

THE POWER OF INVESTOR SENTIMENT: AN  
ANALYSIS OF THE IMPACT OF INVESTOR  
CONFIDENCE ON SOUTH AFRICAN FINANCIAL  
MARKETS

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## **ABSTRACT**

Whether investor sentiment has any authority over financial markets has long been a topic of discussion in the field of finance. This study investigates the relationship between investor sentiment and share returns in South Africa. Determining this relationship will add to the existing work which has documented important determinants of share returns on the stock exchange in South Africa, as well adding to the inconclusive link between sentiment and the South African financial markets. Does sentiment influence share returns or do share returns influence sentiment? Using quarterly data for the period 1996-2010, the study makes use of the FNB/BER Consumer Confidence Index as a proxy for investor sentiment, and the FTSE/JSE All Share Index to represent the South African financial markets. A regression analysis was conducted along with granger-causality tests, impulse response functions and variance decompositions in order to determine the nature of this relationship.

The results showed that investor sentiment has a statistically significant relationship with share returns in South Africa. However, sentiment is only able to account for a very small portion of the variation in returns, with returns able to account for a larger portion of the variation in sentiment. Therefore investor sentiment is not a suitable predictor of share returns in South Africa. In addition, granger-causality tests indicate that returns are actually the leading indicator, suggesting that changes in South African investors' confidence levels occur following changes in the state of the JSE.

The limitations of the study include the infrequent nature of the sentiment measure used, thereby failing to capture important changes in sentiment and their immediate impact on financial markets. In addition, the sentiment of foreign investors must be taken into account due to the large foreign investment in the JSE.

## **DECLARATION**

*Except where explicitly stated otherwise and acknowledged, this thesis is wholly my own work and has not been submitted to any other University, Technikon or College for degree purposes.*

**SIGNED:**

**DATE: 15 December 2012**

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# CHAPTER 1

## INTRODUCTION

### 1.1. BACKGROUND, CONTEXT AND RATIONALE FOR RESEARCH

Prior to 1990, investor sentiment received little attention with regard to the workings of financial markets and the pricing of assets. Traditional finance theorists considered investor sentiment to be little more than fable, incapable of adequately explaining the pricing, and mispricing of financial assets. Such theorists prefer to suggest that individuals need only pay attention to an assets' fundamental value when making investment decisions, and anyone who failed to follow this strategy would swiftly be forced out of the market by ever observant arbitrageurs. However, recently, both economists as well as the general public have begun to acknowledge that investor sentiment, a theory which forms part of the scope of the broader field of behavioural finance, may in fact play a more prevalent role in pricing of financial assets. Baker and Wurgler (2007: 1) define investor sentiment broadly as "...a belief about future cash flows and investment risks not justified by the facts at hand". It is therefore a theory of how real world investors form their beliefs and valuations concerning financial assets.

Despite investor sentiment only recently gaining support amongst economists as a plausible explanation for the mispricing of assets, the theory also provides a logical reason for some of the more well-known instances where gross misvaluations have taken place. Stock market booms and crashes, which cannot be accounted for by changes in economic fundamentals alone have, according to Aliber and Kindleberger (2005), occurred throughout history. Events identified include, among others, the Dutch Tulip Mania of the 1630's, the Mississippi Bubble, the Wall Street Crash of 1929, Black Monday Crash of 1987 and the 2000 dot.com bubble and bust; the 2007 Financial Crisis can be added to this list. Each one of these events refers to the occurrence of a significant rise in equity prices, subsequently followed by a 'bursting of the bubble'.

This of course is not to say that in all instances where equity prices have risen in such a fashion a crash has ensued; however, these events are uncharacteristic of traditional finance theory as the extent of the increase in prices cannot be justified by an improvement in

fundamental factors alone. This suggests that non-conventional forces, such as investor psychology, may be driving asset prices to levels which are considered over or undervalued according to economic fundamentals.

One of the first publications which sought to establish the link between investor psychology and asset prices was a book by Selden (1912) entitled *Psychology of the Stock Market*. Selden (1912, In Ritter, 2003: 1) explains how he based the book “upon the belief that the movements of prices on the exchanges are dependent to a very considerable degree on the mental attitude of the investing and trading public”. Keynes (1936) in the *General Theory of Employment, Interest and Money* was one of the first economists to allude to the significance in which market sentiment plays in the “prospective yield of an asset”. Keynes (1936: 161) believed that human emotions played a large part in economic activity and he asserted that investments are driven by “animal spirits”.

In this study, a consumer confidence index provided by the Bureau for Economic Research (BER) in conjunction with First National Bank (FNB) will be used to test the relationship between consumer confidence and prices of shares listed on the JSE. Consumer confidence will be used as a proxy for investor sentiment following Otoo (1999), Charoenruek (2003), Jansen and Nahuis (2003) and Schmeling (2009). The logic behind the link between consumer confidence and share prices is simple: given an increase in confidence with regards to the economy, consumers are more likely to spend their wealth on income generating assets and investments such as shares in the hope of receiving high returns. At the same time consumers are likely to increase spending on goods and services as they feel more confident about their future. Both of these occurrences will boost the earnings of publicly listed companies, which should result in an increase in dividend payments and share prices. Following an increase in share prices, confidence in the economy will also increase and the cycle will repeat. This study therefore aims at testing the hypothesis that increased (decreased) consumer confidence results in higher (lower) share prices in South Africa.

Traditional asset pricing models have essentially evolved into two strands; present value models such as those developed by Smith (1925) and Gordon (1962), and models which incorporate risk in the pricing of shares such as the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965). The present value model, developed by Smith (1925) provides the foundation of all asset pricing models through the simple concept that price equals the discounted value of future expected payoffs. On the other hand, factor

pricing models such as the CAPM incorporate risk in determining the return and subsequent pricing of risky assets (Fama and French, 2004: 29).

Despite the existence of these asset pricing models, they are not without their shortcomings both theoretically and empirically. For example, many assumptions are made to support the theory including homogenous expectations amongst investors, the inability to rebalance and consume portfolios over time, risk-free borrowing and lending as well as unrestricted short selling of risky assets (Fama and French, 2004: 7). According to Fama and French (2004: 11), early cross sectional studies such as Douglas (1968), Black, Jensen and Scholes (1972), Miller and Scholes (1972), Blume and Friend (1973), and more recently Fama and French (1992) rejected the claims of CAPM and proved the theory was not entirely accurate.

Classical financial economic theory, through the Efficient Market Hypothesis (EMH), postulates that rational economic agents force capital market prices to equal the discounted expected future cash flows of investments (Baker and Wurgler, 2006: 1645). The EMH, developed by Fama in the 1960's, was a widely accepted theory concerning financial market activity in which it was proposed that economic agents could not achieve higher than average returns when investing due to stock market efficiency.

According to Howells and Bain (2005: 347) the Efficient Market Hypothesis (EMH) is built around three fundamental assumptions of financial markets and economic agents. Firstly, investors are assumed to have rational expectations in that they utilise all relevant information available to them when forming expectations of future movements in the market. This stems from the fact that financial markets are said to be informationally efficient; investors swiftly become aware of any information pertaining to the valuation of assets and incorporate this information into their own subsequent valuation of these assets through investment or disinvestment. Asset prices are then said to follow a Random Walk as tomorrow's price changes will depend on tomorrow's news and will be independent of previous price changes (Malkiel, 2003: 59).

Secondly, the EMH assumes that, while not all investors are rational, the erroneous judgments on the part of irrational investors are likely to cancel each other out, leaving the asset to be valued according to the accurately informed judgments of the rational investors (Baker and Wurgler, 2006: 1645). The events described earlier however, provide evidence that in fact investors often behave in concert in their investment decisions, leading to asset

prices which are overvalued according to fundamentals. The final foundation of the EMH states that even in the event that a large number of irrational investors force a financial asset to a level which is contrary to fundamentals, arbitrageurs in the market will take advantage of this price anomaly and in the process will force the price to return to its 'fair' value, and force irrational investors out of the market.

Thus, the Efficient Market Hypothesis postulates that financial assets trade at their 'fair' value, albeit for momentary instances of disequilibrium. What this all points to is the impossibility of the booms and crashes which have littered world economic history; according to the EMH, equity and other asset prices correctly reflect the fundamentals of the underlying asset and that prices move correctly when reacting to new information, making it impossible for asset prices to experience a bubble in the first instance (Ritter, 2003: 2). In addition, since price changes follow a random walk due to the arrival of unknown news each day, such price changes could not be predicted and therefore the uninformed investor was just as likely to succeed as the financial expert (Malkiel, 2003: 59).

Due to the simplifying assumptions of the EMH, as well as the countless occasions when gross misvaluations of stocks have occurred in the past, researchers began to question whether rational behaviour on the part of investors was as widespread as originally believed. Economists began to challenge the notion that in fact stock prices were partially predictable. This led to growing research on the role played by investor psychology in the valuation and subsequent pricing of financial assets. "Behavioural finance is the study of the influence of psychology on the behaviour of financial practitioners and the subsequent effect on markets" (Sewell, 2010: 1). According to Howells and Bain (2005: 553) behavioural finance rests upon two important foundations, including investor sentiment and practical limits to arbitrage. In essence the first foundation helps explain why investors may cause an 'irrational' price to come about, and the second provides an explanation of why such a price may persist (Howells and Bain, 2005: 553).

Traditional finance theory makes no room for the concept of investor sentiment, "...since price changes only reflect the arrival of external news about future cash-flows and interest rates" (Zhang, 2008: 4). However, in recent times the perceived role that investor sentiment plays in determining asset prices has grown in popularity amongst academics and traders alike. Despite several interpretations of the phrase 'investor sentiment', for the purposes of

this study the phrase should be understood as investors' beliefs regarding the valuation of financial assets.

Cognitive psychologists have acknowledged a number of biases which influence the way people behave, and ultimately lead to sub-optimal investments. Of all the biases identified by cognitive psychologists, herding is arguably the main cause of asset price bubbles. Banerjee (1992: 797) analyses the sequential decision making process of subjects, observing that when making a decision, decision makers will look at the decision made by the previous decision maker. Overconfidence is another form of cognitive bias which manifests itself in overreaction and excessive trading by investors. According to Daniel, Hirshleifer and Subrahmanyam (1997: 3) investors often overestimate the accuracy and power of their private information signals which leads to overconfidence in their ability to evaluate stocks.

The second pillar of behavioural finance includes certain practical limits to arbitrage. Theoretically it is possible for a rational investor to make a riskless profit as the investor buys the asset in the cheap market and sells in the more expensive market, converging prices to their 'fair' value. However, in practice arbitrageurs encounter many obstacles in carrying out this process such as trading with imperfect substitutes and unforeseen price divergence (Howells and Bain, 2005: 554). Gabaix, Krishnamurthy and Vigneron (2005) present evidence supporting the theory of limits to arbitrage in the US mortgage-backed-securities market. Barber, Odean and Zhu (2005) present evidence consistent with noise trader models in which noise traders force prices above fundamentals before reverting to their original value over the period 1983 – 2001. Duan, Hu and McLean (2010) find that costs of arbitrage, in the form of idiosyncratic risk, deters arbitrage amongst short sellers. By constructing their own equilibrium model of the commodity markets, Acharya, Lochstoer and Ramadorai (2011) present evidence that financial arbitrage costs limit hedging by producers affecting both asset and goods prices.

Studies involving the relationship between investor confidence and financial market behaviour are limited with regards to South Africa. Kamstra, Kramer and Levi (2003) found that share returns were lower in the winter months in South Africa compared to the summer months, due to a drop in what they describe as Seasonal Affective Disorder (SAD). Edmans, Garcia and Norli (2007) and Smith (2009) found that following a loss in either one of South Africa's national cricket, rugby or soccer teams, the local financial markets would be negatively affected. Bradfield (1990) found evidence of a mid-December effect on the JSE

whilst Bhana (1994) presented evidence that mean share returns were on average five times higher on the trading day prior to public holidays when compared with the remaining days of the year. The exogenous variables utilized in each of these studies could be argued to be a proxy for market sentiment, mainly as a mood variable as certain months of the year as well as the weather and sports results can have a big impact on a large portion of the population.

More closely aligned to this particular analysis, there have been several studies conducted on the relationship between publicly available consumer confidence indices and financial market activity. Fisher and Statman (2003) found a negative and statistically significant relationship between the expectations component of the Conference Board measure of consumer confidence in one month and NASDAQ returns in the following. Charoenrook (2003) used the University of Michigan Consumer Sentiment Index and found that changes in the sentiment index accurately predicted excess stock market returns. Jansen and Nahuis (2003) found that stock returns and changes in consumer sentiment were positively correlated for 9 European countries. Lemmon and Portniaguina (2006) found that in the past 25 years “...consumer confidence forecasts the returns of small stocks and stocks with low institutional ownership in a manner consistent with the predictions of models based on noise-trader sentiment”. More recently, Schmeling (2009) found that sentiment was a good predictor of expected stock returns on average across 18 industrialized countries.

## **1.2. AIMS AND OBJECTIVES OF THE RESEARCH**

This research aims at building on the findings by Kamstra *et al.* (2003), Edmans *et al.* (2007) and Smith (2009) in which a link between consumer sentiment and stock returns on the Johannesburg Stock Exchange (JSE) was established. In addition, the research intends on providing the first study conducted on the relationship between a consumer confidence index, acting as a proxy for consumer sentiment, and share prices in South Africa. Therefore the main goals of the thesis are:

Firstly, to determine whether a non-fundamental factor such as investor sentiment influences share prices on the JSE, or whether it is share price movements that influence sentiment. Secondly, to determine if changes in consumer confidence accurately capture changes in investor sentiment.

### **1.3. MOTIVATION FOR THE STUDY**

Theoretical and empirical merits for the link between consumer sentiment and share returns have been briefly touched upon in section 1.1 and will be revisited in depth later on in the paper. Section 1.3 now explains the motivation for conducting a study which intends on explicating the relationship between consumer sentiment and share returns in South Africa.

Firstly, this study is motivated by the need to supplement the existing research on the link between consumer sentiment and share returns in South Africa and Africa as a whole. Numerous studies have taken place within Europe and the United States, but very little has been conducted with regards to African nations. In particular, the study aims at staking a more conclusive linkage between investor sentiment and share returns, whereas previous studies conducted in South Africa have merely inferred such a relationship between sentiment and sports results or weather. This study will use a consumer confidence index as a proxy for consumer sentiment and is arguably a more accurate portrayal of investor sentiment.

In addition, the study aims at contributing to the existing body of literature supporting the importance of investor sentiment in predicting share returns, and to the wider field of behavioural finance. Much damage can be avoided if the market realizes in advance that financial assets are overvalued due to the false beliefs of the irrational investor. And finally, the study aims at supplementing the existing evidence that consumer confidence indices contain significant explanatory powers for a wide range of economic indicators.

### **1.4. METHODS OF THE STUDY**

The objectives of this study will be addressed by conducting an empirical analysis of quarterly data on the FNB/BER Consumer Confidence Index (CCI) and the FTSE/JSE All Share Index (ALSI) spanning 15 years from 1996 to 2010. Data on the CCI will be obtained from the BER website and daily ALSI values from Thompson Datastream.

The statistical technique of linear regression analysis is employed; according to Gujarati (2004: 23), this determines the level of dependence or the statistical relationship between variables. As this study documents the relationship between consumer confidence and share prices, a two-variable regression model is utilised with the ALSI as the dependent variable and the CCI as the sole explanatory variable. Regressions with varying lags of the explanatory variable are run and statistics such as the Durbin Watson d value, Akaike and Swartz Information Criteria and the  $R^2$  value will be compared to determine which model

best fits the data. Finally,  $R^2$  provides an indication of the model's goodness of fit; how much of the variation in the dependent variable is explained by variation in the explanatory variables. The greater the  $R^2$  the greater is the explanatory power of the model.

The results of the regression analysis are confirmed through use of Granger causality tests. Gujarati (2004: 696) discusses how regression analysis explains the relationship between variables through documenting a dependence on one another, but falls short of causality explanation. Therefore a relationship may exist between variables, but this does not necessarily imply causality in the sense that one variable influences the future values of another. This study therefore conducted Granger causality tests to determine the direction of causality as it is quite possible that consumers grow more confident as a result of higher stock prices, as opposed to greater confidence driving up share prices.

Whilst the Granger causality tests provide an indication of which of the variables has a statistically significant impact on the future values of other variables in the system, they fail to describe the sign of this effect and how long it takes to work through the system. Impulse Response Modelling describes the responsiveness of the dependant variables in a VAR to a unit shock to each of the variables in the system (Brooks, 2008: 299). The impulse response functions also provide an indication of the persistence of each of the shocks in their effect on the dependant variable.

## **1.5. ORGANISATION OF THE STUDY**

The rest of this paper is organised as follows: Chapter 2 reviews some of the well-known asset pricing models in the literature, as well as classical financial theories which, until recently, have been widely accepted. The shortcomings of these models and theories will be discussed with reference to empirical evidence. Chapter 3 then introduces the concept of Behavioural finance, with a particular focus upon investor sentiment. Once again, existing theoretical and empirical evidence will be reviewed, considering particularly the role of behavioural finance and the relationship between investor sentiment and share prices. Chapter 4 discusses the methodology and data which will be utilised to meet the goals of the study. Chapter 5 presents the empirical results of the research before providing a summary of findings and suggested areas for future research in Chapter 6.

## CHAPTER 2

# A THEORETICAL AND EMPIRICAL INVESTIGATION INTO TRADITIONAL FINANCE THEORIES

### 2.1. INTRODUCTION

This chapter reviews theoretical and empirical literature on classical financial theories and asset pricing models. In order to establish the significance of a non-fundamental factor in the pricing of assets, existing theories and models are examined, which provide the context against which theories of behavioural finance emerged. Empirical evidence concerning these theories and models are reviewed to determine their validity, and to establish whether reviewing alternative theories such as those proposed by behavioural finance is in fact warranted.

### 2.2. THEORETICAL LITERATURE

#### 2.2.1. Basics

Individuals trade in the financial markets to productively use the idle excess financial resources they possess. Investors are primarily concerned with two factors when deciding in which financial assets, and in what proportions, to invest their wealth. The first factor includes the asset's return and is equal to the income stream it produces through interest or dividends, plus any capital gain or loss experienced during the period of holding. The rate of return on any asset is calculated as the average return over the specified period, which gives a mean return:

$$\mu = \frac{\sum_{t=1}^{t=T} K_t}{T} \quad (2.1)$$

Where  $\mu$  is the average or expected rate of return,  $K_t$  is the return experienced during time  $t$  and  $T$  is the time period for which the asset is held. The second factor includes risk, or the variance of returns, and is most accurately captured by the probability of actual returns differing from the mean or expected return. The greater and more frequent the deviation of returns from those expected, the greater the risk of investing in such an asset, as illustrated below:

$$\sigma^2 = \frac{\sum(K_t - \mu)^2}{T} \quad (2.2)$$

However, the mean and variance of returns for any asset are only known *ex post*. Therefore in order to determine the fair value price of an asset, expectations of the mean and variance have to be taken *ex ante*. In order to do so, the investor must make use of a probability theory when forming the expected mean:

$$\hat{K} = \sum P_i K_i \quad (2.3)$$

And the expected variance,

$$\hat{\sigma}^2 = \sum P_i (K_i - \hat{K}_i)^2 \quad (2.4)$$

When considering any investment, whether it is in equity, bonds, options or real estate, the investor has to take two forms of risk into account. According to Howells and Bain (2008: 191) the first form of risk is known as market or systematic risk and this is equal for any investor in a particular market. The market risk is determined by the environment in which the asset operates and is affected by macroeconomic variables, such as the interest rate, exchange rate and government policy. The second form of risk is specific or unsystematic risk, which is unique to each asset due to the asset specific risk characteristics (Howells and Bain, 2008: 191). In terms of equity, specific risk is often determined by company specific attributes, such as quality of management, or the competitive nature of the industry. The standard deviation or total risk attached to investing in an asset consists of both the market and specific risk. Portfolio theory has shown that the specific risk faced by an investor could be reduced by holding diversified combinations of assets in a portfolio, rather than holding single assets.

### **2.2.2. The Gordon Growth Model**

The present value model, developed by Smith (1925) provided the foundation of all asset pricing models through the simple concept that price equals the discounted value of future expected payoffs. Any changes in economic fundamentals which affect the expected future payoffs would have a direct effect on the current valuation of an asset. The present value model can be summarized by the following two equations:

$$p_t = E(m_{t+1}x_{t+1}) \quad (2.5)$$

$$m_{t+1} = f(\text{data}, \text{parameters})$$

Where  $P_t$  = asset price,  $x_{t+1}$  = asset payoff,  $m_{t+1}$  = stochastic discount factor (Cochrane, 2000: 9).

The present value model utilises the concept of time preference. Given the option of receiving R100 now or in the future, an individual should choose to receive the R100 now, in terms of both the interest that can be earned and; possibility of an increase in interest rates on this amount.

In the context of the stock market, future expected payoffs are likely to be in the form of dividends and any capital gains from an increase in the price of the stock. However, valuating a stock from an infinite stream of future expected dividends and capital changes is problematic, as both are likely to be erratic throughout the holding period. Gordon and Shapiro (1956) sought to overcome this problem by assuming a constant growth rate. Therefore in the context of a fixed dividend and stock price growth rate the pricing of stocks is carried out as follows:

$$p_t = \sum_{t=1}^n \frac{E(D_{t+n})}{(1+k_t)^n} + \frac{E(p_{tn})}{(1+k_t)^n} \quad (2.6)$$

The model above is termed the constant growth model where  $E(D_{t+n})$  is the expected future dividend payout and  $E(p_{tn})$  is the expected future stock price, assuming a constant growth rate (Moolman & du Toit, 2005: 81).

Gordon (1962) proposed a second method of circumventing the issue of erratic changes in both expected future dividend payouts and stock prices by allowing future dividend payouts to change throughout the period of holding. The two-stage Gordon Growth Model (GGM) was thus developed to cater for a non-constant growth rate by considering a high growth rate in the short run, followed by a lower but sustained period of growth in the long run. The model was then extended to the three-stage GGM, which catered for negative growth in dividends. The essence of the GGM is that macroeconomic factors such as the interest rate, inflation rate and the money supply were all likely to have had an effect on both the dividend payout as well as the discount factor, and subsequently on stock prices.

All asset pricing models, including those involving stocks, bonds and options, stem from this basic theory of evaluation, each with a slightly different interpretation of how the stochastic

discount factor is determined. Depending on the asset and the specific application, different pieces of information are utilised in determining an appropriate rate at which to discount future payoffs and value the asset.

### 2.2.3. The Consumption-Based Model

This led to the consumption based model where the investors' marginal utility of consumption influences their rate of time preference and, subsequently, the stochastic discount factor (Cochrane, 2000: 14).

$$p_t = E_t \left[ \beta \frac{U'(C_{t+1})}{U'(C_t)} \cdot x_{t+1} \right] \quad (2.7)$$

Where  $C_t$  denotes consumption at time  $t$ ,  $x_{t+1}$  is the expected income stream and  $\beta$  is the subjective discount factor. Given the consumption choices  $(C_t, C_{t+1})$  and expected payoff  $(x_{t+1})$  the expected market price of the asset can be derived (Cochrane, 2000: 14). It can be seen that  $\beta \frac{U'(C_{t+1})}{U'(C_t)}$  is the stochastic discount factor and the consumption based model can be restated as the present value model:

$$p_t = E(m_{t+1}x_{t+1})$$

or,

$$p = E(mx)$$

The consumption based model provides a theoretically sound explanation for most asset pricing questions, yet in practice it does not achieve the same level of support. However, advocates of the model argued that it is not totally flawed. Mere adjustments of the utility function through use of different independent utility variables can result in a more accurate account of prices and returns (Cochrane, 2000: 49). Variables such as the amount of leisure, previous consumption and many others may prove to be a better measure of marginal utility, providing a more accurate model.

### 2.2.4. Modern Portfolio Theory

Markowitz is considered to be the pioneer of modern portfolio theory with a description of how an optimizing investor would behave under conditions of uncertainty. Scarcity is a common concept in economics, leading to the occurrence of trade-offs between certain

goods, services and other economic decisions. Markowitz realized that he could apply the principle of the trade-off between risk and return to the case of the investor faced with the decision of where to invest. The theory became known as the Mean Variance Optimization Theory, as it explained how an investor could maximise utility simply by considering the mean (expected return) and variance (risk) of each portfolio (Kroll, Levy and Markowitz, 1984: 47). An investor's portfolio was mean-variance efficient if it either maximized the expected return for a given variance, or minimized the variance for a given rate of return.

Subsequent to Markowitz's work on portfolio theory, investors began to realize the importance of holding a diversified portfolio of assets which co-operated and resulted in high returns being obtained, as opposed to the original emphasis of holding single high-yield assets. Markowitz illustrated that through the thorough diversification of an individual's portfolio the level of risk faced by eliminating the specific risk factor was reduced, leaving only the market risk (Howells and Bain, 2008: 191). Diversification would result in a lower level of risk faced by the investor if assets held in the portfolio were negatively correlated; the loss in returns from one asset would be offset by an increase in returns from another (Markowitz, 1952: 89).

Markowitz illustrated the trade-off between risk and expected return faced by an investor when forming their portfolio through the use of efficient frontiers. According to Markowitz (1991: 470), the efficient frontier explored the various Pareto optimal combinations of expected return and variance of return. Therefore, the efficient frontier identified all feasible portfolios that minimized risk for a given rate of return and maximized expected return for a given level of risk.

Bowen (1984: 19) noted that Markowitz had applied several assumptions in arriving at the modern portfolio theory, which are utilised to varying extents by subsequent asset pricing models and theories. Since they form the basis for the majority of theories which followed, it is useful to consider these assumptions:

1. Investors are rational, utility maximising individuals. Investors utilise all possible information available to them when making their investment decisions in order to achieve the greatest level of utility.
2. Informationally efficient, complete markets with easy access to accurate information regarding risk and return.

3. Individuals base their investment decisions on expected returns and the variance of returns.
4. Single-period investments: Investments are made based on rates of return and risks associated with one particular period, and are therefore fixed for that period.
5. Investors are risk averse. They seek the greatest return for a given level of risk, or the least level of risk for a given rate of return. Individuals are said to be risk averse due to the presence diminishing marginal utility of wealth, which occurs for two reasons; (a) investors prefer more consumption, and (b) an increase in wealth is valued less than an equally sized decrease in wealth. Investors are more concerned about losses than they are with gains.

Markowitz developed the concept of mean-variance efficient portfolios in the context of constructing an equity portfolio. However, since its inception, the mean-variance analysis has been extended to asset allocation which involved constructing portfolios of different asset classes, rather than combinations of the same asset. Kaplan (1998: 2) believed that mean-variance analysis is more suited to asset allocation; correlation between handfuls of asset classes is required as opposed to the correlation between numerous shares. In addition, the correlation between asset classes is likely to have been much lower than between individual shares, presenting a greater opportunity of reduced total risk. According to Kaplan (1998: 2) “The relatively small data requirements of applying mean-variance analysis to asset allocation along with the speed and low cost of powerful personal computers (PCs) has led to the commercial development of many PC-based mean-variance optimization software packages for use in asset allocation.”

### **2.2.5. The Efficient Market Hypothesis**

Classical financial economic theory, through the Efficient Market Hypothesis (EMH), postulates that rational economic agents force capital market prices to equal the discounted expected future cash flows of investments (Baker and Wurgler, 2006: 1645). The Efficient Market Hypothesis (EMH), developed by Fama in the 1960’s, was a widely accepted theory concerning financial market activity in which it was proposed that economic agents could not achieve higher than average returns when investing, due to stock market efficiency.

According to Howells and Bain (2005: 347) the Efficient Market Hypothesis (EMH) is built around three fundamental assumptions of financial markets and economic agents. Firstly, investors are assumed to have rational expectations in that they utilise all relevant information available to them when forming expectations of future movements in the market; financial markets are regarded to be informationally efficient. Investors swiftly become aware of any information pertaining to the valuation of assets and incorporate this information into their own subsequent valuation of these assets, through investment or disinvestment.

Secondly, the EMH assumes that, while not all investors are rational, the erroneous judgments on the part of irrational investors are likely to cancel each other out, leaving the asset to be valued according to the accurately informed judgments of the rational investors (Baker and Wurgler, 2006: 1645). Even in situations where a large number of irrational investors acted in collaboration, incorrect pricing would not be sustained due to the workings of arbitrage. The final foundation of the EMH states that even in the event of a large number of irrational investors forcing a financial asset to a level which is contrary to fundamentals, arbitrageurs in the market would take advantage of this price anomaly, and in the process would force the price to return to its 'fair' value and compel irrational investors to leave the market. This undermines the importance of the process which arbitrage plays in the EMH, as well as preventing asset prices from departing from their intrinsic values.

Fama (1970: 388) identified three forms of market efficiency in which this theory can be held: weak, semi-strong and strong. The extent to which prices "fully reflect" all available information in the market differs in each form of market efficiency, with each subsequent form building on the information set previously contained. Weak form efficient markets are those in which current asset prices incorporate any useful inferences from historical price and return data and are at the lowest level of efficiency (Fama, 1970: 388). Historical price and return data is freely available to all members of the public, and therefore could be a common consideration when forming expectations of future movements in the market. Studies of weak form efficiency involve testing the power of historical return data in predicting current returns.

Semi-strong efficiency supplemented the notion of a weak form of efficiency by stating that in addition to price changes incorporating historical return data, current asset price changes also includes all publicly available information at time  $t$  (Fama, 1970: 388). According to Fama (1970: 388) all freely available information includes, amongst others, "announcements

of stock splits, annual reports, and new security issues, etc". Market participants are unable to make excess returns when the market is, as a whole, aware of such information. These announcements are incorporated into price changes before any individual can act on these discrepancies.

Finally, the strong form of the EMH involves testing the notion that, in addition to incorporating historical and publicly available information, asset prices reflect all private information held by individuals or groups of individuals (Jensen, 2002: 1978). Once again, since price changes reflect this additional private component, no individual in the market is capable of enjoying excess returns.

The EMH is closely associated with the notion of a random walk in which future price changes depended on potential news and were independent of previous price changes. Malkiel (2003: 59) explained how any upcoming news is in itself unpredictable; therefore uninformed investors are likely to attain a level of return similar to that of well-informed market experts.

Fama (1970) acknowledged that in order for the EMH to apply in a practical setting, certain market conditions are needed to enable the efficient adjustment of prices to current information. Firstly, there can be no transaction costs of any form which could hinder the smooth exchange of securities (Fama, 1970: 387). Secondly, all market participants are able to access the relevant information without incurring any costs, whilst the final market condition commonly referred to as the 'homogenous expectations condition', involves complete agreement between market participants regarding the effect that said information would have on current and future prices.

However, these conditions appear to be a poor description of real world financial markets because, in reality, investors face a number of costs when they acquire information as well as when conducting transactions. In addition, it is unlikely that investors would have homogenous expectations with regard to the effect of new information on asset prices. In addressing these issues, Fama (1970) did not consider them to be absolutely necessary for the EMH to hold; they were merely "sufficient". For example, Fama (1970: 387) explained how, even in the presence of transaction costs and provided all available information was considered when transacting, the market would still be considered efficient. This applies equally to the skill of participants in acquiring costless information. If a reasonable number of participants are easily able to access information, the market could be considered efficient.

With regard to homogenous expectations - when a prolonged disagreement between participants does not result in some of the participants consistently forming better evaluations than others, the EMH would still hold (Fama, 1970: 388),

The Efficient Market Hypothesis (EMH) thus proposes that financial assets trade at their ‘fair’ value, albeit for momentary instances of disequilibrium, largely due to the apparently efficient process of arbitrage. What this all points to is the impossibility of the booms and crashes which have littered world economic history. Equity and other asset prices correctly reflect the fundamentals of the underlying asset and that prices move correctly when reacting to new information, making it impossible for asset prices to experience a bubble in the first instance (Ritter, 2003: 2).

Having reviewed the theoretical underpinnings of classical financial economics, traditional asset pricing models are discussed in order to consider how the technique of asset valuation has evolved through time.

### **2.2.6. Factor Pricing Models**

#### 2.2.6.1. Introduction

Difficulties experienced in accounting for the utility gained from consumption led to Linear Factor Pricing Models equating the discount factor to other pieces of data. According to Cochrane (2000: 143), factor pricing models do away with the consumption-based expressions for marginal utility and instead consider other factors which act as good proxies for marginal utility growth. In essence, each of the linear factor models which have been discussed are merely adaptations of the consumption based model, the only differences arise in the additional assumptions “that allow one to proxy marginal utility growth from some other variables” (Cochrane, 2000: 144). Therefore in order to be a proponent of factor models such as the CAPM and ICAPM, the foundations of the consumption-based model must be believed.

#### 2.2.6.2. The Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965) add to the model of portfolio choice developed by Markowitz (1952). The portfolio model determines the weight in which each asset is held in order for the portfolio to be considered mean-variance efficient. According to Fama and French (2004: 26) the CAPM uses these

weights in testing the relationship between risk and return “...by identifying a portfolio that must be efficient if asset prices are to clear the market of all assets”.

Sharpe (1964) and Lintner (1965) add two important assumptions to the portfolio model in order to identify a portfolio which was mean-variance efficient. The first additional assumption includes borrowing and lending at a risk-free rate regardless of the amount borrowed. The second assumption includes homogenous expectations; investors are in complete agreement on the risk and expected return of all assets in the market (Merton, 1973: 867). The remaining assumptions inherent in Markowitz’s MPT would still apply, including the presence of complete markets with rational, risk-averse investors who base their one-period investment decisions on risk and return.

The CAPM states that the rate of return on an asset is equal to the risk-free rate of return plus a risk premium which depends on the market price of risk, and the quantity of market risk contained within the Asset (Fama and French, 2004: 29).

$$\hat{K}_i = K_{rf} + \beta_i(K_m - K_{rf}) \quad (2.8)$$

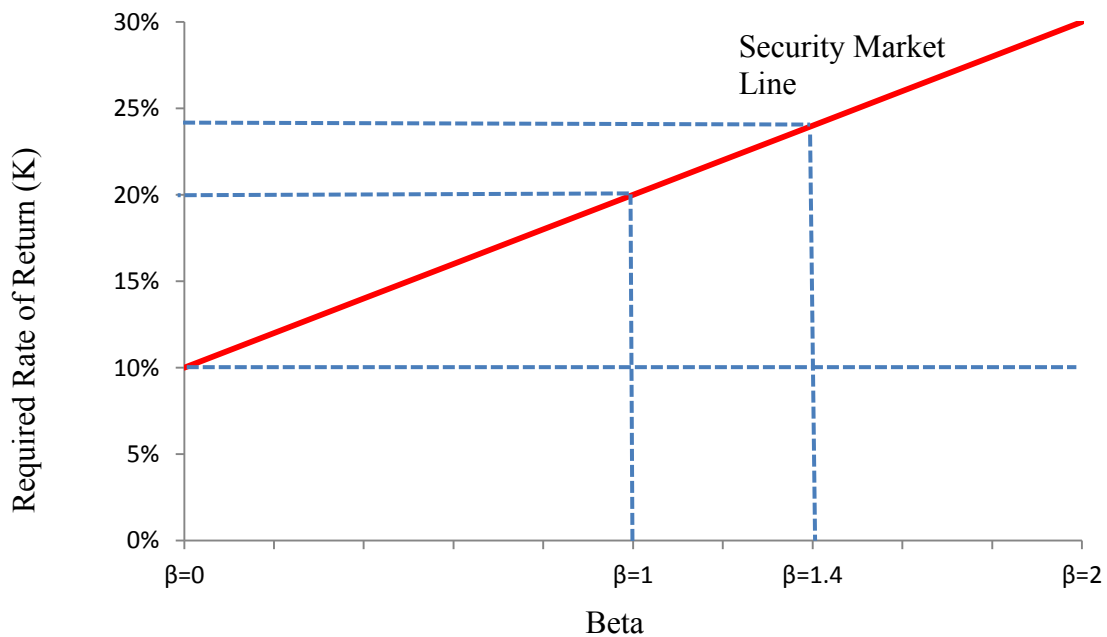
The risk-free rate of return ( $K_{rf}$ ) essentially forms a floor or threshold under the return of all risky assets in the market and is usually determined by either a prevailing national interest rate or the rate of return on government issued bonds. Should this risk-free rate increase, the returns on all risky assets should increase by the same margin. The market price of risk ( $K_m - K_{rf}$ ), on the other hand, is calculated by subtracting the risk-free rate of return from the return which should be experienced if the market portfolio of assets were held; this requires holding a portfolio which contains every single asset at the proportions in which they exist in the market. In practice this is usually represented by some suitable index such as the FTSE/JSE All Share Index. This market price of risk then becomes the benchmark in which the premium to be paid on each asset can be determined.

In order to achieve this, a comparison between the return on an individual asset and the return of the market as whole must be made. This allows for the determination of a relative measure of risk known as an assets Beta ( $B_A$ ); a variable of huge importance in the pricing of assets which shows the extent to which the returns of an individual asset compares to the returns of the market.

$$\beta_i = \frac{\sigma_{im}}{\sigma_m^2} = \frac{\sum_{t=1}^T [(R_{it} - \bar{R}_{it})(R_{mt} - \bar{R}_{mt})]}{\sum_{t=1}^T (R_{mt} - \bar{R}_{mt})^2} \quad (2.9)$$

A beta value greater than unity means an asset is riskier than that of the market as a whole, whilst a beta value less than unity means that the asset is less risky than the market. Use of these rates of return for the market and individual asset allow for the plotting of what is known as the Security Market Line.

Figure 2.1: The Security Market Line of the CAPM



Source: Gujarati (2004: 165)

The Security Market Line shows the additional return required on an individual asset, given that its risk characteristics are comparable to that of the market. The message of the CAPM is that if the asset is fairly priced, it should plot somewhere on the Security Market Line.

One of the primary criticisms of the Sharpe-Lintner CAPM is the assumption of unrestricted risk-free borrowing and lending. In reality, there is always an element of risk involved in such transactions due to the possibility of unfavourable changes in the interest rate, as well as the chance that the borrower could default on the loan. Black (1972) attempted to circumvent this problem, and still achieve mean-variance efficiency, by relaxing the assumption of risk-free borrowing and lending and instead allowing unrestricted short selling of risky assets (Fama and French, 2004: 29). However, Fama and French (2004: 30) argued that “The assumption that short selling is unrestricted is as unrealistic as unrestricted risk-free borrowing and lending”.

### 2.2.6.3. The Inter-Temporal Capital Asset Pricing Model

The ICAPM was developed by Merton (1973) and extended by Breeden (1979) as an alternative to the standard one-period CAPM. According to Cochrane (2000: 156), “The ICAPM is a linear factor model with wealth and state variables that forecast changes in the distribution of future returns or income”. The asset pricing models and theories discussed thus far have considered an investors decision-making process through use of a single-period utility function, whereas the ICAPM moved one step further by considering “...investors who act so as to maximise the expected utility of lifetime consumption and who trade continuously in time” (Merton, 1973: 867). The ICAPM is more realistic than the standard CAPM as it allows ‘uncertain changes in future investment opportunities’ to impact on current investment decisions. Merton (1973: 868) argued that “...portfolio behaviour for an inter-temporal maximiser will be significantly different when he faces a changing investment opportunity set instead of a constant one”.

### 2.2.6.4. Arbitrage Pricing Theory

Arbitrage Pricing Theory (APT) is a further extension of the Sharpe-Lintner CAPM and was developed by Ross (1976). According to Cochrane (2000: 162), the intuition behind the APT involves the following: Stocks often share common movements in returns with the market as a whole, as well as others in the same category, whilst they also display completely idiosyncratic movements in returns. To elaborate: when the market is increasing, most individual stocks also increase, albeit at slightly differing rates. Equally, groups of stocks such as mining, IT, defensive or value stocks often display very similar changes in returns. Conversely, individual stocks exhibit movements unlike any other due to risk characteristics unique to that particular stock. The message of the APT is that these idiosyncratic movements in returns should carry no risk factor, since investors are able to diversify them through the use of portfolios; stock returns should to be determined by these common risk factors alone.

According to Oberuc (2011: 21) “...the arbitrage pricing theory (APT) states that the return of a risky asset such as a stock is a linear function of a number of macroeconomic and financial factors”. Unlike the Sharpe-Lintner CAPM in which a single beta value is used to compare the returns of an individual stock with that of the market, the APT measures the sensitivity of returns to changes in each of several factors and therefore makes use of several beta values. According to Huberman and Wang (2005: 1) the beta values are proportional to the returns’ co-variances with the factors.

$$R_{it} = E_i + b_{i1}f_{1t} + b_{i2}f_{2t} + b_{i3}f_{3t} + \dots + b_{ik}f_{kt} + e_t \quad (2.10)$$

where

$R_{it}$  represents the return on asset  $i$  at time  $t$

$E_i$  is the expected value over time of the return  $R_{it}$

$f_{kt}$  represents  $k$  risk factors with values at time  $t$  that influence the return  $R_{it}$

$b_{ik}$  represents the sensitivity of investment  $i$  to changes in the factor  $f_{kt}$

$e_t$  is an error term representing the portion of  $R_{it}$  that is not explained by the factors

It is clear from this model that an asset's return is a linear function of the beta values or sensitivity to each factor. Returning to the NPV model, the stock's theoretical price is determined by discounting the model's derived expected rate of return. The message of the APT was that if the asset is correctly priced there will be no opportunities for arbitrageurs to make any profits. However, if the asset is priced above the theoretical price, arbitrageurs are able to make a riskless profit by going short on this asset, and going long on the portfolio in which the calculations were based.

### 2.2.7. Summary

This theoretical review discussed classical financial theories, including Modern Portfolio Theory and the Efficient Market Hypothesis, as well as existing asset pricing models which have dominated the field of finance throughout recent history. Much of the present investment strategy and market practices adopted by both individuals and experts are still based largely on these views and their theoretical foundations are difficult to dispute. Despite the use of certain assumptions, as well as the need for perfect market conditions in certain models, these theories came about as a result of years of economic consideration from some of the world's brightest minds.

However, it is due to these simplifying assumptions that questions have been raised as to the validity of such theories in explaining the workings of the field of finance in practice. In addition, the role which arbitrage plays in re-aligning prices to reflect fundamentals is significant in classical financial economics. Despite its theoretical soundness, the ease of the implementation of this process in practice is questioned. Therefore it seemed pertinent that a

review of existing empirical investigations needed to have been conducted in order to have probed the validity of this thinking.

## **2.3. EMPIRICAL LITERATURE**

### **2.3.1. The Efficient Markets Hypothesis**

When performing a review of the EMH it is important to reconsider the essential claims of the theory. The EMH states that prices should be consistent with market fundamentals. In instances when they are not, they should be immediately corrected by rational investors with complete access to accurate market information that enables the practice of arbitrage. Perhaps the most extensive evidence against the EMH includes the number of occasions in which asset bubbles have occurred in the past. The Dutch Tulip Bulb bubble (1636), the South Sea bubble (1720), the Mississippi bubble (1720), the Roaring Twenties Stock Market Bubble (1929), the Japanese asset price bubble (1989), the Asian financial crisis (1997) and the Dot-Com bubble (2000) are just a few examples of many instances where stock and other financial asset prices were moved beyond levels suggested by fundamentals (Aliber and Kindleberger, 2005: 9).

The EMH states that asset prices fluctuate randomly; the previous price should have no bearing on present prices, which in turn rule out the possibility of predicting future returns. This seemed fitting, because if stock returns were easily predictable, then astute investors would be able to out-perform the market on a regular basis. However, it has appeared in the past that even market experts could not have consistently generated favourable returns. Despite this, Campbell, Lo and MacKinlay (1997, in Beechey, Gruen and Vickery, 2000: 5) found evidence which suggested that above average stock returns in one period increased the likelihood of above average returns in the subsequent period. Basu (1977) found evidence that P/E ratios could be used as indicators of future investment performance. Poterba and Summers (1988), and Fama and French (1988) found similar results through evidence of mean reversion in stock portfolio returns over periods of 5 or more years. Pesaran and Timmermann (1995) found that the degree of predictability varied greatly from one sample period to the next.

With regard to the cross-section of returns in South Africa, van Rensburg and Robertson (2003) found a number of measures to have explanatory power including price-to-NAV, dividend yield, price-to-earnings, cashflow-to-earnings and price-to-profit. Following on from the findings of Fama and French (1992), Auret and Sinclair (2006) found the Book-to-

market ratio also to contain significant explanatory power with regards to returns on the JSE. Closely aligned to this study, various measures of investor sentiment were found that explained large portions of expected stock returns in Europe and North America (Charoenrook 2003, Bandopadhyaya and Jones 2005, Lemmon and Portniaguina 2006, Schmeling 2009).

Early studies, such as that by Fama (1970), supported the notion that new information is quickly incorporated into price changes. However, since then there has been contradictory evidence which seems to suggest that new information seems to have a lagged effect on the stock price changes as stocks continue to rise or fall despite the arrival of news which should halt this trend (Ball and Brown 1968, Hong, Lim and Stein 1998). Shiller (1981: 297) concluded that stock market volatility over the past century appears to be too high to be attributed to new information about future real dividends.

The EMH states that due to the level of stock market efficiency, market experts or fund managers are unable to outperform the market. Common sense suggests that due to the substantial resources and expertise possessed by such fund managers, the possibility of them being able to out-perform the market is a very distinct one. Given their line of business, it could be said that achieving this goal was an absolute necessity. Ellis (1995), based on publicly available data over the period 1962-1975, concluded that institutionally managed portfolios were outperformed by the S&P 500 index. Malkiel (2005) presented evidence in favour of the assertion that experts could not outperform ordinary investors through showing that investment managers in America achieved very similar results to industry benchmarks. This evidence suggests that due to the unpredictability in stock returns, the ordinary investor need not waste time in utilizing the services of so-called 'market experts'. However, Daniel, Grinblatt, Titman and Wermers (1997) found that managers of mutual funds outperformed a number of benchmarks constructed from the returns of 125 passive portfolios in the US.

Under the three forms of market efficiency described by Fama (1970), investors are unable to experience excess returns, as other market participants have access to the exact same information set and make the same inferences from this information. However, soon after the theory was developed, a wealth of literature appeared which seemed to suggest otherwise. Ball (1978) and Watts (1978) presented evidence of abnormal profits experienced by investors in the periods following stock related news announcements. Thompson (1978) proved that through use of a relatively simple trading rule, statistically significant abnormal

profits could be made over the period 1940-1971. On the other hand, Galai (1978) found that through the use of a trading rule in the Chicago Board Options Exchange (CBOE), any abnormal profits made would have been eliminated by the transaction costs incurred. The evidence presented suggested that abnormal profits were in fact achievable, possibly as a result of differing information sets or heterogeneous expectations.

### **2.3.2. Factor Pricing Models**

According to Fama and French (2004: 30), tests of the CAPM predominantly involve testing three main implications. First, excess stock returns are fully explained by their respective beta values with no other factors having any influence. Second, the beta values are always positive, implying that the excess return on the market portfolio is greater than that of an asset which is uncorrelated with the market. Finally, assets which are uncorrelated with the market have expected returns equal to the risk-free rate, plus a risk premium.

According to Fama and French (2004) early regressions tests such as Fama and MacBeth (1973), Gibbons (1982) and Stambaugh (1982) suggested that market beta's sufficiently explained expected returns, as well as confirming the original hypothesis that they were constant. However, the notion that the "...premium per unit of beta is the expected market return minus the risk-free rate is consistently rejected" (Fama and French, 2004: 35). These empirical findings, combined with the theoretical soundness of the model, helped establish the CAPM as the centerpiece of financial theory.

Around the same time in which the theory was gaining momentum, empirical work surfaced which suggested that the market beta did not in fact capture all of the variation in expected returns. Various ratios involving stock prices, such as price-earnings, debt-equity and book-to-market were found to contain information on expected returns which were overlooked by the market betas<sup>1</sup> (Fama and French, 2004: 35,36).

In addition to these empirical shortcomings, early tests of the CAPM also found that the intercept is greater than the risk-free rate stated in the Sharpe-Lintner version (Douglas 1968, Black, Jensen and Scholes 1972, Fama and French 2004). Empirical work such as Blume and Friend (1970), Black, Jensen and Scholes (1972), Stambaugh (1982) and Fama and French (2004) seem to suggest that the relation between beta and returns is much flatter than

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<sup>1</sup>See for example Basu (1977), Stattman (1980), Banz (1981), Rosenberg, Reid and Lanstein (1985), Bhandari (1988), Fama and French (1992), Fama and French (1996)

originally believed. As a result, stocks with high beta values overestimated returns, whilst stocks with low beta values underestimated returns (Blume and Friend, 1970). Caution must be exercised in that empirical tests invalidating such theories may have been as a result of incorrect implementation of models. However, any thoughts that these conclusions were based only on specific samples or markets were quickly laid to rest when similar results were found in Asia and Europe<sup>2</sup>.

The APT on the other hand has experienced much greater empirical support; this is expected due to the APT having emerged as a result of the empirical and theoretical shortcomings of the CAPM. In addition, the APT is less restrictive than the CAPM in that an asset's return can be explained by a number of macroeconomic and financial risk factors through use of multiple betas, compared to the single beta use of the CAPM. Roll and Ross (1980) found that several different factor loadings played a considerable part in the generating process of returns over the period 1962-1972. Chen (1983) used daily return data during the 1963-1978 period to compare the performance of the APT with that of the CAPM. It was found that the APT was better able to explain expected returns based on factor loadings as opposed to single beta values. Both Roll and Ross (1980) and Chen (1983) found that adding 'own standard deviations' as in the CAPM, did not add to the explanatory power of the factor loadings. Ferson and Harvey (1993) supported the findings of Chen (1983) in concluding that multiple beta models were better able to predict stock returns across eighteen national equity markets.

### **2.3.3. Summary**

There has been a growing trend in recent years; many economists and financial analysts began to query the validity of the EMH. This is due to the fact that the foundations upon which the EMH is built have been found to be fragile, including the idea that market prices fully reflect all available information. The most apparent form of evidence against the EMH includes the countless occasions of market irrationality that have occurred in recent times, such as the latest housing bubble which originated in the United States. In addition, a wealth of literature claims that returns are at least partially predictable on the basis of various stock price ratios, or other market factors. These apparent shortcomings have resulted in numerous calls for the theory to be rejected.

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<sup>2</sup> See Chan, Hamao and Lakonishok (1991) for evidence on Japanese stocks and Capaul, Rowley and Sharpe (1993) for evidence concerning European stocks.

Despite initial empirical investigations supporting the views of the CAPM, subsequent studies conducted failed to provide the same level of support. Such empirical shortcomings may well be a reflection of theoretical weaknesses. These empirical problems highlighted the fact that the CAPM was not as complete a model as was first expected, and thus it provided the catalyst to discover alternative hypotheses. The APT, on the other hand, enjoyed considerably greater empirical support and this is likely due to the fact that it is far less restrictive than the CAPM. The APT involves the use of multiple betas based on a selection of macroeconomic and financial factors, and therefore it is not surprising that it has experienced greater success. Despite being based on risk premiums, the emergence of the APT and its subsequent empirical success illustrated that models other than the CAPM could better account for changes in asset prices, and this encouraged research into alternative theories.

#### **2.4. CONCLUSION**

The appeal of the EMH, as well as the other factor pricing models discussed, includes the theoretically tenable linkage between risk and expected return. The theoretical underpinnings are so strong that even today many institutional fund managers base their strategies on this line of thought. This linkage allows investors to arrive at equilibrium prices in which to value stocks and upon which to base important investment decisions. Also apparent is the large reliance upon certain assumptions. Both the EMH as well as the CAPM assume that the financial markets are the domain of rational investors, and such rational investors utilise the process of arbitrage to eradicate any irrational investors and return prices to levels reflected by fundamentals. However, the instances of gross misevaluation of stocks described earlier provide evidence that investors often behave in concert, leading to asset prices which are overvalued according to fundamentals. As is discussed in the next chapter, the EMH (in particular) loses much of its viability if in fact the presence of irrational investors is more widespread, and the process of arbitrage not as easily implemented, as was first assumed.

## CHAPTER 3

### A THEORETICAL AND EMPIRICAL INVESTIGATION INTO BEHAVIOURAL FINANCE

#### 3.1. INTRODUCTION

This chapter introduces the concept of investor sentiment and how it fits into the broader field of behavioural finance. A review of the theoretical literature was conducted to see how behavioural finance has evolved, and the role which it plays in the modern day field of finance. Once this was completed, a review of empirical studies was conducted, starting from the early studies which identified weaknesses in traditional finance theory, and then moving onto some more specific linkages between sentiment measures and stock returns.

#### 3.2. THEORETICAL LITERATURE

##### 3.2.1. Behavioural Finance Defined

Due to the simplified assumptions of the EMH, as well as the numerous occasions when gross misvaluations of shares have occurred in the past, researchers began to question whether rational behaviour on the part of investors was as widespread as originally believed.

This led to growing research on the role played by investor psychology in the valuation and subsequent pricing of financial assets. “Behavioural finance is the study of the influence of psychology on the behaviour of financial practitioners and the subsequent effect on markets” (Sewell, 2010: 1). Shefrin (2005: 1) describes behavioural finance as “...the study of how psychological phenomena impact financial behaviour”. Behavioural finance places a large focus on *why* investors trade, *how* they actually go about selecting assets to form portfolios, and why returns vary across shares for reasons other than the risk factors mentioned in traditional finance (Subrahmanyam, 2007: 12).

According to Forbes (2009: 9), traditional finance models make use of several assumptions in forming their hypotheses of financial market activity. Firstly, there are many buyers and sellers in the financial markets unable to exert an influence on the price of such assets. Secondly, investors make use of all the information which is available to them in forming

their expectations of future market movements, and consequently, in their investment decision making. The third assumption includes a minimal number of barriers to the information flow which could potentially alter the underlying message produced by asset prices. Behavioural finance challenges the first two assumptions in particular; the fact that investors are unable to influence asset prices, as well as the rationality of investor decision making.

Trading in the financial markets is not only the exclusive domain of large financial corporations or financial experts. On the contrary, for a long period of time, a significant trader has been someone who is vulnerable to emotional, social and psychological forces. These factors have an impact on their decision making. Therefore it seems sensible that the mental, as opposed to merely fundamental, aspects of investing in financial assets have to be taken into account and given a much larger level of significance. It is noted that behavioural models do not confine misvaluations in asset prices to irrational or exuberant investors. Temporary forced demand and supply issues may result in a share being grossly misvalued in the short run. Ritter (2003: 2) points to the temporary spike in Yahoo stock prices when index fund managers were forced to purchase the stock subsequent to its addition to the S&P 500 in late 1999, as an example.

According to Subrahmanyam (2007: 13), proponents of traditional finance often cite several common criticisms of behavioural finance. Firstly, they believe extensive data mining has been adopted in discovering empirical weaknesses in traditional finance theories and models. However, as seen from the empirical review conducted, there exists an extensive range of literature from many different authors utilizing varying markets and samples which document evidence against such theories. Another criticism is that behavioural models are somewhat restricted as they focus only on certain facets of finance. Subrahmanyam (2007: 13) argues that, unlike traditional models which attempt to explain how markets *should* behave under *rational* conditions, behavioural models explain how markets *have* operated based on extensive empirical evidence.

The final criticism often mentioned includes the fact that behavioural finance fails to stipulate any concrete asset pricing models, similar to those in traditional finance, which are capable of illustrating the link between investor sentiment and equity returns. However, until very recently this has not been the purpose of behavioural finance. Behavioural finance merely challenges the notion that markets are dominated by rational investors who force prices to

reflect certain market risk characteristics. The theory has not attempted to model the relation between investor sentiment and stock returns, only that certain psychological factors or cognitive biases play a large part, often resulting in irrational asset prices. Subrahmanyam (2007: 13) adds to this argument by stating that despite the lack of any asset pricing models, those used in traditional finance theory such as the CAPM were not well supported by the data in any case, and this critique is therefore not well justified.

According to Howells and Bain (2005: 553) behavioural finance rests upon two important foundations, including investor sentiment and practical limits to arbitrage. In essence the first foundation helps explain why investors can cause an ‘irrational’ price occurrence, and the second provides an explanation of why such a price may persist (Howells and Bain, 2005: 553). In the next section possible barriers to the process of arbitrage are identified.

### **3.2.2. Practical Limits to Arbitrage**

The process of arbitrage plays a very important role in traditional finance theory; particularly in the EMH in the event of prices moving beyond levels suggested by market fundamentals, it is the process of arbitrage performed by ‘rational’ investors which force prices to reflect the ‘equilibrium’ price. If it is difficult to take such positions, shorting an overvalued stock and going long on an undervalued stock, then the process of arbitrage would fail to correct any mis-pricing. Behavioural finance directly challenges the notion that arbitrage is as easily implemented as it appears to be in the EMH, and therefore opens the door to the possibility of persistent misvaluations in the financial markets. Behavioural finance involves the idea that the effectiveness of arbitrage varies depending on certain circumstances, and in some cases it would not be possible at all (Ritter, 2003: 2).

According to Alexander and Sharpe (1990, in Shleifer and Vishny 1995: 1), arbitrage can be defined as “The simultaneous purchase and sale of the same (or essentially similar) security in two different markets for advantageously different prices”. Therefore theoretically it is possible for a rational investor to make a riskless profit as the investor goes long the asset in the cheap market and shorts in the more expensive market, converging prices in the process. In this description the arbitrageur requires zero capital and faces no risk. In both steps, the rational investor deals with an irrational investor who is subsequently forced out of the market due to his/her poor asset valuations.

However, in practice arbitrageurs encounter many obstacles to carrying out this process, such as trading with imperfect substitutes and unforeseen price divergence (Howells and Bain, 2005: 554). In addition, Zhang (2008: 6) points out that “Trading costs, including transaction costs, information costs, and financing costs may prevent rational arbitrageurs from taking advantage of market mis-pricings”. Therefore the concept of a riskless arbitrage deal is questioned, “In practice arbitrageurs are forced to take risk and this will limit their ability to guarantee the elimination of mis-pricing” (Howells and Bain, 2005: 554).

In traditional models such as the CAPM and APT, arbitrage is conducted by a large number of rational investors each taking small positions on account of the misguided actions of a small number of irrational investors. However, Shleifer and Vishny (1995: 1) argue that in practice, arbitrage is conducted by a small number of market experts who take large positions where mis-pricing has occurred. Individual investors participate in a market in which they have little knowledge of fundamentals and appropriate hedging strategies, and therefore any acts of arbitrage are left to institutions with a greater level of expertise. The issue then moves on to determining the ease of carrying out this process, and the degree to which such acts of arbitrage are successful in correcting any mis-pricing. The issue becomes particularly troublesome in extreme cases, when stock prices have moved well beyond fundamentals.

Common sense would suggest that the greater the mis-pricing, the greater the opportunity for arbitrageurs, and the larger the amount of resources which are allocated in taking advantage. However, Shleifer and Vishny (1995: 2, 3) believe arbitrage becomes ineffective in such cases due to an agency problem where there is a separation of knowledge and resources. In traditional models the need for capital at the outset of the arbitrage transaction is ignored, as the profit made from shorting the asset covers the amount needed to go long. However, in reality such traders must acquire funds from somewhere in order to take positions in the first place. When the asset is purchased from the cheap market the arbitrageur must have some form of finance for its funding before selling in the more expensive market. Arbitrageurs are able to finance these transactions either through personal means or various credit channels; however this would be true only up to a certain point and such traders will have face credit limits like any other entity. This is likely to limit the amount of funds at their disposal, and subsequently the extent to which they can purchase from the cheap market.

In practice it is often outside investors with limited knowledge of arbitrage who fund the trading activities of the professional arbitrageurs possessing the necessary expertise to

compete in this specialized market. This has three important implications, according to Shleifer and Vishny (1995: 3). Firstly, outside investors are reluctant to allocate large resources to arbitrageurs as the majority of them are novices in this field of finance, and cannot differentiate between good or bad arbitrageurs. Consequently the amount of funds arbitrageurs have at their disposal is limited. Secondly, outside investors attempt to gauge the quality of arbitrageurs from past performances, and allocate funds accordingly. Thirdly, because the practice of arbitrage is highly specialized, only a few arbitrageurs with good track records are able to attract funds from outside investors.

These three implications have important consequences for arbitrageurs, especially in a market which contains a certain group of investors termed by Black (1986) as “noise traders”. Noise traders do not make use of fundamental data when trading in assets, and their investment decisions are therefore described as erratic by traditional finance economists. As Black (1986: 1) explains “Noise causes markets to be somewhat inefficient, but often prevents us from taking advantage of inefficiencies”. Noise trading results in a large level of unpredictability in both investor sentiment and stock prices. Due to the fact that arbitrageurs utilize outside investor funds and run the risk of losing these funds if performance is poor, the risk of further mis-pricing results in a reluctance to take large positions, if any, in the first place.

In addition, unpredictable changes in market sentiment which further worsen any mis-pricing can result in large losses by arbitrageurs who have already taken positions in the market with a view to a price increase in the near future. Despite a worsening in mis-pricing offering a chance for greater returns, Shleifer and Vishny (1995: 23) believe that this may actually result in further mis-pricing, as arbitrageurs are forced to liquidate portfolios due to pressure from investors. The presence of noise traders results in the process of arbitrage becoming ineffective, especially in extreme circumstances. Ritter (2003: 3) describes how arbitrageurs attempted to hedge their positions in mid-1987 by shorting Japanese stocks and going long on US stocks. However, these traders lost huge sums of money in the short term when the US stock market crashed as part of the global ‘Black Monday’ crash of October 1987.

Another example where arbitrage failed to correct an instance of extreme mis-pricing was in the case of Royal Dutch/Shell. A large hedge fund known as Long Term Capital Management (LTCM) was forced to liquidate in 1998, mainly due to significant losses having been incurred in the Royal Dutch/Shell equity arbitrage deal. Royal Dutch and Shell merged their

interests in 1907 on a 60:40 basis, with dividend payments and stock prices also structured on this ratio (Ritter, 2003: 6). The Royal Dutch shares were listed in the S&P 500 whilst the shares of Shell were listed in the FTSE. Subsequent to the merger, an arbitrage opportunity was presented as the prices of these shares began to deviate from this 60:40 parity. LTCM realized the opportunity for arbitrage and resultantly shorted the expensive stock and purchased the cheaper stock. However, the market became increasingly inefficient when prices further diverged from their theoretical value and companies such as LTCM were forced into liquidation (Ritter, 2003: 9). This compounded the inefficiency in the markets because hedge funds such as LTCM were forced to sell out their positions, which in turn aggravated the mis-pricing (Ritter, 2003: 9).

Empirical evidence documenting the various practical limitations to arbitrage is numerous in the literature. Gabaix, Krishnamurthy and Vigneron (2005) present evidence supporting the theory of limits to arbitrage in the US mortgage-backed-securities market. Barber, Odean and Zhu (2005) using data covering the period 1983 – 2001, present evidence consistent with noise trader models in which noise traders (traders who misinterpret available information) force prices above fundamentals before reverting to their original value. Duan, Hu and McLean (2010) found that costs of arbitrage, in the form of idiosyncratic risk, deterred arbitrage amongst short sellers. Using an equilibrium model of the commodity markets, Acharya, Lochstoer and Ramadorai (2011) present evidence that financial arbitrage costs limited hedging by producers, affecting both asset and goods prices.

### **3.2.3. Investor Sentiment**

The second pillar of behavioural finance includes investor sentiment. Traditional finance theory allows no room for the concept of investor sentiment, "...since price changes only reflect the arrival of external news about future cash-flows and interest rates" (Zhang, 2008: 4). However, in recent times the perceived role that investor sentiment plays in determining asset prices has grown in popularity amongst academics and traders alike. Baker and Wurgler (2007: 1) define investor sentiment broadly as "...a belief about future cash flows and investment risks not justified by the facts at hand". It is therefore a theory of how real world investors form their beliefs and valuations concerning financial assets.

Keynes (1936), in the *General Theory of Employment, Interest and Money*, was one of the first economists who alluded to the significance played by market sentiment in the "prospective yield of an asset". Keynes (1936: 161) believed that human emotions played a

large part in economic activity and asserted that investments were driven by “animal spirits”. Keynes continued by adding; “A conventional valuation which is established as the outcome of the mass psychology of a large number of ignorant individuals is liable to change violently as the result of a sudden fluctuation of opinion due to factors which do not really make much difference to the prospective yield” (Keynes, 1936: 154). It was further argued that investors “... are concerned, not with what an investment is really worth to a man who buys it ‘for keeps’, but with what the market will value it at, under the influence of mass psychology, three months or a year hence.”

Cognitive psychologists have acknowledged a number of biases which influence the way people evaluate assets, and ultimately lead to sub-optimal investments. As Ritter (2003: 2) explains, “Cognitive refers to how people think” before he continues to add “There is a huge psychology literature documenting that people make systematic errors in the way that they think, they are overconfident, they put too much weight on recent experience, etc”. Behavioural finance differentiates itself from Classical finance theory by incorporating the possibility that individuals make systematic errors in their valuations due to certain cognitive biases. The role played by psychological forces in financial markets has grown in significance, resulting in a large number of biases having been identified as having an effect on the investor and their investment decisions. Several biases by investors may be identified as being capable of mispricing assets.

#### 3.2.3.1. Herding

Of all the biases identified by cognitive psychologists, herding is arguably the main cause of asset price bubbles. Banerjee (1992) was the first to develop a simple model of herd behavior where investors engaged in parallel trading patterns based, not on their own private information, but on the trading activities of other investors. Banerjee (1992: 797) analysed the sequential decision making process of subjects, and observed that when a choice was made, decisions makers would consider the assessment made by the previous decision maker. Banerjee (1992: 797) argued that individuals did this as they believed that the previous decision maker must have had information that they themselves did not hold, and it was therefore rational to have based their own judgment on that of the previous decision maker. Such behavior results in a herd mentality, and is especially dangerous in financial markets where many participants have a low level of knowledge with regard to the current state of

affairs. Instead of using what little information they have, they rely on that of others, which results in an inefficient outcome.

According to Wermers (1999: 582) there are a few common theories as to why institutional investors engage in herding. Firstly, fund managers may trade with the crowd to avoid damaging their reputations which could result from trading differently to other fund managers. Secondly, managers may trade similarly, as they receive private information from the same sources. Finally, managers may share a tendency to avoid / pursue shares with certain risk characteristics. These theories vary in terms of being considered 'rational herding' and 'non-rational herding'. The latter is of concern here, as 'rational herding' from common fundamental pieces of data is unlikely to have resulted in mis-pricing. Strategies based on the trading activities of other investors are not irrational *per se* because incorporating this information is arguably as important as that of fundamental data. Two common herding strategies are known as momentum trading (trading with the herd) or contrarian trading (trading against the herd) and both may yield favourable returns. Momentum trading in particular can, however, also result in instances of mis-pricing.

A number of studies have documented instances of herding which have occurred in recent history. Wermers (1999) found fund managers to exhibit a greater herding tendency when trading in smaller stocks, particularly growth orientated mutual funds, over the period 1975-1994. Using 18 years of trading data from the Institute for the Study of Security Markets (ISSM), Barber, Odean and Zhu (2005) presented strong evidence of herding between individual investors. Such behaviour was not limited to individual investors, with Brown, Wei and Wermers (2012) finding that, due to common analyst recommendations, mutual fund managers were also likely to have engaged in similar trading patterns. Sias (2004), Chan, Hwang and Mian (2005), Pucket and Yan (2007), Choi and Sias (2008) and Christofferson and Tang (2010) also found evidence of institutional herding. However, Grinblatt *et al* (1995) only found very weak evidence of herding between such fund managers over the period 1975-1984.

#### 3.2.3.2. Over-confidence

Over-confidence is another form of cognitive bias which manifests itself in over-reaction and excessive trading by investors. According to Daniel, Hirshleifer and Subrahmanyam (1997: 3) investors often over-estimate the accuracy and power of their private information signals which leads to a lack of caution in their ability to evaluate stocks. This results in an inflated

response to private information signals and an ineffective response to public information signals as investors are more confident about information they feel they have had a greater level of involvement in (Daniel *et al*, 1997: 3). As Keynes (1936: 148) explained, “It would be foolish, in forming our expectations, to attach great weight to matters which are very uncertain. It is reasonable, therefore, to be guided to a considerable degree by the facts about which we feel somewhat confident, even though they may be less decisively relevant to the issue than other facts about which our knowledge is vague and scanty”. Investors tend to engage in excessive trading activities in the hope that their confidential private information will help them out-perform others who lack the relevant information.

Over-confidence is closely related to biased self-attribution. Investors falsely attribute past successes to their own abilities, and their failures to bad luck. A trader would therefore be considered over-confident if there is a separation between knowledge and their perceived level of knowledge. This is inherent in human nature, as many individuals would classify themselves as being above average in certain facets of life. Self-attribution prolongs over-confidence and results in extended periods of mis-pricing and excessive trading (Subrahmanyam, 2007: 15).

Conducting a study involving 245 participants, Biais, Hilton, Mazurier and Pouget (2004) found that over-confidence in private information led to poor trading performance, more apparent in male subjects. Barber and Odean (2001) also found that women out-performed men in the stock market. They recognized that these findings were due to a greater tendency of men having been over-confident. Deaves, Lüders and Schröder (2005) made use of the Centre for European Economic Research (ZEW) Financial Market Test, a monthly survey of financial practitioners conducted in Germany, in which respondents were asked for the provision of 90% confidence intervals for the DAX six months ahead. It was concluded that (i) having observed very narrow average confidence intervals, the practitioners were found to be grossly over-confident and (ii) through the same technique, individual success led to increased over-confidence for the individual, which if shared by a number of practitioners led to the market as a whole being over-confident (Deaves, Lüders and Schröder, 2005: 8,9).

### 3.2.3.3. Conservatism and Representativeness

Conservatism is defined by Edwards (1968) as being a situation where “individuals do not change their beliefs as much as would a rational Bayesian in the face of new evidence” (Hirshleifer, 2001: 1546). Individuals are reluctant to change their views on a topic until new

evidence has been sufficiently repeated to render it significant. Introduced by Tversky and Kahneman, (1974) representativeness describes the tendency of people, once they have recognised new information, to regard future events as being connected with the relevant information. This applies even when the events are unconnected and occur by chance (Howells and Bain, 2005); individuals are slower to modify their views than is warranted by the evidence. Having crossed this threshold, however, what may have been random occurrences are regarded as a pattern. This results in under-reaction of stock prices to news announcements, and over-reaction to prolonged periods of good or bad news, a phenomenon well documented in the literature<sup>3</sup>.

Shefrin (2007) describes two strands of Representativeness which can lead to the mis-pricing of assets. The ‘gamblers fallacy’ appears in situations where the probability of the outcome is known, whilst the ‘hot hand’ fallacy appears when the probability is unknown. The “gamblers fallacy” is best described using the example of a coin toss. The probability of either a ‘heads’ or ‘tails’ outcome is 50%. This is common knowledge to the participants. Predicting the outcome of the first throw would have involved placing an equal weighting on both ‘heads’ and ‘tails’. This is, in fact, the strategy which should be adopted at every coin toss, regardless of the outcome of previous throws or any number of throws completed. Should the situation arise where six ‘heads’ were thrown consecutively, the individual predicting the subsequent throw would be tempted to predict ‘tails’ as they expect a ‘tails’ was due, incorrectly believing that the odds favour the outcome. This scenario could easily apply in the context of an investor falsely believing that after a prolonged period of comparable returns, a turn in the market was ‘due’.

The ‘hot hand’ fallacy is closely linked to the ‘recency’ bias in which an investor, or any individual predicting the outcome of an event, is likely to have chosen the outcome most similar to the previous one. In other words, the individual would over-weigh the most recent information and under-weigh the long term averages (Ritter, 2003: 4). Shefrin (2007: 5) described the ‘hot hand’ fallacy in terms of predicting the success of a basketball player who is about to throw a free throw. Fans are likely to predict a successful throw if the player is currently on a ‘hot streak’, having achieved successfully in most recent attempts. This applies equally in financial markets, where investors assume asset prices will continue increasing based on the fact that they have been doing so in the past, and that such price increases were

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<sup>3</sup>De Bondt and Thaler (1985), Bernard and Thomas (1989), Cutler, Poterba and Summers (1991), Fama and French (1992), Jegadeesh and Titman (1993) and Chan, Jegadeesh and Lakonishok (1997)

now 'normal'. Grinblatt, Titman and Wermers (1995) found that mutual fund managers tended to purchase stocks based on past returns using a momentum trading strategy. Bloomfield and Hales (2002) reported strong evidence that experimental subjects assigned strong weighting to trends and patterns when they formed price expectations. However, Chan, Frankel and Kothari (2003) found very little evidence in support of this notion.

#### **3.2.4. Summary of Theoretical and Empirical Literature**

The theoretical review presented the idea of a behavioural aspect to financial markets, and the two foundations on which it is built: practical limits to arbitrage, and investor sentiment. Numerous costs which are incurred when conducting arbitrage are likely to deter financial practitioners from engaging in some of these opportunities. In addition, due to the agency problem which is inherent in the arbitrage market, extreme cases of mis-pricing can result in the further separation of prices from fundamentals. Investor sentiment involves the notion that investors often make systematic errors in their investment decisions which do not coincide with the market data. Cognitive psychologists have identified a number of biases which affect the decision-making process of both the individual and institutional investor. A number of these biases were discussed, accompanied by empirical evidence, documenting their occurrence in practice and their effects on financial markets.

In conclusion, behavioural finance states that investor sentiment can have a major influence on financial asset prices under two conditions: firstly, assets are held to a large extent by 'noise traders', and secondly, various financial arbitrage costs and risks are substantial enough to prevent arbitrageurs from taking desired positions in the market. If these two conditions hold, mispricing is not only likely to appear frequently, but it is also likely that the mispricing will be sustained.

### **3.3. EMPIRICAL REVIEW OF SENTIMENT**

#### **3.3.1. Early Tests of Sentiment**

Thanks largely to Keynes' (1936) work on "animal Spirits"; investor sentiment has long been considered as having had relevance in the realm of asset pricing. However, due to the initial findings of Black, Jensen and Scholes (1972) as well as Black and MacBeth (1973) which supported the EMH and CAPM, tests of the relationship between investor sentiment and

expected returns only began emerging long after Keynes' famous General Theory of Employment, Interest and Money.

Friend and Adams (1964) found that consumer sentiment, measured in the form of consumer attitudes, was directly correlated with stock prices, with the exception being the early part of the 1952-1962 sample periods. Fair (1971: 16) used the Michigan Consumer Sentiment Index and found it was "simultaneously related" to stock price variables. Branch (1976) made use of, amongst others, Barron's confidence index as a mood variable when the predictive power of various economic indicators was tested. However, the analysis suggested that the mood variables utilised had very insignificant power in having predicted stock returns. Variables such as the Treasury bill rate or net cash flow into mutual funds were more successful (Branch, 1976: 285). Together with studies such as Douglas (1968) as well as Blume and Friend (1973) which documented evidence against the relation between beta and expected returns, attention started to turn to unearthing additional support for alternative theories in explaining asset returns.

The early empirical investigations which generated momentum in the field of behavioural finance focused on the central claims of the EMH. In particular, early studies sought to determine whether or not stock prices adjusted to the arrival of new information, in accordance with the EMH. Shiller (1981: 297) attempted to provide evidence against efficient market models by utilising volatility tests on US stock market indices for the period 1871 to 1979; it was concluded that stock market volatility over the past century appeared to be too high to have been attributed to new information about future real dividends. It was also suggested that the index stayed more depressed than was warranted in the depression years of the 1930's and too buoyant in parts of the post-war period (Shiller, 1981: 298). At around the same time, many studies utilised volatility measures similar to that employed by Shiller (1981), concluded that the volatility in stock prices<sup>4</sup>, bond yields<sup>5</sup> and foreign exchange rates<sup>6</sup> exceeded the variance implied by dividends and interest rates.

Long considered the originators of Behavioural Finance, De Bondt and Thaler (1985: 793) investigated whether most people tended to over-react to unexpected and dramatic news

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<sup>4</sup>LeRoy and Porter (1981), Mankiw, Romer and Shapiro (1985)

<sup>5</sup>Shiller (1979), Singleton (1980)

<sup>6</sup>Huang (1981), Meese and Singleton (1980)

events, and whether such behaviour affected stock prices. Using data since 1933, *Loser* and *Winner* portfolios were constructed, consisting of the worst and best performing stocks as judged by their achievement during the three previous years (De Bondt and Thaler, 1985: 796). The performance of each portfolio in the 5 years following its formation was computed. The average results across the approximately fifty *Winner* and fifty *Loser* portfolios clearly showed a superior return for the *Loser* portfolios. The results were interpreted as indicating that the *Winner* portfolios had been over-valued due to the stocks experiencing positive reviews, whilst the *Loser* portfolios had become under-valued due to negative reviews. Since then many studies have documented stock prices under-reacting to news announcements such as dividend payouts or stock splits, and over-reacting to good or bad news<sup>7</sup>.

Subsequent to the findings of Shiller (1981) and De Bondt and Thaler (1985) a growing number of studies emerged in order to establish whether investor sentiment could be used to predict stock and other financial asset returns. A number of these studies are discussed below.

### **3.3.2. Investor Sentiment Measures and Stock Returns**

One of the limitations of behavioural finance involves the lack of a clear measure of investor sentiment, thus preventing a thorough analysis into whether or not investor sentiment is better able to predict stock returns than risk. Because investor sentiment is alleged to capture a multitude of psychological forces which impact on the investor, a whole array of variables is necessary, and even then their ability to accurately account for human emotions is questioned. Despite this limitation, a number of potential sentiment proxies have been developed using various measures of trading data.

Baker and Wurgler (2007: 16) used six pieces of trading data to arrive at a proxy for market sentiment: (1) trading volume (2) the dividend premium (3) the closed-end fund discount (4) the number of IPOs (5) the first-day returns on IPOs and (6) the equity share in new issues to consider which stocks were likely to have been more affected by changes in investor sentiment. It was concluded that "...waves of sentiment have clearly discernible, important, and regular effects on individual firms and on the stock market as a whole" (Baker and Wurgler, 2007: 28). Further, "...stocks of low capitalization, younger, unprofitable, high

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<sup>7</sup>See for example Barberis, Shleifer and Vishny (1998) and Avard, Nam and Pyun (2001)

volatility, non-dividend paying, growth companies, or stocks of firms in financial distress, are likely to be disproportionately sensitive to broad waves of investor sentiment” (Baker and Wurgler, 2007: 2).

Bandopadhyaya and Jones (2005) also constructed a measure of investor sentiment, based on Persaud (1996), in which a risk appetite measure in a currency market context was utilised to measure sentiment. Bandopadhyaya and Jones (2005) modified the methodology adopted by Persaud (1996) to measure sentiment in an equity market, and termed their sentiment measure the Equity Market Sentiment Index (EMSI). The EMSI was said to have captured the market’s willingness to accept risk, a factor of huge importance in the pricing of assets according to Persaud (1996). After having computed daily returns and historic volatility for a group of firms in the Massachusetts Bloomberg Index (MBI), Bandopadhyaya and Jones (2005: 6) “then rank the daily rate of return and rank the historic volatility and compute the Spearman rank correlation coefficient between the rank of the daily returns for each firm and the rank of the historic volatility of the returns for each firm, and multiply the result by 100”. According to Bandopadhyaya and Jones (2005: 4) the EMSI quickly incorporated news announcements which concerned firms in the MBI and was capable of explaining a significant proportion of changes in it.

The sentiment measures developed by Persaud (1996), as well as Bandopadhyaya and Jones (2005), can be classified under the *risk aversion* class, with the VIX investor fear gauge being another example in this class<sup>8</sup>. However, this only forms a part of the sentiment measures which have been developed. Another group of sentiment measures can be classified as those which fall under *Optimism/Pessimism about the Stock Market*. The Put-Call Ratio<sup>9</sup>, Barron’s Confidence Index<sup>10</sup> and the Net Cash Flow into Mutual Funds<sup>11</sup> have all been used in various studies when calculating a measure of sentiment. The final class of sentiment measures include *Optimism/Pessimism about the Economy* to which attention is now turned.

### **3.3.3. Consumer Confidence and Stock Returns**

More closely aligned to this particular analysis, many studies have opted to use various consumer confidence indices as direct proxies of investor sentiment.

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<sup>8</sup>See Fleming, Ostdiek and Whaley (1995), Whaley (2000), Giot (2005)

<sup>9</sup> See Simon and Williams (2001), Dennis and Mayhew (2002) and Bandopadhyaya and Jones (2008)

<sup>10</sup> See Lashgari (2000)

<sup>11</sup> See Randall, Suk and Tully (2003)

A wealth of literature concerning the relationship between sentiment and stock returns involves two surveys of consumer confidence published in the United States. The first is an index published by the University of Michigan Survey Research Centre, known as the Index of Consumer Sentiment (ICS), and the second is conducted by the Conference Board, known as the Index of Consumer Confidence (CBIND). For example, Fisher and Statman (2003) sought to establish, amongst other things, whether or not the ICS and CBIND were capable of predicting various stock market index returns. They found a negative and statistically significant relationship between both measures in one month, and stock returns in the following month and in the successive 6 and 12 months (Fisher and Statman, 2003: 121). It was of interest that they also found a positive relationship between changes in consumer confidence and contemporaneous stock returns, which allowed them to conclude that high stock returns boosted consumer confidence.

Lemmon and Portniaguina (2006: 1527) utilized the same set of consumer confidence indices when they determined that in the past 25 years “...consumer confidence exhibits forecasting power for the returns on small stocks and for future macroeconomic activity”. Charoenrook (2003) found that changes in the Michigan sentiment index accurately predicted excess stock market returns for the 1979-2000 and 1955-2000 periods.

Jansen and Nahuis (2003: 97) made use of a consumer confidence index published by the European Commission which surveyed consumers in 11 European countries (excluding Luxembourg). Evidence was presented that, over the period 1986-2001, stock returns and changes in consumer sentiment were positively correlated for 9 of the countries with Germany being the main exception. However, once again the causality in this study ran from equity prices to consumer confidence, a finding supported by Beckman, Belke, and Kühl (2009) for the Central and Eastern European Countries during the transition phase.

More recently, Schmeling (2009) tested the relationship between sentiment and future stock returns across 18 industrialized nations including the U.S, Australia, New Zealand, Japan, and 14 European countries. Using consumer confidence surveys for each country or region, Schmeling (2009: 406) found that, on average, sentiment was a significant predictor of expected stock returns. It was also noted that sentiment had no predictive power at all in several countries.

Otoo (1999) and Bremmer and Christ (2003) both found evidence of a contemporaneous relationship between sentiment and equity prices. Equity prices were the leading indicator

and an increase in equity prices was found to lead to an increase in the Michigan Sentiment Index. In explaining the results, Otoo used the work of Poterba and Samwick (1995) and Morck, Shleifer and Vishny (1990) in which it was argued that a rising stock market is a leading indicator of higher labour income, and subsequently higher consumer confidence. This argument was backed up by the fact that, following an increase in equity prices, sentiment levels of households which owned stock increased as much for those which did not.

#### **3.3.4. Studies conducted in South Africa**

At a general level, Moolman and Du Toit (2005) made use of co-integration and error correction techniques to present evidence that long-term stock prices listed on the JSE were determined by the discounted value of future dividends. The analysis indicated that short term fluctuations were caused by changes in short term interest rates, the Rand/US\$ Exchange Rate, the S&P 500 index, the gold price, investor expectations and a risk premium (Moolman and Du Toit, 2005: 88).

While studies involving the relationship between investor sentiment and financial market behaviour are limited with regards to South Africa, several have sought to establish whether such a link exists. Similar to the study conducted by De Bondt and Thaler (1985), Page and Way (1993), Muller (1999) and Hsieh and Hodnett (2011) found that the extent of positive and negative news experienced by stocks, had a significant effect on South African stock prices as people overvalued ‘good’ stocks and undervalued ‘bad’ stocks. This demonstrated that investors in the South African Financial Markets tended to over-react due to their tendencies of conservatism and representativeness.

Studies involving the Johannesburg Stock Exchange (JSE) have documented several interesting tendencies in the behaviour of stock prices. Kamstra, Kramer and Levi (2003) found that share returns were lower in the winter months in South Africa compared to the summer months, due to a drop in what they describe as Seasonal Affective Disorder (SAD). Edmans, Garcia and Norli (2007) and Smith (2009) found that following a loss in either one of South Africa’s national cricket, rugby or soccer teams, the local financial markets were negatively affected. Bradfield (1990) found evidence of a mid-December effect on the JSE whilst Bhana (1994) presented evidence that mean share returns were on average five times higher on the trading day prior to public holidays, in comparison to the remaining days of the year. The exogenous variables utilized in each of these studies were arguably a proxy for

market sentiment, mainly as a mood variable. Certain months of the year, the weather and sports results could all have had a huge impact on large sections of the population; so much so that it has a statistically significant impact on stocks listed on the JSE.

### **3.3.5. Summary of Empirical Literature**

Subsequent to the emergence of numerous empirical shortcomings of traditional finance, economists have sought to discover alternative variables with greater explanatory power than risk. There is a wealth of literature available which has documented empirical evidence of the importance of how investor sentiment, measured in various ways, has affected the prediction of returns.

With regard to studies involving consumer confidence indices, there is an ambiguity in the literature regarding whether such indices are a leading indicator of stock prices or vice versa. There seems little doubt that these two variables are related. What is unclear, however, is whether equity prices rise as a result of a boost in confidence, or whether this boost in consumer confidence leads to increased demand for stocks. What is clear is the lack of research into this relationship with regard to developing countries. This provides a motivation for a study on South Africa being undertaken which would contribute to the limited amount of empirical literature on the determinants of the JSE, and add to the inconclusive link between sentiment and stock prices, established by Kamstra, Kramer and Levi (2003), Edmans, Garcia and Norli (2007) and Smith (2009).

## **3.4. CONCLUSION**

Having reviewed the theoretical and empirical literature on behavioural finance, and investor sentiment in particular, a case was presented to consider investor sentiment as a variable, with potentially significant explanatory power, in the pricing of assets. The sheer variety of variables used as a proxy for investor sentiment, illustrates the complexity in capturing the psychological impact of the investor on financial markets, with each experiencing varying levels of success. Surveys of consumer confidence have enjoyed much success in developed parts of the world, yet this link is still to be established in developing countries. The next chapter addresses the methodology and data employed to conduct an empirical examination of the link between investor sentiment and stock returns in South Africa.

## CHAPTER 4

### METHODOLOGY AND DATA DESCRIPTION

#### 4.1. INTRODUCTION

This chapter involves a discussion of the analytical framework adopted to meet the objectives set out in Chapter 1. As discussed in Chapter 1, the methodology will set out the framework for testing the relationship between consumer sentiment and stock prices in South Africa. Additionally, the chapter will provide an in-depth discussion of the data which will be utilized as well as reasons for using such data to test this relationship.

The rest of this chapter is organised as follows: Section 4.2 sets out the empirical model. Section 4.3 describes the stationarity tests employed. Section 4.4 sets out the criteria used for model selection. Section 4.5 discusses how to determine causality between different time series through use of Granger causality tests. Section 4.6 then describes the data that will be used in this study before section 4.7 concludes.

#### 4.2. THE EMPIRICAL MODEL

In order to test the relationship between consumer confidence and stock prices a model must be developed which is capable of undertaking such an analysis. As discussed in Chapter 3, Otoo (1999) presents a model mapping changes in consumer sentiment to changes in a stock market index. Following the work of Otoo (1999), the relationship between consumer confidence and stock prices can be represented by the linear expression in Equation 4.1.

$$Y_t = \alpha_0 + \beta_1 CC_t + \mu_t \quad (4.1)$$

Where  $y_t$  is the stock market index,  $CC_t$  is the consumer confidence index at time  $t$ ,  $\alpha_0$  is the intercept,  $\mu_t$  is the stochastic error term,  $\beta_1$  is the slope parameter which shows the degree to which a change in the consumer confidence index is reflected by changes in the stock market index.

It is of important that each and every variable included in the empirical model is tested for stationarity; according to Gujarati (2004:792) “empirical work based on time series data assumes that the underlying time series is stationary”. The next section therefore discusses the need for stationary data and how to determine the stationarity of time series data.

### 4.3. TESTS FOR STATIONARITY

Standard OLS techniques require any time series data used to be stationary. A time series will be considered stationary if its statistical properties such as mean, variance and autocovariance are all constant over time. According to Gujarati (2004) there are two main reasons for testing the stationarity of a time series. First, regression results in the form of a high  $R^2$  and statistically significant coefficients may suggest a relationship between two variables in a situation known as *spurious regression*. As a result of the variables being non-stationary, it may incorrectly be concluded that the variables have a statistical relationship despite the lack of any logical economic relationship. Second, if a time series is non-stationary then it is not possible to generalize the results and conclusions to other time periods. Results will be valid for the period of investigation alone and therefore important forecasting abilities will be absent (Gujarati, 2004: 798).

According to Gujarati (2004: 807) there are several methods which can be adopted in determining whether time series data are stationary; these include graphical analysis, tests based on the autocorrelation function, unit root tests and formal stationarity tests. By plotting the time series under analysis, inferences regarding the stationarity or otherwise of the data can be drawn by viewing whether or not the series tends to revert to a long term mean. If the series follows an upward or downward trend then it is likely that it has a non-constant mean and would therefore be considered nonstationary; however, further tests should be conducted to confirm these initial observations. The autocorrelation function tests involve plotting the covariance of a time series against its variance in a graph known as a correlogram. A stationary time series will exhibit autocorrelations which hover around zero, whereas a non-stationary process will exhibit at least one significant spike (Gujarati 2004: 809).

Unit root tests involve using an autoregressive model to test the lagged dependent variable for the presence of a unit root (Gujarati 2004: 814). Stationarity tests, on the other hand, involve testing the null hypothesis of trend stationarity against the alternative of non-stationarity due to the presence of a unit root (Syczewska, 2010: 4). Popular examples of unit root tests include the Augmented Dickey-Fuller (ADF) and the Phillips-Perron test, and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test is an example of a well-known stationarity test.

Stationarity tests help to determine the order of integration of the time series data used. Variables which have a constant mean, variance and autocovariance are denoted as I(0) and do not require any manipulation to render them stationary. I(1) variables are integrated of order one and will require either differencing or de-trending in order to be made stationary (Gujarati, 2004: 803). This study will make use of both the ADF unit root test and KPSS test for stationarity; with the latter used to confirm the results of the former.

#### **4.3.1. The Augmented Dickey-Fuller (ADF) Test**

Unit root tests involve testing the null hypothesis that a time series contains a unit root. A unit root is present if the autoregressive parameter is equal to 1, and therefore unity  $(1-1) = 0$  (Brooks, 2008: 322). If the null hypothesis cannot be rejected then the series will be considered non-stationary. As with all unit root tests, if the computed test statistic is greater than the relevant critical value then the null hypothesis would be rejected and a stationary time series would be implied. Brooks (2008: 328) explains how the Dickey-Fuller test statistics follow a non-standard distribution since the null hypothesis is one of non-stationarity. As a result of the non-standard distribution, the critical values are greater than those in the standard distribution; Brooks (2008: 328) argues that, as a result, more evidence is required to reject the null than under standard t-tests. Another limitation of the ADF is its low power which may lead to the incorrect rejection of the null hypothesis (Gujarati, 2004: 819). This is common when the process has a root close to the unit root circle. Due to these limitations, it is argued that a stationarity test in addition to a unit root test be employed to confirm the result; the KPSS is one such test.

#### **4.3.2. The Kwiatkowski, Phillips, Schmidt and Shin (KPSS) Test**

The KPSS test tests for stationarity directly and is therefore considered more robust than unit root tests. In the KPSS, time series are made up of three components: a deterministic trend, a random walk, and a stationary error term as illustrated below:

$$y_t = \beta t + r_t + \varepsilon_t \quad (4.2)$$

$$r_t = r_{t-1} + \mu_t$$

Where  $y_t$  is the dependent variable,  $\beta t$  the deterministic trend,  $r_t$  the random walk and  $\varepsilon_t$  the stationary error term.  $\mu_t$  is the error term of the second equation and is also assumed to be stationary. The KPSS test is in a form of the Lagrange Multiplier in that the null hypothesis

assumes the variance of the random walk process is equal to zero. According to Syczewska (2010: 5), if  $\beta = 0$  the null hypothesis suggests the series is stationary around its mean of  $r_t$  whilst if  $\beta \neq 0$  the series is stationary around a linear trend. With the KPSS having greater power than the ADF it is more robust, and will be used to confirm the ADF results.

Having reviewed the potential problems and how to test for the presence of non-stationary time series data, the issue now turns to methods of transforming the data into a stationary form.

### **4.3.3. Transforming Non-Stationary Time Series**

As discussed in the previous section, it is important that the time series data utilised in empirical work is stationary. Fortunately there are ways in which non-stationary time series can be transformed into stationary time series; this will depend on whether they are difference stationary (DS) or trend stationary (TS). According to Gujarati (2004: 802), “Broadly speaking, if the trend in a time series is completely predictable and not variable, we call it a deterministic trend, whereas if it is not predictable, we call it a stochastic trend”. A deterministic trend is therefore considered trend stationary and stationarity may be induced by de-trending. De-trending is carried out by removing the deterministic trend from the series (Gujarati, 2004: 803).

On the other hand, a series with a stochastic trend is considered difference stationary. A difference stationary series is one which contains a unit root and it can be made stationary by differencing it; subtracting a lagged series value from a one-period-ahead series value to give the period-to-period change (Gujarati, 2004: 803). A series which contains two unit roots, given by  $I(2)$ , would require differencing twice in order to render it stationary whilst an  $I(d)$  would require differencing  $d$  times.

## **4.4. REGRESSION ANALYSIS**

Different forms of the proposed model, with varying lag lengths, were considered. Several criteria were used to choose between the models, including the  $R^2$  and adjusted  $R^2$ , and the Akaike and Schwarz Information Criteria. According to Gujarati (2004: 536) all of these criteria aim at minimizing the model’s Residual Sum of Squares (RSS) or alternatively increasing the forecasting power.

$R^2$  provides a measure of the goodness of fit of a model; the extent to which the forecasted in-sample values of the dependent variable fits the actual in-sample values.  $R^2$  takes on values ranging from 0 to 1; the closer to 1 the better the fit of the model and the greater the in-sample forecasting power. However, it must be noted that a high  $R^2$  does not guarantee accurate out-of-sample forecasting and therefore should only be used for the purposes of determining goodness of fit. The adjusted  $R^2$  on the other hand takes into account the number of explanatory variables used in the regression. When using  $R^2$  to compare different regression models, caution must be exercised in that they have the same form and number of explanatory variables. When additional variables are included in a regression,  $R^2$  will increase regardless of whether it makes economic sense to include them as explanatory variables. To bypass this problem, and in order to accurately compare different regression models, the adjusted  $R^2$  should therefore be used instead of the standard  $R^2$ . The adjusted  $R^2$  actually imposes a penalty for every additional variable included in the model. Therefore for the purposes of this study, the adjusted  $R^2$  of each model will be compared as varying numbers of lagged explanatory variables will be included in each model.

#### **4.5. THE GRANGER CAUSALITY TEST**

The literature contains mixed evidence of the relationship between consumer confidence and share prices, with some documenting evidence of causality running from confidence to share prices and others the opposite. Gujarati (2004: 696) explains how regression analysis explains the relationship between variables through documenting a dependence on one another, but falls short of explaining causality. The nature of the relationship is specified according to theory, but this does not necessarily imply causality in the sense that one variable influences future values of another. This study therefore looks at the direction of causality between confidence and share prices in South Africa, as it is quite possible that consumers grow more confident as a result of higher stock prices as opposed to greater confidence driving up share prices. A time series  $X$  is said to Granger-cause  $Y$  if it can be shown, usually through a series of t-tests and F-tests on lagged values of  $X$  (and with lagged values of  $Y$  also included), that those  $X$  values provide statistically significant information about future values of  $Y$ . If this is the case then it can be said that variable  $X$  Granger causes variable  $Y$  and therefore that lags of variable  $X$  should be included in forecasting variable  $Y$  (Brooks, 2008: 298). In summary, Granger causality refers to the correlation between the current value of one variable and past values of other variables (Brooks, 2008: 298).

#### **4.6. IMPULSE RESPONSES AND VARIANCE DECOMPOSITIONS**

Variance Decompositions and impulse responses allow the researcher to observe how the dependent variables in the VAR react to shocks to each of the variables. Whilst the Granger causality tests provide an indication of which of the variables has a statistically significant impact on the future values of other variables in the system, they fall short of describing the sign of this effect and how long it takes to work through the system. Impulse Response Modelling describes the responsiveness of the dependant variables in a VAR to a unit shock to each of the variables in the system (Brooks, 2008: 299). The analysis was conducted on each variable from each separate VAR equation by noting the effects on the VAR system over time due to a one unit shock to each variable's error term. Impulse responses indicate the stability of the system by observing the extent to which the effects of the shock die away. If the shock gradually dies away then the system will be considered stable (Brooks, 2008: 299). In the results of the impulse response analysis discussed in the next chapter, a graphical analysis of the responses of the dependent variables to innovations in the explanatory variables is conducted. In particular, the sign, magnitude and rate of decay of the responses will be analysed.

Variance decompositions, on the other hand, have been used to determine the extent to which the dependent variable moves as a result of 'own' shocks rather than shocks to other variables in the VAR. Due to the dynamic nature of VAR models, a shock to a variable in the model will transmit to others in varying degrees. In addition, variance decompositions determine how much of the forecast variance of a variable is explained by changes in the explanatory variables (Brooks, 2008: 300). For the purposes of this study, variance decompositions computed the proportion of the variation in the JSE/FTSE ALSI due to 'own' shocks and shocks to the CCI. This has the added benefit of indicating whether these variables are endogenous or exogenous.

Having discussed the methodology, the data series utilised in this study to determine the link between consumer confidence and share prices in South Africa is explained.

#### **4.7. DATA**

This study follows the methodology of existing empirical investigations, which have utilised consumer confidence indices as proxies for investor sentiment when studying their link with

stock returns<sup>12</sup>. The majority of these studies have focused on various stock market indices in North America, and have made use of the Index of Consumer Sentiment (ICS) published by the University of Michigan Survey Research Centre. This study focuses on the Johannesburg Stock Exchange and makes use of a South African consumer confidence index known as the FNB/BER Consumer Confidence Index. The FNB/BER CCI is computed in a similar way to the ICS, where consumer responses are used to compile the index. The FNB/BER CCI combines the result of three survey questions posed to adults from an area-stratified probability sample of 2,500 households in South Africa (Bureau for Economic Research, 2012). The questions gauge the adult expectations of the state of the economy and their personal finances as well as the appropriateness of purchasing consumer durables at the present time. These questions are:

1) How do you expect the general economic position in South Africa to develop during the next 12 months? Will it improve considerably, improve slightly, deteriorate slightly, deteriorate considerably or don't know?

(2) How do you expect the financial position in your household to develop in the next 12 months? Will it improve considerably, improve slightly, deteriorate slightly, deteriorate considerably or don't know?

(3) What is your opinion of the suitability of the present time for the purchase of domestic appliances such as furniture, washing machines, refrigerators etc. Do you think that for people in general it is the right time, neither a good nor a bad time or the wrong time?

The index is the average of the results of these three questions with certain weightings applied. The answers to the first and second question are weighted as follows: improve considerably (+10), improve slightly (+5), deteriorate slightly (-5) and deteriorate considerably (-10). The responses of the third question are weighted in the following manner: right time to buy (+10) and wrong time to buy (-10) (Bureau for Economic Research, 2012).

There are several reasons why this measure of consumer confidence is used as a proxy for investor sentiment in this study:

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<sup>12</sup>See for example Otoo (1999), Bremmer and Christ (2003), Charoenrook (2003), Fisher and Statman (2003), Jansen and Nahuis (2003), Lemmon and Portniaguina (2006), Beckmann, Belke and Kühl (2009), Schmeling (2009)

- Firstly, with evidence provided by the studies conducted using the Michigan confidence index, individual investors keep a close eye on the confidence index when undertaking investments, as it indicates the current attitudes of other investors.
- Secondly, the FNB/BER CCI is compiled through use of personal at-home interviews concerning current and expected economic conditions in South Africa. This has the benefit of capturing the attitudes of the general public, which should also capture the attitudes of the stereotypical ‘irrational’ or ‘noise’ investor.
- Thirdly, the final question posed to adults in the sample includes gauging the suitability of the present time for the purchase of household appliances such as furniture, domestic appliances, refrigerators, etc (Kershoff, 2007: 7). Despite the question referring to items of less value than many financial assets, it is assumed that the answers to this question would have applied equally to the suitability of the present time for the purchasing of other goods and services in the economy, including financial assets. An increase in consumer confidence is likely to have reflected an increased willingness to spend (Kershoff, 2007: 8).
- Fourthly, in many countries around the world, measures of consumer confidence similar to that of the FNB/BER CCI are leading economic indicators. Some economic studies show that consumer confidence indices have greater predictive power relative to other economic variables in predicting changes in consumption expenditure and subsequent business cycles. For example, Bram and Ludvigson (1998: 2) found that the confidence index provided by the Conference Board had economically and statistically significant explanatory power for most of the spending categories considered in the United States. Nahuis (2000) found similar results for a study conducted on 8 European countries between 1985 and 1998. In addition, the confidence indices’ influence is not confined to that of financial markets, with some reports in the financial media having claimed consumer confidence to have an impact on fuel prices (Powell, Bloomberg Business Week, 2011).
- Finally, the FNB/BER CCI is the longest time series of all the consumer confidence/sentiment measures available in South Africa, and is therefore the most useful. The FNB/BER CCI has been published quarterly since 1982 and was obtained from the website of the Bureau for Economic Research (BER).

It should be noted that the calculation of the FNB/BER CCI underwent a revision in 2005 in order to align the index to standards of international best practice. Two changes were made; altered reporting units from household heads to all adults, and offering an additional option for the economic performance question (Kershoff, 2005: 1). The additional response allowed for the economic performance question included “remain unchanged” which had an impact on the confidence index. This necessitated a revision of the index values and these revised values are used in this study.

The other item of data used in the study is the FTSE/JSE Africa All Share Index (ALSI). The ALSI is the dependent variable in the empirical model and daily ALSI values were obtained from Thomson DataStream. According to the JSE (2008: 1) the ALSI was instituted in June 2002 when it replaced the JSE Actuarial Indices; however, historic data was made available from July 1995 onward. The series was ‘recreated retrospectively for statistical purposes’ and can therefore still be used to capture South African share prices. The JSE Actuaries Indices consisted of an all share index and several sectoral indices, but was discontinued following the introduction of the ALSI in 2002. The main change from the JSE Actuaries indices included having moved from “indices based on full market capitalisation to free float adjusted indices” (JSE, 2008: 1).

Considering data for the ALSI is only available from June 1995 onward, this study makes use of a sample period running from the beginning of 1996 to the end of 2010, giving 60 observations. This sample period encompasses the 2007/08 global financial crisis, a time of highly volatile stock returns and levels of consumer confidence which should aid in determining the precise relationship between these two variables. The FNB/BER CCI is also available over this period, but is only published quarterly; it was accordingly necessary to convert the daily ALSI values into quarterly values.

#### **4.8. CONCLUSION**

This chapter set out the empirical framework which is used in the examination of the relationship between consumer confidence and stock prices in South Africa. The empirical model was set out in the first section, and the various methods for testing for stationarity of data in the second. The chapter then explained the regression analysis which will be used to determine the level of dependence between the variables. Determination of causality through Granger-causality tests was discussed before an explanation of how impulse response functions and variance decompositions can be used to shed more light on the relationship.

Finally, the data series which were used in the analysis were explained, including their source and purpose. The next chapter presents the results of these tests.

## CHAPTER 5

### EMPIRICAL RESULTS

#### 5.1. INTRODUCTION

Following the discussion of the methodology and data in chapter 4, chapter 5 presents the regression results; results of the various tests used are discussed along with their significance regarding the relationship between consumer confidence and share prices in South Africa.

The rest of the chapter is organized as follows: Section 5.2 presents the results of the ADF unit root test and the KPSS test for stationarity. The results of the regression analysis are discussed in section 5.3 and section 5.4 presents the results of the Granger Causality test. The results of the Impulse Response Functions and Variance Decompositions are presented in sections 5.5 and 5.6 respectively. Section 5.7 concludes.

#### 5.2. TESTS FOR STATIONARITY

As discussed in chapter 4, it is important that tests for stationarity are conducted to determine the order of integration of each series used in the study. OLS time series analysis assumes the variables employed are stationary; tests must be conducted to determine if any of the variables are non-stationary and hence the need for transforming these variables. This study made use of the ADF unit root test and the KPSS test for stationarity to confirm the results. These tests were conducted under both the Intercept and Trend and Intercept assumptions, with both yielding similar results and conclusions.

The results under the Trend and Intercept assumption are shown in Section A of the Appendix. The top half of the table shows results of stationarity tests conducted on the All Share Index and the Consumer Confidence Index over the period 1996 Q1 – 2010 Q4. The CCI was stationary (just) in levels ( $I(0)$ ), whilst the ALSI is only stationary in first differences ( $I(1)$ ). The difference in the order of integration necessitated a manipulation of the ALSI data; the series was logged, first-differenced and multiplied by 100 so that the LALSI was expressed as (changes in) share returns rather than in levels. The process of differencing the ALSI resulted in a loss of one quarter, and therefore the new sample period ran from 1996 Q1 – 2010 Q3. As can be seen from the graphs in section C of the appendix, including share returns as the dependent variable resulted in a visually closer relationship.

The second half of the table shows the stationarity tests conducted on the LALSI and CCI, with the updated sample period. Both the CCI and the LALSI were now stationary in levels (I(0)) in terms of both the ADF and KPSS tests. In terms of the ADF unit root test, the LALSI test statistic was greater than the respective critical value at the 1% level of significance, whilst the test statistic of the CCI was greater than the respective critical value at the 5% level. The results were confirmed through the KPSS test for stationarity which indicated that both series were stationary in level terms at the 1% level of significance.

Having confirmed the variables employed in the study were stationary, a regression analysis was conducted to determine the nature of dependence between the CCI and LALSI; these results are discussed in the next section.

### 5.3. REGRESSION ANALYSIS

The results of the regression analysis are presented in Section B of the appendix. As this study documented the relationship between consumer confidence and share returns, a two-variable regression model was utilised with the LALSI as the dependent variable and the CCI as the sole explanatory variable.

Before discussing the regression analysis, it was important to establish that there was no serial correlation between the residuals of the LALSI series. Table 5.3 below show the results of the Ljung-Box test for autocorrelation conducted on the residuals of LALSI. The Ljung-Box test involves testing a null hypothesis of no autocorrelation, failure to reject this null hypothesis would therefore indicate no autocorrelation among the residuals. It can be seen from table 5.3 that there is no evidence of autocorrelation among the residuals at the 1% level of significance as the Ljung-Box test statistic fails to reject the null hypothesis.

Table 5.3 Ljung-Box test for Autocorrelation

Lags	Ljung-Box Statistic	Probability
1	0.0147	0.904
2	0.2484	0.883
3	0.3555	0.949
4	0.3786	0.984
5	2.6568	0.753
6	2.7403	0.841

7	2.7484	0.907
8	2.7690	0.948
9	3.1048	0.960
10	3.2059	0.976

Several different regression models were run, each with a different combination of lagged explanatory variables, in order to determine which model best explained the data; this was determined with reference to the adjusted  $R^2$  values along with Akaike and Schwarz Information Criteria. As the models contain varying numbers of lagged explanatory variables, the adjusted  $R^2$  was used to compare and determine which model best fitted the data. The adjusted  $R^2$  value takes into account the number of explanatory variables in a regression, and imposes a penalty on any additional variable included. Model 6 had by some distance the greatest adjusted  $R^2$  which suggests that it possessed the greatest in-sample forecasting power. Model 6 also produced the lowest AIC and SIC of all the models. Based on the adjusted  $R^2$  as well as the AIC and SIC statistics, it was concluded that model 6 best suited the data and was therefore the focus of the analysis.

The coefficient t-statistics on the contemporaneous and lagged values of the CCI were significant at the 1% level; the coefficient on the constant term was only significant at the 10% level, but this term is of no economic significance. The sign on the contemporaneous CCI was positive with a value of 0.419, meaning a 1 unit increase in the CCI would result in an approximately 0.4% increase in the contemporaneous LALSI, *ceteris paribus*. The sign of the three-period lagged CCI value was negative with a value of -0.408. Assuming all other variables remained constant; a 1 unit increase in the CCI would result in an approximately 0.4% decrease in the LALSI three periods ahead, which seems counterintuitive. Overall, it could be concluded that the LALSI had a statistically significant relationship with the CCI. Specifically, there is a positive and statistically significant relationship with contemporaneous values of the CCI, and a negative and statistically significant relationship with 3 period-lagged values of the CCI.

A possible explanation for the negative lagged CCI coefficient could be the effect of increased interest rates following an increase in confidence-induced spending. Spending on goods and services is likely to increase following a boost in consumer confidence which is evident with the positive relationship between the CCI and LALSI. To the extent that this

results in increased inflation, the Reserve Bank could react by increasing interest rates. Increased interest rates have the effect of making credit more expensive, which in turn is likely to result in reduced spending, including that spending on investments such as shares listed on the JSE. Reduced spending on the JSE is likely to result in lower returns following a decrease in share prices due to lower demand. This possible effect was not formally modelled.

Reviewing some of the other results, Model 6 produced an  $R^2$  value of 0.148 which can be interpreted as meaning roughly 15% of the variation in the LALSI was explained by variations in the CCI. This of course means the regression had very low explanatory power; the CCI was only able to account for a small portion of the variation the LALSI, with other macroeconomic factors likely to account for the remainder. A DW statistic of 2.044 indicates that there is no problem with serial correlation in the residuals.

In order to ensure accuracy of results the stability of the model had to be determined; in particular, the model was tested for the presence of heteroskedasticity and structural breaks. Heteroskedasticity refers to a situation in which the variance of the error term is not constant (Gujarati, 2004: 68). In this particular setting, homoskedasticity would be present if the variation in the All Share Index remained constant with increases in Consumer Confidence. Homoskedasticity is one of the assumptions of the Classical Linear Regression Model. A situation in which the error terms are not constant is undesirable as this allows for large in-sample forecasting errors and therefore decreases the fit of the model. In order to check for the presence of heteroskedasticity, the ARCH LM test was run (results not presented). The test was run using 1 lag and then 5 lags, in both instances producing insignificant F statistics and suggesting homoskedastic error terms. These results were confirmed through residual and squared residual diagnostics which produced insignificant Q statistics.

Following Szczygielski (2012: 177), parameter stability was tested for using recursive estimates and the CUSUM test. The graphs depicting the recursive estimates are shown in figure 5.1 overleaf. As observed, the recursive coefficient remained within the 2 S.E. confidence interval, indicating that the estimated coefficients were stable over time. This suggests neither any structural breaks in the data nor any parameter instability (Brooks, 2008: 187). To confirm the findings of the recursive estimates, the CUSUM test was conducted and the graphical results are shown in figure 5.2 overleaf. As can be seen, the CUSUM test

statistic did not move beyond the 95% confidence interval. The null hypothesis of parameter stability therefore cannot be rejected, confirming the recursive estimate results.

Figure 5.1: Recursive Estimates

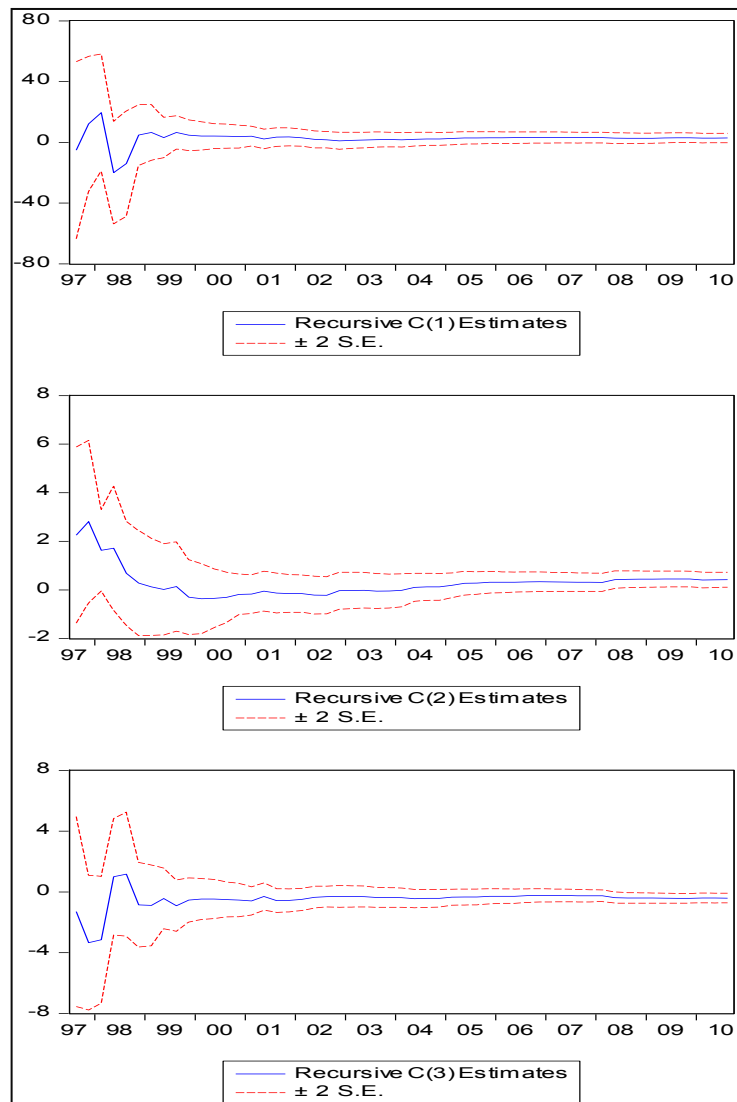
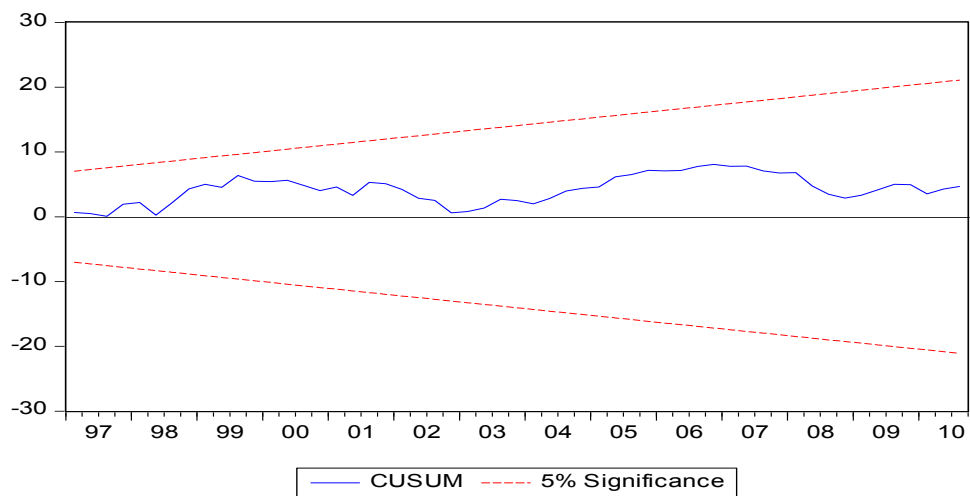


Figure 5.2: CUSUM Test



#### **5.4. GRANGER CAUSALITY TESTS**

The literature contains mixed evidence of the relationship between consumer confidence and share prices, with some having documented evidence of causality running from confidence to share prices, and others having documented the opposite. It is theoretically plausible for both of the variables to be the leading indicator, as increased confidence is likely to result in higher share prices whilst at the same time a strong stock market is also likely to increase confidence. Therefore in order to determine this causal relationship, Granger causality tests were conducted and the results are shown in Section C of the appendix.

In order to reject the null hypothesis in favour of evidence of causality, the probability of the F-statistic must be less than 0.1, 0.05 or 0.01. The results present very weak evidence of a lead-lag relation between the two series, with no evidence to suggest the consumer confidence index Granger-cause changes in the All Share Index. The only instance where causality was found to exist was in model 3 when the test was run at 3 lags. In this model, evidence was found suggesting Granger-causality from the All Share Index to the Consumer Confidence Index at the 10% level. This result was in accord with the results found in the regression analysis in which a relationship was found to exist between the two variables. In addition, the findings of this 'reverse' causality support those of Otoo (1999), Bremmer and Christ (2003), Jansen and Nahuis (2003) and Beckman, Belke, and Kühl (2009) in which various share indices were found to be the leading indicator of confidence.

It is important to note that any evidence found in favour of Granger causality does not necessarily imply that one series determines another. Therefore despite finding evidence that share returns Granger-cause changes in consumer confidence, this should not be interpreted that a change in share returns will lead to a change in confidence. The results should rather be interpreted as share returns being the leading indicator between the two series in that any changes to share returns usually occur before changes in consumer confidence. The stock market is extremely sensitive to political, economic and social conditions across the globe. Major news announcements have an immediate impact on stock exchanges as investors and fund managers move funds in order to achieve the greatest return. Therefore, share prices are likely to be affected by announcements before these incidents have a chance to impact the confidence of ordinary consumers.

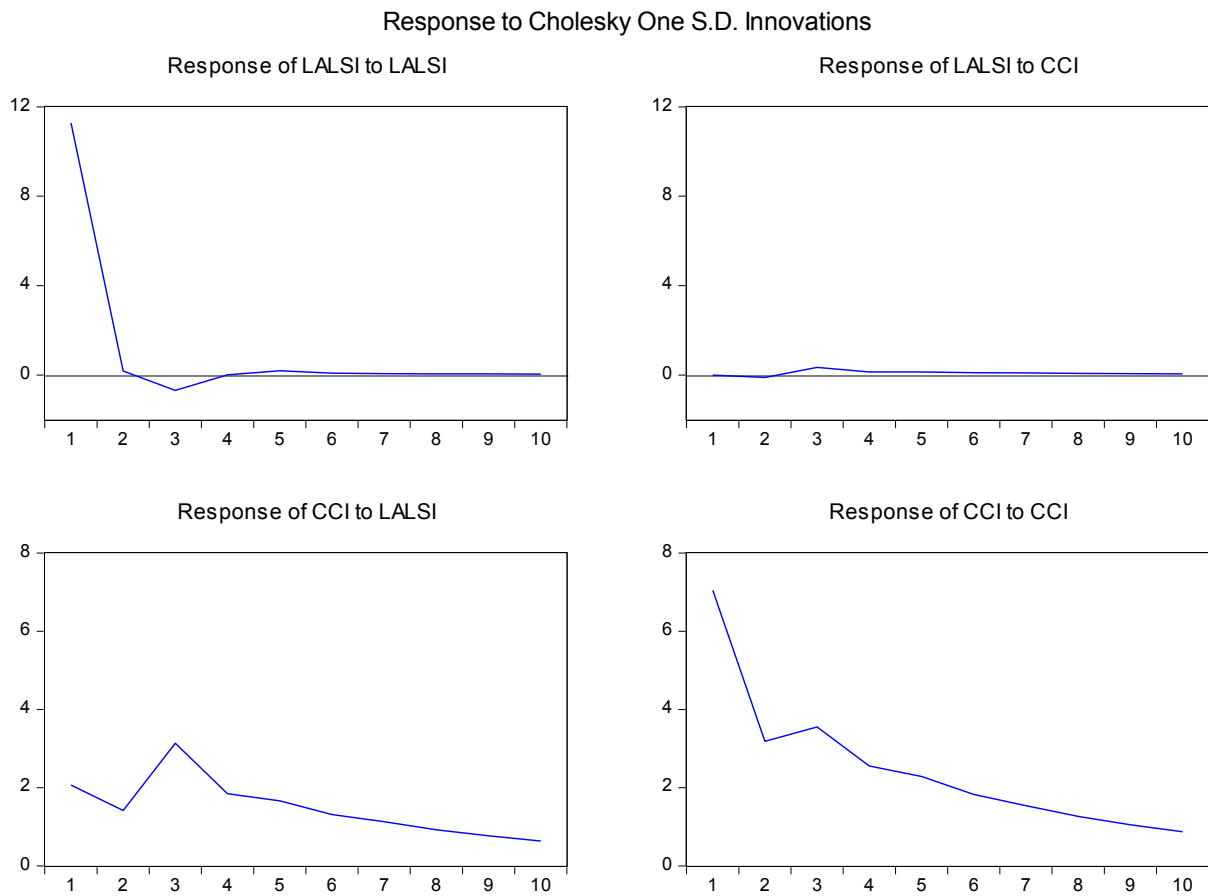
Having considered causality, an impulse response analysis was conducted in order to determine the extent to which the LALSI and CCI reacted to shocks in each. In doing so the stability of the two series could be established.

### **5.5. IMPULSE RESPONSE ANALYSIS**

In order to determine how the dependant variables in the VAR react to one standard error shocks to the explanatory variables, including the sign and persistence of such shocks, twelve-quarter-ahead impulse response functions were estimated. The impulse response functions were estimated using the generalized response approach with Cholesky one standard deviation innovations. The graphical results are shown in figure 5.1 overleaf.

In both cases the LALSI was non-persistent in its response to both 'own' shocks and shocks to the CCI. The LALSI reverted to equilibrium within 4 quarters following a one standard error shock to the CCI. However, in the short run the results are inconsistent with those found in the regression analysis in which it was found that the LALSI shares a positive and statistically significant relationship with the CCI. In the first two quarters, the LALSI responds negatively to one standard error shocks to the CCI. The ALSI responds as expected only after quarter two at which time it starts to respond positively to shocks to the CCI. However, overall the ALSI was seemingly non-responsive to shocks to the CCI. Despite the relative non-responsiveness the ALSI responds positively to shocks in the CCI with a lag of two quarters, and can be considered stable due to the non-persistent nature of its responses.

Figure 5.3: Impulse Response Functions

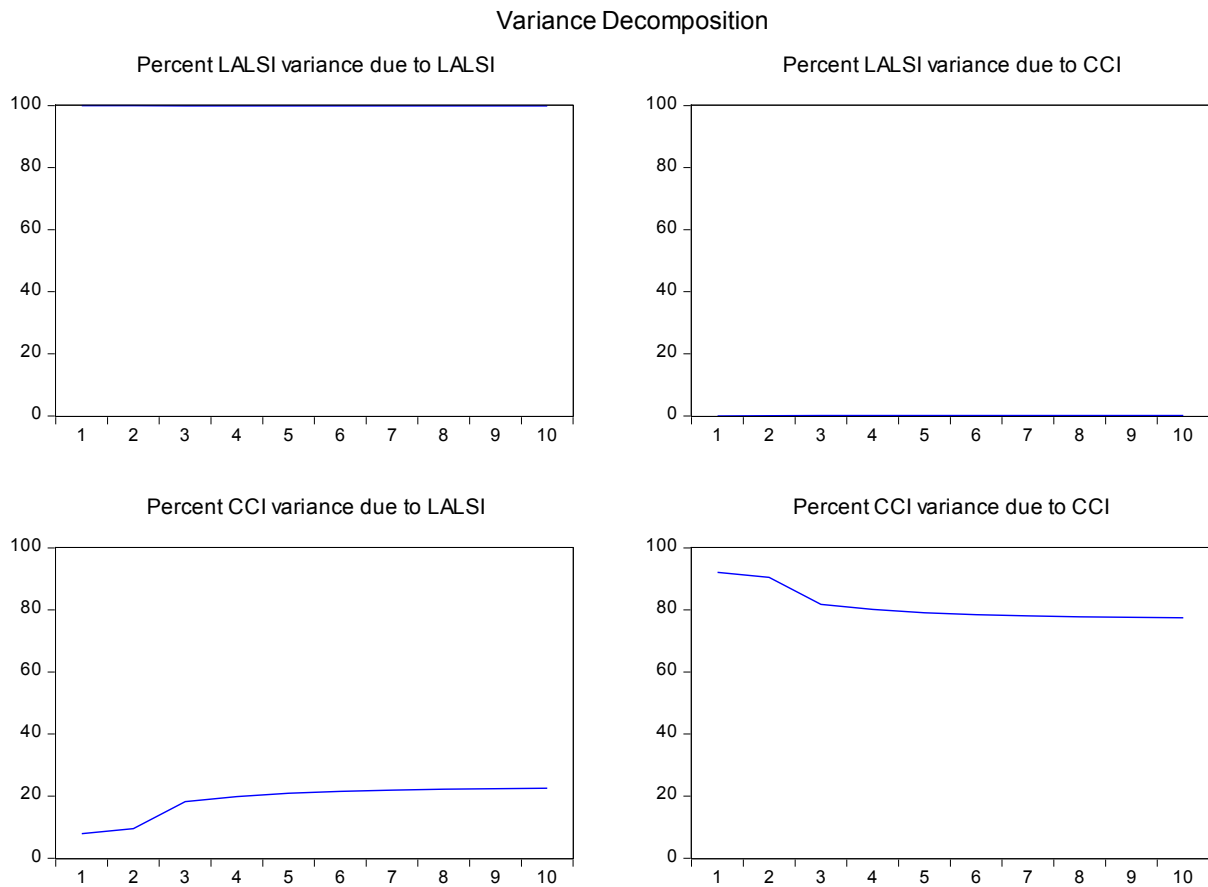


Regarding the CCI, the impulse response functions indicate persistence in its responses to ‘own’ shocks and to those of the LALSI. In both cases the CCI responds positively and sharply to shocks of the LALSI, but fails to revert to equilibrium even after 12 quarters after the shock occurred. Therefore it can be concluded that the CCI series is unstable due to the fact that the effects of the shock die away only gradually.

## 5.6. VARIANCE DECOMPOSITION ANALYSIS

In order to determine the proportion of variation in the LALSI explained by variations in itself and the CCI, variance decompositions were estimated. Figure 5.2 presents the graphical results of the variance decompositions and Section E of the appendix displays the estimated values for 10 quarters ahead.

Figure 5.4: Variance Decompositions



As can be seen from the first graph, the FTSE/JSE All Share Index explains 100% of its own variations throughout the 10 quarters analysed. Subsequently, the Consumer Confidence Index accounts for just over 0% of the variation in the ALSI over the same period. Viewing the impact of shocks to the LALSI on the CCI, the LALSI becomes increasingly important after 3 quarters in explaining the variation in the CCI, steadily growing over time and peaking at 23% in the 10th quarter. Observing the final graph, the CCI explains roughly 90% of its own variations in quarter one before other macroeconomic variables, including the All Share Index, start to explain an increasingly larger portion of the variation. These findings support those of the regression analysis in which a positive relationship between the two series was established, with the consumer confidence index able to account for only a small fraction of the variation in share returns.

## 5.7. CONCLUSION

This chapter presented evidence of the relationship between the returns of the all share index and the consumer confidence index. The first section of the chapter involved determining the stationarity of the series under investigation. The initial tests indicated that the All Share Index was only stationary at first differences and therefore a manipulation, in the form of differencing, was conducted in order to render both series stationary on level terms. After determining the stationarity of the series, a regression analysis was conducted using All Share Index returns as the dependent variable in a 2 variable regression model. The regression results provided evidence that a statistically significant relationship existed between the returns of the all share index and contemporaneous and 3 period lagged values of the confidence index. This confirmed *apriori* expectations that consumer confidence does influence stock returns in South Africa. However, the results indicate that consumer confidence only accounts for a small portion of these returns, with other macroeconomic, political and social factors likely to explain the rest.

The Granger-causality tests helped confirm an anomaly in the literature as to which of these variables is the leading indicator. The results suggested that share returns Granger-cause changes in the consumer confidence index, a finding which contradicts our *apriori* expectations but supports the findings of other similar studies conducted in European and North American markets. The Impulse response functions and variance decompositions were conducted in the final two sections of the chapter. The results reaffirmed those of the regression analysis in that consumer confidence only accounts for a small portion of the variation in the returns of shares listed on the JSE. The results indicate that the returns of the All Share Index were better able to explain changes in the confidence index, as opposed to changes in consumer confidence explaining variation in share returns.

Having discussed the empirical results the next chapter now presents the summary, conclusions and suggested areas for further research

## **CHAPTER 6**

### **SUMMARY, CONCLUSIONS AND AREAS FOR FURTHER RESEARCH**

#### **6.1. SUMMARY AND CONCLUSIONS**

This study set out to investigate the relationship between consumer confidence, acting as a proxy for investor sentiment, and share prices in South Africa. The study was motivated by the need to supplement existing research on the factors which determine the prices of shares listed on the JSE, and to add to the inconclusive link between sentiment and share prices in South Africa. Numerous studies documenting the link between sentiment and share prices have taken place within Europe and the United States, but very little has been conducted with regards to African nations. Following this scant evidence, the study set 2 key objectives. The first included determining whether consumer confidence influences share prices on the JSE, or whether it is share prices which influence consumer confidence. The second objective included determining whether the FNB/BER Consumer Confidence Index was a good proxy for the sentiment of investors in the JSE.

Chapter 2 of the study included a theoretical and empirical review of classical financial theories and traditional asset pricing models. This was conducted to provide an understanding of how the field of finance has evolved from focusing solely on risk and return to incorporating human psychology. In this chapter, the foundations of financial theory in the form of Modern Portfolio Theory (MPT) and the Efficient Market Hypothesis (EMH) were discussed to provide an understanding of how investors and markets are said to operate. The Present Value Model, developed Smith (1925) was discussed as this provided the foundation of all asset pricing models through the simple concept of price being equal to the discounted value of expected payoffs. In addition, factor pricing models such as the Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT) were discussed in order to observe how risk is incorporated in the pricing of assets. Together with the various assumptions in which these theories and models are based, the empirical review provided motivation to explore alternative theories of asset pricing. Despite initially enjoying much empirical support, subsequent studies have disputed the central claims of the EMH and the CAPM in particular.

Due to the theoretical and empirical weaknesses of traditional finance theory, a new school of thought began to emerge which placed a greater emphasis on the psychological aspect of investing. Chapter 3 then included a theoretical and empirical review of the field of Behavioural Finance and focused on the two foundations on which it is built; practical limits to arbitrage and investor sentiment. With regards to the former, theories as to why arbitrage is not easily implemented, along with empirical evidence documenting this, were provided. In terms of investor sentiment, several cognitive biases including herding and representativeness were discussed with respect to asset bubbles. The empirical review of Behavioural Finance then discussed the numerous studies which have sought to establish a link between investor sentiment and financial markets. A wealth of literature is available which has documented the importance of how investor sentiment, measured in various ways, has affected the prediction of returns.

A case was thus presented to consider investor sentiment as a variable, with potentially significant explanatory power, in the pricing of assets. What became clear however was the lack of research into this relationship with regard to developing countries and this necessitated a study, focusing on South Africa, being undertaken in order to have this question answered. The study also sought to examine a common anomaly in the literature; whether it was sentiment which was affecting share prices or if the opposite was taking place.

After determining the stationarity of the series through use of the ADF unit root test and the KPSS test for stationarity, a regression analysis was then conducted to determine the dependence between investor sentiment and share prices in South Africa. A 2 variable regression model was estimated using returns of the FTSE/JSE All Share Index as the dependent variable and various combinations of lags of the FNB/BER Consumer Confidence Index which acted as the independent variable. After determining the most appropriate regression model on the basis of goodness of fit and the AIC and SIC statistics, the regression results provided evidence that a statistically significant relationship existed between the returns of the all share index and contemporaneous and 3 period lagged values of the confidence index. This confirmed *apriori* expectations that consumer confidence does influence stock returns in South Africa. However, despite being dependent, the results indicated that consumer confidence only accounted for 15% of the variation in returns.

With regard to studies which involve consumer confidence indices as a proxy for sentiment, the literature suffers from ambiguity in whether such indices are a leading indicator of share

prices or vice versa. There seems little doubt that these two variables are related. What is unclear, however, is whether equity prices rise as a result of a boost in confidence, or whether this boost in consumer confidence leads to increased demand for equity. The Granger-causality tests conducted suggested that share returns Granger-cause changes in consumer confidence, a finding which contradicts the *a priori* expectations but supports the findings of other similar studies conducted in European and North American markets. This suggested that South African consumers adjust their outlook on the economy only following a change in the state of the JSE and not beforehand as expected.

Impulse response functions were then conducted in order to determine the extent to which shocks in the All Share Index were due to that of its own and to the Consumer Confidence Index. The results confirmed the findings of the regression analysis; consumer confidence does have an influence on share returns, however this is only marginal. In fact, the results indicated that share returns account for a much larger portion of the variance in consumer confidence.

Variance decompositions were then conducted in order to determine the extent to which the variance in the all share index returns were due to changes in the consumer confidence index. The results confirmed the findings of the regression analysis; consumer confidence does have an influence over share returns, however this is only marginal. In fact, the results indicated that share returns account for a much larger portion of the variance in consumer confidence.

Overall the results of the study show that investor sentiment, measured through a consumer confidence index, is related to returns of shares listed on the JSE. However, the influence of consumer confidence on share returns is only slight, with returns actually found to have a greater influence over confidence. In addition, through use of Granger-causality, tests it can be concluded that share returns are in fact the leading indicator in South Africa.

## **6.2. AREAS FOR FURTHER RESEARCH**

Given the relative importance of foreign investment in the SA financial markets, an additional variable could be included to capture the sentiment of foreign investors in the South African financial markets. According to Strate (2012), of the R4.75 Trillion worth of dematerialised shares listed on the JSE, 32% is held by non-residents. This variable would therefore need to capture the sentiment of investors based outside of South Africa, and in so

doing ensure the sentiment of all investors in South Africa's financial markets is accounted for.

In addition, a possible area in which the study may be improved upon involves the frequency of data utilised. The FNB/BER Consumer Confidence Index is published quarterly, which means a single value is used to represent an entire quarters worth of sentiment. This fails to accurately capture important changes in sentiment which occur throughout the quarter and their effect on share prices. Investors are likely to experience waves of sentiment and their effects are likely to be felt immediately on the JSE. Such effects are lost when using quarterly data. A method of bypassing this problem involves constructing a measure of investor sentiment and several such examples exist in the literature.

## APPENDIX

### STATISTICAL AND MODEL FITTING RESULTS

**KEY:**

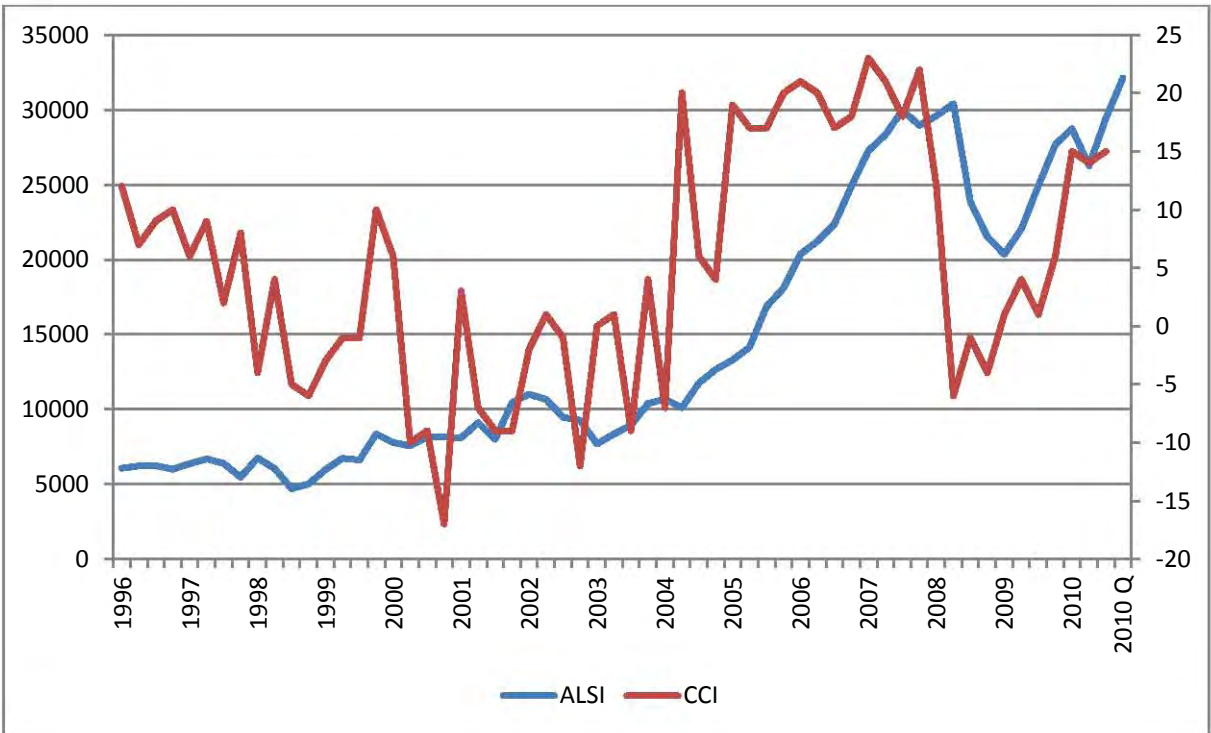
Significance denoted at 1%, 5%, 10% by (\*),(\*\*),(\*\*\*) respectively.

Unless otherwise stated all tables and figures are drawn from the data set.

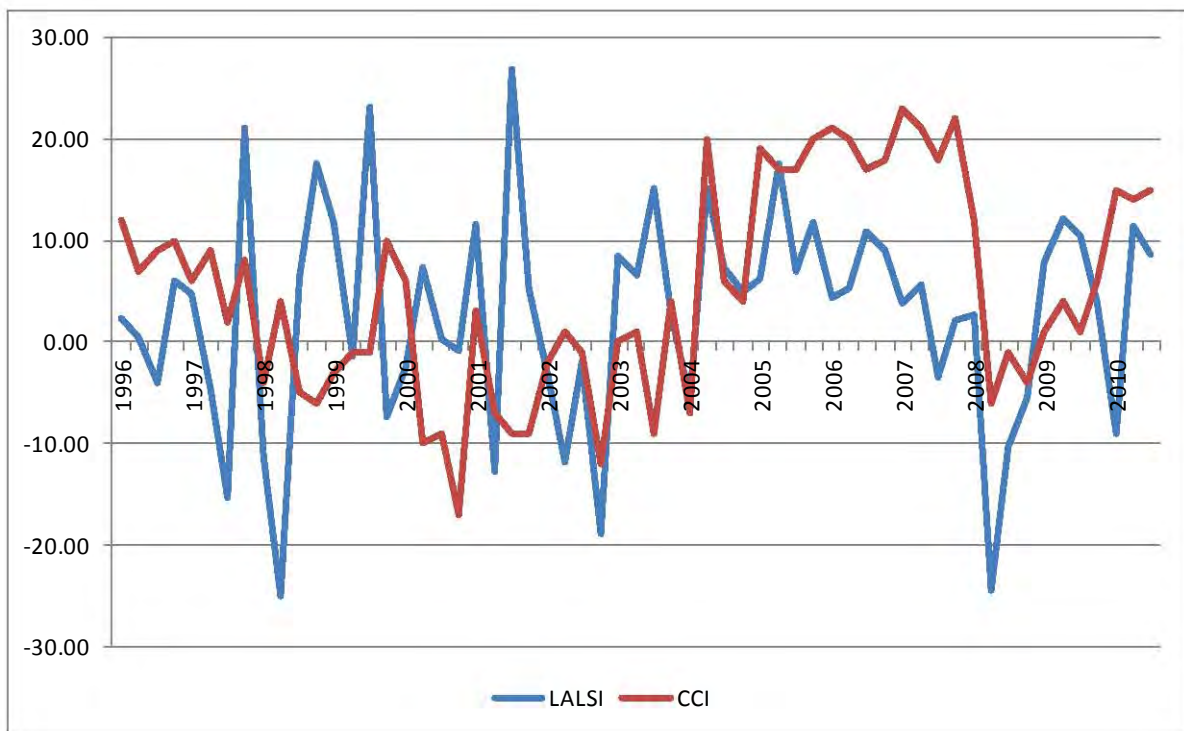
<b>SECTION A: STATIONARITY and UNIT ROOT TESTS</b>			
ADF (H: 0 ~ Unit Root) Critical Values: 1% (-4.121303), 5% (-3.487845), 10% (-3.172314) KPSS (H: 0 ~ Stationary) Critical Values: 1% (0.216), 5% (0.146), 10% (0.119)			
1996 Q1- 2010Q4			
Variable	Test	Level of Integration	t-statistic
ALSI	ADF	Level	-2.188
		1 <sup>st</sup> Diff	-5.803*
	KPSS	Level	0.169*
		1 <sup>st</sup> Diff	0.051*
CCI	ADF	Level	-3.728**
		1 <sup>st</sup> Diff	-11.804*
	KPSS	Level	0.116*
		1 <sup>st</sup> Diff	0.084*
1996 Q1- 2010Q3			
Variable	Test	Level of Integration	t-statistic
LALSI	ADF	Level	-7.329*
	KPSS	1 <sup>st</sup> Diff	0.060*
CCI	ADF	Level	-3.728**
	KPSS	1 <sup>st</sup> Diff	0.118*

## SECTION B: VISUAL ANALYSIS OF THE CONSUMER CONFIDENCE and THE ALL SHARE INDEX OVER TIME

Part A



Part B



## SECTION C: REGRESSION ANALYSIS

Dependent Variable	Model	Coefficients					Descriptive Statistics				
		Constant	Contemporaneous	Lag 1	Lag 2	Lag 3	R <sup>2</sup>	Adjusted R <sup>2</sup>	AIC	SIC	DW
LALSI	1	1.803	0.201				0.037	0.021	7.593	7.663	1.971
	2	2.185	0.356	-0.229			0.064	0.030	7.618	7.724	1.992
	3	2.291	0.381	-0.188	-0.083		0.067	0.014	7.668	7.812	2.024
	4	2.800	0.406	-0.067	0.119	-0.439**	0.154	0.088	7.618	7.800	2.036
	5	2.14	0.303***		-0.160		0.052	0.017	7.648	7.756	2.066
	6	2.829***	0.419*			-0.408*	0.148	0.116	7.554	7.596	2.044
	7	2.767***		0.013			0.000	-0.018	7.649	7.720	1.969
	8	2.736		-0.010	0.039		0.001	-0.036	7.700	7.809	1.945

## SECTION D: CAUSALITY ANALYSIS

Model	Lag	Null Hypothesis	Probability	Causal Inference
1	1	LALSI does not Granger Cause CCI	0.9568	Accept $H_0$
		CCI does not Granger Cause LALSI	0.9413	Accept $H_0$
2	2	LALSI does not Granger Cause CCI	0.1871	Accept $H_0$
		CCI does not Granger Cause LALSI	0.9516	Accept $H_0$
3	3	LALSI does not Granger Cause CCI	0.0742**	Reject $H_0$
		CCI does not Granger Cause LALSI	0.1835	Accept $H_0$
4	4	LALSI does not Granger Cause CCI	0.1257	Accept $H_0$
		CCI does not Granger Cause LALSI	0.3007	Accept $H_0$

## SECTION E: VARIANCE DECOMPOSITIONS

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### Variance Decomposition of

#### LALSI

Period	S.E.	ALSI	CCI
1	11.27245	100.0000	0.000000
2	11.27239	99.98976	0.010235
3	11.30046	99.89913	0.100867
4	11.30127	99.88494	0.115059
5	11.30374	99.87053	0.129469
6	11.30445	99.86287	0.137132
7	11.30497	99.85648	0.143519
8	11.30532	99.85243	0.147571
9	11.30557	99.84957	0.150435
10	11.30574	99.85763	0.152368
11	11.30585	99.84629	0.153706
12	11.30593	99.84538	0.154620

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### Variance Decomposition of

#### CCI

Period	S.E.	ALSI	CCI
1	7.339525	7.893575	92.10643
2	8.123886	9.480740	90.51926
3	9.403665	18.20295	81.79705
4	9.916989	19.81667	80.18333
5	10.31077	20.92523	79.07477
6	10.55320	21.52106	78.47894
7	10.72400	21.94559	78.05441
8	10.83722	22.20867	77.79133
9	10.91494	22.38583	77.61417
10	10.96771	22.50341	77.49659
11	11.00386	22.58323	77.41677
12	11.02856	22.63726	77.36274

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## LIST OF REFERENCES

- ACHARYA, V.V., LOCHSTOER, L.A. and RAMADORAI, T., 2011. Limits to Arbitrage and Hedging: Evidence from Commodity Markets. *EFA 2009 Bergen Meetings Paper, AFA 2010 Atlanta Meetings Paper*.
- AFRICAN ECONOMIC OUTLOOK, 2011. *Portfolio Investment*. [Online]. Available: <http://www.africaneconomicoutlook.org/en/outlook/external-financial-flows/portfolio-investment/> [Accessed 13 February 2012].
- ALEXANDER, G. and SHARPE, W., 1990. *Investments* (4e). In SHLEIFER, A. and VISHNY, R.W., 1995. The Limits of Arbitrage. *National Bureau of Economic Research Working Paper Series* 5167.
- ALIBER, R.Z. and KINDLEBERGER, C.P., 2005. *Manias, Panics and Crashes: A History of Financial Crises*. New Jersey: John Wiley & Sons Inc. 9.
- AVARD, S.L., NAM, K. and PYUN, C.S., 2001. Asymmetric reverting behavior of short-horizon stock returns: An evidence of stock market overreaction. *Journal of Banking & Finance* 25 (4): 807-824.
- BAKER, M. and WURGLER, J., 2006. Investor Sentiment and the Cross-Section of Stock Returns. *The Journal of Finance* 61 (4). 1645.
- BAKER, M. and WURGLER, J., 2007. Investor Sentiment in the Stock Market. *National Bureau of Economic Research Working Paper Series*. 1 – 28.
- BALL, R. and BROWN, P., 1968. An Empirical Evaluation of Accounting Income Numbers. *Journal of Accounting Research* 6 (2): 159-178.
- BALL, R., 1978. Anomalies in Relationships Between Securities' yields and yield surrogates. *Journal of Financial Economics* 6 (3): 103-126.
- BANDOPADHYAYA, A. and JONES, A. L., 2005. Measuring Investor Sentiment in Equity Markets. *University of Massachusetts Boston Working Paper 1007*.
- BANDOPADHYAYA, A. and JONES, A. L., 2008. Measures Of Investor Sentiment: A Comparative Analysis, Put-Call Ratio vs. Volatility Index. *Journal of Business & Economic Research* 6 (8): 27-34.
- BANERJEE, A.V., 1992. A Simple Model of Herd Behavior. *The Quarterly Journal of Economics* 107 (3): 797.
- BANZ, R.W., 1981. The relation between return and market value of common stocks. *Journal of Financial Economics* 9: 3-18.
- BARBER, B.M. and ODEAN, T., 2001. Boys will be Boys: Gender, Overconfidence and Common Stock Investment. *The Quarterly Journal of Economics*: 261-292.

- BARBER, B.M., ODEAN, T. and ZHU, N., 2006. Do Noise Traders Move Markets? *EFA 2006 Zurich Meetings Paper*: 1-45.
- BARBERIS, N., SHLEIFER, A. and VISHNAY, R., 1998. A Model of Investor Sentiment. *Journal of Financial Economics* 49 (3): 307-343.
- BASU, S., 1977. Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis. *The Journal of Finance* 32 (3): 663-682.
- BECKMAN, J., BELKE, J. and KÜHL, M., 2009. Global Integration of Central and Eastern European Financial Markets –The Role of Economic Sentiments. *German Institute for Economic Research Discussion Paper* 952.
- BERNARD, V. and THOMAS, J., 1989. Post-earnings announcement drift: delayed price response or risk premium? *Journal of Accounting Research, Supplement* 27: 1-36.
- BHANA, N., 1994. Public Holiday share price behaviour on the Johannesburg Stock Exchange. *Investment Analysts Journal* No. 39: 45-49.
- BHANDARI, L.C., 1988. Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence. *Journal of Finance* 43 (2): 507-528.
- BIAIS, B., HILTON, D., MAZURIER, K. and POUGET, S., 2004. Judgmental Overconfidence, Self-Monitoring, and Trading Performance in an Experimental Financial Market. *Review of Economic Studies* 72 (2): 287-312.
- BLACK, F., 1972. Capital Market Equilibrium with Restricted Borrowing. *The Journal of Business* 45 (3): 444-455.
- BLACK, F., 1986. Noise. *Journal of Finance* 41 (3).
- BLACK, F., JENSEN, M.C. and SCHOLES, M.S., 1972. *The Capital Asset Pricing Model: Some Empirical Tests*. Studies in the Theories of Capital Markets. New York: Praeger Publishers.
- BLOOMFIELD, R. and HAYES, J., 2002. Predicting the next step of a random walk: experimental evidence of regime-shifting beliefs. *Journal of Financial Economics*: 1-27.
- BLUME, M.E. and FRIEND, I., 1973. A New Look at the Capital Asset Pricing Model. *The Journal of Finance* 28 (1): 19-33.
- BOWEN, P.A., 1984. A hypothesis: Portfolio theory is elegant but useless. *The Investment Analysts Journal*, 11: 16 – 21.
- BRADFIELD, D.J., 1990. A note on the seasonality of stock returns on the Johannesburg Stock Exchange. *South African of Business Management* 21 (1): 7-9.

- BRAM, J. and LUDVIGSON, S., 1998. Does Consumer Confidence Forecast Household Expenditure? A Sentiment Index Horse Race. Federal Reserve Bank of New York. 2.
- BRANCH, B., 1976. The Predictive Power of Stock Market Indicators. *The Journal of Financial and Quantitative Analysis* 11 (2): 269-285.
- BREEDEN, D.T., 1979. An Intertemporal Capital Asset Pricing Model with Stochastic Consumption and Investment Opportunities. *Journal of Financial Economics* 7:265-296.
- BREMMER, D.S. and CHRIST, K.P., 2003. *The Relationship Between Consumer Sentiment and Stock Prices*. Unpublished Report for the 78th Annual Conference of the Western Economics Association International. Colorado: Rose-Hulman Institute of Technology.
- BROOKS, C., 2008. *Introductory Econometrics for Finance* (2e). New York, Cambridge University Press.
- BROWN, N.C., WEI, K.D. and WERMERS, R., 2008. Analyst Recommendations, Mutual Fund Herding, and Overreaction in Stock Prices. *Working Paper Series*. 1-45.
- BROWN, N.C., WEI, K.D. and WERMERS, R., 2012. Analyst Recommendations, Mutual Fund Herding, and Overreaction in Stock Prices. *AFA 2010 Atlanta Meetings Paper*.
- BRUGGEMANS, C., 2012. *Consumer confidence deteriorates significantly during 2Q2012*. First National Bank. [Online]. Available: <http://www.ber.ac.za/FNBBERBCI/2025.aspx>. [Accessed 31 July 2012].
- BULOW, J. and KLEMPERER, P., 1994. Rational Frenzies and crashes. *Journal of Political Economy* 102 (1). 1-23.
- BUREAU FOR ECONOMIC RESEARCH, 2012. FNB/BER Consumer Confidence Index: Historical Data. *Bureau for Economic Research*. Stellenbosch. [Online]. Available: <http://www.ber.ac.za/FNBBERBCI/2025.aspx>. [Accessed 7 April 2012].
- CAMPBELL, J.Y., LO, A.W. and MACKINLAY, A.C., 1997. *The Econometrics of Financial Markets*. New Jersey: Princeton University Press. In BEECHEY, M., GRUEN, D., and VICKERY, J., 2000. The Efficient Market Hypothesis: A Survey. *Reserve Bank of Australia Research Discussion Paper* 2000-01: 5.
- CAPPAUL, C., ROWLEY, I., and SHARPE, W.F., 1993. International Value and Growth Stock Returns. *Financial Analysts Journal* 49: 27-36.
- CHAN, K., HWANG, C.Y. and MIAN, G.M., 2005. Mutual Fund Herding and Dispersion of Analysts' Earnings Forecasts. *Working Paper Series*.
- CHAN, L., JEGADEESH, N. and LAKONISHOK, J., 1997. Momentum strategies. *Journal of Finance* 51: 1681-1713.

- CHAN, L.K.C., HAMAQ, Y. and LAKONISHOK, Y., 1991. Fundamentals and Stock Returns in Japan. *Journal of Finance* 46 (5): 1739-1764.
- CHAN, W.S., FRANKEL, R.M. and KOTHARI, S.P., 2003. Testing Behavioural Finance Theories Using Trends and Sequences in Financial Performance. *MIT Sloan School of Management Working Paper Series* 4375-02: 1-42.
- CHAROENROOK, A., 2003. Does Sentiment Matter? *Working Paper, Vanderbilt University*.
- CHEN, N., 1983. Some Empirical Tests of the Theory of Arbitrage. *The Journal of Finance* 38 (5).
- CHOI, N. and SIAS, R.W., 2008. Institutional Industry Herding. *Working Paper Series*.
- CHRISTOFFERSON, S. and TANG, Y., 2010. Institutional Herding and Information Cascades: Evidence from daily trades. *Working Paper Series*.
- COCHRANE, J.H., 2000. *Asset Pricing*. Princeton, Princeton University Press.
- CUTLER, D., POTERBA, J. and SUMMERS, L., 1991. Speculative dynamics. *Review of Economic Studies* 58: 529-546.
- DANIEL, K., GRINBLATT, M., TITMAN, S. and WERMERS, R., 1997. Measuring Mutual Fund Performance with Characteristic-Based Benchmarks. *The Journal of Finance* 52 (3).
- DANIEL, K., HIRSHLEIFER, D. and SUBRAHMANYAM, A., 1997. A Theory of Overconfidence, Self-Attribution, and Security Market Under- and Over-reactions. *The Journal of Finance* 53 (6): 1839-1885.
- DE BONDT, W.F.M. and THALER, R., 1985. Does the Stock Market Overreact? *The Journal of Finance* 40 (3).
- DEAVES, R., LÜDERS, E. and SHRÖDER, M., 2005. The Dynamics of Overconfidence: Evidence from Stock Market Forecasters. *Centre for European Economic Research Working Paper*.
- DENNIS, P. and MAYHEW, S., 2002. Risk-Neutral Skewness: Evidence from Stock Options. *Journal of Financial & Quantitative Analysis* 37(3): 471-493.
- DEVANOW, A. and WELCH, I., 1996. Rational Herding in Financial Economics. *European Economic Review* 40: 606.
- DOUGLAS, G.W., 1969. Risk in the Equity Markets: An Empirical Appraisal of Market Efficiency. *Yale Economic Essays* 9 (1): 3-45.
- DUAN, Y., HU, G. and MCLEAN, R.D., 2010. Costly arbitrage and idiosyncratic risk: Evidence from short sellers. *Journal of Financial Intermediation* 19.

- EDMANS, A., GARCIA, D. and NORLI, Ø., 2007. Sports Sentiment and Stock Returns. *The Journal of Finance* 62 (4): 1967-1998.
- EDWARDS, W., 1968. Conservatism in human information processing, In KLEINMUNTZ, B., *Formal Representation of Human Judgment*. New York: Wiley.
- ELLIS, C.D., 1995. The Loser's Game. *Financial Analysts Journal* 1995.
- ENDERS, W., 2004. *Applied Econometrics Time Series* (2e). United States of America: John Wiley and Sons.
- ENGLE, R.F. and GRANGER, C.W.J., 1987. Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica* 55 (2).
- FAIR, R.C., 1971. Consumer Sentiment, The Stock Market, and Consumption Functions. *Econometric Research Program Research Memorandum No.119*: 1-18.
- FAMA, E.F. and FRENCH, K.R., 1988. Permanent and Temporary Components of Stock Prices. *Journal of Political Economy* 96 (2): 246-273.
- FAMA, E.F. and FRENCH, K.R., 1992. The Cross-Section Expected Stock Returns. *Journal of Finance* 47 (2): 427-465.
- FAMA, E.F. and FRENCH, K.R., 1996. Multifactor Explanations of Asset Pricing Anomalies. *Journal of Finance* 51 (1): 55-84.
- FAMA, E.F. and FRENCH, K.R., 2004. The Capital Asset Pricing Model: Theory and Evidence. *The Journal of Economic Perspectives* 18 (3): 6-30.
- FAMA, E.F. and MACBETH, J.D., 1973. Risk, Return and Equilibrium: Empirical Tests. *The Journal of Political Economy* 81 (3): 607-636.
- FAMA, E.F., 1970. Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance* 25 (2): 388.
- FERSON, W.E. and HARVEY, C.R., 1993. The risk and predictability of international equity returns. *The Review of Financial Studies* 6 (3).
- FISHER, K.L. and STATMAN, M., 2003. Consumer Confidence and Stock Returns. *The Journal of Portfolio Management* 30(1): 116.
- FLEMING, J., OSTDIEK, B. and WHALEY, R.E., 1995. Predicting Stock Market Volatility: A New Measure. *The Journal of Futures Markets* 15 (3): 265-302.
- FORBES, W., 2009. *Behavioural Finance*. Chichester, United Kingdom: John Wiley & Sons.
- FRIEND, I. and ADAMS, F.G., 1964. The Predictive Ability of Consumer Attitudes, Stock Prices, and Non-Attitudinal Variables. *Journal of the American Statistical Association* 59 (308): 987-1005.

- GABAIX, X., KRISHNAMURTHY, A. and VIGNERON, O., 2005. Limits of Arbitrage: Theory and Evidence from the Mortgage-Backed Securities Market. *The Journal of Finance* 62 (2).
- GALAI, D., 1978. Empirical Tests of Boundary Conditions for CBOE Options. *Journal of Financial Economics* 6 (3). 187-211.
- GIOT, P., 2005. Relationships Between Implied Volatility Indexes and Stock Index Returns. *The Journal of Portfolio Management* 31 (3): 92-100.
- GORDON, M.J., 1962. *The investment, financing and valuation of the corporation*. Homewood Ill., Irwin copyright.
- GORDON, M.J. and SHAPIRO, E., 1956. Capital Equipment Analysis: The Required Rate of Profit. *Management Science* 3 (1).
- GRINBLATT, M., TITMAN, S. and WERNERS, R., 1995. Momentum Investment Strategies, Portfolio Performance and Herding: A Study of Mutual Fund Behavior. *American Economic Review* 85: 1088–1105.
- GUJARATI, D.M., 2004. *Basic Econometrics* (4e). New York, McGraw-Hill.
- HONG, H., LIM, T. and STEIN, J.C., 1998. Bad News Travels Slowly: Size, Analyst Coverage and the Profitability of Momentum Strategies. *NBER Working Paper* 6553: 1-57.
- HOWELLS, P. and BAIN, K., 2005. *The Economics of Money, Banking and Finance* (3e). London: Pearson Education Limited.
- HOWELLS, P. and BAIN, K., 2008. *The Economics of Money, Banking and Finance* (4e). London: Pearson Education Limited.
- HSIEH, H.H., and HODNETT, K., 2011. Tests of the Overreaction Hypothesis and the Timing of Mean Reversals on the JSE Securities Exchange (JSE): the Case of South Africa. *International Scientific Press* 1 (1).
- HUANG, R.D., 1981. The Monetary Approach to Exchange Rate in an Efficient Foreign Exchange Market: Tests Based on Volatility. *The Journal of Finance* 36 (1): 31-41.
- HUBERMAN, G. and WANG, Z., 2005. Arbitrage Pricing Theory. *Federal Reserve Bank of New York Staff Reports* 216. 1
- INTERNATIONAL MONETARY FUND, 2011. *Table 8: Geographic Breakdown of Total Portfolio Investment Assets: Total Portfolio Investment*. [Online]. Available: <http://elibrary-data.imf.org/Report.aspx?Report=9492645> . [Accessed 13 February
- JANSEN, W.J. and NAHUIS, N.J., 2003. The stock market and consumer confidence: European evidence. *Economics Letters* 79: 89 – 98.

- JEGADEESH, N. and TITMAN, S., 1993. Returns to buying winners and selling losers: implications for stock market efficiency. *Journal of Finance* 48: 65-91.
- JENSEN, M.C., 1978. Some Anomalous Evidence Regarding Market Efficiency. *Journal of Financial Economics* 6 (3): 4.
- KAMSTRA, M.J., KRAMER, L.A. and LEVI, M.D., 2003. Winter Blues: A SAD Stock Market Cycle. *The American Economic Review* 33 (1).
- KAPLAN, P.D., 1998. Asset Allocation Models Using the Markowitz Approach. [Online]. Available: <http://corporate.morningstar.com/CA/documents/MethodologyDocuments/IBBAssociates/MarkowitzApproach.pdf>. Corporate Morningstar. [Accessed 11 July 2012].
- KERSHOFF, G., 2000. *Measuring Business and Consumer Confidence in South Africa*. [Online]. Available: [www.ber.ac.za/Knowledge/pkDownloadDocument.aspx?docid=4128](http://www.ber.ac.za/Knowledge/pkDownloadDocument.aspx?docid=4128). Bureau for Economic Research. [Accessed 1 September 2011].
- KEYNES, J.M., 1936. *The state of long-term expectation. The General Theory of Employment, Interest and Money Vol. 7*. London: Macmillan: 147–164.
- KINDLEBERGER, C.P., 1989. *Manias, panics and crashes: A history of financial crises* (3e). New York: John Wiley and Sons. In DEVANOW, A., and WELCH, I., 1996. Rational Herding in Financial Economics. *European Economic Review* 40.
- KROLL, Y., LEVY, H. and MARKOWITZ, H.M., 1984. Mean-Variance versus Direct Utility Maximisation. *The Journal of Finance* 39 (1): 47-61.
- KUMAR, M.C.D., 2010. Empirical Evidence on Weak Form Efficiency of the Indian Stock Market. *ASBM Journal of Management* 3 (1): 98.
- LASHGARI, M., 2000. The role of TED Spread and Confidence Index in explaining the behaviour of stock prices. *American Business Review* 18 (2): 9-11.
- LEMMON, M. and PORTNIAGUINA, E., 2006. Consumer Confidence and Asset Prices: Some Empirical Evidence. *The Review of Financial Studies* 19 (4).
- LEROY, S.F. and PORTER, R.D., 1981. The present value relation: Tests based on implied variance bounds. *Econometrica* 49: 555-574.
- LINTNER, J., 1965. Security Prices, Risk, and Maximal Gains from Diversification. *The Journal of Finance* 20 (4): 587-615.
- LINTNER, J., 1965. The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics* 47 (1).
- MACDONALD, R. and MURPHY, P.D., 1989. Testing for the long run relationship between nominal interest rates and inflation using cointegration techniques. *Applied Economics* 21 (4): 439-447.

- MACKAY, C., 1841. *Extraordinary popular delusions and the madness of crowds*. New York: Farrar, Straus and Giroux. In DEVANOW, A., and WELCH, I., 1996. Rational Herding in Financial Economics. *European Economic Review* 40.
- MALKIEL, B.G., 2003. The Efficient Market Hypothesis and Its Critics. *The journal of economic perspectives* 17 (1): 59.
- MANKIW, N.G., ROMER, D. and SHAPIRO, M.D., 1985. An unbiased Re-examination of Stock Market Volatility. *The Journal of Finance* 40 (3): 677-687.
- MARKOWITZ, H.M., 1952. Portfolio Selection. *The Journal of Finance* 7 (1): 77-91.
- MARKOWITZ, H.M., 1991. Foundations of Portfolio Theory. *The Journal of Finance* 46 (2): 469-477.
- MEESE, R. and SINGLETON, K., (1980). Rational Expectations and the Volatility of Floating Exchange Rates. *Board of Governors of the Federal Reserve Working Paper*.
- MERTON, R.C., 1973. An Intertemporal Capital Asset Pricing Model. *Econometrica* 41 (5): 867-887.
- MOOLMAN, E. and DU TOIT, C., 2005. An Econometric Model of the South African Stock Market. *South African Journal of Economic and Management Sciences* 8 (1): 81 - 88.
- MORCK, R., SHLEIFER, A. and VISHNY, R.W., 1990. The Stock Market and Investment: Is the Market a Slideshow? *Brookings Papers on Economic Activity* 2: 157-202.
- MULLER, C., 1999. Investor Overreaction on the Johannesburg Stock Exchange. *Investment Analysts Journal* 49: 4-49.
- NAHUIS, N.J., 2000. Are Survey Indicators Useful for Monitoring Consumption Growth: Evidence from European Countries. *MEB Series (discontinued), Monetary and Economic Policy Department, Netherlands Central Bank*.
- OBERUC, R.E., 2011. *Dynamic portfolio theory and management: using active asset allocation to improve profits and reduce risk*. USA: McGraw-Hill.
- OTOO, M.W., 1999. Consumer Sentiment and the Stock Market. *Finance and Economics Discussion Paper 1999-60 (November), Federal Reserve Board, Washington, D.C.*
- PAGE, M.J. and WAY, C.V., 1993. Stock Market Overreaction: The South African Evidence. *Investment Analysts Journal*.
- PERSAUD, A., 1996. Investors' Changing Appetite for Risk. *J.P Morgan Securities Ltd, Global FX Research*.
- PESARAN, H.M. and TIMMERMANN, A., 1995. Predictability of Stock Returns: Robustness and Economic Significance. *The Journal of Finance* 50 (4).

- POTERBA, J.M. and SAMWICK, A.A., 1995. Stock Ownership Patterns, Stock Market Fluctuations, and Consumption. *Brookings Papers on Economic Activity* 2: 295-357.
- POTERBA, J.M. and SUMMERS, L.H., 1988. Mean Reversion in Stock Returns: Evidence and Implications. *Journal of Financial Economics* 22(1):27-59.
- POWELL, B., 2011. *Gasoline Slips on Lower Consumer Confidence, Less U.S. Demand*. [Online]. Available: <http://www.businessweek.com/news/2011-09-29/gasoline-slips-on-lower-consumer-confidence-less-u-s-demand.html>. Bloomberg Businessweek. [Accessed 30 September 2011].
- PUCKETT, A. and YAN, X., 2007. Short-term Institutional Herding and Its Impact on Stock Prices. *Working Paper Series*.
- RANDALL, M.R., SUK, D.Y. and TULLY, S.W., 2003. Mutual Fund Cash Flows and Stock Market Performance. *Journal of Investing* 12 (1): 78-81.
- RITTER, J., 2003. Behavioral Finance. *Pacific-Basin Finance Journal* 11 (4). 2 - 9.
- ROLL, R. and ROSS, S.A., 1980. An Empirical Investigation of the Arbitrage Pricing Theory. *The Journal of Finance* 35 (5).
- ROSENBERG, B., REID, K. and LANSTEIN, R., 1985. Persuasive Evidence of Market Inefficiency. *Journal of Portfolio Management* 11 (3): 9-16.
- ROSS, S.A., 1976. The arbitrage theory of capital asset pricing. *Journal of Economic Theory* 13, 341-60.
- SCHMELING, M., 2009. Investor sentiment and stock returns: Some international evidence. *Journal of Empirical Finance* 16.
- SEWELL, M., 2010. Behavioural Finance. *University of Cambridge*. 1.
- SHARPE, W.F., 1964. Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance* 19 (3): 425-442.
- SHEFRIN, H., 2005. *A Behavioral Approach to Asset Pricing*. New York: Elsevier.
- SHILLER, R.J., 1979. The Volatility of Long-Term Interest Rates and Expectations Models of the Term Structure. *Journal of Political Economy* 87: 1190-1219.
- SHILLER, R.J., 1981. The Use of Volatility Measures in Assessing Market Efficiency. *The Journal of Finance* 36 (2). 297 - 298.
- SHLEIFER, A. and VISHNY, R.W., 1995. The Limits of Arbitrage. *National Bureau of Economic Research Working Paper* 5167.
- SIAS, R.W., 2004. Institutional Herding. *The Review of Financial Studies* 17 (1): 165-206.

- SIMON, D.P. and WILLIAMS, R.A., 2001. S&P Futures Returns and Contrary Sentiment Indicators. *Journal of Futures Markets* 21 (5): 447-462.
- SINGLETON, K., 1980. Expectations Models of the Term Structure and Implied Variance Bounds. *Journal of Political Economy* 88: 1159-1176.
- SMITH, A.A., 1993. Estimating Nonlinear Time-Series Models Using Simulated Vector Autoregressions. *Journal of Applied Econometrics* 8: S63-S84.
- SMITH, B.K., 2009. *Evaluating the Economic Impact of National Sporting Performance: Evidence from the Johannesburg Stock Exchange*. Research report presented in partial fulfillment of the requirements for the degree of Master of Business Administration at the University of Stellenbosch. Stellenbosch: University of Stellenbosch.
- SMITH, E.L. 1925. *Common stocks as long-term investments*. New York: Macmillan copyright.
- STATTMAN, D., 1980. Book values and stock returns. *The Chicago MBA: A Journal of selected papers* 4.
- SUBRAHMANYAM, A., 2007. Behavioural Finance: A Review and Synthesis. *European Financial Management* 14 (1): 12-29.
- SYCZEWSKA, E.M., 2010. Empirical power of the Kwiatkowski-Phillips-Schmidt-Shin test. *Working Papers 45, Department of Applied Econometrics, Warsaw School of Economics*: 4-5.
- THOMPSON, R., 1978. The Information Content of Discounts and Premiums on Closed end Fund Shares. *Journal of Financial Economics* 6 (3): 151-186.
- TIJJANI, B., 2009. An empirical investigation of the weak-form of the efficient market hypothesis for the Nigerian Stock exchange. *African Finance Journal* 11 (2): 23.
- TRUEMAN, B., 1994. Analyst forecasts and herding behaviour, *Review of Financial Studies* 7 (1). 97-124.
- WATTS, R.L., 1978. Systematic 'Abnormal' Returns After Quarterly Earnings Announcements. *Journal of Financial Economics* 6 (3): 127-150
- WERMERS, R., 1999. Mutual Fund Herding and the Impact on Stock Prices. *The Journal of Finance* 54 (2).
- WHALEY, R.E., 2000. The Investor Fear Gauge. *Journal of Portfolio Management* 26 (3).
- ZHANG, C., 2008. Defining, Modelling, and Measuring Investor Sentiment. *University of California, Berkeley*: 4 – 6.