	0.01	2.09
1	19	(15.22)	(1.84)	0.18	2.09
2	19	(8.23)	(1.39)	0.14	1.81
3	19	(2.59)	(0.67)	0.03	2.19
4	19	(4.94)	(0.83)	0.04	2.34
	1979-2000				
M	264	12.95	0.88	0.00	2.02
Q	84	2.67	0.23	0.01	2.09
1	22	(8.95)	(1.01)	0.07	2.11
2	22	(6.73)	(0.93)	0.04	2.09
3	22	0.03	0.00	0.01	2.22
4	22	(64.39)	(0.84)	0.04	2.03

Table 5.2.3b: Regression results of change in Y(t) = D(t)/P(t) against change in nominal excess equity returns

Return Horizon T	Regression results of nominal maturity premiums against excess equity returns						Regression results of real maturity premiums against excess equity returns				
	Nominal excess equity returns						Real excess equity returns				
	N	c	t(c)	R^2	s(e)	D-W	c	t(c)	R^2	s(e)	D-W
	1960-2000										
M	492	0.82	6.56	0.08	0.06	1.73	0.82	6.56	0.08	0.06	1.73
Q	164	0.96	4.17	0.10	0.12	2.05	0.95	4.12	0.10	0.12	2.05
1	41	0.95	2.80	0.18	0.24	2.03	0.96	2.82	0.18	0.22	2.04
2	41	1.20	3.03	0.22	0.41	1.23	1.23	3.15	0.23	0.33	1.23
3	41	1.33	2.96	0.28	0.56	0.94	1.33	3.02	0.28	0.41	0.95
4	41	1.26	2.46	0.33	0.70	1.02	1.16	2.34	0.33	0.46	1.01
	1925-1948										
M	288	0.77	7.58	0.17	0.03	1.53	0.78	7.75	0.18	0.03	1.53
Q	96	1.51	7.99	0.41	0.06	1.77	1.51	8.11	0.42	0.06	1.78
1	24	2.87	7.92	0.75	0.12	1.71	2.85	7.67	0.74	0.12	1.70
2	23	3.04	7.24	0.73	0.19	0.72	3.05	7.16	0.73	0.19	0.71
3	22	3.17	6.46	0.70	0.29	0.58	3.11	6.36	0.69	0.29	0.57
4	21	3.45	5.86	0.69	0.39	0.86	3.29	5.68	0.66	0.40	0.89
	1960-1978										
M	228	0.20	0.71	0.02	0.06	1.77	0.20	0.71	0.02	0.06	1.77
Q	76	0.87	2.04	0.07	0.11	2.29	0.86	2.01	0.06	0.11	2.28
1	19	1.52	2.91	0.36	0.19	2.50	1.53	2.90	0.36	0.18	2.48
2	19	2.16	5.03	0.62	0.23	1.44	2.16	4.82	0.60	0.21	1.42
3	19	2.13	4.13	0.53	0.31	1.25	2.18	3.99	0.51	0.27	1.17
4	19	1.76	2.79	0.34	0.39	1.02	1.92	2.70	0.34	0.39	0.90
	1979-2000										
M	264	0.97	7.08	0.16	0.06	1.67	0.98	7.10	0.16	0.06	1.67
Q	84	1.02	3.57	0.13	0.13	1.92	1.01	3.55	0.13	0.12	1.92
1	22	0.83	1.83	0.20	0.28	1.92	0.82	1.83	0.19	0.25	1.95
2	22	1.05	1.92	0.29	0.47	1.31	1.04	1.94	0.29	0.36	1.30
3	22	1.48	2.71	0.52	0.57	1.11	1.48	2.70	0.52	0.40	1.10
4	22	1.73	3.01	0.65	0.66	1.76	1.69	2.87	0.64	0.42	1.71

Table 5.2.3c: Regression results of nominal and real maturity premiums against nominal and real excess equity returns

The regression analysis results of the term premium against excess equity returns are consistent across time horizons and time periods. All the regression coefficients are positive and increase across time horizons. The regression coefficients are generally found to be significant at the 5% level indicating a high degree of correlation. At first glance these results seem to support the notion that the term premium may accurately forecast variation in stock returns. However, in a substantial number of instances the Durbin-Watson statistic reveals a high degree of positive serial correlation or finds the test of the null hypothesis to be indeterminate. Although the nature of the regression functions indicate that the relationship between term premium and the return on stocks has not changed significantly over time, it does raise the question as to whether the statistics are not simply identifying a relationship between the variables of a serial nature. Further evidence that substantiates the merit of this argument is presented in

Table 5.2.3d. This table presents the regression of the first difference of the nominal maturity premiums (the independent variable) against the excess nominal equity returns (the dependent variable). The Durbin-Watson statistic indicates no evidence of serial correlation is present in the observation set. More importantly, the regression results show that only one of the regression coefficients is statistically significant once the effects of serial correlation have been removed.

Return Horizon T	Regression results of change in nominal maturity premiums against change in excess equity returns				
	Change in nominal excess equity returns				
	N	c	t(c)	R^2	D-W
	1960-2000				
M	492	0.00	0.01	0.00	2.00
Q	164	(0.01)	(0.51)	0.01	2.05
1	41	0.01	0.15	0.12	2.11
2	41	(0.00)	(0.10)	0.07	2.05
3	41	(0.05)	(0.27)	0.01	2.32
4	41	0.06	0.21	0.03	2.15
	1925-1948				
M	288	(0.04)	(0.05)	0.00	2.01
Q	96	0.01	0.14	0.00	2.03
1	24	1.91	3.09	0.33	1.68
2	23	0.40	0.70	0.03	1.98
3	22	0.14	1.17	0.18	2.25
4	21	0.04	0.53	0.16	2.34
	1960-1978				
M	228	(0.00)	(0.04)	0.00	1.99
Q	76	(0.01)	(0.70)	0.01	2.09
1	19	0.01	0.11	0.18	2.09
2	19	(0.24)	(0.59)	0.14	1.81
3	19	0.11	0.45	0.03	2.19
4	19	0.02	0.07	0.04	2.34
	1979-2000				
M	264	(0.04)	(0.29)	0.00	2.02
Q	84	0.13	0.69	0.01	2.09
1	22	0.93	0.73	0.07	2.11
2	22	(0.01)	(0.21)	0.04	2.09
3	22	(0.13)	(0.39)	0.01	2.22
4	22	0.06	0.15	0.04	2.03

Table 5.2.3d: Regression results of change in nominal maturity premiums against change in nominal excess equity returns

Return Horizon T	Regression results of Y(t)=D(t)/P(t) against Bond returns										
	Nominal Bond returns						Real Bond returns				
	N	d	t(d)	R^2	s(e)	D-W	d	t(d)	R^2	s(e)	D-W
	1960-2000										
M	492	(0.14)	(2.57)	0.01	0.02	1.72	(0.16)	(2.98)	0.02	0.02	1.67
Q	164	(0.39)	(2.29)	0.03	0.04	1.43	(0.46)	(2.67)	0.04	0.04	1.48
1	41	(1.49)	(1.46)	0.05	0.12	2.12	(1.70)	(1.80)	0.08	0.11	2.33
2	41	(3.73)	(2.29)	0.12	0.18	1.06	(3.76)	(2.90)	0.18	0.15	1.23
3	41	(6.77)	(2.99)	0.19	0.24	0.77	(5.96)	(3.89)	0.28	0.16	1.13
4	41	(11.01)	(3.63)	0.25	0.31	0.39	(8.69)	(5.03)	0.39	0.17	0.66
	1925-1948										
M	288	0.02	0.23	0.00	0.02	1.99	0.14	1.62	0.01	0.02	1.90
Q	96	0.05	0.23	0.00	0.03	1.97	0.43	1.61	0.03	0.03	1.99
1	24	0.22	0.21	0.00	0.07	1.95	1.72	1.61	0.11	0.07	1.50
2	23	0.98	0.60	0.02	0.10	1.02	4.09	2.18	0.18	0.11	0.69
3	22	1.71	0.74	0.03	0.13	0.85	6.81	2.37	0.22	0.16	0.53
4	21	2.74	0.92	0.04	0.15	0.76	10.79	2.71	0.28	0.20	0.47
	1960-1978										
M	228	0.03	0.49	0.00	0.01	1.50	(0.02)	(0.36)	0.00	0.01	1.43
Q	76	0.08	0.41	0.00	0.03	1.42	(0.08)	(0.36)	0.00	0.03	1.43
1	19	0.78	0.66	0.03	0.08	1.73	0.01	0.01	0.00	0.08	1.53
2	19	2.20	1.21	0.08	0.12	1.36	0.40	0.20	0.00	0.13	1.01
3	19	3.89	1.91	0.18	0.12	1.38	0.97	0.38	0.01	0.15	0.72
4	19	5.86	2.80	0.32	0.10	1.59	1.82	0.55	0.02	0.16	0.52
	1979-2000										
M	264	(0.15)	(1.66)	0.10	0.03	1.81	(0.24)	(2.66)	0.03	0.03	1.74
Q	84	(0.41)	(1.47)	0.02	0.05	1.56	(0.68)	(2.40)	0.06	0.05	1.53
1	22	(1.51)	(0.95)	0.04	0.14	2.79	(2.56)	(1.66)	0.12	0.13	2.84
2	22	(4.14)	(2.00)	0.17	0.17	1.87	(5.74)	(3.25)	0.35	0.15	1.80
3	22	(7.28)	(3.20)	0.34	0.19	1.90	(8.53)	(4.81)	0.54	0.15	2.03
4	22	(11.42)	(5.01)	0.56	0.19	1.36	(11.41)	(6.76)	0.70	0.14	1.23

Table 5.2.3e: Regression results of Y(t) = D(t)/P(t) against nominal and real bond returns

The above table presents the results of the regression of the more timely form of the dividend yield against nominal and real bond returns. The data exhibits inconsistent patterns, for example the period 1979-2000 has regression relationships where the gradient is negative. In order to maintain the consistency of data analysis the effect of serial correlation was taken into account in analysing the above data set in table 5.2.3f. The dividend yield, accepted as predicting stock returns, is not found to predict bond returns with the same success as the analysis of Fama et al. (1989) was shown to do.

Return Horizon T	Regression results of Y(t)=D(t)/P(t) against Bond returns				
	Nominal Bond returns				
	N	d	t(d)	R^2	D-W
	1960-2000				
M	492	(15.75)	(1.36)	0.00	2.01
Q	164	8.14	1.29	0.01	2.02
1	41	2.96	0.30	0.12	1.98
2	41	(585.61)	(2.58)	0.15	2.04
3	41	10.19	1.16	0.03	2.07
4	41	(0.97)	(0.23)	0.00	1.93
	1925-1948				
M	288	(87.77)	(12.81)	0.37	2.01
Q	96	(28.67)	(7.09)	0.35	2.04
1	24	16.75	2.34	0.33	1.65
2	23	2.45	0.53	0.01	2.05
3	22	4.01	0.97	0.05	2.15
4	21	0.90	0.36	0.01	1.91
	1960-1978				
M	228	(5.47)	(1.68)	0.01	1.95
Q	76	0.83	0.24	0.00	2.16
1	19	7.51	0.41	0.01	2.02
2	19	(757.39)	(1.87)	0.17	2.02
3	19	15.67	0.96	0.05	2.13
4	19	(7.13)	(0.90)	0.05	2.14
	1979-2000				
M	264	(23.43)	(1.12)	0.00	2.01
Q	84	(0.05)	(0.01)	0.00	1.97
1	22	(0.55)	(0.12)	0.00	2.31
2	22	(9.58)	(1.95)	0.16	1.96
3	22	3.31	0.86	0.04	2.34
4	22	0.50	0.39	0.01	2.46

Table 5.2.3f: Regression results of change in Y(t) = D(t)/P(t) against change in nominal bond returns

6. Conclusion

The regression of returns on dividend yields indicate that time variation in expected returns accounts for a small fraction of the variances of short horizon returns. Dividend yields typically explain less than 5% of the variances of the monthly, quarterly or annual returns. The results presented are similar to those presented by Fama et al. (1988) only in that time variation in expected returns accounts for more of the variation of long horizon returns. However, the percentage of variation explained by the dividend yields is not nearly as strong as those presented by Fama et al. (1988). Dividend yields explain more than 15% of the variances of two- to four-year returns only in the 1979-2000 period. During time horizons 1925-1948 and 1960-1978 both definitions of the dividend yield result in negative regression slopes. This is in stark contrast to the results of Fama et al. (1988) who find that time variation in expected returns typically accounts for up to 25% of variation of long horizon returns. Fama et al. (1988) explain this phenomenon by the following statement:
"The persistence (high positive autocorrelation) of expected returns causes the variance of expected returns, measured by the fitted values in the regressions of returns on dividend yields, to grow more than in proportion to the return horizon. On the other hand, the growth of the variance of the regression residuals is attenuated by a discount rate effect: shocks to expected returns are associated with opposite shocks to current prices. The cumulative price effect of an expected return shock and the associated price shock is roughly zero. On average, the expected future price increases implied by higher expected returns are just offset by the immediate decline in the current price. Thus the time variation of expected returns gives rise to mean-reverting or temporary components of prices."

While their argument is appealing, the results presented in this paper do require further analysis in order to determine whether the inconsistency in results may be the function of common characteristics of stock market data, such as serial correlation. Durbin-Watson statistics for each regression reveal a high incidence of serial correlation amongst the data set analysed. Once the data is adjusted for the effects of serial correlation only one of the regression slopes remains significant at the five percent level. It is clear that the simple explanation offered by Fama et al. (1988), while theoretically appealing, is overstating the simplicity of the results.

The term premium, which due to informational constraints captures the default spread as well as the spread of short versus long term bonds, is a widely accepted business conditions indicator, high when the economy is performing poorly and low when the economy is performing well. In contrast to Fama et al. (1989), this paper finds that the dividend yield is not correlated to the term premium. Thus the conclusion drawn by Fama et al. (1989) that the independent variables all track the same components of variable returns across asset classes does not hold when examining the South African data. The correlation between the term premium and dividend yield is close to zero across all periods examined. It can therefore be inferred that the dividend yield and term premium do not track similar components of expected returns across asset classes. This is not easily explained and does not appeal to the economic intuition that if term spreads widen, so to should dividend yields rise as the firm's share price drops in response to a higher cost of capital.

The results of this paper have led to the conclusion that none of the null hypotheses posed may be rejected. The question remains: What drives the prices of stock and bond markets in South Africa in the long term and short term? Is the answer within the application of government monetary and fiscal policies? Is there an answer in the shifting economic paradigms of each financial era? Or are the markets driven by animal spirits devoid of logic? These are questions central to economic theory to which this paper has added further evidence. Unfortunately a firm answer to the questions central to economic theory are needed before the answer to the hypotheses presented in this paper may be fully and finally affirmed or denied.

7. Reference Appendix

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