



**An analysis of the effect of managerial overconfidence through corporate investments on
share price: Evidence from some FTSE/JSE TOP 40 index companies**

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Student number: 21557052

Submitted in partial fulfilment of the requirements for the degree of

Masters of Management Sciences

In

Business Administration

Department of Applied Management

Durban University of Technology

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May 2017

DECLARATION

I, Emmanuel Lawa, hereby declare that the work in this dissertation represents my own work and findings except where indicated, and that all references, to the best of my knowledge, are accurately reported. I also declare that this dissertation has not been submitted for a degree at any other university.

Emmanuel Lawa

Date

ACKNOWLEDGEMENTS

My first and foremost gratitude goes to the one and only Almighty God that I serve. Through the ups and downs of this piece of work and my life in general, He always held my hand and saw me through. I am also grateful to my supervisor Dr. Farai Kwenda who was patient and kind during the preparation of thesis. I pray and trust that God will bless him abundantly as he continues shaping minds. Special thanks go to my Dad Rev. Dr. Samuel Frousiou, my Mom Mame Marie-Claire Frouisou, and my siblings Nathalie Fida Lassang, Ezechiel Ngana Bayangsou, and Antoine Badi Mame. Without their moral, spiritual, and financial support, this work would not have been possible. I also thank Professor Ignatius Verla Nsahlai, Dr. Kwasi Sackey Yobo, and Dr. Bongani Innocent Dlamini for their time and advice. Special thanks go to my Aunties Joan and Brunhilda, who have always supported me. I also acknowledge Luther King Jnr Zogli, Martin Kabange Mulunda, Ernest Dalle Herve, Kuleza Phirri, Veritas Nsahlai, Vera Nsahlai, Elizabeth Nsahlai, Natalie Nsahlai, Abrans Nsahlai, and so many others who encouraged me and added value to my life in ways that mere words cannot explain. I pray that God rewards them all in His own special way.

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LIST OF ABBREVIATIONS

Capital asset pricing model (CAPM)

Chief Executive Officer (CEO)

Chief Financial Officer (CFO)

Classical least square model (CLRM)

Consumer Sentiments Index (CSI)

Dividend per share (DPS)

Earnings per share (EPS)

Economic Sentiments Index (ESI)

Efficient marker hypothesis (EMH)

Financial Times stock exchange (FTSE)

Fixed effects (FE)

Gross domestic product (GDP)

Johannesburg Stock Exchange (JSE)

Mergers and acquisitions (M&As)

Net asset value per share (NAVPS)

Net present value (NPV)

New York Stock Exchange (NYSE)

Ordinary least square (OLS)

Random effects (RE)

Variance-inflating factor (VIF)

Weighted least square (WLS)

ABSTRACT

The discipline of corporate finance has undergone numerous transformations over the past two-and-a-half decades. One such change has been in the area of corporate finance. Driven by certain behavioral biases, it has been observed that managers sometimes make subjective decisions that do not always follow the norms of traditional corporate finance. One such behavioral influence is overconfidence or optimism. There is a paucity of research on the impact that managerial overconfidence through corporate investments has on the general movement of a company's share price. This study bridges that gap by investigating the effect of managerial overconfidence on the share price of 10 companies from the JSE/FTSE top 40 index. Its main objective was to inspect the relationship between managerial overconfidence and share price. The results show the presence of managerial overconfidence observed through the investment-cash flow sensitivity of firms. The fixed effects panel regression reveals that Tobin's Q which is the proxy measure of the investment-cash flow sensitivity of a firm, does affect the share price. Holding every other explanatory variable constant, an increase in Tobin's Q causes the share price to rise, which leads to the conclusion that managerial overconfidence does have an influence on the stock price. It is further observed that managerial overconfidence tends to increase with firm size. This is shown by the weak positive correlation between the Q ratio and LnTA, and Q ratio and sales. In order to avoid the possible loss in value of a firm caused by an overconfidence manager, it is recommended that shareholders or owners ensure that the manager clearly understands the company's objectives and vision. Due to the resultant influence of managers' on the value of a company's stock, investors should not only look at a company's past performance, as well as the price earnings ratio (PE ratio), dividend yield, DPS, or any other market value ratios. They should also consider the characteristics of the CEO before making their investment decisions.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The discipline of corporate finance has undergone numerous transformations over the past two-and-a-half decades. Traditional finance paradigms such as rationality have been subject to debate. This paradigm posits that investors and managers amongst other stakeholders make decisions based on empirically testable profitable future expectations. In other words, individuals make decisions which should be of the most optimal benefit or utility to them. However, a rich body of research in economics, finance, and even psychology, has found evidence which suggests that managers are sometimes irrational, and that they make decisions subject to certain behavioral influences. One such influence is overconfidence or optimism. Simply put, overconfidence describes one's overestimation of an expected outcome based on the belief that one is above average, and so would be able to positively influence future outcomes. Some research results even suggest that overconfidence on the part of individuals has been one of the causes of world events such as economic crises, conflicts, and even wars (Scheinkman and Xiong, 2003; Johnson, 2004). This has resulted in increasing research that seeks to understand overconfidence, tracing its roots, and analyzing its effects in different contexts. While the results have been mixed, there is general consensus that overconfidence is an important concept that plays a pivotal role in disciplines like psychology, finance, and economics, and thus requires further investigation. This study investigates overconfidence in the context of the firm. More specifically, it explores the effect of managerial overconfidence on the share price of a firm.

Behavioral corporate finance emerged in response to research on the effect of behavioral biases. Lobão (2016) argues that traditional financial theory sometimes ignores the importance of the role

played by managers' personal characteristics in their decision-making processes. For example, the effect that a manager's confidence will have on the company's share value is not explained by orthodox financial theory. Because decisions in firms are made by a manager or managers, it is important to be aware of how managerial biases impact the value of a company.

The rest of the chapter presents a background to the study and the discussions that follow. It briefly introduces the concept of managerial overconfidence in the context of behavioral corporate finance, and examines its importance and influence in a firm's investment decisions. The remainder of the chapter is divided into seven sections. The following section provides a background of this study and explains its importance. This is followed by the research problem and the study's objectives, the context of the study, and a summary of the methodology employed. The last three sections emphasize the importance of the study, discuss its limitations, and provide an overview of the subsequent chapters.

1.2 Background of the study

The stock market is an important investment channel. Indeed, many regard it as the backbone of modern economies. This is due to its role in raising capital for companies through issuing shares at a reasonable cost, as compared to alternatives such as borrowing. One of the primary reasons that investors buy shares on stock markets is to make a profit. This means that they tend to buy shares that they either believe are undervalued, or from which they expect profitable future returns; a practice known as arbitrage. This logic has spurred the need to understand stock price fluctuations, and has led to numerous studies across the world, which aim to gain a better understanding of the stock price. Keeping company specific factors constant; demand and supply of shares by investors is what fundamentally drives stock prices up or down. Therefore, understanding the factors that influence the demand for stocks offers insight into the causes of stock price fluctuations. Investors can use this knowledge to make improved investment decisions.

Kothari et al. (2006) investigated stock returns in relation to aggregate earnings surprises. They argue that discount-rate shocks account for a considerable portion of the variation of aggregate stock returns. Shubiri (2010) regrouped the major determinants of stock price into microeconomic and macroeconomic factors. Shubiri's (2010) study reveals that factors such as net asset value per share, dividends per share (DPS), and gross domestic product (GDP) all significantly affect the stock price in a positive direction. The aforementioned studies investigated stock price fluctuations from the point of view of traditional finance, which as noted earlier, assumes that investors and managers are rational beings. In contrast, Schabek (2013) found evidence to suggest that behavioral factors also determine the stock price. For example, it has been observed that a manager's personality traits have considerable influence on corporate decisions as well as a company's share value (Adam et al., 2012, Ben-David et al., 2007, Malmendier and Tate, 2008). Furthermore, studies have shown that investors interpret market data and events at two cognitive levels, the intellectual level and the logical and rational level (Mitroi and Oproiu, 2014). In terms of the intellectual level, the authors argue that investors make investment decisions based on a process of ordination, processing, and analysis of the financial data required for their decision. The logical and rational level deals with identifying factors which could influence their decision and that of other stakeholders, and making their final decision based on a good understanding of their own objective. Mitroi and Oproiu's (2014) study is one of numerous investigations that have found that personal biases influence individual decisions.

Stracca (2004) reviews of behavioral finance and asset prices identifies five major behavioral anomalies which could influence asset prices. These are decision heuristics, emotional and visceral factors, choice bracketing, unknown preferences, and reference dependence (Stracca, 2004: 379-389). Under emotional and visceral factors, Stracca (2004) discusses how overconfidence affects aggregate market price.

One of the primary assertions of portfolio theory is that, assuming no transaction costs, every investor should participate in all security markets. This assumes that investors make rational investments. However, the evidence shows that many investors fail to consider some major asset

classes (Hirshleifer, 2001). According to Hirshleifer (2001), one reason for this behavior is personality biases. Hirshleifer (2001) adds that investors fail to create efficient two-asset portfolios, thus violating two-fund separation. This argument is based on a synthesis of the results of studies which investigated the relationship between investor psychology and asset prices. For example, Benartzi et al. (1997) show that the extent to which investors invest in their company's stock does not predict its future returns. Studies by Bloomfield et al. (2000, 2001) provide evidence that investors, especially men, invest aggressively. This is evident in their investments that offer returns that are not commensurate with the high transaction costs. Furthermore, it was observed from experimental markets that traders did not adequately consider information emanating from other traders' transactions in making their own trade (Bloomfield, Libby, and Nelson 1999). These results are consistent with the overconfidence paradigm of behavioral corporate finance.

Most studies that have examined the effect of managerial overconfidence on corporate performance focused on companies in the United States of America, Europe and Asia. A review of the relevant literature revealed that very few studies have been conducted in Africa and South Africa in particular. This study therefore extended the analysis by examining how the overconfidence of managers (managerial overconfidence) influences the stock price performance of companies listed on the Johannesburg Stock Exchange (JSE). According to Heaton (2002), larger companies are more likely to have overconfident managers than smaller ones. Therefore, the study was confined to FTSE/JSE top 40 index companies as these are the largest on the JSE by market capitalization.

1.3 Research problem

Based on the background presented above, there is a need to supplement the current literature on behavioral corporate finance with empirical research on the effect that managerial overconfidence has on a company's performance measured by its stock price. Many investors regard a company's share price as an indication of its value. As such, inadequate knowledge of the forces behind share

price movement puts investors at a disadvantage when making investment decisions. Motivated by the need to better understand share prices and how they are determined, this study investigated the influence of managerial overconfidence on the share price of ten companies listed on the FTSE/JSE top 40 index. Based on the argument that managers influence firm investment behavior, the research question which drove the present investigation is:

- Does managerial overconfidence through corporate investments influence the general movement of a company's share price?

1.4 Research objectives

In order to answer this question, research objectives were set based on previous studies and on behavioral corporate finance theory which are discussed in chapter two. The study's objectives were to:

- Estimate managerial overconfidence
- Determine the relationship between managerial overconfidence and company size
- Determine the effect of managerial overconfidence on corporate investments
- Determine the effect of managerial overconfidence on share price

1.5 Research design and methodology

A longitudinal research design was used. This was appropriate because the data related to different companies and was gathered over time. The research design is further discussed in chapter three. A quantitative methodology was adopted that used econometric regression models and various statistical tools to analyze the data. Data for the study were obtained from the INET BFA database. The research process is fully elaborated in chapter three.

1.6 Significance of the study and limitations

Schabek's (2013) study found that the three main potential descriptors of stock returns are market factors, macroeconomic factors, and behavioral factors. The current study investigated the behavioral aspect of stock returns, focusing on the effect that managerial overconfidence through corporate investment has on share price. The rationale was to better understand stock price fluctuations. This would lead to more accurate share valuations, and empower investors with improved knowledge to make better informed investment decisions.

Malmedier and Tate (2005) and Shu et al. (2013) note that it is not easy to measure managerial overconfidence. This is due to its abstract nature (it cannot easily be empirically tested), and the fact that there is no generally agreed upon or generic measure. Park and Kim (2009) identify eight main measures of overconfidence. Each is based on the kind of data available and the aim of a study. In this study, the problem of measuring managerial overconfidence was overcome by using investment-cash flow sensitivity as a proxy for managerial overconfidence. This measure is discussed in more detail in chapters two and three.

1.7 Overview of chapters

The dissertation comprises of five chapters. Chapter one introduces the topic, and presents a brief background, the research problem, and an outline of the study's methodology. Chapter two reviews the relevant literature in this field of study. It introduces and elaborates on key concepts such as rationality, behavioral corporate finance, and managerial overconfidence. It also discusses the different ways of measuring managerial overconfidence so as to understand its influence on share price. Chapter three details the methodology adopted to conduct this study. It discusses the steps involved as well as the tools used to achieve its objectives. This chapter also sets out the hypotheses which were tested to answer the research question. Each research hypothesis introduced in chapter three is linked to an objective. These were tested, and the results are presented and discussed in chapter four. Finally, chapter five presents recommendations based on the study's findings and an overall conclusion.

1.8 Chapter summary

This chapter presented the rationale for the study and highlighted the gaps in knowledge that it sought to fill. The research question and objectives were set out. The following chapter introduces and elaborates on relevant concepts related to behavioral corporate finance, and sets the empirical foundation for the remainder of this dissertation.

CHAPTER TWO

A REVIEW OF THE LITERATURE ON MANAGERIAL OVERCONFIDENCE AND SHARE PRICES

2.1 Introduction and chapter overview

According to Kim and Nofsinger (2008), contrary to the rationality paradigm portrayed by traditional finance theories, human beings do not always act rationally. Thus, their financial decisions are fully or partially influenced by their behavioral prejudices. The evidence shows that economic agents such as investors and managers make decisions based on their interpretation of market information using rationales which go beyond the scope of traditional finance and economic theories. Scholars have sought to understand the behavior of these stakeholders in order to better comprehend the predominant dynamics inherent in the market. Mitroi and Oproiu (2014) suggest that high levels of uncertainty and market fluctuations are some of the main reasons why investors and managers have turned to past personal experience to give meaning to their results. In line with this focus on market participants explaining market behavior, research has shown that firms' investment decisions are related to managerial overconfidence, and that overconfident chief executive officers (CEOs) tend to overestimate future returns from their firms' investments (Hwang et al., 2014).

Psychology and Finance have thus combined to investigate the effects of past personal experiences on the decisions that economic agents make in different settings. This chapter discusses the impact of behavioral biases such as managerial overconfidence on firms in general and their stock price in particular. It begins by reviewing the literature on the determinants of stock prices. This is followed by a discussion on behavioral finance, with a focus on stock returns from a behavioral finance perspective. Finally, it synthesizes studies on managerial overconfidence with the aim of better understanding the relationship between this behavioral corporate finance concept (managerial overconfidence) and share prices.

Current research areas in the field of traditional investment finance include portfolio allocation, which is based on expected risk and expected return; asset pricing models, which are risk-focused; the capital asset pricing model (CAPM); the pricing of contingent claims such as stocks; and the Miller-Modigliani theorem (MMT) supplemented by agency theory. All these are based on the notion of investor rationality, in which no rational investor would invest in something which does not yield returns greater than the risk borne by the investor (Subrahmanyam, 2008). However, research has shown that, individuals and firms do not always act in what is considered the most rational way. Scholars such as Malmendier and Tate (2005) and Beukes (2010) amongst others, studied stock returns, and found that forces other than rationality drive human behavior in the economy. Some of these forces form the foundation for the behavioral finance stream, which in terms of its scope and size, is a dynamic and rapidly emerging field of economic research and finance (Stracca, 2004). Behavioral corporate finance is discussed in more detail in section 2.3.

2.2 Determinants of stock prices

Investing in the stock market always involves some element of risk. Due to the volatile nature of the market, investors are very reluctant to invest; thus, knowledge of the factors which influence the movement of stocks would result in more confident investment decisions. Srinivasan (2011) supports the notion that in an efficient market, fundamental factors such as Earnings Per Share (EPS), Dividend Per Share (DPS), firm size, management, diversification, yield rate, etc., would determine stock prices. Numerous studies have thus investigated the factors that affect the way stock prices behave (Oyama, 1997; Al-Shubiri 2010; Mehr-un-Nisa and Mohammad Nishat, 2011; Srinivasan, 2011). For purposes of clarity, these factors are regrouped into non-behavioral determinants of stock prices and behavioral determinants of such prices. The former are discussed in the following subsection and the latter in the section following it.

2.2.1 Non-behavioural determinants of stock prices

Non-behavioural determinants of stock prices are empirical factors which influence a company's stock value. That is, they can easily be observed and quantified. As noted by Verberne (2010), they comprise of variables like company size, cash flow, investment, etc.

In line with other studies (Oyama, 1997; Al-Shubiri, 2010; Mehr-un-Nisa and Mohammad Nishat, 2011), Mohammed Belal Uddin (2009) explored the determinants of stock price. Focusing on company specific indicators which affect the prices of stocks in Bangladesh, he explored the possible relationship between net asset value per share (NAVPS), dividend percentage and EPS on the equity return of bank leasing, and insurance companies in Bangladesh. The results suggest a significant relationship between NAVPS, dividend percentage and EPS, and these variables are shown to have a statistically significant influence on the share price of companies.

Somoye et al. (2009) investigated the factors which could influence the prices of equity stocks. The study examined how DPS, EPS, GDP, interest rate, and the oil price affect share prices on the Nigerian stock market. It found that DPS, EPS, and GDP are all positively correlated to share prices, but are statistically insignificant in determining the prices of equity on the Nigerian stock market.

In a similar study, Sharma (2011) found that DPS negatively influenced stock prices in India. This means that DPS is inversely related to the share price; if DPS increases, stock prices go down. Srinivasan (2011) examined the fundamental determinants of share prices in India. The study's results corroborate those of Sharma (2011). Srinivasan (2011) also found that EPS, price-earnings ratio, company size, and the book value per share, are important and fundamental in providing information relative to share prices. However, unlike Somoye et al.'s (2009) study which found a positive and statistically insignificant relationship between EPS and stock price, Sharma (2011) and Srinivasan's (2011) studies found that DPS is negatively related and statistically significant in determining stock price.

Al-Shubiri (2010) studied the relationship between macroeconomic indicators and the stock price of Jordanian commercial banks on the Amman Stock Exchange, and found a positive significant relationship between stock price and NAVPS, and stock price and market price of stock dividend percentage. GDP was also found to be significantly positively related to stock price, whereas there was a negative significant relationship between stock price and inflation rate, and stock price and interest rates (bank lending rates). The results of this study reveal some important non-behavioral determinants of stock price.

Mehr-un-Nisa and Mohammad Nishat's (2011) study explored the empirical links between stock prices, financial fundamentals and macroeconomic dynamics on the Karachi Stock Exchange from 1995 to 2006. Based on a traditional finance perspective, the study examined how variables such as interest rate, GDP, etc., affect the movement of share prices on this Exchange. It found that the past behavior of share prices, the size of the company, and EPS were the most important determinants. Furthermore, macroeconomic indicators such as GDP growth, interest rates, inflation rates, and microeconomic factors such as market to book value and share turnover also significantly influenced stock prices. These results suggest that investors need to examine past economic performance and share price performance; the market capitalization (as a proxy for company size) of each of their trading companies; the different earnings that companies are paying per share (as reported by the EPS); interest rates and the health of the economy measured by its growth rate, in order to make informed investment decisions. This would give investors a better indication of the state of the company, and inform their company valuations so as to decide which companies' stock to purchase at what price.

As discussed in the next section, the literature has identified other factors (termed behavioral factors) that could also explain the functioning of companies and their share price.

2.2.2 Behavioural determinants of stock prices

Unlike the non-behavioral factors which explain stock prices, behavioral factors have not been extensively identified and researched to date. Some of these are discussed in the following sections. Investor sentiment and managerial overconfidence which are fundamental behavioral biases that affect stock prices have received increased attention over the past two-and-a-half decades. The following section presents a more focused review of behavioral corporate finance. It explores the main research trends in this discipline, highlighting the impact of behavioral factors on stock prices, with an emphasis on managerial overconfidence. Key studies and their research gaps are explored, some of which the current study sought to fill.

2.3 Behavioral corporate finance and stock returns: A loop from the beginning

Drawing on the discipline of psychology, behavioral corporate finance brings a new perspective to traditional understanding of financial markets and corporate finance. In contrast to mainstream economics and finance which assume full rationality on the part of agents who would always seek to maximize their expected returns, behavioral corporate finance moves away from sole reliance on the firm characteristics that drive corporate decisions. It thus looks beyond the agency theory, asymmetric information theory, capital market imperfections, and financial constraints driving firm investments and offers a new perspective to explain investment cash flow sensitivity. Brabazon (2000) points out, that, investors have long known that psychology affects the behavior of the market. Nonetheless, it was not until the early 1970s with the work of researchers such as Paul Slovic, Amos Tversky and Daniel Kahneman that in-depth studies were undertaken in the field of behavioral finance. Slovic's study (1972) examined the misperceptions of individuals with regard to risk. Tversky and Kahneman (1975) investigated how personal biases affect individual decision making. The results of both studies challenged theories such as the rationality assumed by traditional finance.

Behavioral finance has been defined from diverse points of view. While each researcher has a different perspective, there are some similarities in the definitions. According to Lintner (1998: 9), behavioral finance is “the study of how humans interpret and act on information to make informed investment decisions”. Thaler, (1993) defines behavioral finance as “simply open-minded finance” (Thaler, 1993: 17). This author claims that at times the answer to financial or empirical problems is found by entertaining the possibility that some of the economic agents act irrationally some of the time. Olsen (1998) argues that instead of labelling decision making as irrational, biased or faulty, behavioral finance seeks to “understand and predict systematic financial market implications of psychological decision processes”.

Behavioral finance therefore focuses on positively describing human behavior under conditions of risk and uncertainty, rather than normatively analyzing behavior which is generally a characteristic of mainstream finance (Stracca, 2004). It seeks to understand investors’ behavior under different circumstances so as establish the relationship between different human behaviors and the market. Behavioral finance sets out to investigate how mental or emotional prejudices cause anomalies in the value of stocks and their returns (Akintoye, 2008). This emerging field of finance refutes the idea that economic agents’ behavior is solely based on the maximization of expected utility. Instead, instances have been found where individuals act irrationally. For example, Stamer (2000) observed that economic agents in both controlled experiments and in real life situations, behaved in ways which violated the axioms of expected utility. This prompted researchers to pose questions on why individuals would act in ways which according to mainstream finance, would not lead to the maximization of their resources or utility.

While behavioral finance explains some phenomena that are not addressed in mainstream finance and economics such as irrational investor behaviors, it has not negated the rationality and utility maximization paradigms. Rather, it complements these fields by bridging existing knowledge gaps (Mitroi and Oproiu, 2014). As such, one of the main objectives of behavioral finance is to understand the systematic market implications of the psychological traits of agents (Stracca, 2004).

2.3.1 Behavioural corporate finance and cognitive psychology

Cognitive psychology has greatly influenced behavioral corporate finance. Research in this discipline suggests that most individuals are naturally optimistic about the future, and tend to maximize their utility (Lin et al., 2005). This means that under most circumstances, the average individual would act optimistically in ways that are believed to increase their chances of success. This notion is in line with that of rationality; financial markets and investors are said to be rational and seek maximum utility (Baker and Wurgler, 2007). According to the principle of rationality, given their limited resources, individuals would endeavor to maximize their total utility. The conclusion that investors are rational, infers that they tend to make investment choices that maximize their utility or returns in general. Where risk is involved (such as investing in stocks or bonds), investors would expect a return that is commensurate with the risk taken (Fama and French, 1992). This is evident in theories such as the Capital Asset Pricing Model (CAPM) first proposed by Sharpe (1964), which argues that there is a linear relationship between returns on a security and returns on a market given a certain level of risk measured by beta (market risk).

The Efficient Market Hypothesis (EMH) proposed by Fama (1970) also strongly supports the notion of rationality. It states that market prices “fully” reflect the expectations of market participants (investors, managers, firms, etc.). Through arbitrage, these participants would identify mispriced securities and make a profit from them until the market readjusts by reaching an equilibrium value in line with available information (Akintoye, 2008). In its most basic form, arbitrage is the process of taking advantage of low prices by buying when prices are low and selling when they are high, all else being equal. The EMH has been used as a tool to analyze the primary role of capital markets, which is allocating capital stock in the economy (Fama, 1970). This hypothesis considers markets as clear and reliable indicators for resource allocation (Fama, 1970), explaining the term “efficient market”. The EMH has thus been adopted to conduct empirical research on whether prices “fully reflect” available information. This theory presents three forms of market efficiencies, the weak form, the semi-strong form, and the strong form.

In terms of weak form efficiencies, all historical prices are available for decision making, while the semi-strong form suggests that prices efficiently adjust to all publicly available information, and in the strong form investors have complete access to any information (both private and public) relevant to determine prices. Thus, any relevant information in the market is rendered useless since it would already be incorporated in the market price (Fama, 1970). The EMH postulates that every decision made by investors is based on knowledge of certain market factors which gives investors a sense of certainty about the future outcome of their decisions. Therefore, information becomes capital in determining the efficiency of capital markets and this gives rise to the presence of information efficiency in the market. Information efficiency implies that all market participants simultaneously have access to information without incurring any costs. It should be noted that one of the characteristics of an efficient market is the fact that participants are “price takers” (Akintoye, 2008). This means that they do not have the power to influence the general price level through individual actions such as buying or selling at a price different from the prevailing market price. Akintoye’s (2008) review of the literature on the EMH notes that, most studies have found results consistent with the strong form efficiency except in cases where market imperfections exist. Thus, the traditional finance paradigm concludes that decision makers are rational and seek to maximize their utility in any given situation.

Contrary to mainstream finance, cognitive psychology advocates that human beings make decisions based on processes that are subject to numerous perceptual illusions. Brabazon (2000) regrouped these in two categories: illusions caused by heuristic decision processes, and those caused by adopting mental frames. The rules which humans use to make decisions in complicated and uncertain environments are called heuristics (Brabazon, 2000). Research by Kahneman and Tversky (1974) has shown that the rules used when making decisions are not necessarily rational ones. This is caused by the decision maker employing “mental short cuts”, sometimes as a result of limited time. Consequently, heuristic decision practices may result in poorer decision outcomes. Typical examples of illusions which result from employing heuristics are representativeness, overconfidence, anchoring, gambler’s fallacy, and availability bias (Brabazon, 2000).

Representativeness is the propensity of decision makers to succumb to stereotypes when making decisions. An example is when investors use the law of small numbers to make decisions. Investors would assume the continuation of recent events into the future, thereby yielding to this law, which argues that a past event is highly likely to repeat itself in the future. Representativeness can manifest itself in financial markets through investors seeking to buy “bullish” stocks, and avoiding the purchase of stocks which have performed poorly in the recent past. Brabazon (2000) argues that this effect could explain the term “investor overreaction” first coined by DeBondt and Thaler (1985).

Overconfidence causes market participants to overestimate their ability to predict trends and “time” the market (Brabazon, 2000). A number of studies have recently been conducted on the effect of overconfidence on numerous aspects of the market, such as its link to corporate finance through issues like managerial overconfidence and decision making (Subrahmanyam, 2008). Della Vigna and Malmendier (2006) examined this behavioral bias (overconfidence) and pricing. Similarly, Landier and Thesmar’s (2009) survey of French managers found that 56% considered themselves as having the ability to survive under harsh economic situations, and only 6% were pessimistic about their future. If generalized, these results express French managers’ optimism or overconfidence vis-à-vis their survival in the market. Studies relating to managerial overconfidence are reviewed later in this chapter.

According to Brabazon (2000), anchoring occurs when recent observations fix or anchor a value scale. The outcome could be that investors expect a share to continue trading in a defined range or anticipate that a company’s earnings will maintain a certain historical drift, causing them to underreact to visible trend changes. Brabazon (2000) shows that increased trading activity is a byproduct of investor overconfidence.

Brabazon (2000) defines gambler’s fallacy as a situation where individuals improperly predict that there will be a trend reversal. As a result, they may predict the end of a series of positive or negative market returns. The author adds that gambler’s fallacy could be regarded as an extreme belief in

regression to the mean, which is the belief that extreme trends will always tend to converge closer and closer to the mean over time. In financial markets, participants often misinterpret regression to the mean, assuming that upward trends will always be followed by downward trends.

Availability bias occurs when individuals make decisions based on information to which they assign unjustified importance (Brabazon, 2000). This could result in overestimation of the probability of occurrence. An example is a mother overprotecting her child because it is known that child kidnappers exist. The assumption is that the child will be kidnaped if the mother is not careful enough.

These examples of cognitive illusions have been widely observed. However, behavioral finance does not assume that all investors or managers suffer from a similar illusion at the same time. Nonetheless, the evidence suggests that the experience of each investor plays an important role in explaining why the least experienced investors or managers are prone to representativeness (extrapolation) whereas those that are more experienced fall into gambler's fallacy (Shefrin, 2000). Extrapolation refers to drawing conclusions based on past events, while those that succumb to gambler's fallacy reach conclusions based on predictions.

The complexity of human behavior has thus greatly influenced returns on stock markets, and trading activity worldwide. Based on a study of the value premiums of South Africa's equity market, Beukes (2010) submits that not all investors invested in value stocks (i.e., stocks which trade at prices below their fundamentals). This suggests that not all investors invest rationally; thus the need for further investigation. Saunders (1993) provides a possible reason for irrational investor behavior, noting that greater returns were recorded on the New York Stock Exchange (NYSE) on sunny days as compared to cloudy days. The same behavior was observed by Hirshleifer and Shumway (2003) on other international markets. Goetzmann and Zhu (2005) also found evidence to suggest that the disparities in returns on these stock markets were not caused by investors' trading patterns. This raises the possibility that the effect may be explained by the moods (behavior) of investors on different days. The question is thus whether JSE investors' sentiments

(such as moods, overconfidence, etc.) could impact on their investment behaviors or patterns, which would also affect the general share price movement. This research gap is one of the areas which behavioral finance sets out to fill.

Other studies that adopt the psychological concept of cognitive illusions to explain stock return patterns include those by Barberis et al. (1998), Hong and Stein (1999), and Daniel et al. (2001) among others. Barberis et al. (1998) postulate that extrapolation from random sequences, wherein agents expect patterns in small samples to continue, creates over-reaction (and subsequent reversals), whereas conservatism, the opposite of extrapolation, creates momentum through under-reaction. Hong and Stein (1999) maintain that gradual diffusion of news causes momentum, and feedback traders who buy based on past returns create overreaction because they attribute the actions of past momentum traders to news and hence end up purchasing too much stock. When the positions are reversed, this causes momentum. Daniel et al. (1998) examined the impact of self-attribution on overconfidence.

2.4 Investor overconfidence and managerial overconfidence

In order to better appreciate the research questions presented in chapter one, this section presents a more concise view of overconfidence by examining investor overconfidence and managerial overconfidence with an emphasis on the latter which is the main subject at hand.

2.4.1 Brief review of investor overconfidence

Investor overconfidence is said to explain asset pricing theories like momentum trading which is a short term continuation in trading due to investors' beliefs, and reversals in stock returns which occur in the long run (Verberne, 2010). Glaser and Weber (2007) argue that these asset pricing theories are not in line with rational and efficient markets, and account for the unequal risk experienced by investors. Momentum trading is a process by which investors purchase stock with high returns within a period of three to 12 months, earning profits of about 1% per month. During

the same period, they sell poorly performing stocks (Jegadeesh and Titman, 1993). Glaser and Weber (2007) suggest that these momentum profits arise from inherent biases caused by the way investors understand the information at hand. The theory of long term reversals stipulates that stocks are ranked on three to five years' past returns. Past winners tend to be future losers and past losers are likely to be future winners (Debondt and Thaler, 1985). The main point is that investors tend to overreact to past information. Therefore, investor overconfidence could be explained by both of these asset pricing theories. Some scholars suggest that investor overconfidence has undesirable effects, while others argue that it has positive consequences.

Chuang and Lee (2006) claim that due to overconfidence, some investors overreact to private information and tend to ignore publicly available information. They add that investors that are overconfident overtrade during certain periods, causing volatilities in the market. A further negative by-product of overconfidence is that these investors do not fully appreciate the risks involved in their actions, and thus end up trading in more risky situations (Chuang and Lee, 2006). For their part, Ko and Huang (2007) note that overconfident investors overinvest in information which results in stock prices converging closer to their intrinsic value, creating market efficiency.

2.4.2 Overview of managerial overconfidence

A major thrust of the various applications of behavioral finance within the discipline of corporate finance has been to understand how the behavioral characteristics of top executives, such as their level of confidence, tie in with their decision-making (Subrahmanyam, 2008). It has also been observed that, these decisions have repercussions for the value of the company (Malmendiere et al, 2011). Consequently, the impact of overconfidence or optimism in different settings has been the subject of numerous research studies.

In behavioral finance, managerial overconfidence and optimism mean different things some times and at others have the same meaning. Malmendier et al. (2011) define overconfidence as the

overestimation of average proceeds from an investment. Likewise, Shu et al. (2013) state, that, overconfidence refers to a manager overestimating his/her ability to influence the successful outcome of the firm's projects. However, Lin et al. (2005) define optimism as a personal characteristic inherent in some managers, which causes them to systematically overestimate their firm's future performance. Therefore, optimism is a subjective overvaluation of the likelihood of future events, whereas overconfidence is an underestimation of the variance of such events. It is important to note that most behavioral finance studies nevertheless use these terms interchangeably (Shu et al., 2013).

Managerial overconfidence has received increasing attention in the literature. In line with the psychology literature, overconfident managers are said to exhibit the "better-than-average" effect, which simply means that they tend to overstate their personal ability (Alicke et al., 1995). Although there are many definitions of managerial overconfidence, the underlying idea is that of a general miscalibration of beliefs. Miscalibration is "the tendency to overestimate the precision of one's information" (Verberne, 2010). This means that the predictions made differ from the actual outcomes.

Managers have also been observed to exhibit optimism in their decision-making for reasons such as when they believe that outcomes are under their control (Weinstein, 1980). March and Sharpia (1987) observe that managers in particular exhibit high levels of optimism when their firm's performance is mainly determined by them. The evidence from these studies suggests that managerial control of a firm's performance is a major factor which accounts for managerial optimism. Numerous studies have thus identified managerial overconfidence as a vital influence on the life of a company.

Ben-David, Graham, and Harvey's (2007) study suggests that firms with overconfident chief financial officers (CFOs) exhibit a marginal propensity to adopt managerial and financing policies which are generally more aggressive in nature. This implies that these firms would prefer to use more of their own funds (i.e., cash flow from past investments) to fund their investment projects. According to Ben-David, Graham, and Harvey (2007), this is because managers believe that their

firm's equity is undervalued by the market. As such, if they raise investment capital through public offerings, the actual return would be less than what they expect. Malmendier, Tate, and Yan's (2010) findings support this conclusion. They add that overconfident managers would issue less equity and rather invest using cash flow from past successful investments.

Hribar and Yang (2010) observe that overconfident managers are more optimistic and make positively biased future predictions of their firms' performance. This suggests that optimistic managers have the tendency to make risky investments based on their belief in positive future returns. This is perhaps fueled by their confidence that they will be able to influence returns, or as suggested by psychological theory, the belief that their personal ability is above average, and as such they can outsmart the market to yield the expected returns.

Schrand and Zechman (2010) found a positive correlation between overconfidence and an increase in managerial sensitivity to earnings management and financial fraud. This suggests that managerial overconfidence could have a negative effect on firm value. Studies with similar conclusions include that by Malmendier and Tate (2008).

Cordeiro (2009) concluded that, overconfident managers believed that their firms were undervalued by the market when they received less revenue than expected from their investment, or when actual firm growth did not tie in with expected firm growth. This affects the firm's dividend policy, because it might be induced to pay nothing to investors, but rather to reinvest the capital in other projects which are considered more profitable (Cordeiro, 2009). A further observation was that, firms with overconfident managers would use internal funds to finance these projects, in an attempt to avoid issuing undervalued securities (Cordeiro, 2009). Thus, as Malmendier et al. (2011) observe, measurable managerial characteristics such as overconfidence go some way in explaining corporate financial decisions.

DeAngelo et al. (1996) observed that managerial optimism causes an increase in a firm's dividends. That is, overconfident managers have a tendency to overvalue their company by paying

higher dividends so as to create a positive impression of the firm's financial health among investors. Hackbarth's (2002) study on the effect of optimistic managers on the capital structure of their firms revealed that optimistic managers will choose higher leverage capital structures. This is due to the fact that, they believe that financing costs will increase with asymmetric information, thereby following the "pecking order" theory. Malmendier, Tate and Yan (2011) support this conclusion by showing that overconfident managers use less external finance and issue less equity when they do so because they overestimate the returns from the investment of their internal funds.

Other research has shown that optimism influences managers to put greater effort into their job; this results in cost efficiencies to shareholders, who would benefit more from hiring optimistic managers than moderately optimistic ones (Gervais et al., 2002). Shu et al. (2013) provide evidence of this tendency in their investigation of the combined effects of managerial overconfidence, asymmetric information and moral hazard problems on the manager's choice of financing. Their study found that managerial overconfidence was positively correlated with share repurchasing in Taiwan, and concluded that it could thus be a good thing for shareholders (Shu et al., 2013).

In terms of investment decisions, Heaton (2002) found that firms with free cash flows faced the threat of distortions in investment policies. Overinvestment is one of the problems that could arise. Overconfident managers could invest in projects with negative net present value (NPVs) which are mistakenly regarded as profitable, firstly because they have available funds (free cash flow), and secondly because they consider their corporate projects as overvalued. The NPV of a project is the total return on its operating cash flows after the cost of the project has been taken into account (Brealey et al., 2012). Therefore, rational managers should only consider projects with a positive NPV, because negative NPV projects are costly as they bring less cash flow than the required amount of capital investment. Underinvestment is another potential problem. Given adequate internal funds, overconfident managers may also be unwilling to invest because, according to Verberne (2010), they may feel that the market undervalues their shares, and issue (sell) fewer or no shares. This could lead to underinvestment, with overconfident managers being unwilling to finance even those projects with positive NPVs. This is termed the underinvestment-

overinvestment tradeoff. According to Heaton (2002), psychological research has shown people to be generally too optimistic. Heaton (2002) observed that managers either underinvest or overinvest the assets of the firm; this could be attributed to their ignorance of the effects caused by traditional theories such as information asymmetry and the agency problem. According to Mohamed et al. (2013), firms' investment decisions depend on their capital structure, which is highly influenced by asymmetric information and agency problems. Asymmetric information describes a situation where during a transaction one party is in possession of either more or better information than the other. The agency theory suggests that given sufficient internal financial resources, managers will invest more in order to limit external control of the firm which occurs when external borrowed funds are used for investments (Mohamed et al., 2013). These two phenomena give rise to investment-cash flow sensitivities.

Lin et al. (2005) investigated managerial overconfidence and its effect on corporate investment decisions in Taiwan. They observed that, given sufficient funds, optimistic managers would invest in projects which yielded negative NPVs. As soon as the funds were depleted and these firms became financially constrained due to overestimation of their investment outcomes, these optimistic managers perceived that the market was undervaluing their firm. As a result, they were hesitant to issue new equity, and even rejected the possibility of investing in positive NPV projects. The authors conclude that firms with more financial constraints and an optimistic manager have greater investment to cash flow sensitivity than similar firms with non-optimistic managers. This means that, firms with optimistic managers that were low on liquidity due to poor cash flow, exhibited a lower marginal propensity to invest than firms with equally low cash flow but a non-optimistic manager. Glaser, SchÄafers, and Weber (2008) support this conclusion with evidence from their study on managerial optimism and corporate investment in Germany. Their results support higher investment-cash flow sensitivity for financially constrained firms with optimistic managers, which is consistent with theory.

It can thus be concluded that managerial optimism can increase the sensitivity between corporate investments and cash flow in constrained firms. The reason is that as reported in previous studies, optimistic managers would invest more than non-optimistic ones when there is abundant cash, and

less when funds are inadequate (Lin et al., 2005). Lin et al. (2005) suggest a measure of managerial optimism based on management's earnings forecast. They classified a manager as optimistic if the number of upwardly-biased projections of earnings was higher than their downwardly-biased ones. This was done by counting the number of times a manager optimistically forecast earnings against the number of times that he/she was not optimistic about future cash flows. However, Lin et al.'s (2005) classification was challenged by the possibility that managers could have reasons other than optimism for their upwardly-biased forecasts. To remedy this, they excluded all forecasts which could be influenced by incentive effects. In such instances, managers would want to give a positive outlook of the firm to investors so as to positively affect the stock price, before making a public offering. Their results revealed that compared to non-optimistic managers in more financing constrained firms, optimistic managers portrayed higher investment-cash flow sensitivity

2.4.3 Determinants of overconfidence

Scholars have identified many factors which account for overconfidence in general, and possibly managerial overconfidence (Margolin, 2012). This section reviews the most common school of thought, which views overconfidence as a cognitive bias (Margolin, 2012). The major sources of overconfidence identified are level of education, age, gender, level of experience, and managerial compensation.

Level of education

In considering education as a determinant of overconfidence, Margolin (2012) points to two effects which are contradictory. It appears that the more educated a person is, the more competent that person is expected to be. However, when it comes to new graduates, their educational achievements might cause them to believe that they have greater abilities than is the case, which might lead to overestimation of their actual capacity. While both effects are realistic, Margolin (2012) notes that more psychological studies have been conducted on the latter. For example,

Graham et al. (2009) investigated investors' self-perceived competencies. Their results suggest a positive correlation between overconfidence and investors' undergraduate and postgraduate education. Investors that had completed an undergraduate or postgraduate degree were more likely to be overconfident. This conclusion is supported by Ben-David et al.'s (2006) study on CFOs' forecasts of stock market returns in the United States of America. They observed that better-educated CFOs were more inclined to be overconfident. This was measured by the miscalibration of their forecasts (Ben-David et al., 2006).

Age

Age has been hypothesized to have considerable influence on an individual's level of confidence. Grimes' (2002) study on university students' expectations of their test results observed that age was highly statistically significant in explaining their confidence levels. Likewise, but in the context of finance, Bertrand and Schoar (2003) and Malmendier and Nagel (2011) found that older, more mature executives tend to adopt more conservative managerial approaches than younger, more inexperienced executives. These two studies suggest that, based on risk averseness, older managers are less confident than their younger counterparts. This is somewhat counterintuitive, given that one would expect an older manager to be more confident than a young one based on their level of experience. Thus, Malmendier and Nagel (2011) conclude that age and experience cannot be easily separated.

Gender

It is generally believed that men are more overconfident than women (Margolin, 2012). This conclusion was reached by Soll and Klayman's (2004) Nowell and Alston's (2007) studies on university students, and Graham and Harvey's (2005) research on stock market investors. Nowell and Alston (2007) found that male students were more overconfident than female students when asked to predict their grade at the end of the year. A possible explanation could be that female

students are more risk averse or, as Soll and Klayman (2004) suggest, that men tend to overestimate their accuracy. Similarly, when investors were asked to forecast expected market returns and their own portfolio's returns, Graham et al. (2005) found that male investors predicted a bigger outperformance margin even though female investors also forecast that they would outplay the market. As noted in the previous section, general overestimation of future performance is termed "miscalibration". These studies thus identify gender as a possible factor in determining levels of overconfidence.

Level of experience or task familiarity

Intuitively, one would expect that an individual's level of experience would determine their confidence in accomplishing certain tasks. This hypothesis has been empirically investigated in order to determine the effect of different levels of task familiarity (Margolin, 2012). However, the results of these investigations have been mixed.

It is argued that, individuals are generally more confident when confronted with tasks that they consider easy compared to more difficult ones. This has been termed the *hard-easy-effect* (Koriat et al. 1980). This argument is supported by Hoelzl and Rustichini's (2005) study which looked at how selected students' decisions varied in an easy and a difficult task situation, and the consequent effect on their level of overconfidence.

Ben-David et al. (2006) observed that CFOs' stock market predictions increased miscalibration. Their results suggest that overconfidence is negatively correlated with professional experience. This means that the more experienced a CFO is, the less overconfident he/she is. A possible reason could be that experienced individuals tend to be relatively more cautious.

In contrast, Allen and Evans's (2005) investigation into the relationship between overconfidence and the level of task familiarity or experience that used information drawn from an experimental

bidding game, did not statistically identify any relationship. The mixed nature of the results implies that the level of experience does have an effect on overconfidence. Nonetheless, the direction of the effect (whether positive or negative), is subject to debate.

Managerial compensation

Managerial compensation is another factor which has been used to measure managers' overconfidence. Hambrick (1997) differentiated overconfident managers from non-overconfident ones by ranking them according to their level of compensation. Those with the highest compensation were found to be overconfident. Hambrick (1997) argues that highly compensated managers occupy more important managerial positions and are thus overconfident. Sivanathan and Galinsky (2007) support this argument by empirically showing that, based on salary more powerful managers are more likely to be overconfident. Jiang et al. (2008) divided the cash compensation of a manager by the sum of the first three highest paid managers in a firm. The manager with the highest weighted average cash compensation was found to be overconfident. This measure of managerial overconfidence is similar to that of Frith et al. (2006, 2007).

Investment-cash flow sensitivity of the firm

Based on the theoretical implications of the model that they developed, and the results of Malmendier and Tate (2005) and Lin et al.'s (2005) studies, Campbell et al. (2011) argue that firm investment conveys some information about the overconfidence of its manager. The investment to cash flow sensitivity of a firm shows how sensitive a company's investments are to the availability of internal cash flow (Mohamed et al., 2013). This means that firms which highly depend on internal cash flow for corporate investments have high sensitivity, and those that do not, have low sensitivity. To empirically test the extent to which managerial overconfidence could be explained by the investment cash flow sensitivity of a firm, Lin et al. (2005) studied the investment decisions of companies listed on the Taiwanese Stock Exchange, focusing on the importance of cash flow

in the investment decisions of overconfident and non-overconfident managers. Their results revealed high investment cash flow sensitivity among these firms. In addition, Lin et al. (2005) observed that overconfident managers exhibited higher investment-cash flow sensitivity than non-optimistic ones. A similar investigation in the Chinese context by Huang et al. (2011) also revealed that investment-cash flow sensitivity is greater in firms with optimistic managers.

2.4.4 Measuring managerial overconfidence

Campbell et al. (2011) note that it is difficult to measure overconfidence or optimism because it cannot be directly observed. It is therefore important to examine the common methods that have been employed to measure this phenomenon. The aim is to highlight the challenges confronting researchers in measuring this abstract concept. Park and Kim (2009) summarize the major proxy variables which have been used to measure managerial overconfidence. These are: the *options-based measure*, the *press-based measure*, the *managerial upward bias optimism measure*, optimism measured using information from the transactions of top executive members on their personal accounts (*revealed beliefs measure*), the *frequency of mergers and acquisitions* completed by a manager, managerial overconfidence based on a *confidence index*, and measuring managerial overconfidence using the *investment-cash flow sensitivity of a firm*.

The options-based measure of managerial overconfidence was introduced by Malmendier and Tate (2005a), Malmendier and Tate (2005b), Malmendier and Tate (2008). It has three main facets. Managers are said to be overconfident if they hold options which are more than 67% in-the-money during their lifespan without exercising them; if they hold options until the maturity year; or if they acquire additional company stock while already exposed to a high level of risk. Information on how many company stock options managers have is gathered, and they are categorized as overconfident or not based on the options they choose to exercise. Recent studies that used the exercise of managerial stock options to gauge managerial overconfidence include Croci et al. (2010) Hirshleifer et al. (2012), Yilmaz and Mazzeo (2014). Malmendier and Tate (2005) further developed a cross-sectional measurement of managerial overconfidence based on managers'

voluntary overexposure to their firm's nonsystematic risk. Such behavior was observed through the managers' unwillingness to exercise options which were vested, and their tendency to always increase the holding of their firm's stocks. The reason was that, managers overestimated the potential returns from investment of their internal funds (Malmendier and Tate, 2005b).

Hayward and Hambrick (1997) introduced a measure of managerial overconfidence based on the media's (the press) evaluations of managers. Managers were classified into six categories and points were assigned to each depending on their category. Malmendier and Tate (2005b) revised this measure by retrieving news articles from major media sources and recording the total number of articles; hand counting the number of articles with words such as confidence, confident, or their variants, overconfidence or overconfident; counting the number of times a manager was said to be optimistic or have optimism or over optimism; recording the number of times words such as pessimism/pessimistic were recorded; and finally, counting the number of times the words steady, cautious, reliable, frugal, practical, and gloomy were used. Managers were said to be overconfident or not based on a word count of how the media portrayed them. Shu et al. (2013) examined the relationship between managerial overconfidence and share repurchases in Taiwan. They reviewed 2 744 share repurchase programs launched by 782 firms listed on the Taiwanese Stock Exchange (Shu et al., 2013). Key words from media reports were used to represent managerial overconfidence. The number of times that a manager was said to be "confident" or "optimistic" against the number of times they were said to be "not confident" or "not optimistic", "cautious", "practical", and "frugal", was used to classify them as overconfident or not. This method was inspired by Malmendier and Tate (2005a). In addition to media portrayals, Malmendier and Tate (2005a) constructed an optimism measure using executive stock option exercise and CEO stock transaction behavior. CEOs who bought additional stock in their own company were said to be optimistic. This approach was also used by Jin and Kothari (2005), Hribar and Yang (2006), and Brown and Sarma (2007).

Similar to Malmendier and Tate's (2005) study, Lin et al. (2005) propose a measure of managerial overconfidence which uses a manager's positive bias towards favorable expected earnings. This is based on the notion that overconfident managers are biased towards making earnings forecasts that

predict positive future earnings. Hribar and Yang (2006) and Jiang et al. (2008) also employed this method. They calculated the forecasting error which is the difference between forecast earnings before tax and actual earnings before tax. A positive forecasting error symbolizes upward bias, which is the belief in a positive future outcome. If the number of managerial upward biases is greater than the number of downward ones, the manager is said to be overconfident.

Malmendier and Tate (2005a) used information from CEOs' personal portfolios to measure managerial overconfidence. They observed these personal transactions in company stock to signal CEOs' beliefs about the future of their company. This method requires detailed information about the CEOs' personal transactions in their company's shares and options.

The frequency of mergers and acquisitions (M&As) measure proposed by Doukas and Petmezas (2007) has also been used as a proxy for managerial overconfidence. The authors suggest that more confident managers are prone to encourage M&As. They examined managers' track records and classified those who directed a minimum of five M&As as overconfident. Billett and Qian (2008) used the same methodology to develop a measure of overconfidence based on serial acquirers. This refers to investors that constantly purchase the shares of particular companies which they regard as overvalued. It was concluded that higher acquiring frequency revealed overconfidence. Billett and Qian (2008) observed the negative wealth effects of subsequent acquisitions. That is, the CEOs involved had the tendency to make higher net purchases of the new firm's stocks in subsequent deals than in the initial acquisition, despite the negative wealth effects of subsequent deals.

Olivier (2010) proposed a measure of managerial overconfidence using the past 12 month's Consumer Sentiment Index (CSI). The maximum and minimum figures of this index are +100 and -100, respectively. Managers of firms rated above 100 are overconfident. Similarly, Mefteh and Oliver (2009) measured managerial overconfidence using the European Commission's Economic Sentiment Index (ESI). Like many other indices, this index's values lie between +100 and -100,

with +100 maximal and -100 minimal. Managers found to exhibit confidence below 50 are said to be overconfident, while those that fall below 50 are under confident.

Ben-David, Graham and Harvey (2006) measured CFOs' overconfidence using the Duke/CFO Business Outlook survey developed by Graham and Harvey (2001). The survey is based on managers' stock market forecasts. They observed that companies with CFOs that display narrow confidence intervals (i.e., overconfident CFOs) tend to invest more than those with wider confidence intervals. This suggests that managers with biased beliefs have an important influence when it comes to financing choices.

The findings of Malmendier (2001); Heaton (2002); Malmendier and Tate (2005a); and Glaser et al. (2008) studies suggest that firms with overconfident managers exhibit higher investment-cash flow sensitivity. Heaton (2002) argues that, given sufficient internal funds, optimistic managers tend to overinvest and sometimes even invest in negative value creating projects. This supports Malmendier and Tate's (2001) study that provides evidence that a CEO's level of optimism is explained by their firm's investment-cash flow sensitivity. There are two main models in the financial literature to measure investment-cash flow sensitivity: the Q model and the Euler equation model (Mohamed et al., 2013). The Q model assumes that the main determinants of firms' investments are the expectation of profits. This is calculated by the ratio of the market value of assets to their book value (Mohamed et al., 2013). Ağca and Mozumdar (2008) modified the Q model by including the adequacy of internal funds as a determinant of corporate investment, and called it the adjusted Q model. Verberne (2010) and Mohamed et al. (2013) used the Q ratio to measure investment-cash flow sensitivity. The Euler equation model assumes that cash flow, total debt, past investments, and total sales are important determinants of corporate investments (Demirguc-Kunt et al., 2003).

2.5 Chapter summary

Behavioral finance as a whole and more precisely, managerial overconfidence has received increasing attention in the literature. Numerous factors account for this trend. One is the need to better understand the interaction between the complexities of human nature and financial markets. Coupled with the volatility of financial markets, human intricacies create financial anomalies which are not fully explainable by traditional finance and economics theories. The growing literature on these research areas seeks to shed more light on the influence of managers in mergers and acquisitions, overconfident CEOs and innovation, and managerial overconfidence and share prices. The current study focused on the last issue with the aim of empowering investors and other stakeholders to make better informed decisions. The following chapter presents the methodology employed to answer the research questions presented in chapter one.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

Evidence from the behavioral finance literature suggests that the decisions taken in firms and how those firms operate are considerably influenced by behavioral biases (Nicholas Barberis, 1998, Adam et al., 2012, Glaser and Weber, 2007, Malmendier and Tate, 2005a), Malmendier and Tate (2005b), Malmendier and Tate (2008), (Shu et al., 2013). One of the objectives of this study was to show how managerial overconfidence can be measured based on behavioral finance theory. The study sought to determine its effect on the share price of 10 companies from the FTSE/JSE top 40 index from 1996 until 2015. The chapter presents and discusses the approach selected to measure managerial overconfidence based on its relevance to the current study. The approach concerned is the investment-cash flow sensitivity of a firm discussed in section 2.4.4 in the previous chapter, and elaborated on in section 3.7 of this chapter. The rest of the chapter is subdivided into 8 sections. Sections 3.2 and 3.3 explain the rationale for the research methods employed in this study, while sections 3.4 to 3.7 explain the actual research process. 3.8 points out some major limitations encountered during the study, and 3.9 provides a summary of the chapter.

3.2 Research methods

The research methodology is the overall technique employed to conduct research. The two most common research methodologies are the qualitative approach and the quantitative approach. This study employed a quantitative research approach. According to Sawilowsky (2007), a quantitative research methodology primarily uses mathematical techniques and numeric data to answer the research question(s).

3.2.1 Synthesis of research methodology

For the purposes of this study, managerial overconfidence was measured using a proxy variable based on the investment-cash flow sensitivity of the firm. This method of measurement follows the work of Malmendier (2001); Heaton (2002); Malmendier and Tate (2005a); Glaser et al. (2008) and Verberne (2010). Based on the findings of these authors, the main assumption is that firms with overconfident managers, exhibit higher investment-cash flow sensitivity than those with non-optimistic managers. Section 3.7 explains how this measure was constructed and used in the current study. The decision to measure managerial overconfidence using the investment-cash flow sensitivity of the firm was based on three fundamental reasons. Firstly, the use of an overconfidence measure based on how the manager reacts to market based information such as investment incentives and cash flow, would be more informative on the effect of the manager's overconfidence on share price. Secondly, given the data available for this research (publicly available company financial statements), using investment-cash flow sensitivity to measure managerial overconfidence is the most ideal and empirically applicable method amongst those discussed in chapter two, section 2.4.4. Thirdly, this method helped to test the research hypotheses (see section 3.6).

3.3 Research design

Cooper and Shindler (2001) define a research design as the art of describing the methods or techniques employed in a study to collect and analyze data. Collis et al. (2003) note that a research design is a way of planning data collection in order to conduct an inquiry and extract the most significant and valid findings. Thus, a research design consists of a strategy or strategies that is followed in order to answer the research question(s) in the most accurate and reliable way. It guides the selection, collection, measurement and analysis of the data. Matthews and Ross (2014) identify four major types of research design, namely, experimental, case studies, cross-sectional, and longitudinal.

Experimental research designs are used in studies which intend to test cause-effect relationships in controlled settings (Bhattacharjee, 2012). This is achieved by separating the possible causes from the effect by creating two experimental groups, and administering the cause to one group called the treatment group and a placebo to the other group known as the control group. The objective is to observe the subjects within the two groups in terms of how the average effects differ amongst them.

A case study research design investigates in-depth issues relating to real life cases over an extended period of time (Bhattacharjee, 2012). The data collected for this kind of research includes personal observations, focus groups, documents pertaining to the respective interest groups, and interviews. The strength of case study research lies in its ability to unveil sociocultural or other factors which relate to the research phenomenon, which are not known.

According to Bhattacharjee (2012), a cross-sectional research design is used when the information for the research is gathered on a population at a specific point in time. An example would be a survey conducted to collect information on South Africans' experiences during the 2010 soccer world cup. It investigates the relationships which might exist between factors. Mann (2003) thus argues that cross-sectional studies help to identify multiple outcomes.

A longitudinal research design uses data which has been gathered over time (Bhattacharjee, 2012). This enables the researcher to analyze and explain the observed changes. Longitudinal studies are useful in studying relationships between different elements of the same population over time. This allows for variable factors as well as time-specific factors to be analyzed simultaneously to answer a research question.

The current investigation employed a mixed cross sectional and longitudinal research design. This was due to the fact that the data used was for different companies, and had been collected over time.

3.4 Sample selection

In order to determine how managerial overconfidence affects the share price of companies, 10 companies listed on the FTSE/JSE top 40 index were randomly selected. In line with Ilaboya and Aggreh (2013) study on the impact of dividends on share price volatility, convenient sampling was used to select these companies. According to Bhattacharjee (2012), convenient sampling which is also known as opportunity sampling is a sampling method where the sample is a proportion of the population which is readily available or convenient. This is a non-probability sampling method, which means that it is difficult to measure how well the population is represented (Bhattacharjee, 2012). Firstly, in order to represent the entire market's biggest companies in terms of size and market capitalization, only main board companies were selected. Secondly, the FTSE/JSE top 40 index was chosen because it represents the 40 biggest companies on the Johannesburg stock market according to size, measured by market capitalization.

3.5 Data and analysis

Two main kinds of data are used in research, primary and secondary. Primary data is directly collected (first-hand) from the population sample under study. Examples include information from surveys and focus group discussions. Secondary data is data collected and documented by someone other than the user. Examples include company records and financial statements. This study only used secondary data in the form of panel data. Jirata et al. (2012) define panel data or longitudinal data as data in which the variables are obtained from a similar set of entities over a period of time. The regression model employed is described in section 3.7.2. The data for this study comprised company share prices and financial statements for the period 1996 to 2015. It was sourced from INET BFA and the respective company websites. The data was analyzed using descriptive and inferential statistical analysis.

3.5.1 Descriptive analysis

According to Sekaran (2006), descriptive statistics describe and summarize information or data. The results can be presented in simple tables, charts, graphs, and other pictorial figures. In this study, descriptive analysis was used to determine the average or mean, standard deviation, and minimum and maximum values of the dependent variable and the control variables.

3.5.2 Inferential analysis

Leedy and Ormrod (2005) note, that, inferential statistical methods are useful in testing hypotheses. Correlation analysis and panel data regression analyses were used to determine the effect of managerial overconfidence on share price. These methods are discussed in more detail later in this chapter.

3.5.3 Hypothesis testing

In order to answer the research question, achieve the research objectives, and test behavioral corporate finance concepts such as investment-cash flow sensitivity, six empirical predictions based on each independent variable were tested. This is in line with the work of Malmendier (2001), Heaton (2002); Malmendier and Tate (2005a), Glaser et al. (2008), Verberne (2010), Mohamed et al. (2013), Ilaboya and Aggreh (2013), and Yilmaz and Mazzeo (2014).

As noted earlier, the hypotheses were tested using a combination of correlation analysis and regression analysis. According to Cohen et al. (2013), correlation analysis is an econometric technique which measures the strength of the relationship between two variables. The measure of the relationship is termed the correlation coefficient. Pearson correlation is used to test the degree of association between two variables. A hypothesis is a prediction of the possibility of an occurrence. It can be defined by a two-tailed test: $H_0: r = 0$ and $H_1: r \neq 0$. H_0 is the null hypothesis.

If it is accepted, this means that there is a relationship between the variables under study. H_1 is the alternative hypothesis. If accepted, this means that we reject the null hypothesis, meaning that we agree that there is no relationship between the variables under study (Cohen et al., 2013).

3.6 Description of variables and hypothesis development

In line with previous studies on managerial overconfidence and corporate investments, and the determinants of stock price discussed in the literature review, the key variables were identified. These variables were examined to determine the influence of managerial overconfidence through corporate investments on the general movement of a company's share price. The variables were: share price (SP), cash flow (CF), investments (I), Tobin's Q (Q), firm size, the Bureau of Economic Research's Business Confidence Index (BER BCI), and dividends per share (DPS). Managerial overconfidence was measured by investment-cash flow sensitivity. The Tobin's Q ratio was used as a proxy of investment-cash flow sensitivity. The dependent variable was share price, and the independent variables were CF, I, Q, firm size (the natural logarithm of total assets), the BER BCI, and DPS. The main independent variable was Tobin's Q which was used to measure managerial overconfidence; the other independent variables acted as control variables. These other variables had previously been identified as important factors which influence share price. Thus, they were key instruments in answering the research question. Studies that employed similar variables include Malmendier and Tate (2005b), Mohamed et al. (2013), Park and Kim (2009), Verberne (2010), Yilmaz and Mazzeo (2014) and Ilaboya and Aggreh (2013). Each variable is now discussed.

3.6.1 Dependent variable

Share price (SP)

The dependent variable was the share price, which is the market value of a unit of a company's equity, which investors have to pay in order to become shareholders. The annual average share price was used. This is calculated by adding the average monthly share prices and dividing the total by 12. Each company's annual share price was obtained from INET BFA for the period under study (1996-2015). The share price was measured in Rands.

3.6.2 Independent variables

i. Tobin's Q (Q)

This was the main independent variable, and the proxy for managerial overconfidence. The Q ratio helps to measure the expected value of a firm's future profitability. It is useful because the information used to calculate it comes directly from the stock market; thus, it provides a more informative picture of the general sentiment of the market towards a company.

This ratio is calculated by dividing the market value of assets by the book value of assets at the end of a year. To calculate the market value of assets, book equity is subtracted from the sum of total assets plus market equity for that year. To calculate the market value equity of a firm, all its outstanding common shares are multiplied by the closing share price for the fiscal year. To find book equity, total liabilities are subtracted from total assets. The book value of assets is the total assets.

A Q ratio greater than 1 means that the shares of that company are overvalued. This suggests that the value of an asset is more than its replacement cost, implying that the company is appreciated

by the market, and it should therefore increase its investment. A Q ratio equal to 1 implies that the market value of investments is equal to the current replacement cost, thus, only replacement investments should be accepted. A Q ratio less than 1 suggests that management should disinvest if possible, because the cost of investment is greater than its gain. This is the basis of the assumption that a high Q ratio should cause investments to increase, and a low one should cause a drop in investments. The table below summarizes incentives to invest based on the Q ratio.

Table 1: Investment incentives

Q ratio	Ideal investment choice
Q ratio > 1	Increase investment
Q ratio = 1	Replacement investment only
Q ratio < 1	Decrease investment

$$Q \text{ ratio} = \frac{\text{market value of assets}}{\text{book value of assets}}$$

$$\text{Market value of assets} = (\text{total assets} + \text{market value equity}) - \text{book equity}$$

$$\text{Market value of equity} = \text{outstanding common shares} \times \text{closing share price of the fiscal year}$$

$$\text{Book equity} = \text{total assets} - \text{total liabilities}$$

$$\text{Book value of assets} = \text{total assets}$$

Table 2 summarizes how managerial overconfidence is assumed based on the Q ratio.

Table 2: Determination of managerial overconfidence

Q ratio	Managerial overconfidence
Q ratio \geq 1	Overconfident
Q ratio < 1	Otherwise

Measuring managerial overconfidence using Tobin's Q

Managerial overconfidence was measured in this study using the investment-cash flow sensitivity of the firm. Following the work of Heaton (2002), Verberne (2010), and Mohamed et al. (2013), this offers insight into the level of confidence of a firm's manager. High investment-cash flow sensitivity means that the manager is overconfident, while low investment-cash flow sensitivity means the opposite. The Q ratio is used as a proxy of investment-cash flow sensitivity. Research has shown that companies with a high market value of equity to book value of equity, have overconfident managers (Shu et al., 2013).

Heaton (2002), Malmandier and Tate (2005a), Glaser et al. (2008), and Verberne (2010) observe that optimistic managers are sensitive to cash flows from both their investment projects and the firm. Firms' investment-cash flow sensitivity was thus used to gauge managerial overconfidence. Verberne (2010) used Tobin's Q to measure investment-cash flow sensitivity. Tobin's Q is explained in more detail in section 3.6.2. Among other scholars, Heaton (2002), Malmandier and Tate (2005a), and Glaser et al. (2008) observe that given adequate capital, overconfident managers would invest more than non-overconfident managers, and the increase in investments has a positive effect on share price. Under financially constrained conditions (low capital), overconfident managers would be reluctant to make investments. As a result, the higher the level of Tobin's Q (also called the Q ratio), the higher the expected share price for companies with overconfident managers and vice versa. A key motive for using the Q ratio to measure investment-cash flow sensitivity was its extensive use in previous studies and its practicability given the available data.

Hypothesis 1: An increase in managerial overconfidence (the Tobin's Q ratio) increases share price.

The first hypothesis related managerial overconfidence to share price. It is expected that managerial overconfidence measured by investment-cash flow sensitivity (Tobin's Q) significantly affects a company's share price, and is positively correlated to it. This is because the Q ratio measures the expected future profitability of a firm. Therefore, an increase in Tobin's Q demonstrates profitability, which investors would translate into increased stock value (Mohamed et al., 2013). Furthermore, an increase in Tobin's Q is also a signal that the firm should increase its investment because the replacement value of assets is less than the actual value of those assets. In addition because of the important role played by managers in corporate governance, their influence on decisions which affect the value of the firm are expected to translate into the share price. For this reason, managerial overconfidence is expected to be statistically significant in affecting a company's stock price. This hypothesis was tested using regression analysis. For result robustness, two types of regressions were used. These regression models are explained later in this chapter.

ii. Cash Flow (CF)

Cash flow is important for investments. Companies with overconfident managers rely on cash flow from past investments for future investments. Therefore, an increase in investments means that past investments were successful. The amount of cash flow will determine the level of investment. Cash flow is expected to be positively correlated with share price based on hypothesis one. Cash flow for a year is computed by finding the sum of earnings and depreciation for that year. This figure (cash flow) can be extracted from the statement of cash flows of a company. The figures for cash flow are measured in thousands of Rands.

Hypothesis 2: An increase in cash flow causes share price to increase.

According to Heaton (2002), overconfident managers rely on internal cash flow to finance investments because they believe that it would be too costly to fund these investments externally, and that the market undervalues their company's stock. Verberne's (2010) results support Heaton's (2002) argument. Given that managerial overconfidence through corporate investments is expected to increase the share price, an increase in cash flow is also expected to lead to an increase in share price. The reason is that high current cash flows point to successful past investments. Managers would be more optimistic about investing when there has been past success, and this behavior is expected to reflect positively in the share price. Previous research has identified cash flow as an important factor in determining share price (Chen et al., 2013). Therefore, this variable was used as a control variable in the current study. This hypothesis was tested using correlation and regression analysis.

iii. Investments (I)

Some studies have identified corporate investment as an important determinant of stock price (Joshiyura, 2011). This variable is thus expected to be statistically significant in shaping the stock price of a company. In addition, one way of assessing overconfidence is through the level of investment. This is evident from the literature reviewed in sections 2.2 and 2.3 of chapter two, which found empirical evidence of the presence of higher investment-cash flow sensitivity for firms with optimistic managers. This means that for optimistic managers, investments are driven by cash flow. Based on hypothesis 2, an increase in investment should also lead to a higher share price. The level of investment can be measured by the capital expenditure for a particular year. Capital expenditure is found in the cash flows statement. This is measured in thousands of Rands. Investment was used as a control variable.

Hypothesis 3: An increase in investments will lead to a rise in the company's share price.

Demand is one of the main determinants of stock price (Mehr-un-Nisa and Nishat, 2011, Nazir et al., 2010, Shubiri, 2010). As explained under hypothesis 2, a positive correlation is expected between cash flow and share price. According to Malmendier and Tate (2005), firms with optimistic managers are more sensitive to cash flow when it comes to investing than firms with non-overconfident managers (higher investment-cash flow sensitivity for firms with optimistic managers). Based on this, a positive correlation is also expected between investment and share price, because an increase in the company's investment would mean adequate cash flow from previous investments. This could signal profitability to investors who would drive the stock price up by increasing demand for that company's shares.

iv. Firm size

Firm size was the third control variable. According to Verberne (2010), Park and Kim (2009), firm size plays a vital role in firms' investment behavior. Smaller firms tend to invest less than bigger firms due to factors such as capital adequacy and cash flow. Furthermore, Heaton's (2002) findings show that investment-cash flow sensitivities are greater in larger firms than in smaller ones. The three main measures of firm size are the natural log of total assets, total sales, and market capitalization (Dang and Li, 2015). The current study measured the size of a firm using the natural logarithm of its total assets (LnTA) and total sales for a particular year. That is, company size was proxied by LnTA and by total sales.

Company size = LnTA and total sales

Where: Ln= natural logarithm

Hypothesis 4: An increase in firm size causes share price to also increase.

According to Verberne (2010), the size of a firm plays an important role in its access to capital and performance. The author argues that by virtue of their size, larger firms have more potential to take on riskier investments which yield higher returns than smaller firms. Higher risk tolerance gives larger firms a comparative advantage, which could lead to an increase in their share price through higher profit margins. A possible outcome is a further increase in total assets. Furthermore, an increase in sales is expected to increase cash flow which can be used for future investments. This hypothesis was tested using correlation analysis and regression analysis.

v. Business Confidence Index (BCI)

Following the work of Yu et al. (2006), Mefteh and Oliver (2009), Oliver (2010), and Park and Kim (2009), the BCI was included in the current study as a control variable. The index used was the Bureau for Economic Research (BER) South African BCI. This index assesses the level of confidence of top executives in the building, manufacturing and trade sectors in current and future sales, inventories, orders, selling prices and employment. The index covers a total population of about 3 800 managers and is compiled and published by the BER on a quarterly basis. The range of the scale is between 0 and 100, with 0 being an indication of extreme lack of confidence and 100 representing extreme confidence. Managers who score 50 are considered as neutral. A major reason why this measure was selected is because the data is readily available. The information required to calculate the first five variables listed above is available in company financial statements. The BER BCI was obtained from the BER's website.

Hypothesis 5: The business confidence index affects share price.

As in hypothesis 1, where managerial overconfidence is expected to affect the stock price, the BCI which represents the general confidence level of managers is also expected to affect the share price.

When the general confidence level of managers is low the share price is expected to drop, and when the BCI increases the share price is expected to increase. This hypothesis was tested using regression analysis and correlation analysis.

vi. Dividends per share

Dividends per share (DPS) is the amount of dividends that ordinary shareholders would receive per the number of ordinary stocks held in a company. This is calculated based on either the dividend pay-out ratio of a company or on the amount of dividends which a company declares in a particular year. Mathematically, DPS can be calculated using the following formula:

$$\text{DPS} = \frac{\text{total amount of dividends declared}}{\text{outstanding ordinary shares}}$$

Research by Hashemijoo et al. (2012) and Ilaboya and Aggreh (2013) shows that the amount of dividends that companies pay out has an important, significant effect on the volatility of the stock price. These authors observe that an increase in dividends also increased the share price and a decrease in dividends led to a fall in the stock price. This shows that dividends are an important determinant of share price because investors use this as an indicator of profitability. Therefore, DPS was used as a control variable in the current study. The DPS figures were obtained from the INET BFA database. DPS is measured in Rands.

Hypothesis 6: An increase in dividends per share increases share price.

Previous studies have shown that an increase in DPS causes the share price to increase (Hashemijoo et al., 2012; Ilaboya and Aggreh, 2013). The DPS is expected to positively influence share price. This was tested using regression analysis and correlation analysis.

3.7 Analyzing the effect of managerial overconfidence on the JSE top 40 share price

Regression analysis was used to gauge the effect of managerial overconfidence on the share price of the 10 companies from the FTSE/JSE top 40. Following Ilaboya and Aggreh (2013), two econometric models were used to promote validity and robust results. The first was a pooled OLS model and the second a panel data model. Cash flow, investment, BER BCI, Tobin’s Q, LnTA, total sales, and DPS were used in both models. These were regressed against share price in two sets of regressions. The first set (SET1) used the pooled OLS regression model and the second (SET2) the panel data regression model. The results from the pooled OLS model (SET1 results) and the panel data model (SET2 results) were compared in order to increase the robustness of the results. Furthermore, diagnostic tests were conducted to determine which model best represented the data, and based on these results one model was selected to give a better picture of the effect that managerial overconfidence through corporate investment has on share price. Table 3 summarizes the two models. Each model is explained the following sections.

Table 3: Summary of variables in SET 1 and SET 2 models

SET 1: Pooled OLS model	SET2: Panel data models
$\text{Share price}_{it} = \alpha_i + \beta Q \text{ ratio}_{it} + \beta I_{it} + \beta_{it}CF_{it} + \beta BER \text{ BCI}_{it} + \beta LnTA_i + \beta \text{ total sales}_i + \beta DPS_{it} + \varepsilon_{it} \dots\dots\dots(1)$	$\text{Share price}_{it} = \beta_{it}Q \text{ ratio}_{it} + \beta_{it}I_{it} + \beta_{it}CF_{it} + \beta_{it}BER \text{ BCI}_{it} + \beta_{it}LnTA_i + \beta_{it}\text{total sales}_i + \beta_{it}DPS_{it} + \alpha_i + u_{it} + e_{it} \dots\dots\dots(2) \text{ fixed effects}$ $\text{Share price}_{it} = \beta_{it}Q \text{ ratio}_{it} + \beta_{it}I_{it} + \beta_{it}CF_{it} + \beta_{it}BER \text{ BCI}_{it} + \beta_{it}LnTA_i + \beta_{it}\text{total sales}_i + \beta_{it}DPS_{it} + \alpha_i + u_{it} + e_{it} \dots\dots\dots(3) \text{ random effects}$

Where:

Q ratio = Tobin's Q

I = Investment

CF = Cash flow

BER BCI = Bureau of Economic Research Business Confidence Index

LnTA = size measured by the natural log of total assets

Total sales = size measured by the total sales of the firm

DPS = dividends per share

3.7.1 Pooled ordinary least square model (OLS)

When data is put together and run as one linear regression without taking into account the cross section difference or time series nature of the data, it becomes an ordinary least square (OLS) regression (Park, 2011). Regressing all the variables from the 10 companies over the 20-year period without taking into account variations within companies from one year to the next created a pooled OLS regression. Park (2011) points out that pooled OLS assumes that there is no individual or time effects i.e. $u_{it} = 0$. This makes this form of regression very simplistic and it is subject to numerous errors. According to Park (2011), pooled OLS regressions are often used as a yardstick to analyze results from other more refined regressions. The pooled OLS model is specified as follows:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \dots\dots\dots (4)$$

- Y_{it} is the dependent variable (where i = company, and t = time)
- β is the coefficient for the independent variable
- X_{it} stands for independent variable
- α is the unknown intercept of the regression
- ε_{it} is the traditional error term

Equation (1) represents the pooled OLS model which was run.

3.7.2 Panel data regression model

Theoretically, a panel data set is defined as one which is made up of a certain number of entities (n), with a certain number of observations (T) throughout a certain period of time (t) (Park, 2011). Each entity has a number of observations across the time period. Based on this, the total observations could be calculated as $n \times T$. According to Park (2011), panel data are ideally measured at regular intervals such as months or years. In the case of irregular data intervals, the data analysis should be done with care. There are three main characteristics of panel data: balanced or unbalanced panel data, fixed or rotating panel data, and long or short panel data (Park, 2011). Each is briefly described.

Panel data is considered balanced when all the entities have observations for all the time periods. When some entities do not have recorded measurements in certain times, it is viewed as being unbalanced.

When the same entities are measured over time in the data set, the panel data is said to be fixed. Alternatively, if the entities observed change over time, the panel data is rotating (Greene, 2008).

Cameron and Trivedi (2009) define short panel data as that characterized by many entities (large n) and few time periods (small T). Alternatively, when panel data has few entities and many time periods, it is called long panel data.

Panel data models are therefore best suited to handle data containing entities which have individual effects pertaining to the entities alone or as a whole, time effects, or both. In other words, panel data models are fit to handle datasets which have both fixed or random effects. A fixed effects

model analyzes whether intercepts change across entities within the time period, whereas a random effects model deals with differences in the error variance component across entities and over the time period (Park, 2011). These models are thus able to handle the problem of heterogeneity. The fixed effects model and random effects model are discussed below.

3.7.2.1 Fixed effects model

According to Torres-Reyna (2007), the fixed effects panel data model is only used when the objective is to study the impact of variables that change over time. This means that, the fixed effects regression analyzes the relationship between predictor variables and a predicted variable within a subject, i.e., a company, population, or country under study. The model assumes that each subject has certain characteristics which may or may not affect the dependent variable. For example, factors within a company may influence its share price. The purpose of using the fixed effects model lies in the assumption that certain factors within the entity could influence the dependent variable and they thus need to be controlled (Torres-Reyna, 2007). This forms the fixed effects assumption that *there is a correlation between the entity's error term and independent variables' error terms*. The fixed effects model removes these variations so that the real relationship between the dependent and independent variables can be analyzed. This model further assumes that the *time-invariant characteristics of one entity should not be correlated with another entity*. It assumes that each entity is different and therefore the error terms and constant terms should not be correlated. Should there be a correlation of error terms, then the fixed effects model becomes invalid, and the random effects model should be considered in order to obtain accurate results. The fixed effects model is written as:

$$Y_{it} = \beta_1 X_{i1} + \alpha_i + u_{it} \dots\dots\dots (5)$$

Where:

- Y_{it} is the dependent variable (where i = company, and t = time)
- β_1 is the coefficient for the first independent variable

- X_{i1} stands for the first independent variable
- u_{it} represents the error term
- α_i is the unknown intercept for each company or constant

Equation (2) represents the fixed effects model which was run.

3.7.2.2 Random effects model

The random effects model is used when the differences which exist between the different individuals or companies within the sample affect the independent variables (Torres-Reyna, 2007). The disparities between each individual are assumed to be arbitrary and uncorrelated with the independent variables. The random effects model is written as:

$$Y_{it} = \beta_1 X_{i1} + \alpha_i + u_{it} + e_{it} \quad \dots\dots\dots (6)$$

Where:

- Y_{it} is the dependent variable (where i = company, and t = time)
- β_1 is the coefficient for the first independent variable
- X_{i1} stands for the first independent variable
- u_{it} represents the error term
- α_i is the unknown intercept for each company
- e_{it} is the within entity error

Equation (3) represents the random effects model which was run.

3.8 Diagnostic tests

The cornerstone of most economic theory which is known as the Classical Linear Regression Model (CLRM) makes some very important assumptions (Gujarati, 2003). The CLRM assumptions must hold for the validity of the pooled OLS results and the panel data results. These assumptions include the linearity of the model, that the error term has a zero population mean, the independent variables have to be uncorrelated with the error term, there should be no serial correlation (observations of the error term should be uncorrelated), that the error term has a constant variance (there should be no heteroscedasticity), and none of the independent variables should be a perfect linear function of the other. Furthermore, when running panel data regressions, it is the practice to test for random and fixed effects, in order to determine the best model to handle the data. As a result, specification tests are run to ensure that the variables used are fit to be used for analysis, and that the best model is selected for interpretation purposes.

Pooled OLS tests

i. Multicollinearity test (VIF)

When the relative movement over time of the dependent variable perfectly matches the movement of an independent variable even if the absolute movement of the sizes of each variable differs, this is called perfect collinearity (Studenmund, 2011). Perfect collinearity of two variables means that they are the same, or that one is a multiple of the other (Studenmund, 2011). When many of these instances occur, this is called Multicollinearity. To test for the presence of any collinearity, the Variance-Inflating Factor (VIF) test is used. This test assesses how inflated the variance of an estimator is by the presence of Multicollinearity. To calculate the VIF, it is important to consider the value of R-square (R^2) (Gujarati, 2003). The VIF is computed using the following formula:

$$VIF = \frac{1}{1-R^2}$$

The implication of this equation is that as R^2 approaches 1, the value of the VIF tends to infinity. This means that, the higher the presence of variation, the higher the collinearity.

ii. Heteroscedasticity test

The Breusch-Pagan / Cook-Weisberg test is used to test for heteroscedasticity in order to draw inferences from the pooled OLS and panel data models estimations. Similar to the CLRM, the panel data model assumes that the variance of the error term is constant. This assumption is often violated by problems such as heteroscedasticity. Heteroscedasticity occurs when the variability of the dependent variable is different across the independent variables. Studenmund (2011) puts it as when $\text{Var}(u_i) \neq \sigma^2$. According to Gujarati (2008), the nature of the relationship between the explanatory and explained variable, outliers in the data and model misspecifications can cause heteroscedasticity. When the results of the Breusch-Pagan / Cook-Weisberg test reveal a high chi square value, heteroscedasticity is probably present, and when the chi square value is low, it can be assumed that there is no heteroscedasticity. Breusch-Pagan / Cook-Weisberg tests the following hypotheses:

H_0 : the error variances are all equal

H_1 : the error variances are a multiplicative function of one or more variables

Should this problem of heteroscedasticity occur, it can be resolved by using the Weighted Least Squares (WLS) or the robust estimation. This study provided for heteroscedasticity by including the robust estimation due to the fact that the actual form of heteroscedasticity which could be present was not known (Gujarati, 2008).

If some of the CLRM assumptions are violated, the OLS model is no longer the best model to fit the data. The panel data regression is used as an alternative model. Unlike the pooled OLS model, the panel data regression is best suited to explore data which has the properties of both time series

and cross sectional data. That is, panel data has space as well as time dimensions (Guajarati, 2003). Advantages of panel data identified by Guajarati (2003) include:

- The inclusion of heterogeneity which exists because the companies are different. Panel data allows for individual specific variables.
- Because it combines both time series and cross sections observations, it is more informative, has lower potential for collinearity, has more degrees of freedom, and is more efficient.
- Panel data studies more complex behavioral models because of its ability to better detect and measure unobservable phenomena such as managerial overconfidence.

Panel Data tests

iii. Testing for random effects

The Breusch-Pagan Lagrange multiplier (LM) test examines the data for the presence of existing random effects. The null hypothesis is that individual-specific or time-specific error variance components are zero. That is $H_0: \sigma^2_u = 0$. If the null hypothesis is not rejected, the pooled OLS is preferred; otherwise, the random effects model is better. According to Park (2011), this test helps to assess whether a pooled OLS model would be better than a random effects model. If the null hypothesis of the LM test is rejected, this implies the presence of random effects, and the random effects model would thus be better than the pooled OLS in analyzing the data. In a case where we fail to reject the null hypothesis, this means that there are no random effects in the data or heterogeneity (diversity), and the pooled OLS model is thus best to fit the data. The regression equation for the LM test is as follows:

$$\text{Average share price [company]} = Xb + u [\text{company}] + e [\text{company}]$$

iv. Hausman Test

Once a fixed effects model and a random effects model have been run, the Hausman test is used to see which model best analyses the data. The Hausman test examines if the individual effects are uncorrelated with the other regressors in the model (Park, 2011). As a rule of thumb, if the results of the Hausman test show that individual effects are correlated with any other independent variables, the random effects model violates a CLRM assumption and should thus be rejected. In this case, it presumes that a random effects model has individual effects in its error term. This will result in the rejection of the null hypothesis, and the conclusion that a fixed effects model better represents the data.

3.9 Limitations of the research

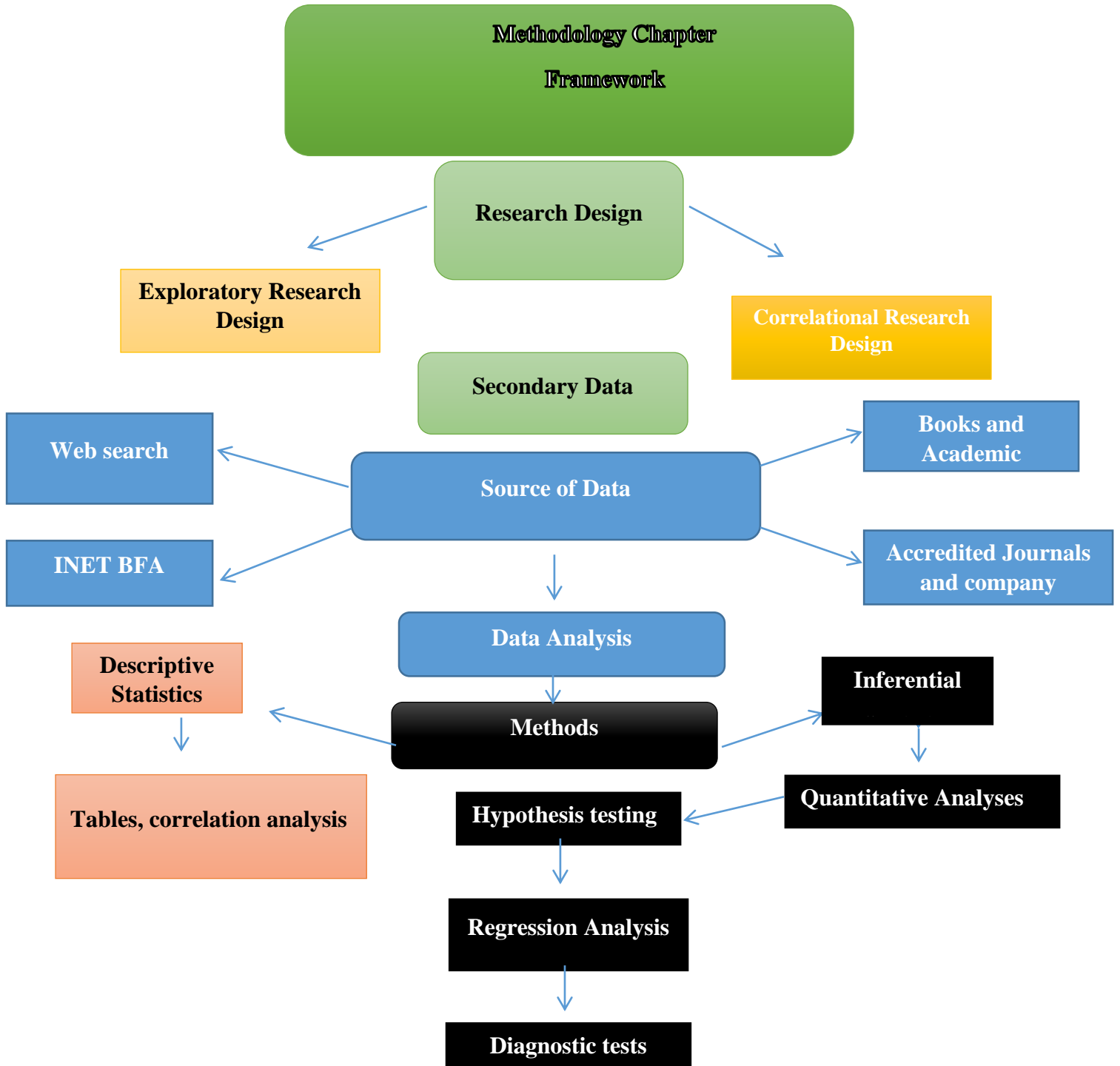
Given the difficulties encountered in identifying a plausible, generally agreed upon measure of managerial overconfidence, the measures used by different scholars are specific to the investigation at hand. Therefore, the measure of managerial overconfidence employed for this study best fit its purpose, which was to analyze its effect on share price through its presence in corporate investment decisions. It should also be noted that due to the non-probability sampling method employed (convenient sampling), the outcome of this study is specific to the 10 companies used. Generalization of the findings should take into consideration that companies outside of this sample might not necessarily experience similar outcomes.

3.10 Chapter summary

This chapter presented an in-depth discussion on the methodology employed to conduct this study. The process is summarized in the conceptual framework presented in figure 1. The following chapter presents the results of the processes outlined in this chapter, and discusses these results in the context of the South African economy and the JSE in particular.

Figure 1: conceptual framework

Conceptual framework of the methodology



Source: Author's own

CHAPTER FOUR

RESULTS, FINDINGS, AND DISCUSSION

4.1 Introduction

The main objective of this study was to investigate whether managerial overconfidence through corporate investments has any influence on the stock prices of FTSE/JSE top 40 companies. To achieve this objective, the data was analyzed using the quantitative methods discussed in the previous chapter. The hypotheses presented in section 3.6 were introduced in order to test whether, in line with the findings of previous studies, managerial overconfidence affects a company's share price. The core tools used to explore this relationship were descriptive and inferential analysis. In line with these methods, two sets of regressions were run, one using pooled OLS regression and the other using panel data regression. The two models, which were discussed in section 3.7.2 were used to increase the robustness of the results. The output from each set, and the diagnostic tests are presented in this chapter. These results contribute to on-going endeavors to understand the effect of behavioral biases on companies' share price. In particular, they will assist stakeholders in their share valuations, taking managerial overconfidence into consideration.

The first section of this chapter presents and discusses the study's results in comparison with previous studies and behavioral corporate finance theory. The summary statistics are presented and the major observations from these statistics are discussed. Each diagnostic test is presented and discussed. The OLS and panel data regression results are also presented and discussed. The second section of the chapter synthesizes the results and discusses them in the context of the FTSE/JSE top 40 index. The implications of these findings are highlighted and reference is made to previous studies with similar results.

4.2 Comprehensive presentation of results

4.2.1 Descriptive statistical results and analysis

The descriptive statistics presented in Table 4 summarize the variables used in this study. This table combines the 10 companies and describes the behavior of the variables throughout the period of observation. The average annual price of a share was 122, 67.31 cents. The minimum and maximum annual share prices were R40 and R183, 370, respectively. The average DPS paid by companies during the period under review was 311.37 cents and the average total assets of firms were R9, 965,968.47. The values of most firms' assets were above the replacement cost of their assets as shown by an average Tobin's Q of 2.7. This indicates that on average, most firms had high investment-cash flow sensitivity, which according to the literature discussed in chapters two and three, shows the presence of overconfident managers. Therefore, in accordance with the investment-cash flow sensitivity paradigm and Heaton (2002), Malmendier and Tate (2005), and Verbene's (2010) findings, it can be deduced from the average Tobin's Q being greater than 1, coupled with a high average cash flow of R3, 665,896 and annual average investment of R16, 874,890.01 that these firms had overconfident managers. Such managers will invest more due to capital availability shown by high levels of cash flow and sales volumes.

Table 4: Descriptive statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
Share price	200	12267.31 cents	22305.81 cents	48 cents	183370 cents
Investment	200	R16,874,890.01	R39,787,380.05	R0	R227,656,000
Cash flow	200	R3,665,896	R7,928,605	-R31,191,000	R63,600,000
BER BCI	200	48.2%	18.6%	17.8%	83.5%
Tobin's Q	200	2.7	3.4	0.56	27.1
DPS	200	311.37 cents	700.85 cents	0	5300 cents
Ln TA	200	15.54	3.10	7.72	20.86
Total sales	200	R9,968,968	R14,600,000	0	R73,092,000

Source: Author's construction based on data sourced from the INET BFA data base

4.2.2 Correlation results and analysis

The Pearson correlation matrix presented in Table 5 shows the relationship between the different variables as well as the level of significance of the relationship. Only statistically significant results are discussed in this section. The correlation results are presented in two steps. The relationship between share price, which is the dependent variable and the other independent variables is analyzed, followed by an analysis of the correlation between the independent variables.

4.2.2.1 Correlation between share price and independent variables

It is observed that, share price is positively correlated with all the independent variables (Q, I, CF, BERBCI, LnTA, sales, and DPS). However, positive statistically significant relationships are only observed between share price and cash flow, firm size (measured by LnTA and sales), and DPS. Cash flow has a statistically significant positive correlation of 0.3058 with share price which shows that firms with higher cash flows tend to experience growth in their share price. This is perhaps due to investors' confidence that such a firm would yield positive future returns. As a result, investors would highly value the company, thus increasing the share price through increased demand. Furthermore, share price and LnTA have a correlation of 0.2723, and share price and sales have a correlation of 0.84741. Both these relationships are statistically significant to the 0.01 level. This means that bigger firms in terms of size, measured by LnTA and sales, generally have higher share prices than smaller firms. Another important observation with regard to share price is its relationship to DPS. There is a correlation of 0.4764 between share price and DPS, and this relationship is statistically significant to the 0.01 level. According to the corporate finance theory, the DPS plays a pivotal role in determining a company's market value (Dolvin et al., 2012). The evidence presented reveals this importance through the statistically positive relationship between DPS and the share price. Dolvin et al. (2012) further argue that the significant relationship between DPS and share price is one reason why DPS is used in the Dividend Discount Model (DDM) which also uses the cost of capital and the growth rate to value a share. These results suggest that higher DPS could be attributed to higher share price, shown by a correlation of 0.4764 between the two variables. It can be concluded that DPS plays a vital role in driving up the share price, and thus

companies which pay a high DPS are held in high esteem by investors, causing a rise in their share price.

4.2.2.2 Correlation between independent variables

The correlation results further depict statistically significant relationships between cash flow and investment, investment and LnTA, cash flow and LnTA, cash flow and sales, cash flow and DPS, the BERBCI and DPS, LnTA and sales, sales and DPS, and the Q ratio and investment.

Cash flow and investment have a positive correlation of 0.1720, and this relationship is statistically significant to the 1% level. This is further proof of the sensitivity of investment to the availability of cash flow in larger firms with overconfident managers. The result shows a weak positive correlation, but a very strong statistical relationship between the two variables. Glaser et al. (2008) report similar results. The reason for this relationship is that optimistic managers rely on cash flow to fund firm investments (Glaser et al., 2008). According to the authors, optimistic managers' investment behavior is explained by agency theories; one reason why managers are believed to overinvest is so that they reap private benefits. Furthermore, Heaton (2002) and Malmendier and Tate (2005), amongst others, argue that optimistic managers believe that the market undervalues the value of their firm. As a result, the funds used for investment are not raised through equity or debt, but rather from cash flows from previous investments. This explains the positive relationship between investment and cash flow in the current study. It can be concluded that firms with optimistic managers have more pronounced investment-cash flow sensitivity than firms that do not have optimistic managers. Therefore, higher cash flows would increase the investments of firms with optimistic managers. To supplement this result, the BER BCI which is a survey of managers' general confidence in the economy, is positively related to cash flow (0.1314), and statistically significant to the 10% level (0.0636). This shows that, in general, managers are overconfident about economic conditions when their firms have increased cash flows, and less confident when cash flows are low.

Cash flow has a positive statistically significant relationship with DPS, with a correlation coefficient of 0.2632. This simply means that firms which report higher cash flows generally tend to pay more DPS than those with low levels of cash flow, all else being equal. DPS is also statistically positively correlated to the BERBCI and sales, with correlation values of 0.392 and 0.3569, respectively. The positive association between DPS and the BERBCI is an indication that when companies increase DPS, managers generally become more confident about the future outlook of the economy. The results also indicate that an increase in sales increases DPS and vice versa. This shows that an important part of the profit which is shared with investors in the form of dividends comes from sales. Therefore an increase in sales will increase the DPS.

A negative but statistically significant relationship to the 1% level is observed between Tobin's Q and investment. This is further evidence of the presence of managerial overconfidence. According to Malmendier and Tate (2005), overconfident managers believe that the market undervalues their company, and thus might make value destroying decisions such as investing in negative NPV projects, or not investing in positive NPV investments. The negative correlation of -0.1766 between investment and Tobin's Q shows that the managers of the companies under study do not easily react to market investment signals given by high Q ratios.

Hirshleifer et al. (2012) argue that bigger firms usually have optimistic managers. In addition, empirical evidence has shown that higher levels of sales, Return on Assets (ROA), and Tobin's Q are associated with managerial overconfidence (Hirshleifer et al., 2012). This study used the natural log of total assets (LnTA) and total firm sales as proxies for firm size, and investment-cash flow sensitivity proxied by Tobin's Q as the measure of managerial overconfidence. Tobin's Q was seen to have a weak positive correlation with LnTA and sales, respectively.

Cash flow and firm size are also positively correlated. Cash flow and LnTA have a positive correlation of 0.3206, and cash flow and total sales have a positive correlation of 0.3527. These relationships are significant to the 0.01 level. Sales and the LnTA have a statistically positive correlation of 0.4111. Dang and Li (2015) found similar results.

Table 5: Pearson correlation matrix

	Share price	Cash flow	investment	BER BCI	Tobin's Q	DPS	Ln TA	sales
Share price	1.0000							
Cash flow	0.3058 0.0000***	1.0000						
Investment	0.0025 0.9720	0.1720 0.0149***	1.0000					
BER BCI	0.0340 0.6329	0.1314 0.0636*	0.0278 0.6962	1.0000				
Tobin's Q	0.0798 0.2612	-0.0523 0.4619	-0.1766 0.0123***	0.0668 0.3472	1.0000			
DPS	0.4764 0.0000*	0.2632 0.0002***	-0.0819 0.2490	0.1392 0.0492**	0.0012 0.9860	1.0000		
LnTA	0.2723 0.0001*	0.3206 0.0000***	0.4196 0.0000	0.0436 0.5395	0.0380 0.5936	0.1096 0.1222	1.0000	
sales	0.8471 0.0000***	0.3527 0.0000***	-0.0989 0.1637	0.0107 0.8800	0.0974 0.1699	0.3569 0.0000***	0.4111 0.0000***	1.0000

Source: Author's construction based on data sourced from the INET BFA data base

*, **, *** show significance at 10%, 5%, and 1%, respectively

4.2.3 Diagnostics tests results

Diagnostic tests were conducted before running both the pooled OLS regressions and the panel data regressions. In line with the CLRM assumptions for the pooled OLS model, the VIF test was conducted to test for multicollinearity and the robust estimator was included in the regression to cater for heteroscedasticity as explained in section 3.8 of chapter three. Since the panel data regression analysis was also employed to increase the robustness of the results, the LM test and the Hausman test were conducted. Each diagnostic test and its importance were discussed in section 3.8. The results of each specification test are presented with an emphasis on their implications for each respective model.

v. *Multicollinearity test (VIF)*

To test for the presence of collinearity, the VIF test was conducted after running the pooled OLS regression. This test assesses how inflated the variance of an estimator is by the presence of multicollinearity. As a rule of thumb, VIFs greater than 10 show the possibility of collinearity (Landau and Everitt, 2003). Table 6 shows that all the variables have VIF figures of less than 10. This implies that there is no presence of collinearity. Therefore no variable was dropped, and each pooled OLS regression was run with all the stated variables included.

Table 6: VIF results

	Pooled OLS	
<i>Variables</i>	<i>VIF</i>	<i>1/VIF</i>
LnTA	1.66	0.601744
Sales	1.59	0.627405
Investment	1.44	0.693841
Cash flow	1.28	0.783380
DPS	1.21	0.827856
Q ratio	1.06	0.940885
BER BCI	1.04	0.958201
Mean VIF	1.33	

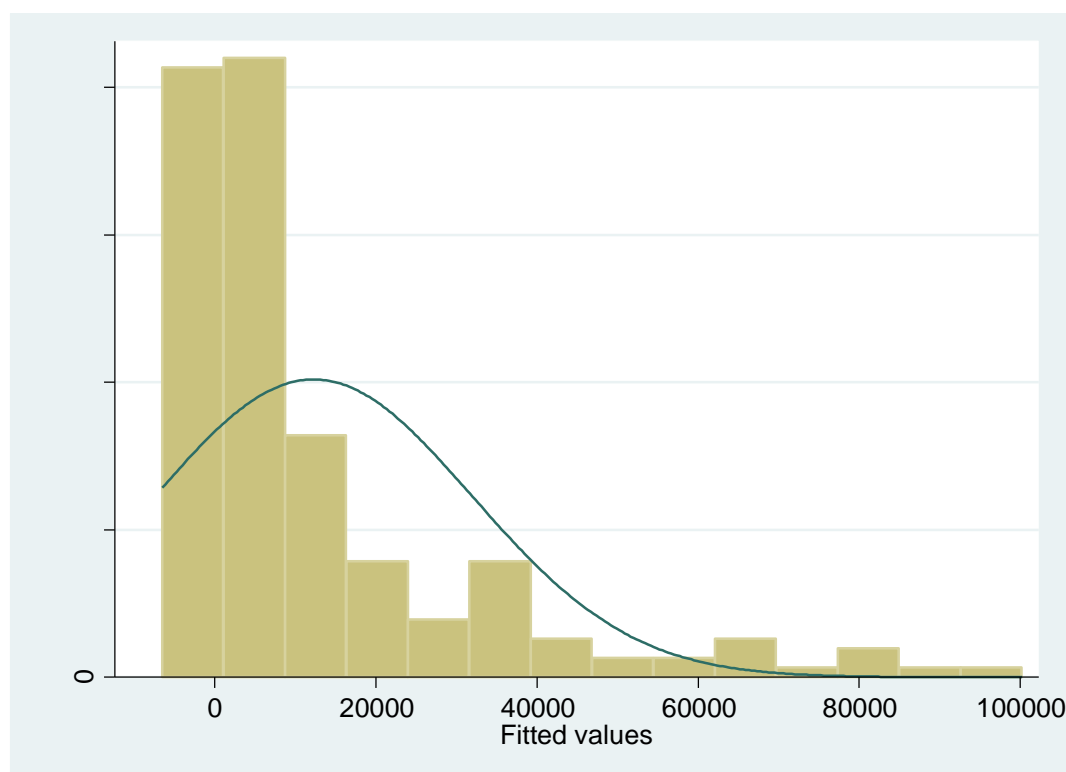
Source: Author's construction based on data sourced from the INET BFA data base

i. *Heteroscedasticity test*

The Breusch-Pagan / Cook-Weisberg test was also conducted to test the OLS model. The result yielded a prob > chi2 equal to 0.0000, showing the presence of heteroscedasticity. This test's results are presented in Appendix 2. In addition to this test, the residual plot presented in figure 2 confirms the results of the Breusch-Pagan / Cook-Weisberg test. The graph shows a distribution

skewed to the left. On the basis of these results, it is assumed that there is heteroscedasticity because the independent variable's error is not normally distributed. To solve this problem, the robustness estimation was used in the pooled OLS model.

Figure 2: Residual plot



Source: Author's construction based on data sourced from the INET BFA data base

ii. Testing for random effects

The Breusch-Pagan Lagrange multiplier (LM) test was used to test for the presence of random effects. The null hypothesis is that individual-specific or time-specific error variance components are zero ($H_0: \sigma^2_u = 0$). If the null hypothesis is not rejected, the pooled OLS is preferred; otherwise, the random effect model is better. As shown in table 7, the results of the LM test reveal a Prob > chibar2 of 0.0033. It is thus evident that there is heterogeneity or random effects in the data. This suggests that random effects panel regressions would yield more accurate results than pooled OLS

because they handle heterogeneity; the random effects model was therefore chosen over the pooled OLS model.

Table 7: LM results

	<i>Variance</i>	<i>Standard Dev</i>
Share price	498,000,000	22,305.81
E	98,300,000	9,915.781
U	2,899,046	1,702.658

Source: Author's construction based on data sourced from the INET BFA data base

$$\text{chibar2 (01)} = 7.36$$

$$\text{Prob} > \text{chibar2} = 0.0033$$

$$\text{Share price [company, t]} = Xb + u [\text{company}] + e [\text{company, t}]$$

Where:

t = time period

X = independent variable

b = coefficient

u = the error term

e = within entity error

iii. Hausman Test

The Hausman test was used to choose between fixed or random effects panel regressions. This is a test to examine if the individual effects are uncorrelated with the independent variables in the models (Park, 2011). The null hypothesis is that there is no correlation. If we reject the null hypothesis, we conclude that at least one independent variable is correlated with individual effects,

and thus we choose the fixed effects. If we fail to reject the null hypothesis, we assume that no independent variable is correlated with individual effect. In this case, the random effects model is preferred. The results of the Hausman test show that the fixed effects model is the most appropriate model given the data. This test revealed a $\text{Prob} > \chi^2$ of 0.0004. Appendix 6 shows the results of the Hausman test.

4.2.4 Regressions results, hypotheses, and discussion

This section presents the results from the pooled OLS model and the fixed effects panel regression model. Each model measures the causal effect of the independent variables on share price. The results of the hypotheses with respect to each independent variable are also presented. As discussed in chapter three, the hypotheses serve to test the relationship between the independent variables and the share price. Amongst other things, they test the presence of managerial overconfidence and assess the effect of such overconfidence on share price. The hypotheses are tested using correlation and regression analysis. The main focus is to observe how Tobin's Q which is the measure of managerial overconfidence affects share price. SET 1 presents and discusses the results of the pooled OLS regressions. This model assumes that there is no difference between the different companies over time. In other words, there is no cross sectional or time effect. SET 2 shows the results of the fixed effects panel regression. It assumes that there are cross sectional and time effects in the data, as shown by the LM results discussed in section 4.2.3. The use of two regression models was motivated by the need to increase the robustness of the results. This is in line with Ilaboya and Aggreh (2013) study that used the pooled OLS model in comparison to the panel data model to examine the effect of dividend share price policy on the volatility of share price.

SET 1 results

As noted previously, SET 1 comprised of a pooled OLS model. This model included seven independent variables which were regressed against share price. The main explanatory variable tested was the Q ratio. The other control variables were investment, cash flow, the BER BCI,

LnTA, total sales, and the DPS. Table 8 summarizes the results of the pooled OLS model. The model reports an R-squared of approximately 78%. This means that the independent variables explain about 78% of the variation in the share price. It can thus be concluded that this model is good. In addition, it reports an F statistic of 0.0000 which means this model is statistically significant. Due to the problem of heteroscedasticity detected by the Breusch-Pagan / Cook-Weisberg test, the robustness function in stata13 was used to fix this. This model shows that investment, LnTA, sales, and DPS are statistically significant to 1%, whereas Tobin's Q, cash flow, and the BCI are not statistically significant.

It was hypothesized that managerial overconfidence measured by Tobin's Q is significantly positively related to the share price. However, the pooled OLS reveals that the Q ratio is not statistically significant, having a p-value of 0.267. It nevertheless has a positive coefficient of 223.0627. Based on this model, managerial overconfidence measured by Tobin's Q does not explain share price, even though it has a positive correlation of 0.0798 with share price. This could be due to the fact that the model does not consider the effect of managerial overconfidence (Tobin's Q) over time and across the different companies used. The OLS model considers all these companies as one. This is one of the disadvantages of the OLS model. It does not take into consideration cross sectional or time effects that could distort the results. The fixed effects model presented in SET 2 addresses this problem.

Investment has a p-value of 0.015, and keeping all other variables constant, a R1 increase in investment would cause the share price to rise by an average of R0.01. This supports the third hypothesis which stated that an increase in investments will lead to a rise in the company's share price.

Another hypothesis predicted that an increase in cash flow would cause the share price to increase. With a p-value of 0.425 and a coefficient of -0.0000853, the OLS results do not support this prediction. This result is not consistent with the findings of Heaton (2002), who argues that cash flow is an important determinant of firm value. Again, the non-significance of this variable can be attributed to the nature of the OLS model which perhaps does not accurately model panel data.

One of the empirical predictions of the current study was that the BCI affects share price. The results are inconsistent with the findings of Yu et al. (2006), Mefteh and Oliver (2009), Oliver (2009), and Park and Kim (2009), and suggest that the general overconfidence of managers in the South African economy does not have explanatory power for share price. The BER BCI reports a p-value of 0.998 and a negative coefficient of -0.1137352.

Firm size measured by LnTA and sales have p-values of 0.004 and 0.000, respectively. Given that total assets were log transformed, the estimated effect of this variable is no longer linear, even though the effect of the variable LnTA is linear. Therefore, this variable had to be transformed. A 10% increase in total assets, would on average decrease the share price by -54.49 cents ($-1316.483 \times \log(1.10)$) because LnTA has a coefficient of -1316.483. Total sales has a coefficient of 0.0013375. This means that holding all other explanatory variables constant, a R1 increase in sales causes the share price to increase by R0.133. These two variables do not fully confirm the hypothesized relationship between firm size and the share price. It was predicted that an increase in firm size (measured by LnTA and sales) would also cause the share price to increase; however, the results show that only an increase in sales causes the share price to increase.

Finally, the OLS regression reveals that when DPS increases by R1, the overall approximate effect on the share price is a simultaneous increase of R6.63. Hypothesis 6 stated that an increase in DPS increases the share price.

Table 8: Pooled OLS regression

	Regression 1 (robust)	
	<i>Coef.</i>	<i>P-value</i>
<i>Share price</i>		
<i>Q ratio</i>	223.0627	0.267
<i>Investment</i>	0.0001088	0.015***
<i>Cash flow</i>	-0.0000853	0.353
<i>BERBCI</i>	-0.113752	0.997
<i>LnTA</i>	-1316.483	0.004****
<i>Sales</i>	0.0013375	0.000***
<i>DPS</i>	6.626826	0.000***
<i>Constant</i>	15206.37	0.003***
<i>R²</i>	0.7841	

Source: Author's construction based on OLS results run on STATA 13

*** shows significance to 1%

SET 2 results

According to the Hausman test results discussed in section 4.2.3, the fixed effects model was chosen over the random effects model as the most appropriate panel data model. The test results revealed a chi squared value of 0.004. For this reason, the random effects model results are not discussed but are presented in Appendix 5. The results discussed here are based on the fixed effects model presented in Table 9. The fixed effects model has an R^2 of about 82% and an adjusted R^2 of about 80%, and the model's F test value is 0.0000. These goodness-of-fit measures show that the model is good.

Tobin's Q, investment, sales, and DPS are all statistically significant to the 1% level. Furthermore, they are all positively related to share price based on the correlation results and they all have positive coefficients.

In accordance with Hypothesis 1 explained in chapter three, the Q ratio was expected to significantly and positively affect the share price. The results of this model support this prediction. Tobin's Q which is the measure of managerial overconfidence has a p-value of 0.003, and a coefficient of 753.96. This suggests that keeping every other explanatory variable constant, a 1 point increase in Tobin's Q causes the share price to rise on average by 753.96 cents. The very significant p-value of Tobin's Q shows that managerial overconfidence measured by the investment-cash flow sensitivity of the firm proxied by the firm's Tobin's Q ratio, strongly influences the share price. These results are in line with the arguments of Heaton (2002), Malmendier and Tate (2005), and Verberne (2010) that managerial overconfidence has a significant effect on corporate performance. It can be concluded that a manager's personal beliefs expressed through the investment decisions he/she takes can either increase or decrease their firm's share value. This is because these investment decisions translate into the firm's Q ratio which investors can read and use to make buying or selling decisions in relation to a particular company.

Investment has a p-value of 0.013, and a coefficient of 0.0000885. This suggests that a R1 000 increase in investments leads to an average share price increase of R0.09 per share, holding all other independent variables constant. The influence of investments on share price confirms hypothesis 3, which stated that an increase in investments will lead to a rise in a company's share price.

The hypothesized relationship between the share price and company size measured by its sales was also confirmed. In accordance with the work of Park and Kim (2009), the size of a company has a significant influence on its value. This value can also be measured by its share price. The results show that a R10 increase in a company's total sales leads to the stock value rising by an average of R1.35 when every other independent variable remains constant.

Based on the literature discussed in chapters two and three, the dividends paid by a company were predicted to have a significant influence on its share price. This is because dividends are sometimes seen as a signal of confidence by investors; that is, the company is telling investors that they made enough profit to grow the company and reward shareholders with a portion of that profit.

Therefore, as expected, DPS influences the share price positively. The fixed effects model shows that a R1 increase in DPS causes the share price to rise by 8.06 cents.

Table 9: Fixed Effects (FE) regression

	Regression 2	
	Coef.	P-value
<i>Share price</i>		
<i>Q ratio</i>	753.9572	0.003***
<i>Investment</i>	0.0000885	0.013****
<i>Cash flow</i>	-0.000041	0.689
<i>BERBCI</i>	-22.16843	0.570
<i>LnTA</i>	-399.2564	0.413
<i>Sales</i>	0.0013481	0.000***
<i>DPS</i>	8.062011	0.000***
<i>Constant</i>	188.9253	0.980
<i>R²</i>	0.8183	
<i>Adj. R²</i>	0.8024	
<i>Prob>F</i>	0.0000	

Source: Author's construction based on panel data FE results run on STATA 13

*** shows significance to 1%

4.3 Synthesis of the results

Based on the results on 10 companies from the FTSE\JSE top 40 index, it can be concluded that managerial behaviors and actions have significant influences on the way companies perform. The following section discusses the results presented in section 4.2 with a focus on investment-cash flow sensitivities, share price, and company size.

4.3.1 Investment-cash flow sensitivity and managerial overconfidence

The financial literature highlights two main hypotheses which seek to explain corporate investment decisions. These are the agency problem introduced by Jensen and Meckling (1976), and information asymmetry posited by Myers and Majluf (1984).

The agency problem and asymmetric information theories postulate among other things that, company investment decisions depend on their capital structure. These corporate finance theories strongly posit the presence of investment-cash flow sensitivity caused by managerial biases such as overconfidence. In testing various hypotheses, the current study found evidence to back these claims and highlighted the important effect of managerial overconfidence on corporate investments and on the share price of a company. It was found that a certain degree of investment-cash flow sensitivity exists in the 10 firms from the FTSE\JSE top 40 index. The results show that overconfident managers increase their firms' investment levels when there are adequate internal funds, and decrease investments when there are insufficient cash flows. This is done to avoid external control which would arise if outside funds were used. In addition, the asymmetric information theory supports the presence of overconfident managers by postulating that there is sensitivity between corporate investment and internal cash flow. According to asymmetric information theory, overconfident managers restrict external financing so as to avoid the dilution of shares. This causes investment to highly depend on the availability of internal funds, as shown by the positive and statistically significant correlation between investment and cash flow reported in the current study. Malmendier and Tate's (2005a) study produced similar results.

Verberne's (2010) argument for using internal funds is that current cash flows are a good measure of the success of previous investments. Therefore, large cash flows indicate successful previous investments, as indicated by the positive relationship between Tobin's Q and cash flow also reported in the current study. This motivates a manager to make more investments, and thus further explains the positive relationship between investment and cash flow.

4.3.2 Managerial overconfidence and share price

One of the main objectives of this study was to investigate whether managerial overconfidence through its effect on corporate investments affects the share price of a company. This objective was achieved using correlation and regression analysis. The results show the presence of investments-cash flow sensitivity depicted by the statistically significant positive correlation between cash flow and investment. Furthermore, the fixed effects model shows that managerial overconfidence measured by Tobin's Q affects the share price. It can thus be concluded that the statistically significant effects of cash flow, investment, and Tobin's Q on share price shown in this study are evidence of a possible ripple effect of managerial biases (such as overconfidence) on a company's value. In other words, the effect on share price caused by these variables (cash flow, investment, and Tobin's Q) reflects how biased actions on the part of managers affect the share price. Behavioral corporate finance discourses such as investment-cash flow sensitivity argue that a manager's personal beliefs and personality traits can influence a firm's performance by either investing more or less depending on the adequacy of cash flow which is subject to the success of past investments (Tobin's Q) and the size of the firm.

4.3.2 Managerial overconfidence, investment, and company size

The size of a company plays a pivotal role in its investments. This is supported by the literature (Welc, 2012) and cannot be overemphasized. All of the companies used in this study are among the top 40 companies listed on the JSE. By asset size, they are some of the biggest companies in South Africa. The investment-cash flow sensitivity theory can thus be linked to the magnitude of a company, and it can be concluded that managerial overconfidence measured by investment-cash flow sensitivity, increases with company size. The results of the current study support this claim with evidence showing that managerial overconfidence is positively related to company size.

Generally, smaller companies are more affected by internal inadequacy of funds for investment, because they have less access to external capital financing than bigger companies. They should thus have higher investment-cash flow sensitivity than larger firms. However, this is not the case.

Kaddapakkam, Kumar and Riddick (1998) found evidence that investment-cash flow sensitivity is generally greater for larger firms because they try as much as possible to avoid external financing costs. The authors do not reject the generally accepted claim that smaller firms have less access to capital than larger firms, but point out that investment-cash flow sensitivity influences capital accessibility. It should be noted that, among larger firms, sensitivity of investments to cash flow is not because they cannot raise the capital, but rather due to the agency problems and asymmetric information discussed earlier. This was empirically proven by Kaddapakkam, Kumar and Riddick (1998), who argue that firms with higher investment-cash flow sensitivity are not necessarily financially constrained. The results of the current study support Kaddapakkam, Kumar and Riddick's (1998) position that larger firms experience higher investment-cash flow sensitivity. Investment and company size have a moderate positive correlation of 0.4196. This correlation is substantiated by a very significant p-value of 0.0000, which shows a clear causal relationship between these two variables. Another explanation for high investment-cash flow sensitivity in larger companies as compared to smaller ones is that, in terms of the timing of their investments, larger firms have greater flexibility and may even defer these investments until they have sufficient internal funds.

4.4 Chapter summary

Since managerial overconfidence is an abstract concept, in line with Heaton (2002), the investment-cash flow sensitivity of firms was used as a measure of the level of managerial overconfidence. Verberne (2010), amongst other scholars, found that firms with high investment-cash flow sensitivity are more likely to have an overconfident manager. Furthermore, using the Tobin's Q measure as an overconfidence measure, as well as to capture the "invest" or "do not invest" signal to companies given by this ratio, the results show that managers do not rely on this signal to invest, but rather on cash flow availability. The Pearson correlation table in section 4.2.2 shows that investment and cash flow have a correlation of 0.3058 and a p-value of 0.0000, while investment and Tobin's Q have a correlation coefficient of -0.1766 and a p-value of 0.0124. This means that firms invest more when cash flow is high, and not when there is an "invest" signal, shown by a Tobin's Q value above 1. Such investment behavior is attributed to firms with overconfident managers. The fixed effects panel data regression shows that Tobin's Q does affect

share price. Therefore, it is concluded that all else being equal, managerial overconfidence does have explanatory power for share price. Furthermore, based on the results, firm size is another major determinant of managerial overconfidence. The results show that larger firms have a greater marginal propensity to have overconfident managers. This conclusion is also supported by the literature.

CHAPTER FIVE

RECOMMENDATIONS AND CONCLUSION

5.1 Introduction and summary of the study

Due to its abstract nature, managerial overconfidence is a complex issue. Researchers continue to seek new and better ways to measure it, and the measures used are generally specific to the study at hand. A number of studies have investigated the role played by managerial overconfidence in firm performance. It has been examined in relation to innovation, stock price crash risk, and corporate investment (Galasso and Simcoe, 2011, Glaser et al., 2008, Kim et al., 2016). However, no previous study has investigated the effect that an overconfident manager would have on the share price of the firm. This study filled this research gap by investigating the effect of managerial overconfidence on stock price. Numerous studies that explored the causes of stock price fluctuations note that understanding such fluctuations is critical in making informed investment decisions. Furthermore, it has been shown that in addition to fundamental determinants like microeconomic or macroeconomic factors, behavioral factors influence the share price. They refer to personal biases which cause an individual to behave in irrational ways that impact their investment decision. One of these behavioral biases is managerial overconfidence, which was investigated in this study. Because the decisions taken by firms play an important role in their profitability and thus, the way investors value them, investigating the influence of the manager's personality biases on a firm's investment decisions offers insight into how such biases influence the value of a firm, as shown by its share price. The managerial bias which was investigated is managerial overconfidence.

To determine the impact of managerial overconfidence on share price, 10 firms from the FTSE/JSE top 40 index were sampled and analyzed using a quantitative analytic approach. This involved, amongst other things, correlation examination, and running two sets of regressions. Share price

was the dependent variable, and Tobin's Q, investment, cash flow, the business confidence index, dividends per share, the natural log of total assets, and total sales were the independent variables. The following section summarizes the study's main findings as a foundation for the recommendations that follow.

5.2 Summary of findings

The results of this study can be summarized in three ways. The first shows the presence of managerial overconfidence, evident in firms' investment-cash flow sensitivity, while the second highlights evidence that managerial overconfidence tends to increase with firm size, and the third shows that managerial overconfidence does influence the stock price.

According to Heaton (2002), a firm's investment-cash flow sensitivity offers insight into whether or not the firm has an overconfident manager. The author argues that because overconfident managers overvalue their ability to positively influence their company's performance, they only increase investment when there are adequate internal funds. This is to avoid dilution of ownership and the costs associated with borrowing from external sources. The correlation results revealed that investment and cash flow have a positive correlation of 0.1720, and this relationship is statistically significant to the 1% level (0.0149). This shows that investment is sensitive to the availability of cash flow. Cash flow is money from previous successful investments. Therefore an increase in cash flow is an indication to the overconfident manager that his/her previous investments were successful, making him or her optimistic about future investment regardless of the net present value of those projects. Glaser et al. (2008) report similar results.

Firm size is another variable which shows the presence of managerial overconfidence. Kadapakkam, Kumar and Riddick (1998) provide evidence that investment-cash flow sensitivity is generally higher for larger firms. The presence of investment-cash flow sensitivity suggests the presence of an overconfident manager. The current study considered 10 of the FTSE/JSE top 40

companies. These are the largest companies listed on the JSE in terms of market capitalization. As a proxy for size, the natural log of their total assets (LnTA) and total sales were used.

The fixed effects panel regression shows that Tobin's Q does affect the share price. Tobin's Q was used to proxy managerial overconfidence. The regression output suggests that keeping every other explanatory variable constant, a 1 point increase in Tobin's Q causes the share price to rise on average by 753.96 cents.

5.4 Recommendations

The study's results have implications for firms and managers as well as investors. Two main recommendations are presented.

One of the main objectives of the owners of a firm is to grow their wealth. This could be achieved through increasing the value of their share price. All else being equal, when managerial overconfidence is present, such as in large companies with higher investment-cash flow sensitivities, there is an increased possibility of agency issues. Agency problems arise when managerial and shareholder objectives are misaligned. Given that share performance is also reliant on cash flows from investments made by the manager, it is evident from the results of this study that managerial decisions can either benefit or harm a firm's share price. This would go against one of the main objectives of shareholders. According to Glaser et al. (2008), a CFO's overconfidence does not play a role in corporate investment decision making. This implies that the decision is heavily reliant on the manager. Therefore, beyond the presence of any behavioral biases such as managerial overconfidence, shareholders or owners should ensure that the manager clearly understands the company's objectives and vision. To avoid the possibility of selecting negative NPV investments which would cripple the company's stock price, important corporate decisions such as those concerning investment should not only rest with the manager who is the head of the firm. These decisions should be tabled, and contributed to by all managerial executives, as the

outcome will affect the company's share price. Managers should also be aware of their own biases and consider advice from others when making corporate decisions.

As pointed out by Brabazon (2000), investors have always suspected that behavioral biases influence the market. The results of this study provide evidence of this. Because an overconfident manager influences the value of a company's stock, investors should not only look at a company's past performance, as well as the price earnings ratio (PE ratio), dividend yield, DPS, or any other market value ratios, but should also consider the characteristics of the manager in charge. The evidence reveals that managerial overconfidence illustrated by high investment-cash flow sensitivity, increases a company's share price. One way to determine the overconfidence status of a manager is to read reviews or articles on that manager, and determine how, on average, he or she is portrayed (Malmendier and Tate, 2005).

5.5 Final remarks

In conclusion, this study, which examined the impact of a manager's overconfidence on their firm's value, has provided further evidence of the importance that psychology or personalities play in determining the behavior of markets. As mentioned in chapter 3, this study had some limitations. One major one consisted of the use of only 10 out of the 40 FTSE/JSE top 40 companies. Future studies ought to include all of the 40 companies. Also, perhaps managers from different sectors have different behavior types in regards to overconfidence, which ought to also be studied. Perhaps a qualitative paradigm might provide a richer picture than solely an aggregate study such as this one. In addition, since there is still no generally accepted measure of overconfidence, further research to determine a plausible and generally agreed upon measure of overconfidence and managerial overconfidence would make a significant contribution to the emerging field of behavioral corporate finance. An intriguing question emerging from the current study, which could also be the subject of further research, is whether managerial overconfidence and share price simultaneously affect each other. Answering this question would clarify the effect which share price could have on managers' confidence levels. One of the benefits of knowing the effect of

share price on managerial overconfidence is possible improvement of the company's financial performance. This is because the level of managerial overconfidence is arguably an indication to company owners of the kind of influence which the manager could possibly have on their company's profitability. Therefore, owners would hire a manager who fits with their company goals and objectives, thereby reducing the occurrence of information asymmetry and agency problems.

6. REFERENCES

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7. Appendices

Appendix 1

SET 1 regression (pooled OLS)

Source	SS	df	MS	Number of obs = 200		
-----+-----				F(7, 192) = 99.61		
Model	7.7635e+10	7	1.1091e+10	Prob > F = 0.0000		
Residual	2.1377e+10	192	111338623	R-squared = 0.7841		
-----+-----				Adj R-squared = 0.7762		
Total	9.9012e+10	199	497549223	Root MSE = 10552		

averageshareprice	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
tobinsqoc	223.0627	226.8661	0.98	0.327	-224.4072	670.5325
investment	.0001088	.0000226	4.82	0.000	.0000643	.0001533
averagecashflow	-.0000853	.0001066	-0.80	0.425	-.0002955	.000125
berbci	-.1137352	41.08728	-0.00	0.998	-81.15413	80.92666
size1nta	-1316.483	310.8368	-4.24	0.000	-1929.576	-703.3895
sizesales	.0013375	.0000647	20.66	0.000	.0012098	.0014652
dividendspershare	6.626826	1.172992	5.65	0.000	4.313222	8.940431
_cons	15206.37	4784.977	3.18	0.002	5768.501	24644.25

Appendix 2

Breusch-Pagan / Cook-Weisberg

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

Ho: Constant variance

Variables: fitted values of average share price

chi2(1) = 715.25

Prob > chi2 = 0.0000

Appendix 3 SET 2

SET 2 Fixed effects regression (FE)

```

R-sq:  within = 0.7170          Obs per group: min =      20
        between = 0.8830          avg =      20.0
        overall = 0.7666         max =      20
    
```

```

                                F(7,183)      =      66.22
corr(u_i, Xb) = -0.4124         Prob > F      =      0.0000
    
```

```

-----+-----
averageshareprice |      Coef.   Std. Err.    t    P>|t|    [95% Conf. Interval]
-----+-----
      tobinsqoc |    753.9572   253.0785    2.98  0.003    254.6302    1253.284
      investment |     .0000885   .0000352    2.51  0.013     .000019    .0001581
averagecashflow |    -.000041   .0001025   -0.40  0.689    -.0002432    .0001611
      berbci |   -22.16843   38.94007   -0.57  0.570   -98.99764    54.66079
      sizelnta |   -399.2564   487.0061   -0.82  0.413   -1360.125    561.6125
      sizesales |     .0013481   .0000806   16.73  0.000     .0011891    .0015071
dividendspershare |    8.062011   1.239979    6.50  0.000     5.615518    10.5085
      _cons |    188.9253   7372.817    0.03  0.980   -14357.73    14735.58
-----+-----
      sigma_u |   5853.2199
      sigma_e |   9915.7813
      rho |   .25840574   (fraction of variance due to u_i)
    
```

```

F test that all u_i=0:      F(9, 183) =      3.82          Prob > F = 0.0002
    
```


Appendix 4

SET 2 *Linear regression, absorbing indicators*

Number of obs = 200

F(7, 183) = 66.22

Prob > F = 0.0000

R-squared = 0.8183

Adj R-squared = 0.8024

Root MSE = 9915.7813

```

-----+-----
averageshareprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
      tobinsqoc |    753.9572   253.0785     2.98   0.003    254.6302   1253.284
      investment |     .0000885   .0000352     2.51   0.013     .000019   .0001581
averagecashflow |    -.000041   .0001025    -0.40   0.689    -.0002432   .0001611
      berbc1 |   -22.16843   38.94007    -0.57   0.570    -98.99764   54.66079
      sizelnta |  -399.2564   487.0061    -0.82   0.413   -1360.125   561.6125
      sizesales |     .0013481   .0000806    16.73   0.000     .0011891   .0015071
dividendspershare |    8.062011   1.239979     6.50   0.000     5.615518   10.5085
      _cons |    188.9253   7372.817     0.03   0.980   -14357.73   14735.58
-----+-----
      company |           F(9, 183) =     3.824   0.000           (10 categories)

```

Appendix 5

SET 2 random effects regression (RE)

```

R-sq:  within = 0.7083          Obs per group: min =      20
        between = 0.9299          avg =      20.0
        overall = 0.7833         max =      20
  
```

```

Wald chi2(7) = 614.82
corr(u_i, X) = 0 (assumed)    Prob > chi2 = 0.0000
  
```

```

-----
averageshareprice |      Coef.   Std. Err.      z    P>|z|    [95% Conf. Interval]
-----+-----
      tobinsqoc |   359.2204   233.701     1.54   0.124   -98.82505    817.266
      investment |    .000107   .0000246    4.35   0.000    .0000587    .0001552
averagecashflow |  -.0000683   .000105    -0.65   0.515   -.000274    .0001375
      berbc1 |  -5.539249   40.25016    -0.14   0.891   -84.42811    73.34961
      sizelnta |  -1197.93   342.4181    -3.50   0.000   -1869.057   -526.803
      sizesales |    .001335   .0000676   19.74   0.000    .0012025    .0014676
dividendspershare |  7.022704    1.19016     5.90   0.000    4.690034    9.355374
      _cons |  13122.91   5256.167     2.50   0.013   2821.009    23424.8
-----+-----
      sigma_u |  1702.6584
      sigma_e |  9915.7813
      rho |  .02864054   (fraction of variance due to u_i)
-----
  
```

Appendix 6

Hausman test

```
----- Coefficients -----
      |      (b)      (B)      (b-B)      sqrt(diag(V_b-V_B))
      |      fe      re      Difference      S.E.
-----+-----
      |
tobinsqoc |      753.9572      359.2204      394.7367      97.12155
investment |      .0000885      .000107      -.0000184      .0000252
averagecas~w |      -.000041      -.0000683      .0000272      .
berbci |      -22.16843      -5.539249      -16.62918      .
lnta |      -399.2564      -1197.93      798.6737      346.3017
sales |      .0013481      .001335      .000013      .0000438
dividendsp~e |      8.062011      7.022704      1.039307      .3479473
-----+-----
```

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
          =      20.27
Prob>chi2 =      0.0004
(V_b-V_B is not positive definite)
```