CHAPTER 4

A REVIEW ON EXISTING STOCK MARKET MODELS

4.1 INTRODUCTION

Studies modeling stock markets can be divided into two broad categories, namely those that test stock market efficiency and those that model stock prices or stock returns. Studies modeling stock market efficiency are basically evaluating the efficient market hypothesis and the random walk model. On the other hand, studies that model stock market prices or returns are based on the theory of the present value model. Within the latter category, studies can be classified as either structural models that try to develop and estimate a model of the stock market, or studies that evaluates the relationship between stock market and macroeconomic variables.

In this study a structural model of the South African stock market will be estimated and therefore the focus of the literature review will be on literature estimating structural stock market models rather than the literature evaluating stock market efficiency. However, stock market efficiency has important implications for the profitability of a trading rule based on technical analysis versus trading based on a structural model. Therefore, although the focus of this study and hence the focus of the literature review will be on the structural models of the stock market, it is important to also include a brief overview on the literature evaluating stock market efficiency.

In this chapter, a brief overview of studies modeling stock markets will be given. First, the literature on international stock market models will be reviewed, differentiating between studies evaluating stock market efficiency and those that estimate structural models of the stock market or analyze the relationship between the stock market and specific macroeconomic variables. The latter category will distinguish between studies that modeled stock prices or those that modeled stock returns. This is followed by an overview of the literature on empirical studies of the

South African stock market, again distinguishing between studies evaluating the efficiency of the JSE and studies modeling stock prices or stock returns.

4.2 INTERNATIONAL STUDIES

4.2.1 Studies Evaluating Stock Market Efficiency

Stock market efficiency has fundamental implications for stock market analysis and trading. If stock markets are not efficient, stock prices are forecastable from past price behavior alone. The random walk theory, which assumes that consecutive price changes are independent and identically distributed over time, is central to the testing of the ability of past returns to predict future returns (Thompson and Ward 1995). If prices follow a random walk, it means that yesterday's price change should not be related to the price change of today, or any other day since it should be independent. The implication for trading is that future price movements cannot be predicted successfully on the basis of historic price movements.

Empirical studies have mainly used three econometric techniques to evaluate stock market efficiency, namely serial correlation tests, the runs test and the variance ratio test. Tests for weak form efficiency can be divided into two broad categories. The first group includes studies that test whether trading rules based on exploiting possible systematic patterns in share prices can yield abnormal profit, in other words can beat a random selection of securities. Spectral analysis, serial correlation tests and the runs test are usually utilized to analyze the dependence of share prices. Although share prices are seldom perfectly independent, stock market investors are mostly concerned with whether the dependence is sufficient to allow the history of the series of price changes to be used to predict the future in such a way that the expected returns would be greater than under a simple buy-and-hold model (Thompson and Ward 1995).

The second group of weak form efficiency tests comprises studies testing the statistical dependence in changes in share prices, attempting to determine whether share prices have sufficient dependence to make it possible for investors to predict future share prices by studying past trends. Weak form efficiency is invalidated if a

trading rule, in other words a strategy for buying and selling securities based on objective signals, *consistently* outperforms a simple buy-and-hold portfolio with equivalent risk (Thompson and Ward 1995).

Tests of semi-strong form market efficiency generally evaluate the speed and accuracy of market adjustment to specific new information that affects the intrinsic value of the security. These studies test whether the market moved in the right direction and the speed of market adjustment following a specific type of information generating event. Information generating events include earnings announcements, changes to dividend policy, capitalizations, large secondary offerings of common stock, changes in the discount rate and changes to accounting methods. The main methodology followed in these studies is to compare expected share prices to actual share price performance, where the expected share prices are usually determined with some form of asset pricing model. The residuals are then analyzed to determine the impact of the information on share prices and whether share prices adjusted rapidly and accurately to this information (Thompson and Ward 1995).

Tests of strong form market efficiency entail evaluating whether specific investors or groups of investors have monopolistic access to non-public information relating to price formation. The rates of return on portfolios of investors that have access to private information, usually professional portfolio managers of unit trusts and investment funds, are compared to that of a passive buy-and-hold-the-market strategy. If such an investor consistently and significantly outperforms the market, it indicates either exceptional skills or access to special information, which negates the strong form of the efficient market hypothesis (Thompson and Ward 1995).

The empirical evidence on market efficiency in international stock markets has been inconclusive. While many studies found that markets are efficient (see e.g. Kavussanos and Dockery 2001; Chen, Kwok and Rui 2001; Nieto, Fernandex and Munoz 1998), there are also studies that found evidence against market efficiency (see e.g. Omet, Khasawneh and Khasawneh 2002; Siourounis 2002; Hasan, Samarakoon and Hasan 2000; Mecagni and Sourial 1999).

4.2.2 Structural Stock Market Models

(i) Stock price models

The literature on modeling stock market prices instead of modeling stock market returns (i.e. changes in the stock market prices) is quite sparse. Studies that did model stock prices all employed cointegration techniques and used the present value model as theoretical basis. Even though most of these studies used the Gordon-Shapiro (i.e. constant growth) version of the present value model, different studies interpreted the empirical implications of this model differently.

According to the present value model, stock prices are a function of future dividends, the discount rate and the growth rate. In empirical studies, dividends are often proxied by variables such as economic growth or industrial production, while the discount rate is specified as the long-run interest rate to which a risk premium is sometimes added (see section 3.3.1).

Harasty and Roulet (2000) used cointegration techniques to model the stock prices of 17 developed countries. They argue that economic theory can explain the long-run trend of the stock market, but that short-run movements are driven by variables other than those dictated by theory and hence it can only be determined empirically. Therefore, they estimate the long-run behavior of stock prices based on the present value model and then empirically try to explain the fluctuations of the market around this long-run trend. Using the Engle-Granger cointegration technique, they showed that stock prices are cointegrated with earnings (a proxy for dividends) and the long-term interest rate in each country (except the Italian market for which the short-term interest rate was used). The main variables that explained the short-term fluctuations were short-term interest rates, exchange rates and the spreads between domestic long-term and short-term interest rates, as well as between domestic and foreign interest rates.

Following a similar approach to model the long-run behavior of Spanish stock prices, Ansotegui and Esteban (2002) also based their model on the present value model. They showed that stock prices cointegrate with industrial production (used as proxy

for dividends), inflation and the interest rate. Han (1996) interpreted the present value model differently and tested for cointegration between stock prices and dividends of the Standard and Poor stock index. He found that neither the levels nor the logarithmic transformations of stock prices and dividends are cointegrated and therefore concluded that the present value model doesn't hold for the Standard and Poor stock index. However, Yuhn (1996) argues that the present value model doesn't imply cointegration between stock prices and dividends. By using extensive mathematical derivations, he shows that the present value model rather implies that the sum of current stock prices and dividends should cointegrate with lagged stock prices. When he tests the present value model with this specification, he found little evidence supporting linear cointegration but overwhelming evidence of non-linear cointegration.

There is evidence that the present value model has been interpreted in various ways in the literature. This resulted in different model specifications in different studies, which has a crucial impact on their results especially in terms of whether they reject validity of the present value model. In addition to the model specification differences, different authors have used different proxies for dividends and discount rates.

(ii) Stock return models

The studies that have modeled actual, expected or excess stock market returns can be divided into two categories. The first category includes studies that test whether stock markets are efficient, while studies in the second category analyze the relationship between the stock market and macroeconomic variables. Studies in the latter category either evaluate the bivariate relationship between stock prices and a macroeconomic variable, or try to build a model for stock prices

As set out in chapter three, the present value model asserts that stock prices are determined by dividends and the discount rate and are hence influenced by macroeconomic variables that influences or proxies dividends or the discount rate. It follows trivially that the systematic forces that influence stock prices and hence returns, are those that influence the discount factor or dividends. Since the seminal article by Chen *et al* (1986), the influence of variables such as interest rates and

inflation on the discount rate and of the economic growth on dividends has been well established. However, different studies have defined the discount rate differently and also used different proxies for economic growth and dividends.

The relationship between stock prices and interest rates has received considerable attention in the literature. A distinction has to be made between the influence of the long-term and the short-term interest rates, since the rationale for their relationships with the stock market differs. The proxy hypothesis of Fama (1981) argues that expected inflation is negatively correlated with anticipated real activity, which in turn is positively related to returns on the stock market. Therefore, stock market returns should be negatively correlated with expected inflation, which is often proxied by the short-term interest rate. On the other hand, the influence of the long-term interest rate on stock prices stems directly from the present value model through the influence of the long-term interest rate on the discount rate (see section 3.3).

Lee (1997) used three-year rolling regressions to analyze the relationship between the stock market and the short-term interest rate. He tried to forecast excess returns (i.e. the differential between stock market returns and the risk-free short-run interest rate) on the Standard and Poor 500 (S&P500) index with the short-term interest rate, but found that the relationship is not stable over time. It gradually changes from a significantly negative to no relationship, or even a positive although insignificant relationship.

Zhou (1996) also studied the relationship between interest rates and stock prices using regression analysis. He found that interest rates have an important impact on stock returns, especially on long horizons, but the hypothesis that expected stock returns move one-for-one with ex ante interest rates is rejected. In addition, his results show that long-term interest rates explain a major part of the variation in price-dividend ratios and suggests that the high volatility of the stock market is related to the high volatility of long-term bond yields and may be accounted for by changing forecasts of discount rates.

Rather than using either short-term or long-term interest rates, Campbell (1987) analyzed the relationship between the yield spread and stock market returns. He

argues that the same variables that have been used to predict excess returns in the term structure also predicts excess stock returns, deducing that a simultaneous analysis of the returns on bills, bonds and stock should be beneficial. His results support the effectiveness of the term structure of interest rates in predicting excess returns on the US stock market.

Kaul (1990) studied the relationship between expected inflation and the stock market, which, according to the proxy hypothesis of Fama (1981) should be negatively related since expected inflation is negatively correlated with anticipated real activity, which in turn is positively related to returns on the stock market. Instead of using the short-term interest rate as a proxy for expected inflation (like for example Lee (1997)), Kaul (1990) explicitly models the relationship between expected inflation and stock market returns. His results is supportive of Fama's (1981) proxy hypothesis and showed that the relationship between stock returns and expected inflation in the US is significant and negative.

Spyrou (2001) also studied the relationship between inflation and stock returns but for the emerging economy of Greece. Consistent with Kaul's results, Spyrou (2001) found that inflation and stock returns are negatively related, but only up to 1995 after which the relationship became insignificant. He ascribes the change in the relationship to the increased role of monetary fluctuations, in line with the argument of Marshall (1992) that the negative relationship between stock returns will be less pronounced during periods when inflation is generated by monetary fluctuations.

In addition to inflation and interest rates, Leung, Daouk and Chen (2000) included the lagged stock market index and economic growth as explanatory variables in their stock market models for the US, UK and Japan. They model not only the stock market index, but also turning points in the stock market index in order to compare the profitability of trading rules based on the two approaches. To model stock prices they employ adaptive exponential smoothing techniques, the VAR-Kalman Filter, a transfer function and neural networks. They model turning points in the stock market with linear discriminant analysis, a logit model and neural networks. Their results suggest that classification models outperform level estimation models in terms of predicting the direction of the stock market movement and maximizing returns.

Fang (2002) argued that exchange rates could also influence stock prices. This should especially be relevant in the current globalized economy. His results confirmed that currency depreciation adversely affects stock returns and increases market volatility over the period of the Asian crises (1997-1999). The implication for investors is that they have to evaluate the stability of foreign exchange markets prior to investing in stock markets. However, this study only covered crisis periods and the results might differ for normal periods.

Black and Fraser (1995) argue that the predictable variation in excess stock returns is a rational response to the general level of expected business conditions. Following the present value model, stock prices are in part determined by future dividends, which in turn are influenced by the future state of the economy. Since current financial variables reflect the expected future state of the economy, it should be able to predict the conditional risk component of excess returns. The results of their Garch-M model are supportive of their hypothesis that financial variables, specifically the term spread, default spread and dividend yields, influence UK stock returns.

Chen (1991) follows a similar line of reasoning than Black and Fraser (1995). He argues that stock market returns are a function of expected economic growth through its influence on dividends and economic growth in turn is a function of so-called "state variables" such as interest rates, interest rate spreads and dividend yields. In addition, the uncertainty regarding future economic growth (or dividends) also plays a role in determining the stock prices, so his stock market model also includes the volatility of economic growth as explanatory variable. He empirically showed that lagged economic growth, the default spread, the term spread, short-term interest rates and the dividend-price ratio are important determinants of future stock market returns in the US. In addition, expected excess market return is negatively related to recent economic growth and positively related to future growth.

There are several studies on the relationship between the business cycle and the stock market. Fama and French (1989) and Perez-Quiros and Timmerman (1996) showed that expected stock market returns are lower when economic conditions are strong and higher when economic conditions are weak. Fama and French (1989) argue that when

business conditions are poor, income is low and expected returns on bonds and stocks must be high to induce substitution from consumption to investment. In contrast, when times are good and income is high, the market clears at lower levels of expected returns. They showed that dividend yields can be used to forecast stock returns.

The relationship between the stock market and the business cycle has important implications for stock market investments and investment strategies. Lucas, Van Dijk and Kloek (2002) formulated alternative investment strategies, including both once-and-for-all choices of a particular style and state-dependent choices of investment styles. They use the yield spread and the composite index of leading indicators to indicate the state of the economy. They found that business cycle oriented approaches to style rotating investment strategies outperform purely statistical models for style rotation in the US. Brocato and Steed (1998) studied the optimal asset allocation of nine types of assets over business cycle and compared the returns and correlations of nine asset types during recessions and expansions. There results indicated that total returns of equity assets rise during expansions while those of fixed income debt instruments do better during downturns.

Recently, the potential asymmetry in the relationship between the stock market and the business cycle has received considerable attention in the empirical literature. Studies analyzing this asymmetric relationship can be classified into two categories, namely those that studied the direct relationship between the stock market and the business cycle and those that studied the relationship between the stock market and macroeconomic variables conditional on the state of the business cycle. In the former category, Domian and Louton (1995) argued that the business cycle asymmetries identified by Neftci[1] (1984) could potentially cause the relationships between the business cycle and other series, such as the stock market, to be asymmetric. They used regression analysis to show that an asymmetric relationship exists between stock index returns and unemployment. Consistent with their earlier results, Domian and Louton (1997) uses threshold autoregressive models to show that negative US stock returns are followed by sharp decreases in increases in industrial production growth rates, while only slight increases in real activity follow positive stock returns.

[1] Neftci (1984) found evidence that suggested that economic time series go through two different regimes during the business cycle.

Silvapulle and Silvapulle (1999) and Silvapulle, Silvapulle and Tan (1999) use threshold autoregressive (TAR) models to show that negative stock market returns have steeper effects on the business cycle than positive returns in the US and Malaysian respectively. Siklos (2002) uses a threshold cointegration model to show that share prices cointegrate asymmetrically with unemployment and that real share prices above the corresponding unemployment rate are a relatively stronger "attractor" than when the situation is reversed. His argument is based on the so-called "structural slump" invented by Phelps (1994) which asserts that a steep decline in share prices is followed by a gradual rise in unemployment.

In the latter category, Jensen, Mercer and Johnson (1996) argued that monetary variables will have an asymmetric influence on the stock market depending on the state of the business cycle. They found that after including a broad measure of monetary stringency, business conditions explain future stock returns only in expansive monetary policy periods. They also found that only the dividend yield and the default premium are significant while the term spread is insignificant. After controlling for monetary stringency, the term spread alone contributes significantly in explaining expected bond returns in restrictive monetary policy periods. In contrast, only the dividend yield is significant in expansive policy periods. Therefore, business conditions proxies play substantially different roles in explaining variation in expected stock and bond returns depending upon monetary stringency.

McQueen and Roley (1993) and Jarvinen (2000) studied the impact of macroeconomic news on the stock market (residuals from VAR models) conditioned on the state of the economy for the US and Finland respectively. They argue that it is possible that higher than expected economic growth during a depression might indicate the end of the recession and hence influence the stock market positively. On the other hand, higher than expected economic growth in an economic expansion might induce fears of an overheating economy which might prompt monetary authorities to rise interest rates and hence be bad news for the stock market. Their results were supportive of asymmetric relationships between the stock market and macroeconomic variables conditional on the state of the business cycle.

Most studies modeling stock prices or stock returns use data for developed countries. The study by Fifield, Power and Sinclair (2002) is an exception in which cross-sectional data for 13 emerging markets are used. They test the influence of domestic variables (inflation, exchange rate, short term interest rate, GDP, money supply and the trade balance) as well as global variables (world return, world inflation, commodity prices, world industrial production, oil price and US interest rates) in explaining the stock market. Their results indicate that domestic GDP, inflation, money supply, interest rates, as well as world production and world inflation is able to explain fluctuations in equity returns in emerging markets. The importance of the factors varies between countries.

The results of the study by Fifield, Power and Sinclair (2002) on emerging stock markets, which differs substantially from the results of studies for developed countries, highlights the importance of empirically modeling the South African stock market. The South African stock market, which functions in an emerging economy, will be determined by different factors than stock markets in developed countries. In addition, the results of Fifield, Power and Sinclair (2002) pertinently showed that the importance of the various determinants differs even among emerging stock markets.

4.3 SOUTH AFRICAN STUDIES

4.3.1 Studies on the Efficiency of the South African Stock Market

There are several studies that tested the efficiency and the existence of anomalies on the Johannesburg Stock Exchange (JSE). Le Roux and Smit (2001) tested for the presence of several well-known stock market anomalies in the JSE, namely the day-of-the-week effect, the week-of-the-month effect, the month-of-the-year effect, the turn-of-the-month effect, the turn-of-the-year effect and a quarterly effect using the Anova F-test and the Kruskal-Wallis test. They found evidence of week-of-the-month and turn-of-the-month effects, while the day-of-the-week and turn-of-the-year effects that previously existed have disappeared. Bradfield (1990) also tested for the presence of anomalies in the JSE and found December as well as July effects.

The evidence on all three forms of market efficiency are quite mixed for the JSE. Gilbertson (1976) tested 11 South African unit trusts for the period 1970-1976 and found evidence supporting strong-form efficiency. In contrast, Knight and Firer (1989) rejected strong-form efficiency based on their analysis of 11 South African unit trusts for the period 1977-1986. Knight and Afflect-Graves (1983) rejected semi-strong form efficiency while Knight, Affleck-Graves and Hamman (1985) found support of for semi-strong form efficiency. Jammine and Hawkins (1974) rejected weak-form efficiency based on the results of their analysis of JSE share prices for the period 1966 to 1973. Affleck-Graves and Money (1975) tested the random walk hypothesis for 50 industrial shares and found evidence supporting weak-form efficiency. Likewise, Hadassin (1976) rejected the random walk hypothesis using 30 shares traded on the JSE for the period 1971-1973. Gilbertson and Roux (1977, 1978) analyzed 24 industrial and mining shares and found dependencies which were too small and random to be profitable so that they did not reject weak form efficiency. Consistent with these results, Brummer and Jacobs (1981) found price change dependencies which were too small to be profitable in their study of 94 industrial shares for the period 1970-1971. Du Toit (1986) rejected the weak form efficiency using 180 highly trades shares.

Given the mixed evidence on efficiency of the JSE, the issue is whether there is sufficient abnormal price behavior to make it worthwhile for normal investors to seek superior returns. Thompson and Ward (1995) presented a thorough overview of the literature on the efficiency of the JSE and their conclusion from the literature is that there are some share price dependencies but too small to be profitably exploited. Given the mixed evidence on the efficiency of the JSE, the issue is whether there is sufficient abnormal price behaviour to make it worthwhile for the average investor to seek opportunities for abnormal returns, or whether the best option for most investors would simply be to buy and hold a well-diversified portfolio. They conclude that the JSE is “operationally efficient”, which is defined as a market that “provides a reward mechanism for those whose expertise and efforts sustain its efficiency” (Keane 1986:59). Such a market will enable a small group of investors to profit from market inefficiencies but will prevent the majority of investors from market inefficiencies by rapidly adjusting prices when the specialists communicate their knowledge to the

public. In other words, while a small group of investors will be able to outperform the market, most investors will not be able to do so.

4.3.2 Structural Models of the South African Stock Market

Similar to the case of international studies, few studies modeled the level of the South African stock market. Barr and Kantor (2002) developed and estimated a structural econometric model in which they attempt to capture the linkages between the South African real and financial markets and the global economy using cointegration techniques. Since their focus is on identifying and modeling the linkages between the different markets, their stock market equation reflects the main channels through which the South African stock market is influenced rather than the fundamental factors driving it. In addition to an autoregressive term, their results show that the JSE is also a positive function of foreign stock prices and commodity prices.

Van Rensburg (1995, 1998, 1999) made the largest contribution to the literature on modeling relationships between returns on the JSE and macroeconomic variables. Van Rensburg (1995) estimated linear relationships between the Johannesburg Stock Exchange and four economic factors, namely the unexpected changes in the term structure, unexpected returns on the New York Stock Exchange, unexpected changes in inflation expectations and unexpected changes in the gold price. His results indicated that all four factors significantly influences stock prices.

Van Rensburg (1998) used bivariate Granger causality tests and correlations to study relationships between stock market returns and macroeconomic variables. He does not attempt to estimate a model for the stock market, but only causal relationships between the stock market and macroeconomic variables. He tests three categories of variables, namely factors influencing the discount rate (such as various interest rates), factors influencing dividends (such as economic growth) and international factors.

In addition to returns on the Johannesburg Stock Exchange (JSE) overall index, Van Rensburg (1999) also analyzed relationships between the returns on the industrial index and gold index of the JSE and several macroeconomic variables. His results show that the long-run interest rate, the gold and foreign reserve balance and the

balance on the current account significantly influence the returns all three indexes. In addition, the industrial index is influenced significantly by the short-term interest rate and the Dow Jones industrial index while the gold index is influenced significantly by the rand-dollar exchange rate and the gold price.

Like Van Rensburg (1995, 1998, 1999), Barr (1990) tried to identify the macroeconomic factors that influence returns on the JSE. Unlike Van Rensburg, however, Barr follows a factor-analytic approach and identify the gold price, the short-term interest rate, foreign stock markets and local business confidence as factors that significantly influence returns on the JSE.

Jefferis and Okeahalam (2000) used cointegration and error correction techniques to model the stock markets of South Africa, Botswana and Zimbabwe. They followed an a-theoretical approach. They used quarterly data for the period 1985 to 1995 and modeled the JSE overall index as a function of domestic and foreign GDP, the real exchange rate and long-term domestic and foreign real interest rates. They hypothesized a positive relation between stock market and GDP, exchange rate and foreign interest rates and a negative relation between the stock market and domestic interest rates. Higher GDP increases profits and hence share prices should rise, while a depreciation boosts the profitability of domestic producers of tradables (exports and import substitutes) relative to foreign competitors. As a result the exchange rate should have a positive influence on their profits and hence on their stock prices. Higher interest rates are hypothesized to depress stock prices through the substitution effect (interest-bearing assets become more attractive relative to shares), an increase in the discount rate (and hence a reduced present value of future expected returns), or a depressing effect on investment and hence on expected future profits. Their empirical results for South Africa indicated that real stock prices are positively related to the real exchange rate and real GDP and negatively related to the long-term interest rate. In the short-run, real domestic long-term interest rates, US interest rates, the real exchange rate and domestic GDP influence the stock market.

4.4 CONCLUSION

In this chapter studies modeling stock markets has been reviewed in order to analyze the empirical implications of the theoretical stock market models in chapter 3. The studies that have modeled stock markets have been divided into two categories. The first category includes studies that test whether stock markets are efficient, while studies in the second category analyze the relationship between the stock market and macroeconomic variables. Studies in this category either evaluate the bivariate relationship between stock prices and a macroeconomic variable, or try to build a model for stock prices

Studies analyzing the relationship between stock prices and macroeconomic variables or trying to build a stock price model use the present value model as theoretical foundation. According to this model stock prices are determined by dividends and the discount rate and are hence influenced by macroeconomic variables that influences or proxies dividends or the discount rate. It follows trivially that the systematic forces that influence stock prices and hence returns, are those that influence the discount factor or dividends. Variables identified in the literature as determinants of stock prices include short-term and long-term interest rates, (expected) inflation, economic growth, the state of the business cycle, the gold price, exchange rates, term premium, default premium, money supply and the trade balance. In addition, emerging stock markets are also influenced by global variables such as world return, world inflation, commodity prices, world industrial production, the oil price and US interest rates.

The literature on empirical models of the South African stock market is quite sparse. The evidence on the efficiency of the JSE is mixed, but the general conclusion seems to be that it is operationally efficient, so that stock price behavior cannot be successfully predicted on the basis of historical stock prices alone (Thompson and Ward 1995). This emphasizes the scope of developing a structural model that can be used with potentially more success than technical analysis in trading shares on the JSE. Variables that have been found significant in influencing the JSE can be divided into three categories, namely variables that influence dividends, variables that influence the discount rate and variables capturing the influence of global markets (Van Rensburg 1995, 1998, 1999).

The literature review in this chapter has confirmed that stock prices are in practice determined according to the dividend discount model explored in chapter three. In other words, stock prices are determined by future stock returns, which are usually proxied by an indicator of economic activity, and the discount rate, which is usually proxied by the long-term interest rate and a risk premium. However, consistent with the theoretical hypothesis in chapter three, the relationship between economic activity and stock prices is found to be asymmetric with respect to the state of the business cycle, in other words whether the economy is in a downswing or an upswing. Any empirical stock market model therefore has to capture this potential asymmetry. In the next chapter, a Markov switching regime model of the South African economy will be developed and estimated. This model generates a business cycle indicator that can be used to model business cycle asymmetry in the empirical stock market model in chapter six.