Investor short-termism on the Johannesburg Stock Exchange

by
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Thesis presented in fulfilment of the requirements for the degree of Master of Commerce in the Faculty of Economic and Management Sciences at Stellenbosch University

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December 2023

Declaration

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December 2023

Abstract

Participants in global financial markets appear to be placing increased pressure on corporate managers to prioritise short-term results. When managers are pressurised into focusing on short-term financial performance, the actions required to ensure the long-term sustainability of a company might be deferred or overlooked. Barton (2011) argued that the capital markets are experiencing an era of quarterly capitalism, where the nearly continuous release of new information has contributed to a shift in market participants' focus from the long-term sustainability of a company to its short-term share performance.

Traditional finance theory assumes that markets operate efficiently, and that market participants have access to perfect information which allows them to make decisions in a rational manner. Under traditional assumptions, market prices accurately reflect a share's intrinsic value. However, volatile market conditions and numerous market anomalies may suggest the opposite. Behavioural finance theory attempts to explain this by examining behavioural biases such as short-termism, often displayed by investors when making intertemporal investment decisions. When accentuated by herding, myopic preferences could have a significant impact on asset valuation models.

Short-termism occurs when investors overvalue short-term returns by applying higher discount rates to more distant cash flows. This disproportionate discounting might result in market prices deviating from their intrinsic values. This problem might be further compounded when corporate managers also prioritise short-term cash flows, possibly resulting in underinvestment in future, long-term fundamental value-generating projects.

The results of previous studies (Haldane and Davies, 2011; Miles, 1993; Chou and Guo, 2004) have indicated that investors in the United Kingdom (UK) and the United States (US) exhibited short-termism. The authors found that the discount rates applied to shares were adjusted to overvalue near-term cash flows and undervalue long-term returns. Whereas these studies have investigated the presence of short-termism in developed countries, only limited research has been conducted on the phenomenon in developing countries. The primary objective of this study was to investigate investor short-termism in South Africa from 1995 to 2014.

The sample of the study included companies that had been listed on the Johannesburg Stock Exchange (JSE) from 1995 to 2014. The regression model employed included five years of lagged and future variables for each company considered. Therefore, the data were collected within the timeframe from 1990 to 2019. In order to provide five years of lagged and future values, companies were required to publish the necessary data continually for 11 years. The resulting sample consisted of 280 companies and 3 577 company-year observations. To assess for changes over time, the

sample was divided into two ten-year subperiods over the study period. The sample was also divided between sectors to investigate short-termism in companies operating in different industries.

Multiple regression analyses were used to test for short-termism in the sample. The regression model employed was based on a theoretical model developed by Davies, Haldane, Nielsen and Pezzini (2014). The regression model was estimated using the Generalised Method of Moments (GMM) estimation method. The Wu-Hausman endogeneity test, Sargan's test for overidentifying restrictions and the Cragg-Donald weak instrument test were used as diagnostic tests to determine the suitability of the GMM estimation method for the current study.

The results of the study indicated that investors in JSE-listed companies exhibited significant levels of short-termism over the study period, the degree of which was found to have increased over time, with statistically significant evidence of sustained short-termism found in the final decade of the study period. When considered at a sector level, investors in the basic materials sector were found to have exhibited the highest levels of short-termism among the four applicable sectors in the study.

To reduce short-termism in South Africa, the researcher recommends that managers adopt a corporate culture that promotes long-termism, discourage quarterly reporting, structure executive remuneration to facilitate long-term financial performance and offer enhanced shareholder participation rights to long-term investors. Furthermore, investors are encouraged to exercise stewardship and provide executives with investor mandates that prioritise sustainable investing. The government is also encouraged to adjust capital gains tax to reward long-term share ownership, promote short-termism awareness through improved financial literacy programmes in curriculums and enhance or modify fiduciary duties of financial intermediaries to align the long-term interests of stakeholders.

Keywords: investor short-termism, managerial myopia, behavioural finance theory, behavioural bias, hyperbolic discounting.

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List of acronyms and abbreviations

2SLS	two-stage nonlinear least-square
AIM	alternative investment market
APT	arbitrage pricing theory
B/M	book-to-market
BOD	board of directors
CAPM	capital asset pricing model
CFA	chartered financial analyst
CSR	corporate social responsibility
CX	customer experience
DCF	discounted cash flow
DF	degrees of freedom
DPS	dividend per share
DU	discounted utility
EMH	efficient market hypothesis
EPS	earnings per share
ESG	environmental, social and corporate governance
EUT	expected utility theory
FF3	Fama-French three-factor
FF5	Fama-French five-factor
FSCA	Financial Sector Conduct Authority
FTSE	Financial Times Stock Exchange
GDP	gross domestic product
GMM	generalised method of moments
JSE	Johannesburg Stock Exchange
MPS	market price per share
MPT	modern portfolio theory

NPV	net present value
NYSE	New York Stock Exchange
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
S&P	Standard and Poor's
SARB	South African Reserve Bank
SML	security market line
UK	United Kingdom
UNPRI	United Nations Principals for Responsible Investing
US	United States
WHO	World Health Organisation

CHAPTER 1
INTRODUCTION TO THE STUDY

1.1 INTRODUCTION

> *We believe a healthy society requires healthy and responsible companies that effectively pursue long-term goals. Yet in recent years, boards, managers, shareholders...have allowed short-term considerations to overwhelm the desirable long-term growth and sustainable profit objectives of the corporation.* (The Aspen Institute, 2009)

Capital markets are suggested to be experiencing an era of "quarterly capitalism"; where an apparent preference for short-term results has placed increasing pressure on management to achieve interim targets (Barton, 2011). Sophisticated capital markets allow shareholders and managers nearly instantaneous access to information, where both parties can access share prices in real-time. However, Mayes and Wood (2013) argued that management is often burdened with the challenge of shifting shareholders' focus from short-term share price performance to the actual business and its long-term sustainability.

In an effort to satisfy myopic shareholders, managers are pressurised into accepting high-risk projects that initially yield high returns but are ultimately unsustainable. This desire for immediate reward, exhibited by both shareholders and management, might create an environment in which market failures, such as WorldCom, Enron and Wirecard, may continue to occur. The Aspen Institute (2009) has argued that myopic behaviour is a systemic concern that extends beyond investors and corporate management to include governments, boards, financial advisors and capital providers. Market participants' need for instant gratification is thus argued to have come at the expense of underinvestment and the subsequent decrease in long-term value (Erasmus, 2015).

The rest of this chapter is structured as follows. Firstly, a background on the relevant literature relating to short-termism is presented (Section 1.2). Thereafter, the problem statement (Section 1.3) and research objectives are provided (Section 1.4). Then the research methodology that was followed in order to address the study's research objectives is explained (Section 1.5). Lastly, the orientation to the study is provided (Section 1.6).

1.2 BACKGROUND TO THE STUDY

To explain short-termism and the potential implications thereof, an overview of the relevant literature is provided. Firstly, a summary of traditional finance theory is presented, with a specific focus being placed on the assumptions underlying the efficient market hypothesis (EMH). Thereafter, a

discussion on behavioural finance theory is provided. More specifically, the concepts of managerial myopia and investor short-termism will be explained, and their impact on asset valuation is highlighted. Given that excessive short-termism could distort the evaluation of financial decisions, attention was finally given to the impact of short-termism on companies that are listed in the different sectors of the Johannesburg Stock Exchange (JSE).

1.2.1 Traditional finance theory

Traditional finance theory is generally used to explain the behaviour of financial markets. Markowitz (1952) was instrumental in formulating the fundamental assumptions that underlie traditional finance theory, arguing that investors "consider expected return a desirable thing and variance of return an undesirable thing"; where the term variance may be used interchangeably with risk. He proposed that market participants will attempt to reduce risk and maximise return when making an investment decision. This argument is extended by Baskin and Miranti (1997), who suggested that modern finance theory is built on two fundamental assumptions. The first is based on the aforementioned argument of Markowitz (1952), which suggested that investors will attempt to minimise risk via a diversified portfolio. The second assumption addresses the predictability of security price movements; where stock prices are believed to move randomly in response to the availability of perfect information, suggesting that financial markets are inherently efficient.

1.2.1.1 Efficient market hypothesis

One of the main assumptions underlying traditional finance theory is that markets operate efficiently (Brigham, Ehrhardt and Fox, 2019). In an efficient market, securities are considered to be priced at their intrinsic value. This intrinsic value is determined by using a suitable discount rate to discount the expected future cash flows that will be generated from an investment in the security (Els, Erasmus and Viviers, 2020). The intrinsic security price, in turn, reflects all available information and investor expectations that existed when the price was estimated. This estimated security price represents all the information pertaining to the riskiness, size and timing of the expected cash flows that investors had access to at that point in time (Moles, Parrino and Kidwell, 2011). The effectiveness with which securities' market prices truly reflect all available information is discussed in a theory known as the EMH, developed by Fama (1970).

The EMH upholds that investors have access to perfect information and behave in a rational manner. Investors are therefore believed to make decisions that are not influenced by feelings or emotions (Suryawanshi and Jumle, 2016). This assumption extends to corporations, where transactions are assumed to be correctly recorded, credit issues effectively addressed and share prices are transparent and fully reflect the value of the company (Brigham *et al.*, 2019).

In an efficient market, it is therefore assumed that the intrinsic value of a share should correspond to the current market price that shareholders are prepared to pay for the security (Mayo, 2021). Any deviation from the intrinsic value would be temporary since rational and well-informed investors would recognise and react to the resulting arbitrage opportunity. Consequently, market prices would be adjusted to a level in line with the intrinsic value of the share. The discounted cash flow (DCF) model and the capital asset pricing model (CAPM) are two of the predominant models that are used to determine the intrinsic value of a share.

(a) Discounted cash flow model

It is generally accepted that the DCF model should be used to calculate the intrinsic value of financial assets (Martin, Petty and Wallace, 2009). The intrinsic value of a financial asset is determined by discounting the expected future cash flows that will be generated by the asset, using an appropriate discount rate that reflects the level of risk that the investment presents (Madura, 2016). The DCF model is widely used to calculate the intrinsic value of a share. For this purpose, the future cash flows consist of the expected future dividends that will be received during the investment period, and the future share price at which the investor will be able to sell the share again. The discount rate represents the investor's required rate of return.

The general equation for the DCF model is (Els *et al*., 2020):

$$\hat{P}_0 = \frac{E(D_1)}{(1+r_S)^1} + \frac{E(D_2)}{(1+r_S)^2} + \cdots + \frac{E(D_n)+E(P_n)}{(1+r_S)^n} \qquad \textbf{Eq. 1.1}$$

where:

$\hat{P}_0$ = current intrinsic value of a share

$E(D_1)$ = the expected dividend at the end of period 1

$E(D_2)$ = the expected dividend at the end of period 2

$E(D_n)$ = the expected dividend at the end of period *n*

$E(P_n)$ = the expected share price at the end of period *n*

r_S = the required rate of return

When estimating share prices according to the DCF model, two challenges arise. The first is the estimation of the expected future dividends and share price. For this purpose, investors will have to consider all currently available information, including aspects such as historical levels of dividend payments, earnings and market prices (Davies, Haldane, Nielsen and Pezzini*,* 2014*).*

The second challenge is how to estimate the relevant discount rate that is used when discounting the expected future dividends and share price. In traditional finance theory, several asset pricing

models have been proposed for this purpose. Among the most widely adopted models is the CAPM of John Lintner (1965), William Sharpe (1964) and Jan Mossin (1966), which is one of the predominant models used to determine shareholders' required rate of return.

(b) CAPM

The relationship between risk and return was formalised by Markowitz (1952) in what has become known as modern portfolio theory (MPT). This theory suggests that the goal of an investor is to maximise the potential returns from an investment while minimising the risk. According to MPT, investors can eliminate unsystematic risk factors using a diversified portfolio, as these risks are company-specific and may not affect the entire market. Markowitz (1952) argued that investors are still, however, exposed to a level of systematic risk (i.e. market risk) that cannot be eliminated through diversification.

Based on the suggested relationship between risk and return in Markowitz's (1952) MPT, Sharpe (1964), Lintner (1965) and Mossin (1966) developed the CAPM equilibrium model. The CAPM estimates the excess return beyond the risk-free rate that an investor would require if they chose to invest in the shares of a specific company rather than in a risk-free asset. This return only compensates an investor for systematic risk and does not include any company-specific risk that the investor may choose to accept (Focardi and Fabozzi, 2004).

The CAPM equation is (Kürschner, 2008):

$$\mathrm{E}(r_i) = r_f + \beta_i[\mathrm{E}(r_m) - r_f] \qquad \textbf{Eq. 1.2}$$

where:

$\mathrm{E}(r_i)$ = required expected rate of return for company *i*

r_f = risk-free return

β_i = beta coefficient for company *i*

$\mathrm{E}(r_m)$ = expected return on the overall market portfolio

The required return is therefore the total of the risk-free rate and a risk premium to compensate the investor for the risk associated with the investment in the specific company.

However, it should be noted that the CAPM and the DCF model are based on a large number of assumptions that include efficient markets, no transaction costs or taxes and homogeneous investor expectations (Jensen, 1972). Due to a large number of restrictive assumptions included as part of the model, the use of the CAPM to estimate investors' required rate of return for a specific share has been severely criticised. In an attempt to improve on some of the CAPM's limitations, alternative asset pricing models have been developed. These models include the Fama-French three-factor

(FF3) model (Fama and French, 1993), the Carhart four-factor model (Carhart, 1997), the Fama-French five-factor (FF5) model (Fama and French, 2015) and the Arbitrage Pricing Theory model (APT) of Ross (1976). The FF3 model includes three variables in the calculation of the investor's required rate of return on an investment, namely the size and value of the company and the market risk. The Carhart four-factor model is an extension of the FF3 model and incorporates a fourth factor, namely the momentum of share prices. The FF5 model is a further alteration of the FF3 model and includes two additional factors to determine an asset's returns, namely profitability and investment patterns. The APT suggests that numerous systematic risk factors might influence the relationship between risk and return. By incorporating a greater number of factors in these adjusted asset pricing models, it is proposed that an improved estimate of a company's cost of equity can be obtained.

Despite all the problems associated with the CAPM, it continues to be the most widely applied asset pricing model used to estimate the cost of equity (Cooper and Davydenko, 2007; Graham and Harvey, 2001). For this study, an adjusted version of the CAPM will be considered in line with the methodology employed by Davies *et al.* (2014). This adjusted CAPM attempts to address the problems regarding the stationarity of beta values over time, as well as the impact that differences in leverage have on a company's required return.

Ball (2009:12) argued that the EMH is an "abstraction from reality". The CAPM and DCF models only hold if financial markets are efficient and if investors behave rationally. However, market anomalies such as investment bubbles have suggested that financial markets may be inefficient and that traditional finance models are not always able to explain the relationship between risk and returns. This apparent disconnect between theory and reality has given rise to behavioural finance.

1.2.2 Behavioural finance theory

In contrast to the relatively stable equilibrium between intrinsic values and market prices that is predicted by traditional finance theory, investors often have to face extremely volatile market conditions, characterised by large differences between their expected and actual investment performance. As a result, the existence of efficient markets has been questioned almost continuously since the EMH was first proposed (Basu, 1977; Malkiel, 2003). Critics of the EMH point out that security prices do not fully reflect all available information, and that investors sometimes behave in a manner that, according to traditional finance theory, is not considered to be rational. Baker and Nofsinger (2010) argued that traditional finance theory does not fully explain empirical market patterns.

A large portion of the failures associated with traditional finance theory can be ascribed to limitations imposed by the assumptions incorporated in the theory. Behavioural finance theory attempts to explain the inconsistencies between these assumptions and market performance by examining

human behaviour, specifically behavioural biases (Brigham *et al.,* 2019). Market participants exhibit behavioural biases by making choices that are deemed illogical and behaving in a manner that is considered irrational by traditional finance theory (Baddeley, 2018).

Behavioural finance theory, therefore, attempts to reconcile traditional finance theory with the actual behaviour of market participants (Suryawanshi and Jumle, 2016). This is achieved by incorporating the "human element" into traditional financial models (Thaler, 1999a), and understanding what impact it will have on their outcome. Numerous studies have been conducted to investigate deviations from normality (as defined by traditional financial models), and a large number of behavioural biases have been identified. Examples include overconfidence (Ritter, 2003), loss avoidance (Suryawanshi and Jumle, 2016), confirmation bias (Acks, 2019) and anchoring (Singh and Bahl, 2015).

Despite the relatively extensive research that has been conducted on the aforementioned biases, few attempts have been made to study the effects of another behavioural bias, namely short-termism, on capital markets (Davies *et al.*, 2014). This apparent paucity in research is somewhat surprising, given the impact that short-termism could have on asset valuation models.

1.2.2.1 Short-termism

Short-termism refers to the tendency of market participants to overemphasise the importance of immediate financial outcomes, often at the cost of foregone long-term opportunities (Davies *et al.*, 2014). It is suggested that investors exhibiting short-termist behaviour value immediate cash flows more highly than those received at a later stage. The impact of this behaviour was highlighted by Laverty (1996), who pointed out that investors may choose projects that initially generate higher short-term results but are ultimately value-destroying. As a result, short-termism could have a pronounced negative impact on financial performance.

According to traditional finance theory, investors would have access to and correctly interpret all relevant information regarding the expected risk and return of an investment and would be able to accurately estimate future dividends and share prices based on this information (Fama, 1970; Jensen, 1972). In an efficient market, the actual market price of a share would therefore be equal to its intrinsic value (based on the present value of the discounted future cash flows) (Chandra, 2020), since any deviation resulting from short-termism would be identified immediately and corrected using arbitrage. However, if a large group of market participants exhibited short-termist behaviour, their combined actions could distort the estimation of expected future cash flows and result in the mispricing of shares (Haldane and Davies, 2011). This problem is further compounded when short-termist behaviour is not only limited to investors but also occurs among corporate management (Rappaport, 2011).

(a) Managerial myopia

There is a notion that stock market participants, such as individual and institutional investors, are placing increasing pressure on corporate management to produce immediate results (Aoki and Saxonhouse, 2000). Managerial myopia refers to the resulting shift in management's focus towards achieving improved short-term financial performance to satisfy the market (Erasmus, 2015). Unfortunately, this increase in short-term financial performance is often achieved at the expense of long-term sustainability. This kind of myopic behaviour is suggested to be a result of, inter alia, investor pressure and unsuitable managerial incentive structures (Walker, 2010).

Companies are usually controlled by agents (i.e. managers), who are appointed by principals (i.e. the shareholders) to make decisions on their behalf. The relationship between these two parties was formalised in the form of the agency theory by Jensen and Meckling (1976). According to the agency theory, conflict might occur between principals and agents if the interests of the two parties are misaligned (Eisenhardt, 1989). To address potential agency problems, incentive schemes are usually designed to ensure that management will act in the best interest of their shareholders (Martin *et al.*, 2009).

One popular way to align the interests of management with those of shareholders is to incorporate share-based compensation as part of their overall remuneration (Bryan, Hwang and Lilien, 2000). An unintended drawback associated with this type of incentive, however, is that management may pursue higher share prices by implementing high-risk strategies that ultimately have a negative impact on the company (Sappideen, 2011). For instance, remuneration incentives structured around short-term share performance measures have been linked to increased engagement in real earnings management activities (Peng and Roell, 2008). Roychowdhury (2006) defined real earnings management as an effort to delay expenses or increase short-term sales in order to boost earnings, which assists in reaching quarterly targets. Achieving quarterly earnings targets is pursued, in turn, because it is believed to increase the price of a company's shares (Graham, Harvey and Rajgopal, 2005).

However, share price increases achieved in this way may come at a cost. Lazonick (2014) argued that in an effort to increase short-term earnings and cash payouts, investment in research and development (R&D) and expansion opportunities may suffer. It is suggested that the focus on quarterly earnings targets only increases the price of a share in the short term. Management's myopic behaviour ultimately threatens the long-term value of shareholders and the overall sustainability of the company (Erasmus, 2015).

It should be noted that market participants' demand for increased short-term results could also contribute to managerial incentive schemes where short-term earnings and unsustainable distribution policies rather than sustainable, long-term value creation are rewarded (Rappaport, 2011). These types of incentive schemes would amplify myopic behaviour among management as they attempt to increase their personal earnings potential to satisfy the company's shareholders (Bolton, Scheinkman and Xiong, 2006).

(b) Investor short-termism

Investor short-termism refers to investors' tendency to prefer "smaller and sooner" cash flows above "larger and later" rewards, often referred to as hyperbolic discounting (Laibson, 1997). Investors are hence suggested to overvalue short-term performance, which contributes to the aforementioned pressures placed on management to meet quarterly targets (Haldane and Davies, 2011).

Miles (1993) found that shareholders in the United Kingdom (UK) excessively discount future cash flows. Excessive discounting refers to the situation where investors apply higher discount rates to more distant cash flows, at times using discount rates that exceed their required rate of return and the return on debt (Davies *et al*., 2014). As a result, distant cash flows are disproportionately discounted in comparison to current or near-future payments (Bushee, 2001).

To illustrate the impact of short-termism on asset valuation, a simple example based on the DCF model is used, following Haldane and Davies (2011). For this purpose, a risk-free asset with a discount rate of 9% and a zero terminal value is considered. It is assumed that the asset requires an initial investment of R60 and generates a cash flow of R10 at the end of each year for the next ten years. Employing DCF principles, the net present value (NPV) of the investment can be determined as follows:

$$NPV = \frac{R10}{(1+0.09)^1} + \frac{R10}{(1+0.09)^2} + \cdots + \frac{R10}{(1+0.09)^{10}} - R60 \qquad \textbf{Eq.1.3}$$

$$= +R4.18$$

The investment's positive NPV indicates that it will generate value and is worth investing in. In this example, no hyperbolic discounting took place and the values of the different cash flows, regardless of the point in time where it was received, were considered to be equal.

However, if excessive discounting occurred, it might change the outcome of the investment decision. Assets that have the potential to generate positive NPVs will be incorrectly priced under conditions of myopic discounting. To illustrate this, assume that the level of miscalculation (i.e. excessive discounting) is captured by parameter x.

To reflect the impact of investor short-termism on the investment decision, Equation 1.3 can be amended as follows:

$$NPV = \frac{R10x}{(1+0.09)^1} + \frac{R10x^2}{(1+0.09)^2} + \cdots + \frac{R10x^{10}}{(1+0.09)^{10}} - R60 \qquad \textbf{Eq. 1.4}$$

If investors do not discount excessively (i.e. are rational), x will be equal to one and the investment's NPV will remain unchanged. However, if investor short-termism is present, x will be below unity (x<1), causing cash flows received in the distant future to be undervalued. If, for example, x is equal to 0.90, the NPV of the investment would decline from +R4.18 to -R19.61. Based on the negative NPV obtained, the investment would appear to be value-destroying. Due to the excessive discounting associated with investor short-termism, a profitable investment would therefore be rejected.

In addition to the problem of excessive discounting, a marked decline in the average time investors retained their investment in a company's shares is highlighted by Rappaport (2005). He argued that these shorter holding periods further contribute to myopic investor behaviour. Short holding periods, often less than a year, combined with the expectation of high end-of-horizon share prices, fuel the demand for short-term results. These short holding periods are also in stark contrast to the relatively long investment horizons that some companies need to consider when conducting their capital budgeting decisions.

(c) Short-termism in different sectors

The findings of Haldane and Davies (2011), based on results obtained for companies operating in the UK and the United States (US), reveal that the degree of short-termism observed differs between industrial sectors. This suggests that investors might differentiate between long- and short-term sectors when forming return expectations. McCallion and Warner (2010) argued that sectors that require large initial investments, such as mining, might experience deferred cash inflows. Conversely, industries with lower capital intensity, such as retail services and management consultancies, are expected to receive payments in a timelier manner. Cosh, Hughes, Singh, Carty and Plender (1990) proposed that the level of myopic behaviour exhibited by an investor is influenced by the expected payback period of an investment group, where the expected periods might range from quarterly benchmarks to years.

In the UK and US, Haldane and Davies (2011) found that, despite the long-term return nature of the industry, investors in the materials sector exhibited higher degrees of short-termism in comparison to investors in the consumer sector over the period 1985 to 2004. These results do not support the aforementioned argument of Cosh *et al.* (1990), who suggested that investor myopia is more prominent among investments with shorter return horizons. It is therefore suggested that the phenomenon of short-termism is not necessarily limited to sectors that are short-term in nature. The potential impact of short-termism on the activities of companies operating in more capital-intensive

sectors, however, is expected to be more pronounced, given the noticeable mismatch between the investment horizons of shareholders and management.

When considering the local context, these findings become significant. In 2014, the mining sector constituted 19 per cent of the JSE All Share Index, rendering it South Africa's largest sector (Colquhoun, 2015). The presence of short-termism, where investors demand near-term payouts, might therefore hold widespread consequences for the South African economy. The impact of excessive short-termism would be particularly disruptive in the mining industry where global mining exploration expenditure dropped by 20.5 per cent in 2020, ultimately threatening the sustainability of one of the country's leading sectors (Vandome and Khama, 2021).

1.3 PROBLEM STATEMENT

Traditional finance theory assumes efficient markets, where shares are priced at their intrinsic value. The intrinsic value of a share is determined by discounting the expected dividends and future price associated with an investment in the share, using a suitable discount rate (Els *et al*., 2020). It is assumed that cash flow expectations are formed by rational investors who have access to perfect information, that expectations are correctly estimated and that the intrinsic value of a share equates to the current market price. However, Baker and Nofsinger (2010) argued that empirical market patterns are not fully explained by the assumptions of an efficient market and that investors might exhibit certain behavioural biases when estimating returns. Laibson (1997) suggested that investors tend to prefer "smaller and sooner" returns over those received at a later stage. This short-term behaviour is, in turn, believed to result in the excessive discounting of expected cash flows by myopic investors, distorting the estimation of intrinsic values. The question arises whether market prices accurately reflect the intrinsic value of shares.

Haldane and Davies (2011) found that investors in the UK and US exhibited short-termism for the period 1985 to 2004. Over this period, the bias became more prominent during the second decade of the study period, suggesting an increasing trend in the level of short-termism displayed by investors. Myopic behaviour was revealed to be most significant in the materials sector. Given that the mining industry constitutes a significant part of the national gross domestic product (GDP) (Vandome and Khama, 2021), potential investor short-termism in the local context might come at a considerable cost. Since mispricing caused by excessive investor short-termism would inflate a company's cost of capital, reinvestment in long-term value-generating projects might suffer.

Given the lack of research on short-termism in the local context, this study was conducted to investigate potential short-termism among South African investors for the period 1995 to 2014. The study aimed to establish if there is a difference between the intrinsic and actual market prices of JSE-listed companies, and whether any differences can be attributed to investor short-termism.

1.4 RESEARCH OBJECTIVES

The study's primary research objective was to investigate investor short-termism in South Africa for the period 1995 to 2014.

To address this primary objective, the following three secondary research objectives were formulated:

- To establish whether short-termism is exhibited by South African investors for the period 1995 to 2014.
- To assess whether the degree of short-termism differs between sectors for the period 1995 to 2014.
- To determine whether the degree of short-termism changes over time for the period 1995 to 2014.

1.5 RESEARCH METHODOLOGY

In this section, attention is given to the research strategies, approaches, data collection process and statistical analyses that were followed in order to address the study's hypotheses.

1.5.1 Hypotheses

The following hypotheses were formulated for each of the three secondary research objectives in terms of the parameter $\hat{x}$, as proposed by Davies *et al*. (2014):

H_o: $\hat{x} = 1$ (i.e. no short-termism or long-termism is observed)

H_{a1}: $\hat{x} > 1$ (i.e. long-termism is observed, as reflected by moderate discounting)

H_{a2}: $\hat{x} < 1$ (i.e. short-termism is observed, as reflected by excessive discounting)

1.5.2 Research strategies and approaches

Zikmund, Babin, Carr and Griffin (2013) have identified three main research strategies, namely exploratory, descriptive and causal research. A researcher might engage in exploratory research to clarify ambiguous scenarios and to develop a conceptual framework of the variables relating to a particular study. Descriptive research is often used to expand on the results of an exploratory study (McNabb, 2021), where the characteristics of a study's variables, such as environments and objects, might be described by observation or survey methods, leading to the formulation and testing of hypotheses (Nath, 2007). The relationship between a study's variables might also be analysed using causal research. This research strategy aims to identify cause-and-effect relationships, where alterations of the dependent variable, as a result of manipulation of the independent variable(s), are measured (Wrenn, Stevens and Loudon, 2007). For the purposes of this study, descriptive research was conducted to investigate the presence of short-termism in South Africa.

Two research paradigms exist, namely phenomenological and positivistic paradigms. The phenomenological paradigm involves the active engagement of the researcher in analysing data and drawing conclusions (Saee, 2006). The results of a phenomenological study are therefore researcher-dependent and subjectively interpreted. A qualitative research approach describes the phenomenon in an interpretive manner, using non-numerical data and is often used within phenomenological studies. Alternatively, the collection and measurement of objective, factual data from which hypotheses might be formulated are characteristic of the positivistic paradigm. A quantitative research approach is often used in conjunction with this paradigm where the characteristics of a phenomenon are described using numerical measurement (Thomas, 2003). A positivistic approach, using existing quantitative financial data, was used for this study.

1.5.3 Primary and secondary research

Rugg and Petre (2007) defined primary research as the process of collecting new data by means of, inter alia, questionnaires, observations and experiments, intending to address a specific study's research question(s). The inherent disadvantage of conducting primary research is the costly and time-consuming nature of the data collection process. No primary data were collected for this study.

Secondary research refers to the collection of data that existed before the commencement of this study, such as industry studies and company reports. The cost-effectiveness and ease, as highlighted by Collins (2018), of collecting secondary data in comparison to using a primary research method(s) is one of the intrinsic advantages of secondary research. However, outdated data, varying archival formatting and incomplete information are among the numerous disadvantages that secondary data might present. For this study, secondary data were collected through an analysis of existing corporate financial records and market-based data.

1.5.4 The sample of the study

In this study, a non-random judgement sampling method was used. The sample included JSE-listed companies across all sectors for the period 1995 to 2014, resulting in a study period of 20 years. To estimate intrinsic values for at least one year of the study period, five years of lagged and future dividends per share (DPS), market prices per share (MPS) and earnings per share (EPS) were required. The final sample, therefore, included only those companies that published all the required data continually for 11 years between 1990 and 2019. A more detailed description of the estimation process is provided in Section 4.6.3.3.

Given the process required to estimate future dividend and share price values, the study was exposed to survivorship bias. Only those companies that were listed on the JSE All Share Index over the study period and published all the company-specific variables required for the purposes of the study for a minimum of 11 years were considered. In an effort to reduce survivorship bias, both listed

and delisted companies were included in the sample. Exposure to survivorship bias, however, was unavoidable as companies with incomplete data could not be included in the data analysis.

The data that was required from the sampling units were manually collected from existing corporate financial records and market-based data. In the next section, a description of each of the variables that were included in the study is provided.

1.5.5 Variables

The variables that were included in this study are presented in Table 1.1. The source of each variable is also provided.

Table 1.1: Variables

Variable:	Included in:	Source:
DPS per company p.a.	Estimation of expected dividends and prices	IRESS
MPS per company p.a.	Estimation of expected dividends and prices	IRESS
EPS per company p.a.	Estimation of expected dividends and prices	IRESS
Beta per company p.a.	Estimation of company-specific risk premium as part of the discount rate	IRESS
Debt-to-equity per company p.a.	Estimation of company-specific risk premium as part of the discount rate	IRESS
Forward risk-free rate p.a.	As part of the discount rate	SARB (2019)
Dividend yield	Descriptive statistical analysis	IRESS
Earnings yield	Descriptive statistical analysis	IRESS
Dividend payout ratio	Descriptive statistical analysis	IRESS

1.5.6 Data analysis

The collected data from the secondary data providers were interpreted and analysed by using descriptive and inferential statistics to address the study's research objectives.

1.5.6.1 Descriptive statistics

Holcomb (2017) described descriptive statistics as a process of elementary analysis that involves organising raw data to reflect the basic characteristics of the variables. Data are often summarised in a way that describes the central tendency, dispersion and shape of the values (Zikmund *et al*., 2013). Measures of central tendency indicate the central value within a dataset and include the mean, median and mode. Dispersion refers to the degree of variation among the variables within a dataset and may be measured via the maximum and minimum values, as well as by the standard deviation (Jha, 2014). The shape of a distribution describes how peaked or symmetrical it is when compared to a normal distribution. Measures of central tendency, dispersion and shape were used in this study. A summary of the collected data, such as the number of companies listed on the JSE All Share Index and on the different sectors, was also provided.

1.5.6.2 Inferential statistics

After the descriptive analysis was conducted, inferential analysis was performed to allow the researcher to make inferences about the population in question. In this study, regression analyses were conducted to investigate the relationship between the study's variables. Regression analysis might be used to measure the relationship between a study's dependent variable and independent variable(s). Multiple regression analyses consider the effect of multiple independent variables on the value of the dependent variable (Zikmund *et al*., 2013). This study investigated the relationship between the dependent variable and four independent variables. Therefore, multiple regression analyses were conducted.

For this study, a theoretical regression model developed by Davies *et al.* (2014) was used to test for short-termism (explained in Section 4.9.2.6). The model included a measure for short-termism, namely parameter $\hat{x}$. To determine the value of parameter $\hat{x}$, the regression model was estimated via the Generalised Method of Moments (GMM) (Hansen, 1982) estimation method, where $\hat{x}$ = 1 would imply that South African investors do not exhibit short-termism.

The GMM estimation method estimates the parameters of an economic model by combining economic data with the information on population moment conditions. The GMM estimation method can be applied to panel data that includes endogenous and instrument variables, as it is sensitive to endogeneity. For the GMM estimation method to produce accurate parameter estimates, the instrument variables included in the model must be valid and the model's error terms uncorrelated (Sharma, Bakshi and Chhabra, 2020). Therefore, before the regression model was estimated, three diagnostic tests were used to determine whether the GMM estimation method was suitable for the current study.

The diagnostic tests considered the endogeneity of the independent variables, as well as the validity and strength of the instrument variables. The Wu-Hausman endogeneity test was the first diagnostic test to be employed. This test can be used to determine whether the independent variables included in a model are endogenous. If the test indicates that the independent variables are endogenous, then the use of instrument variables is justified (Ao, 2009). The second diagnostic test considered was Sargan's (1958) test of overidentifying restrictions. The test is often used to investigate whether excluded instrument variables in a model are valid by considering their possible correlation with the model's error term. The final diagnostic test that was considered was the Cragg-Donald weak instrument test, which can be used to determine whether any of the instrument variables included in the regression model are weak. Weak instruments occur when their correlation with the endogenous regressor in a model is too small for the given sample size (Mikusheva, 2013). If the test indicates that none of the instrument variables are weak, they can be included in the regression model employed.

1.5.7 Ethical considerations

Potential ethical considerations were addressed. The researcher applied for ethical clearance from the departmental ethics committee. Ethical clearance was granted, and the study was considered to be of minimal risk as it entailed the use of existing secondary data.

1.6 ORIENTATION TO THE STUDY

This study is structured as follows:

Chapter 1: Introduction to the study

In this chapter, an overview of the study is provided. Firstly, a brief overview of short-termism is given, thereafter the problem statement, research objectives and hypotheses are presented, and the methodology that was used to draw empirical conclusions is explained.

Chapter 2: The time value of money

In Chapter 2, an in-depth review of traditional finance theory is presented. Specifically, the concept of the time value of money is explained, followed by a discussion of the assumptions underlying the EMH. Thereafter, an explanation of the DCF model is provided. Finally, a discussion of some of the asset pricing models is presented, where the CAPM, FF3 model, Carhart four-factor model, FF5 model and the APT model are explained.

Chapter 3: Investor short-termism

This chapter offers a perspective on behaviour finance. Firstly, a description of anomalies that occur in financial markets is provided, followed by a discussion of the theory about human decision-making behaviour. Thereafter, heuristics and behavioural biases are described. Subsequently, short-termism is explained by including relevant theories and using examples. Lastly, the potential impact of short-termism on companies operating in different sectors is discussed.

Chapter 4: Research design and methodology

The research design and method that was followed in the study are presented in Chapter 4. Subsequently, an in-depth explanation of the data collection process and statistical analyses conducted is provided.

Chapter 5: Results

The results that are obtained from the data collection process and statistical analyses are discussed in this chapter.

Chapter 6: Conclusions and recommendations

Based on the findings presented in Chapter 5, conclusions regarding investor short-termism in the local context are drawn. Thereafter, possible recommendations are made based on these empirical results. Lastly, any limitations that the study might present are highlighted and suggestions for future research are provided.

CHAPTER 2
THE TIME VALUE OF MONEY

2.1 INTRODUCTION

A dollar today is worth more than a dollar tomorrow. This is the basis of the time value of money, where the present value of an asset is higher than its value at a future point in time. The main reason for this sequential decline in worth is that the future is largely uncertain and can, therefore, not guarantee returns (Waters, 2011). Delaying consumption to a future date thus requires the investor to accept a degree of risk. To be compensated for delaying gratification, the investor's present value is exponentially increased by a percentage called interest (Warneryd, 1999).

The concept of the time value of money underlies present-value analysis which forms the foundation of modern-day finance theory. The concept of present value was first introduced in 1202 by Fibonacci in his book *Liber Abaci*. By using Fibonacci's present-value analysis, the investor can determine the value of an asset at different points in time. For nearly 800 years, the notion of the time value of money has been accepted by numerous economists (Rae, 1834; von Bohm-Bawerk, 1930; Fisher, 1906, 1930; Fama, 1970) and quantified into the financial models commonly used in public finance (Samuelson, 1937; Markowitz, 1952; Linter, 1965; Sharpe, 1964; Mossin, 1966).

Present-value analysis is also widely used to determine the value of a company, where the expected future cash flows generated by the company are discounted to the present using a rate that reflects the risk that the investment might represent (Larrabee and Voss, 2013). A company is an entity that enables shareholders to pool their resources to invest in risky, long-term projects. How much investors are willing to pay for a share in a company indicates how much they expect the company to earn in the future (Ferguson, 2008). According to the assumptions of traditional finance theory, investors will accurately and rationally process all available information and form the same conclusions about future earnings. The same assumptions apply to shareholders' assessment of the degree of risk that the company is exposed to, reflected in equivalent discount rates (Gottesman and Leibrock, 2017).

However, human beings are prone to myopia and heuristics and, as the future is largely uncertain, their assessments of a company's imminent profitability are likely to vary (Ferguson, 2008). The time value of an investor's money might also be determined based on personal factors, such as the size and risk of his or her income stream, self-control, foresight and the desire to follow the "whims of fashion" (Fisher, 1930). Fisher (1930) assumed that, when making intertemporal choices, investors will form rational expectations about future earnings and time-consistent preferences, implying the use of a constant discount rate. Strotz (1956), Green, Fry and Myerson (1994) and Zauberman and

Urminsky (2016) all questioned the assumption of the single utility function underlying traditional theory and argued that myopic behaviour might result in changing discount rates over time, where some investors are suggested to prefer "smaller and sooner rewards" over "larger and later" payouts (Chaloupka, Grossman, Bickel and Saffer, 1999:104). This is also known as hyperbolic discounting.

Keynes (1936:141) pointed out the role of investors' "animal spirits" which refer to the role of emotions and attitudes to risk when making investment decisions:

> *Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction, not as the outcome of a weighted average of qualitative benefits multiplied by quantitative probabilities.*

When an investor's "animal spirit" experiences the desire for immediate rewards, the applied discount rates are suggested to change to reflect the over-valuation of short-term returns. A potential consequence of changing discount rates might be the mispricing of share prices on capital markets (Davies *et al.*, 2014). An emphasis on short-term results places management under increasing pressure to achieve interim targets (Barton, 2011), where managers are pressured into accepting initial high-yield projects which are not sustainable in the long-term. Underinvestment in projects and innovation initiatives might thus come at the expense of a decline in long-term value (Erasmus, 2015).

The remainder of this chapter is structured as follows. Firstly, a background on the time value of money is presented (Section 2.2), followed by an overview of MPT (Section 2.3). Thereafter, the EMH is described (Section 2.4). Subsequently, an explanation of the DCF model is provided, followed by a discussion on asset pricing models, where the CAPM, the FF3 model, the Carhart four-factor model and the APT model are explained (Section 2.5). Lastly, concluding remarks are offered (Section 2.6).

2.2 THE TIME VALUE OF MONEY

Smith (1776) sought to determine why countries experience different levels of wealth over time in his publication *An Inquiry into the Nature and Causes of the Wealth of Nations*. In this book, he argued that the generation of wealth could be attributed to the number of resources allocated to the production of a nation's capital. Smith's (1776) explanation for economic development was criticised by Rae (1834), who suggested that this theory did not provide a complete explanation of why discrepancies between the wealth of countries occur. He argued that the number of resources attributed to the production of capital was not the only determinant of capital output and that the initial decision to assign resources played a role in the generation of wealth. Rae (1834:198) emphasised

that the allocation of resources was dependent on a psychological factor, “the effective desire of accumulation”, where the desire to accumulate is dependent on the willingness of a nation to defer consumption, thereby delaying gratification to a future point in time (Loewenstein, 2007). In a country with a high desire for accumulation, citizens would be willing to invest resources in the production of capital instead of engaging in immediate consumption, thereby increasing the wealth of the country.

Rae (1834) argued that a nation’s effective desire for accumulation could be determined by four factors, where the first two determinants hinder the desire to delay consumption, and the last two facilitate it. Firstly, he suggested that the uncertain and brief nature of human life encourages the individual to engage in immediate gratification. He stated that “when engaged in safe occupations, and living in healthy countries, men are more apt to be frugal, than in unhealthy, or hazardous occupations, and in climates pernicious to human life. Sailors and soldiers are prodigals” (Rae, 1834:123). Secondly, he suggested that the discomfort that accompanies delaying immediate gratification hinders the desire for accumulation, where “the prospects of future good…seem at the moment dull and dubious…everywhere we see, that to spend is easy, to spare, hard” (Rae, 1834:120). Conversely, he provided two factors that promote the desire to accumulate. The bequest motive suggested that individuals may choose to save over present consumption with the aim of accumulating wealth that might then be transferred to a second party. Lastly, individuals’ “intellectual powers, and the consequent prevalence of habits” may influence their consumption behaviour, resulting in a higher propensity to save for the future (Rae, 1834:58). These observed psychological motives, and their role in economic decision-making gave rise to Rae’s (1834) theory of intertemporal choice, where an intertemporal choice refers to “a decision involving trade-offs among costs and benefits occurring at different points in time” (Frederick, Loewenstein and O’Donoghue, 2002:351).

Rae (1834) emphasised the role of psychological and sociological determinants during intertemporal decision-making and highlighted the effect of the desire for immediate gratification. This suggested short-sighted behaviour was incorporated into the conceptual framework underlying intertemporal decision-making theory, where it is argued that “present goods have a greater value than future goods of like kind and amount” (von Bohm-Bawerk, 1930:xi). The evaluation of goods is therefore argued to be time-dependent. As a result, the individual demands compensation for any delay in the delivery of rewards, where the present value is expected to be exponentially increased by a specific percentage (i.e. interest). The phenomenon of interest is therefore explained by the need to compensate the individual for any discrepancies between present and future values (Warneryd, 1999).

Von Bohm-Bawerk’s (1930) argument about the time value of goods is accepted by Fisher (1930), who suggested that an individual’s “impatience” might influence the utility of any goods received, where the term impatience may be used synonymously with time preference. Rewards received

sooner would thus be valued as having a higher utility in comparison to goods received at a later stage**.** The rate of interest that is used by an individual while calculating the value of goods is therefore influenced by one's degree of impatience.

Fisher (1930) proposed that an individual's time preference is influenced by specific characteristics of their income stream, namely the expected size, composition, risk (i.e. its probability or uncertainty) and expected time shape (i.e. whether it is increasing, decreasing or constant). The expected size of one's income stream is argued to be influential as "in general, it may be said that other things being equal, the smaller the income, the higher the preference for present over future income, that is the greater the impatience..." (Fisher, 1930:30). The distribution of an individual's earnings among numerous mental accounts is suggested to play a role, where accounts with varying consumption propensities, such as shelter, education, and amusement, might compose an income stream.

Fisher (1930) argued that, in addition to the above-mentioned economic factors, "personal" factors might play a role in the formation of time preferences. The first four of Fisher's (1930) personal factors correspond to those previously introduced by Rae (1834). Fisher (1930) expanded on Rae's (1834) list of determinants that are suggested to influence an individual's myopic behaviour by adding two additional elements, thereby expanding the list to include self-control, expenditure habit (i.e. spending freely or saving money), the expectation of one's life span, bequest motive, foresight, and the desire to follow the "whims of fashion''. Short-sighted individuals are believed to possess a higher level of impatience, whereas a high degree of foresight "enables him to give to the future such attention as it deserves" (Fisher, 1930:35). Similarly, a lack of self-control (i.e. weak will) shortens one's time preference and a strong will "enables him to abstain from present real income in order to increase future real income" (Fisher, 1930:35).

The conceptual framework underlying the intertemporal choice theory of von Bohm-Bawerk (1930) was quantified by Fisher (1930), who employed a two-date model to illustrate the trade-off between immediate and delayed consumption. The model used indifference curves spanning over two periods. The asymmetry of Fisher's indifference curves, or "willingness lines", demonstrated that the individual does display a degree of impatience when faced with present or future consumption options (Hammond, Seidl and Barberà, 1998). Fisher's (1930) intertemporal framework is, however, based on the assumption of "foresight" (i.e. rational expectations).

Consequently, Thaler (1997:440) argued that the model should be interpreted as a normative theory, as it is "a theory of how rational agents would behave and a prescriptive lesson on how to behave, but not an accurate description of how real people do behave". The model is further based on the assumption of single or stationary utility (i.e. time-consistent preferences), where the individuals' trade-offs for receiving rewards are independent of when the realisation occurs. This time-consistent

trade-off implies that the ranking of options remains constant, with present and future selves agreeing on the ranking of plans (Crawford, 2012).

Following Fisher's (1930) unvarying utility assumption, Samuelson (1937) developed the discounted utility (DU) model, where a constant discount rate is used to discount future utils to the present. This model of intertemporal choice thus involves exponential discounting, which, building on von Bohm-Bawerk's (1930) aforementioned argument of the role of interest, involves the periodic increase in utils and thus the proportionate increase in periodic discount rates, allowing for a constant ratio between discounted utils over time. However, Zauberman and Urminsky (2016) and Green *et al*. (1994) suggested that the assumption of a constant discount rate is often violated, where discount rates are proposed to change over time following variations in an individual's personal and/or economic factors.

The assumption of the single utility function was further questioned by Strotz (1956:165), who argued that present and future selves might alter the initial ranking of options over time, where "the individual's future behaviour will be inconsistent with his (initial) optimal plan". He suggested that the trade-offs evaluated among different consumption options might vary periodically, resulting in varying discount rates. Strotz (1956:177) emphasised how myopic behaviour might challenge the normative assumption of a constant discount rate, where the normative theory is argued to contradict observed discounting behaviour which "differs from a logarithmically linear one in that it overvalues the more proximate satisfaction relative to the more distant ones".

In traditional finance theory, many of the asset pricing models that are employed hold the assumption of a single utility function. Following the DU model, several traditional pricing models discount the future cash flows (i.e. utils) that are expected to be generated by a company back to the present and view the discount rate as the investor's required rate of return or, from a managerial perspective, the cost of capital (Hammond *et al*., 1998). This method is followed within the DCF model, which is commonly used within traditional finance theory to determine the price of securities, as explained in Section 2.5.

The delay of consumption from the present to a future point in time includes a degree of risk, as the future is largely uncertain (Ferguson, 2008). By postponing present consumption, the investor engages in the risk-return trade-off that was highlighted by Fisher (1906) in his discussion of the "cost of risk". Fisher (1906) argued that the greater the uncertainty of realising a future cash flow, the greater the risk "grows". This greater uncertainty is subsequently reflected by a higher discount rate, to compensate the investor for accepting the additional risk. Building on Fisher's (1906) mean-variance, or risk-return, utility theory, Markowitz (1952) translated this trade-off into MPT, where it is argued that individuals will attempt to minimise risk and maximise returns when making investment decisions.

2.3 MODERN PORTFOLIO THEORY

Markowitz's (1952:77) MPT formalised the fundamental assumption that investors "consider expected return a desirable thing and variance of return an undesirable thing". Building on this assumption, Markowitz (1952) developed a mathematical framework that would allow the investor to determine the expected return for a portfolio of securities based on a given degree of risk. He emphasised the role of three factors within this framework, namely the expected annual return, expected risk and the way the assets comprising a portfolio behave in response to one another.

The theory is based on the key assumptions that market participants are risk averse (i.e. will select the less risky option when presented with two investments both offering the same return) and rational. Markowitz (1952) distinguished between two types of risks within capital markets, namely unsystematic and systematic risk factors. The investor might reduce the level of risk that they are exposed to by eliminating company-specific risk factors via a diversified portfolio. These unsystematic risks are random and are unique to the specific company, as the certainty of expected future cash flows is dependent on the characteristics that are distinctive to a company or industry. As a result, such risks are diversifiable, as the individual can spread his or her investment among different companies and industries. Companies are, however, also exposed to risks that might systematically affect the broad market, such as war, inflation, pandemics, and recessions. Markowitz (1952) therefore argued that diversification cannot eliminate all risk and that investors are still exposed to a level of market risk, where a large number of securities might be negatively affected by general movements in the market that are caused by systematic factors.

The primary concept of MPT (i.e. that a significant portion of a share’s risk can be eliminated) is fundamental as a rational investor will consequently remove it. Markowitz (1952) incorporated a statistical measure by which an investor might assess the level of risk that an investment might present, namely the standard deviation of returns, which indicates the range above and below the average expected return that might be realised (Shipway, 2009). Investments with a higher standard deviation are more volatile and therefore present a higher level of risk. As investors are assumed to be risk averse, Markowitz (1952) argued that all things being equal, a portfolio with lower volatility is more desirable.

The correlation between investment returns is further suggested to influence a portfolio's level of variance, where an exact correlation would indicate that two investments are likely to rise and fall in value at the same time. An instrumental outcome of MPT is thus the ability of the investor to reduce risk without experiencing a reduction in return by combining investments that are negatively correlated. Baskin and Miranti (1997) suggested that Markowitz's (1952) theory formed one of the main assumptions of traditional finance theory, namely that investors aim to reduce risk via a diversified portfolio. The second fundamental assumption is that of the random character of share

price movements in response to the availability of perfect information, as formalised by Fama (1970) in his theory known as the EMH.

2.4 THE EFFICIENT MARKET HYPOTHESIS

Traditional finance theory is based on the assumption that markets operate efficiently (Brigham *et al.*, 2019). In efficient capital markets, the prices of financial instruments are determined by the availability of information. The price of a share adjusts in response to the accuracy and time with which information enters the market to reflect the asset's intrinsic value. Accordingly, the theory of efficient markets assumes that market participants have access to perfect information, where all available information is considered in an unbiased manner before making an investment decision.

The assumption of perfect information implies that securities are priced at their intrinsic value, where the price of a financial asset reflects all available data pertaining to the size, riskiness, and timing of its expected future cash flows (Moles *et al.,* 2011). This fundamental value is, in turn, determined by discounting the expected future cash flows using an appropriate discount rate that reflects the level of risk that the investment might present (Madura, 2021). The degree to which the market price fully represents the best estimate of the intrinsic value of a financial asset is discussed in Fama's (1970) EMH.

Fama (1970) suggested that there are three types of market efficiency, each reflecting fundamental share prices that incorporate all information available at that time. In efficient markets, share prices are therefore assumed to remain in stable equilibrium in the absence of new data (Ball, 2009). There is, therefore, no opportunity for the average investor to achieve a return greater than the market equilibrium, implying that in all forms of market efficiency, share prices accurately reflect the true value of the asset. Fama (1970) suggested that financial markets can be characterised by weak form efficiency, semi-strong form efficiency and strong form efficiency.

Weak form efficiency suggests that a market's share prices incorporate all information reflected in past prices. In a market that is characterised by this type of efficiency, investors will not be able to capitalise on historical trade-related information by adopting a trading strategy that is based exclusively on past share price movements (Madura, 2021). A technical analysis of past price movements would, therefore, not give an investor an advantage in predicting future share prices, as all market participants would also have access to this information.

Alternatively, markets could exhibit semi-strong form efficiency. This classification not only implies the existence of weak form efficiency but also upholds that market prices include all public information. Semi-strong form efficiency thus assumes that share prices would have already reacted to any publicly available data before an investor attempts to take advantage of the announcement

(Ho and Lee, 2004). As a result, an investor cannot hope to earn abnormal returns using published information in a market characterised as semi-strong efficient. If an investor can capitalise on public information that is not immediately reflected in share prices, the market would be considered weak form efficient, since the assumptions of semi-strong form are not supported (Madura, 2021).

Efficiency in strong form implies the assumptions of both weak and semi-strong form efficiency and argues that, in addition to past and public information, market prices also include private insider knowledge. Strong form efficiency, therefore, assumes that investors cannot gain an unfair advantage by using insider information to generate abnormal returns. If investors can earn excess returns by using private information, the market would be characterised as semi-strong form efficient, but not strong form efficient (Madura, 2021). Strong from efficiency, therefore, assumes perfect markets, where no investor has exclusive access to private information that might be used to derive excess returns. Thus, in perfect markets, an investor cannot generate abnormal returns as all information is already accurately reflected in share prices (Bhat, 2008).

The EMH further assumes that investors are rational and make decisions that will maximise their expected utility (Suryawanshi and Jumle, 2016). A rational investor is argued to make decisions in a logical and unbiased manner, where all available information is processed when considering investment alternatives. The theory thus holds that when new information enters the market, investors will form their own rational expectations of value changes concerning price and risk, implying that prices will move to correctly reflect the value of the asset. Following the assumption that a rational investor is inherently risk averse (Markowitz, 1952), they are believed to make investment decisions that will result in the maximum possible gain while accepting the lowest risk, as discussed by Von Neumann and Morgenstern (1953) in expected utility theory (EUT).

In traditional finance theory, investors are argued to make decisions that will result in maximum expected utility, where the decision-maker will "always pursue self-interest" (Suryawanshi and Jumle, 2016:84). EUT considers human behaviour during decision-making under conditions of both certainty and uncertainty, where the investor is expected to arrange their investment choices in order of preference, selecting those that will permit them to maximise their utility. The theory further assumes a positive marginal utility. The investor is thus believed to, assuming that the probability of each outcome is known, allocate a monetary amount to each investment alternative and select the option that will result in the greatest value realised. The EUT holds that market participants have a systematic order of preferences when having to make choices under conditions of risk, where the individual will consistently select the option that will yield maximum wealth (Briggs, 2014).

The EMH consequently assumes that the intrinsic value of a share, formed by rational, well-informed utility-maximising market agents, should correspond to the current market price (Mayo, 2021).

Following the assumptions of the EMH and the DU model of Samuelson (1937), the DCF model is widely used to calculate the fundamental value of financial assets (Martin *et al.*, 2009).

2.5 THE DISCOUNTED CASH FLOW MODEL

The DCF model is generally accepted as an appropriate approach that can be used to calculate the intrinsic value of shares. The fundamental value of an asset is estimated as the present value of all future cash flows that the asset is expected to generate (Brigham and Daves, 2007). Similarly, the intrinsic value of a share is represented by the present value of its expected future cash flow stream, where the cash flows consist of expected dividends that will be received over the investment period, as well as the expected terminal share price at which the investor will be able to sell the share at the end of this period. This present value is determined by discounting the expected cash flows using an appropriate discount rate that reflects the level of risk that the investment might present, and that the investor is willing to accept (Madura, 2021).

The general equation for the DCF model is (Els *et al.*, 2020):

$$\hat{P}_0 = \frac{E(D_1)}{(1+r_S)^1} + \frac{E(D_2)}{(1+r_S)^2} + \cdots + \frac{E(D_n)+E(P_n)}{(1+r_S)^n} \qquad \textbf{Eq. 2.1}$$

where:

$\hat{P}_0$ = current intrinsic value of a share

$E(D_1)$ = the expected dividend at the end of period 1

$E(D_2)$ = the expected dividend at the end of period 2

$E(D_n)$ = the expected dividend at the end of period *n*

$E(P_n)$ = the expected share price at the end of period *n*

r_S = the required rate of return

An important step in calculating the intrinsic value of a share entails the estimation of expected dividends. These future cash flows also influence the expected terminal share price, as this value is a function of the expected dividends that a subsequent buyer of the share would anticipate receiving. All expected future cash flows that are considered to calculate the intrinsic value of a share are thus based on the expected dividends the company is anticipated to produce (Brigham and Daves, 2007). In efficient markets, investors would consider all available information (such as the time series of past dividend payments, prior earnings, and market prices) when forming dividend expectations and will subsequently form rational estimates which accurately reflect the fundamental value of the company (Davies *et al*., 2014).

The estimation of the relevant discount rate that is used to determine the present value of expected future cash flows represents the second step of estimating a share's intrinsic value. The discount rate represents the ordinary shareholders' required rate of return on the share, or the company's cost of equity when viewed from management's perspective. The required return could thus be considered as the minimum return that an investor is willing to accept, considering the risk that the share represents and the returns that might be earned by investing in other assets (Keown, Martin, Petty and Scott, 2005). The assumption that investors are risk averse will therefore influence the discount rate as, other factors being held constant, the higher the degree of risk that a share might present, the higher the return that the investor might require (Brigham and Daves, 2007).

In traditional finance, the required rate of return might be calculated using a number of asset pricing models. The CAPM of John Linter (1965), William Sharpe (1964) and Jan Mossin (1966), the FF3 model (Fama and French, 1993), the Carhart four-factor model (Carhart, 1997), the FF5 model (Fama and French, 2015) and the APT of Ross (1976) are among the most widely used.

2.5.1 Capital asset pricing model

The CAPM is a one-factor risk model that is widely used within traditional finance as a means of estimating the cost of equity. Following the assumptions underlying Markowitz's (1952) MPT, the CAPM was formulated as a means of calculating asset prices in efficient markets.

Markowitz (1952) formalised the relationship between risk and return in MPT, where the assumption of investor rationality and risk aversion is followed. According to MPT, an investor is argued to reduce risk via diversification, as rational individuals would not expose themselves to company-specific risk when that same risk might be eliminated by combining certain shares in a portfolio. Markowitz (1952) provided investors with a means to reduce their level of risk (i.e. via a diversified portfolio), however, it was not until the contributions of Sharpe (1964), Linter (1965) and Mossin (1966) led to the development of the CAPM, that a method of measuring any remaining systematic risk was introduced.

The CAPM equilibrium model estimates the rate of return that an investor would require if they purchased the shares of a company instead of a risk-free asset, where an excess return beyond the risk-free rate, in the form of a risk premium, is provided. This risk premium compensates the investor for the market risk that a share is exposed to and does not consider any company-specific risk that the investor may choose to accept (Focardi and Fabozzi, 2004).

Accordingly, the CAPM provides an estimation of the investor's required rate of return on a share, given its market risk, where this risk is measured via the share's beta. A beta greater than one indicates a higher level of risk in comparison to the market portfolio. The returns of a high beta share might thus react more severely in response to systematic changes (Besley and Brigham, 2015).

Conversely, the returns of a share with a beta coefficient of less than one are likely to react less severely to fluctuations in the capital market, exposing the investor to lower risk. The CAPM, therefore, holds that a share's expected return is a linear function of its beta (Houthakker and Williamson, 1996), indicating that a higher return is linked to a higher beta, and therefore a higher level of risk.

The equation used to calculate the cost of equity according to the CAPM is as follows (Kürschner, 2008):

$$\mathrm{E}(r_i) = r_f + \beta_i[\mathrm{E}(r_m) - r_f] \qquad \textbf{Eq. 2.2}$$

where:

β_i = the beta coefficient for company i according to the CAPM

$\mathrm{E}(r_i)$ = the expected return for share i

r_f = the return on risk-free securities

$\mathrm{E}(r_m)$ = the expected return on the market portfolio

Under the CAPM the cost of equity is the sum of the risk-free rate and a risk premium which represents the investor's required return for accepting the market risk of the share.

The relationship between a share's risk and return can be illustrated by the security market line (SML). The SML describes the linear relationship between a share's market risk and its expected return. The slope of the SML is determined by the efficiency of the market. In efficient markets (i.e. correctly priced financial assets), the slope will be positive as investors will require higher returns when purchasing riskier securities. Likewise, low expected returns will correspond with a lower level of risk, indicated by a smaller beta. In inefficient markets, the slope will be negative, indicating that low expected returns correspond with high betas (Barucci and Fontana, 2017). The SML is illustrated in Figure 2.1.

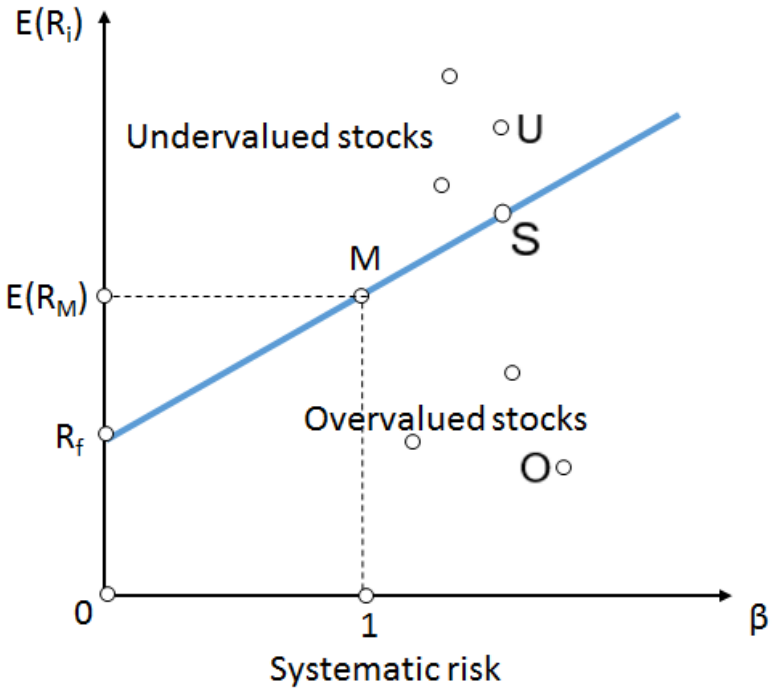

Figure 2.1: The security market line

Source: Adapted from Groenen (2015)

In Figure 2.1, Point M indicates the market equilibrium, which is the return that a shareholder of the market portfolio would expect to receive, as calculated by the CAPM. In market equilibrium, a share will have a beta of one, indicating that its returns move in sync with the market (Besley and Brigham, 2015). A share with a beta of greater than one should offer a higher return than the market portfolio to compensate the investor for accepting the additional systematic risk, shown by Point S. However, if the expected return of a share exceeds the return predicted by the SML, the share is undervalued and will plot above the SML line (Point U). Conversely, overvalued shares are predicted to produce returns that are lower than the expected return of the market portfolio and will consequently plot below the SML line, as indicated by Point O.

The SML is widely used in finance as a tool to determine the price of financial assets based on their market risk. The line can be used to determine if a share is under or overvalued. It can also be used to determine shareholders' required return or a company's cost of capital when viewed from a managerial perspective.

However, following MPT, the CAPM is based on several assumptions that include the following (Sharpe, 1964):

i) All investors will consider alternative portfolios' expected returns and standard deviations and select the option that will result in the maximum expected utility of their terminal wealth while focusing on a single holding period.
ii) All investors have access to an unlimited amount of money that may be borrowed at a given risk-free rate of interest.
iii) No restrictions exist on the short sale of assets.
iv) All investors have homogeneous expectations (i.e. identical estimates of risk, expected return and covariance between assets).
v) All assets may be sold at their market price (i.e. are perfectly liquid and divisible).
vi) There are no transaction costs.
vii) There are no taxes.
viii) All investors assume that their buying and selling of shares will not change share prices (i.e. price takers).
ix) There is a known and fixed number of assets.

The assumptions of the CAPM have been severely criticised (Ward and Muller, 2012; Abbas, Ayub, Sargana and Saeed, 2011). As a result, the ability of the model to accurately estimate the required rate of return on a share has been questioned (Friend and Blume, 1970). More specifically, the slope of the SML is argued to be flatter than predicted by the CAPM, challenging the assumption of a linear relationship between risk and return. The CAPM assumes that the greater the systematic risk a share might present, the higher the return that an investor would require. However, a flatter SML slope suggests that securities presenting lower levels of risk provide rates of return that are higher than those predicted by the CAPM. Likewise, high-risk shares would then provide returns that are lower than those predicted by traditional theory (Arnold and Lewis, 2019).

The ability of the CAPM to explain the cross-section of share returns has also been questioned. The model uses only one factor, namely market risk, to account for differences in share returns. However, Arnold and Lewis (2019) argued that the variability in expected returns cannot be fully accounted for by systematic risk only, thereby suggesting that additional risk factors influence returns. Fama and French (1992) found two additional factors that might explain variability in returns, namely the size of a company and its book-to-market (B/M) ratio. The findings of Fama and French (1992) suggested that systematic risk does not fully explain the variability in returns and that numerous risk factors, such as unsystematic influences, might also have an effect on returns.

The limitations of the CAPM have led to the development of alternative asset pricing models, such as the FF3 model (Fama and French, 1993), the Carhart four-factor model (Carhart, 1997), the FF5 model (Fama and French, 2015) and the APT of Ross (1976).

2.5.2 The FF3 model

Fama and French (1992) attempted to offer an alternative to the CAPM by introducing a multi-factor asset pricing model. The FF3 model attempts to explain the cost of equity more effectively than the CAPM by incorporating, in addition to market risk, two more risk variables, namely company size (as measured by the market capitalisation of a company's equity) and B/M ratio (Brigham and Daves, 2007). The model assumes that companies with a smaller market capitalisation value and high B/M ratio offer higher returns, as they tend to outperform the overall market.

The equation used to calculate the cost of equity based on the FF3 model is as follows (Armitage, 2005):

$$\mathrm{E}(r_i) = r_f + \beta_{i,\mathrm{FF3}}\left[\mathrm{E}(r_m) - r_f\right] + \beta_{i,\mathrm{SMB}}\mathrm{E}(SMB) + \beta_{i,\mathrm{HML}}\mathrm{E}(HML) \qquad \textbf{Eq. 2.3}$$

where:

$\beta_{i,\mathrm{FF3}}$	=	share i's beta measured against the market, as calculated by the FF3 model
$\mathrm{E}(r_i)$	=	the expected return for share i
r_f	=	the return on risk-free securities
$\mathrm{E}(r_\mathrm{m})$	=	the expected return on the market portfolio
SMB	=	the difference in returns between a portfolio of small-cap and large-cap companies
HML	=	the difference in returns between a portfolio of high and low B/M ratio companies
$\beta_{i,\mathrm{SMB}}$	=	measures the sensitivity of share i to SMB
$\beta_{i,\mathrm{HML}}$	=	measures the sensitivity of share $\boldsymbol{i}$ to HML

The cost of equity, according to the FF3 model, is thus the sum of three independent variables, namely the return on the market over and above the return on risk-free bonds, the excess return earned on companies with smaller market capitalisation values in comparison to those with higher market values and the return earned by high value B/M in excess of low value B/M companies.

The FF3 model is generally considered the most widely accepted multi-factor asset pricing model and is often used as an alternative to the single-factor CAPM (Cochrane, 2005). By including a greater number of risk variables to estimate the cost of equity, the results tend to be higher in comparison to the CAPM (Pratt and Grabowski, 2010).

The FF3 model has been tested in numerous share markets, in both developed and developing countries, to see if it can account for differences in the cross-section of returns. The findings from studies conducted in Japan (Charitou and Constantinidis, 2004), the US (Fama and French, 1992), Nigeria (Ajao and Igbinosa, 2014) and Istanbul (Eraslan, 2013) provided support for the model's ability to explain the differences in portfolio and share returns.

2.5.3 The Carhart four-factor model

Carhart (1997) argued that the FF3 model does not fully account for variations in cross-sectional share returns when portfolios are sorted by momentum. Carhart (1997) adopted the findings of Jegadeesh and Titman (1993), where the authors found that companies that experienced prior higher returns, continued to consistently realise greater returns in comparison to previous losers. The authors also found that companies that performed poorly, when compared to the market, continued to experience lower returns. Carhart (1997) incorporated this one-year movement effect into the calculation of expected returns by expanding on Fama and French's (1992) model to include a fourth risk factor, namely momentum. The Carhart four-factor model tries to account for a larger amount of share pricing anomalies, in comparison to the FF3 model. Carhart (1997) argued that by incorporating a fourth risk factor into the asset pricing model, the estimates tend to be more accurate in comparison to the three-factor model.

The equation used to calculate the cost of equity using the Carhart four-factor model is (Rehnby, 2016):

$$\mathrm{E}(r_i) = r_f + \beta_{i,\mathrm{CH4}}[\mathrm{E}(r_m) - r_f] + s_i(SMB) + h_i(HML) + w_i(WML) \qquad \textbf{Eq. 2.4}$$

where:

$\beta_{i,\mathrm{CH4}}$ = share i's beta measured against the market, as calculated by the Carhart four-factor model

$\mathrm{E}(r_i)$ = the expected return for share i

r_f = the return on risk-free securities

$\mathrm{E}(r_m)$ = the expected return on the market portfolio

SMB = the difference in returns between a portfolio of small-cap and large-cap companies

HML = the difference in returns between a portfolio of high and low B/M ratio companies

WML	=	the difference in return of a portfolio of winner securities and loser securities
w_i	=	the sensitivity of the share to the momentum risk factor
s_i, h_i	=	the sensitivity of the share to changes in each risk factor

According to the Carhart (1997) model, the cost of equity is therefore the sum of four independent variables, namely the company-specific risk premium, the excess returns earned by companies with smaller market capitalisations over returns earned by companies with larger market value, the return of companies with high B/M values minus the return of companies with low B/M values and the excess return earned by companies with winner shares over companies of loser shares.

Jegadeesh and Titman (2001) conducted another study on price momentum and found that the momentum effect was more prominent in companies with smaller market capitalisations, supporting the results of their initial study on momentum returns. Nijman, Swinkels and Verbeek (2004) also found that momentum effects are most evident in small-value shares in the European share market. However, when investigating the South African share market, Bartens and Hassan (2010) found that momentum, company value and size did not explain the variability in cross-section share returns.

The findings that support the momentum effect contradict the assumptions of the EMH, where share prices are believed to follow a random walk. The random walk assumption states that share prices change in response to changing fundamentals, and therefore future movements cannot be predicted based on past performance.

2.5.4 The FF5 model

In 2015, Fama and French (2015) proposed an additional multifactor model to calculate the cost of equity. The researchers constructed the new FF5 model by extending their FF3 model to include two new variables, namely profitability and investment. Previous research has highlighted the statistical significance of including variation due to profitability and investment factors when determining a company's cost of equity. Novy-Marx (2013) revealed a positive relationship between expected returns and profitable companies, while Titman, Wei and Xie (2004) determined that companies which increase capital investment frequently experience future negative risk-adjusted returns.

The equation used to calculate the cost of equity based on the FF5 model is as follows (Yang, Li, Zhu and Mizrach, 2017):

$$\mathrm{E}(r_i) = r_f + \beta_{i,\mathrm{FF5}}\left[\mathrm{E}(r_m) - r_f\right] + \beta_{i,\mathrm{SMB}}\mathrm{E}(SMB) + \beta_{i,\mathrm{HML}}\mathrm{E}(HML) + \beta_{i,\mathrm{RMW}}\mathrm{E}(RMW) + \beta_{i,\mathrm{CMA}}\mathrm{E}(CMA) \qquad \textbf{Eq. 2.5}$$

where:

$\beta_{i,\mathrm{FF5}}$	=	share i's beta measured against the market, as calculated by the FF5 model
$\mathrm{E}(r_i)$	=	the expected return for share i
r_f	=	the return on risk-free securities
$\mathrm{E}(r_\mathrm{m})$	=	the expected return on the market portfolio
SMB	=	the difference in returns between a portfolio of small-cap and large-cap companies
HML	=	the difference in returns between a portfolio of high and low B/M ratio companies
RMW	=	the difference in returns between a portfolio of companies with robust and weak operating profitability
CMA	=	the difference in returns between a portfolio of companies with conservative and aggressive investment strategies
$\beta_{i,\mathrm{SMB}}$	=	measures the sensitivity of share i to SMB
$\beta_{i,\mathrm{HML}}$	=	measures the sensitivity of share i to HML
$\beta_{i,\mathrm{RMW}}$	=	measures the sensitivity of share i to RMW
$\beta_{i,\mathrm{CMA}}$	=	measures the sensitivity of share i to CMA

The cost of equity, according to the FF5 model, is therefore the sum of five independent variables. The first variable included is the return on the market over and above the return on risk-free bonds. The model then determines the excess returns earned by companies with small share portfolios in comparison to companies with large share portfolios, followed by the returns of high value B/M in excess of low-value B/M companies. The fourth variable included is the return of companies with robust operating profitability portfolios in comparison to portfolios with low operating profitability. The final variable is the return earned by companies with conservative investment portfolios in comparison to aggressive investment portfolios.

By including profitability and investment factors, researchers (Chiah, Chai, Zhong and Li, 2016) found that the FF5 model can account for more asset pricing anomalies in comparison to the FF3

and the Carhart four-factor model in the Australian market. Singh and Yadav (2015) also found that the FF5 model is more effective in determining the cost of equity than the CAPM and FF3 model in the Indian market. However, Fama and French (2017) found that their FF5 model cannot be adapted to every market, where the investment variable is found to be redundant for Europe and Japan.

2.5.5 The arbitrage pricing theory

Expanding on the assumptions of the CAPM, the APT is a multivariant model that assumes that numerous risk factors, in addition to market risk, might influence the returns of a share (Ross, 1976). The APT is a multiple regression model that investigates the relationship between an investment's cost of equity and multiple market risk factors. While the model does not specify which systematic risks are included, most APT models include prevalent macroeconomic factors, such as interest rate risk, inflation risk, and investor confidence risk (Burmeister, Roll and Ross, 2003). The required return is influenced by each share or portfolio's level of sensitivity (measured via betas) to each of the risk factors included in the model.

The equation for the APT model is as follows (Rehnby, 2016):

$$E(r_i) = r_f + \beta_{i1}\lambda_1 + \beta_{i2}\lambda_2 + \ldots + \beta_n\lambda_n \qquad \textbf{Eq. 2.6}$$

where:

$\mathrm{E}(r_i)$	=	the expected return for share i
r_f	=	the return on risk-free securities
β_{ik}	=	the sensitivity of share i to different risk factors
λ_k	=	the risk premium of the factor
k	=	(1,2, …, n) number of the factor

The APT model was developed with the assumption that there is no single factor that can fully capture the risk that an investment is exposed to. The model, therefore, considers an investment's risk based on several systematic factors, where a higher exposure to risk is compensated for by a higher expected return. Pratt (2002) argued that the APT and CAPM often produce different estimates of a company's cost of equity or investor's required return. The author highlighted that in certain industries, such as oil, APT model estimates tend to exceed the required rates of return that are calculated using the CAPM, while in other industries, such as specific utility groups, CAPM estimates are higher than those determined by the APT model. Overall, it is suggested that by considering a larger number of risk factors the APT model might provide a more accurate estimation

of the cost of equity in comparison to the single-factor CAPM (Koller, Goedhart and Wessels, 2010). However, the univariate CAPM remains the more widely used alternative. Pratt (2002) suggested that the lack of consensus regarding which risk variables to include and the complexity of incorporating multiple coefficients contribute to the comparatively slow adoption of the APT model.

2.6 CONCLUSION

The concept of the time value of money underlies traditional finance theory, where an asset's present value is higher than its value at a future point in time. Following this concept, present-value analysis was introduced, which allows the investor to calculate the value of an asset at different points in time. Present-value analysis is also used to determine the fundamental value of a company, where the future cash flows that a company is expected to generate are discounted back to the present using a rate that reflects the risk that the investment might present. According to the assumptions of traditional finance theory, investors will rationally consider all available information and accurately forecast future earnings and discount rates. The CAPM is usually used to determine the shareholder's required rate of return. However, the model only accounts for the market risk that the investor might be exposed to. The ability of the model to accurately determine discount rates that reflect the intrinsic value of a company has thus been questioned and has led to the development of alternative asset pricing models, such as the FF3 model, Carhart four-factor model, FF5 model and the APT.

However, the CAPM, FF3 model, Carhart four-factor model, FF5 model and the APT still fail to account for the large number of pricing anomalies, when viewed from a traditional finance perspective. Some of the most widely documented market irregularities include share price volatility, share price overreaction and underreaction, calendar effects and the equity premium puzzle. As the assumptions of traditional finance fail to account for these apparent non-random price movements, researchers (Barberis and Thaler, 2003; Shefrin, 2002; Ritter, 2003; Singh and Bahl, 2015) have considered that the risk factors that influence the pricing of shares might be greater in scope than reflected by the assumptions of traditional finance theory. Statman (1999:18) argued that while the EMH assumes that rational share prices "reflect only utilitarian characteristics, such as risk", the hypothesis fails to account for "value-expressive characteristics, such as sentiment". This apparent imbalance between theory and reality has given rise to behavioural finance, which attempts to explain observed anomalies by considering the potential role of investor sentiment and the influence of behavioural biases.

CHAPTER 3
INVESTOR SHORT-TERMISM

3.1 INTRODUCTION

> *The qualities most useful to ourselves are, first of all, superior reason and understanding, by which we are capable of discerning the remote consequences of all our actions; and, secondly, self-command, by which we are enabled to abstain from present pleasure or to endure present pain in order to obtain a greater pleasure in some future time.* (Adam Smith, 1759:282)

This quote by Smith (1759) emphasises the importance of considering the long-term consequences of choices that might be made today. The premise of his argument extends to traditional finance theory which assumes that market participants will rationally defer immediate consumption in order to realise a greater utility at a future point in time. However, the assumptions underlying traditional finance theory have been questioned since they were first proposed (Basu, 1977; Malkiel, 2003). Critics of the EMH argue that the high number of market anomalies observed in financial markets indicate that share values do not follow a random walk nor fully reflect all available information.

Another assumption of the EMH that has been severely criticised, is that investors are considered to be rational utility-maximising agents. Researchers (Simon, 1957; Kahneman, 2003) have argued that this is an inaccurate description of investor behaviour, given that market participants are suggested to be prone to heuristics and biases when making investment decisions. Kahneman (2011:5) challenged the traditional assumption of investor rationality and suggested that these inherent heuristics are a result of the "design of the machinery of cognition", where biases are a predictable manifestation of the decision-making process. Similarly, myopic tendencies have also been described as an outcome of the basic structure of the brain, showing prevalence since early human evolution (Ferguson, 2008). Haldane and Davies (2011) observed that investors in the UK and US exhibited a short-term "bias" when making financial decisions. Kahneman (2011) argued that these myopic tendencies are a predictable and systematic response during intertemporal decisions. However, myopic behaviour might have negative consequences when a large number of market participants exhibit a preference for immediate outcomes, such as the mispricing of shares and the underinvestment in long-term value-generating projects.

The remainder of this chapter is structured as follows. Firstly, a description of anomalies that occur in financial markets is provided (Section 3.2). Thereafter, the behavioural finance perspective is explained, and a discussion of human decision-making behaviour is presented (Section 3.3). Subsequently, an overview of heuristics is provided (Section 3.4), followed by a description of

behavioural biases (Section 3.5). Thereafter, a discussion on short-termism is presented (Section 3.6). Lastly, concluding remarks to the chapter are offered (Section 3.7).

3.2 ANOMALIES IN FINANCIAL MARKETS

In efficient markets, the share prices of companies incorporate all publicly available information and correctly reflect their intrinsic value. Capital markets are therefore assumed to be informationally efficient, where informed investors are believed to rationally process all available information when pricing assets. Therefore, investors cannot earn abnormal returns by exploiting the market, as prices move in a random manner and instantly reflect all information as it becomes available (Fama, 1970). Any deviation from an asset's intrinsic value would thus be corrected by arbitrage. However, researchers (Ziemba, 2012; Singal, 2004) have identified situations where asset mispricing appears to persist. These non-random movements in share prices are argued to be caused by the irrational behaviour of market participants (Lehman, 2009). Human behaviour is suggested to deviate from the assumptions of the EMH, with these departures from rationality resulting in market anomalies. An anomaly is therefore defined as a "deviation from the prediction of the efficient markets theory" (Khan, 2011:1). Some of the most widely researched market anomalies include excess volatility, share price overreaction and underreaction, the weekend effect, the neglected firm effect, and the equity premium puzzle.

3.2.1 Excess volatility

In traditional finance theory, price fluctuations experienced within financial markets reflect adjusted investor expectations in response to changing fundamentals. As share prices represent the present value of expected future dividends and terminal prices, adjustments in share prices should be attributed either to the change in expectations regarding cash flow streams, or the discount rate (LeRoy, 2005).

Following the assumptions of the EMH, these price changes should vary systematically with fundamental changes. However, investors often experience large differences between their actual and expected investment performance. Their expected investment performance should coincide with an expected level of volatility in response to changes in fundamentals, as predicted by the EMH. Yet, Shiller (1979) and LeRoy and Porter (1981) observed excess volatility within financial markets, where the fluctuations in price levels have exceeded those changes that can be attributed to the arrival of new information. Shiller (1979) therefore argued that the total volatility experienced within financial markets cannot be fully accounted for by rational reactions to new information.

Shiller (1979) suggested that the excess volatility experienced over and above that accounted for by economic influences might be attributed to an additional factor, namely the behavioural biases of

investors. Shiller (1979) argued that investors display an irrational desire to follow the trends of fashion, also referred to as herding, which contributes to the fluctuations in share prices, where a large number of investors simultaneously buy or sell assets in certain industries or groups. De Bondt and Thaler (1985) further suggested that agents use inaccurate and irrational mechanisms to determine future dividends, such as under or overreacting to news about the associated share's future cash flows.

These excess price fluctuations have contributed to the almost continuous critique of the EMH (Basu 1977; Malkiel, 2003), where particular attention is placed on the restrictive assumptions upheld within traditional finance theory, and the limitations that are thereby imposed. Baker and Nofsinger (2010) argued that empirical market patterns cannot be fully accounted for by the EMH.

3.2.2 Share price overreaction/underreaction

In efficient markets, financial agents instantaneously absorb new information, which is then reflected in share returns and prices. As efficient security prices always reflect all available data, an investor cannot predict future price movements by analysing historical returns. However, it has been argued that new information might be absorbed and reflected in the prices of securities inaccurately, where share prices are suggested to underreact or overreact to certain announcements (Frank, 2004).

Underreaction occurs when share prices reflect new information too slowly. Specifically, the price of a share might not increase high enough following positive news or decrease low enough to reflect a negative signal. Barberis, Shleifer and Vishny (1998) suggested that investors might underreact to news due to conservative behaviour. Investors exhibit conservation bias when they fail to fully incorporate new information in order to maintain any pre-existing beliefs. This belief perseverance bias causes financial agents to overweight prior views and underweight new information. Investors thus inadequately adjust their forecasts and actions in response to news, resulting in underreaction (Pompian, 2013).

Overreaction refers to market agents responding in an overly sensitive way to the arrival of new information. When investors overreact to a positive signal, the change in their forecasts causes asset prices to increase too much. Conversely, when overreaction to a negative signal occurs, security prices drop too far (Neelan, 2007). Numerous financial bubbles have been caused by overreactive investors, where share prices have risen and declined by excessive levels. The crash of October 1929 caused the US share market to decline by 89 per cent over the subsequent three years (Ferguson, 2008). In response to the 1929 financial crisis, President Franklin D. Roosevelt (1933) stated that "the only thing we have to fear is fear itself - nameless, unreasoning, unjustified…". Roosevelt (1933) therefore suggested that a psychological factor might have had a role in causing the financial crisis. More recent bubbles occurred during the 1990s, where euphoric sentiments and

overstated expectations about the future of technology companies caused share prices to increase by excessive levels. The value of internet shares reached heights that were unwarranted by their associated fundamentals, leading to the subsequent crash of the dot-com bubble as buyers became unwilling to purchase the overvalued assets.

3.2.3 The weekend effect

The weekend effect is a behavioural anomaly that addresses the return volatility of securities which have been suggested to vary on certain days of the week. Specifically, the trading returns on Fridays and Mondays are argued to be more volatile in comparison to Tuesdays, Wednesdays, and Thursdays. The return behaviour of financial assets is, therefore, suggested to be inconsistent across trading dates (Mattarocci, 2014), contrasting the traditional assumption that daily weekday returns should not differ. This behavioural anomaly is known as 'the weekend effect' as it considers the effect of the weekend on the share returns of the preceding Friday and the following Monday. The average returns on Fridays are found to be greater than the returns on the subsequent Monday (Cross, 1973). The negative performance on Mondays is only prevalent during the first hours of the day; thereafter, the returns are not statistically different to those experienced during other days of the week, apart from Fridays (Smirlock and Starks, 1986). On Fridays, security prices have been found to increase more than on any other day of the week (Cross, 1973). Tong (2000) found that the weekend effect is prevalent during almost every week of the year and is stronger during the last week of every month.

A behavioural perspective is often used to provide a possible explanation for the weekend effect. Kamara (1997) argued that, according to the dynamics of financial markets, during the weekend, investors should collect and analyse information to determine their investment decisions for the following week. However, Lakonishok and Maberly (1990) found a difference in the behaviour between individual and institutional investors. During the weekend, individual investors are suggested to not extensively collect information and plan an investment strategy, as they might prefer to engage in other activities. On Monday mornings these individual investors are more active in financial markets and submit a larger number of sales orders in comparison to other days of the week. This increase in supply subsequently decreases the price of certain securities, contributing to the decrease in returns experienced on Mondays. Institutional investors are argued to follow a different investment approach by developing their weekly investment strategies each Monday morning. The initial hours of each Monday are therefore used for strategic planning and, consequently, no buy orders are placed (Abraham and Ikenberry, 1994). Financial markets are therefore dominated by sales orders and a lack of liquidity on Mondays, decreasing security prices. Mangot (2009) argued that the reason for the increase in returns on Fridays is more intuitive. The

close proximity of the weekend is suggested to stimulate a positive mood bias, resulting in an optimistic investment approach and generating higher returns.

3.2.4 The neglected firm effect

The neglected firm effect is another market irregularity that questions the validity of the EMH. Arbel, Carvell and Strebel (1983) argued that institutional analysts, such as those associated with insurance companies and mutual and pension funds, do not direct the same amount of attention and scrutiny to all publicly traded companies. According to the authors, certain companies, often medium and small market capitalisation companies, are neglected or less closely followed by institutional investors, while companies with larger market capitalisations receive more institutional attention.

A possible result of companies being neglected by investment analysts based on their size could therefore be a disparity between the quantity and quality of available information for large and small capitalisation companies (Gaa, 2008). The neglected firm effect refers to information asymmetry, where smaller, less transparent companies have been suggested to outperform highly analysed companies with larger market capitalisations. The increase in and availability of information about large capitalisation companies might raise their market prices and decrease their relative returns when compared to the returns earned by small and medium-sized companies (Reilly and Brown, 2012; Mayo, 2021; Dimson, 1988). Conversely, smaller companies might outperform large companies due to higher returns that are offered as compensation for accepting the risk related to neglected securities. This risk is suggested to mainly arise from a decrease in institutional monitoring, thereby increasing the potential for managers to exploit shareholders. Additionally, lower informational transparency increases the uncertainty about whether a company's market value accurately reflects its fundamental value (Beard and Sias, 1997).

Arbel *et al.* (1983) studied a random sample of 510 companies from the New York Stock Exchange (NYSE), NYSE American and over-the-counter markets, between 1970 and 1979, where the selected companies were divided into three groups based on the number of institutional investors holding each share. The three groups were categorised as highly researched securities, moderately researched securities, and neglected securities. The researchers found that those companies that experienced limited interest and coverage from large investors outperformed those that were highly invested in. However, Beard and Sias (1997) reinvestigated the neglected firm effect using a larger sample of 7 117 companies listed on the NYSE, NYSE American and over-the-counter markets, from 1982 to 1995. Their study provided no evidence to support the assumption that investors might earn additional returns by investing in riskier neglected shares. Despite these contrary findings, both studies found that not all companies receive the same degree of institutional interest. Large companies are often better researched than smaller companies. This information asymmetry

suggests that a decrease in company size corresponds with a decrease in market efficiency (Mayo, 2021).

3.2.5 The equity premium puzzle

Traditional finance theory assumes that investors will be provided with a rate of return that corresponds to the level of risk that they accept when investing in a security. However, when investing in a share of a company, it has been observed that investors often require a rate of return that exceeds the level of risk that that share might present (Mehra, 2006). This phenomenon is referred to as the equity premium puzzle, where the return that investors require on shares anomalously surpasses that offered by relatively riskless securities, such as treasury bills. Shuler (2014:98) challenged the traditional assumption that "there can be no kind of difference in returns except based on risk".

The equity risk premium is viewed as an additional return over the risk-free rate that is offered to investors for accepting a security's associated risks (Goetzmann and Ibbotson, 2006). Common shares are considered to be riskier than government bonds due to the uncertainty of their rate of return, where returns might be influenced by several company-specific risk factors. Irregular dividend payments, rising interest rates coupled with high corporate leverage, governance issues and unexpected inflation are some of the risks that might influence a security's rate of return. Conversely, the nature of treasury bills is considered a low-risk investment, where the amount and timing of their cash receipts are specified in an agreement (Scott, 2005). In order to induce investors to make the riskier choice by purchasing shares, the return on equity exceeds the return on bonds; however, Mehra (2006:2) argued that it is "greater than can be rationalised in the context of the standard neoclassical paradigm of financial economics". Likewise, Chadha (2015) suggested that, according to traditional economic theory, the difference between the rate of return from investing in shares and government bonds is abnormally high.

Mehra and Prescott (1985) and Mehra (2006) studied the returns on shares on the Standard and Poor's (S&P) 500 Index and treasury bills in the US between 1889 and 2005. The authors found that share returns largely exceeded those of relatively riskless securities over the 116-year period. During this time, US shares generated an average real return of 7.67 per cent, while the return on treasury bills was 1.31 per cent. The equity premium (i.e. the difference between the returns on shares and riskless securities) was 6.36 per cent, indicating that US shares generated a return that far surpassed that offered by treasury bills. This phenomenon was also observed in other countries characterised by a significant capital market. The share market in Japan produced an average equity premium of 9.8 per cent between 1900 and 2005. A significant equity premium was also observed in Germany (9.1 per cent) and the UK (6.1 per cent) over the same period (Dimson, Marsh and Staunton, 2002). Hassan and van Biljon (2010) conducted a study that measured the equity premium in South Africa

between 1900 and 2005. The researchers found that the average equity premium offered over bills was 6.30 per cent over the period. Mehra and Prescott (1985) argued that these historically high equity premiums present an anomaly that cannot be rationalised by the assumptions of traditional finance theory.

The equity premium puzzle, excess volatility, share price overreaction and underreaction, the weekend effect and the neglected firm effect are among some of the market anomalies that have been observed throughout financial history. These movements in share prices indicate that values might not follow a random walk, as assumed within traditional finance theory. Ferguson (2008) argued that one of the fundamental reasons for the inherent instability of financial markets is human behaviour. Researchers (Tversky and Kahneman, 1974) have highlighted the role of numerous behavioural biases in generating market volatility. This apparent gap between the assumptions of traditional finance and observed empirical market patterns has given rise to behavioural finance.

3.3 A BEHAVIOURAL FINANCE PERSPECTIVE

Human choices deviate from the rules of rationality. (Kahneman, 2011:XI)

Market anomalies, such as those highlighted in the previous section, suggest that the assumptions of traditional finance theory might not provide an accurate description of empirical market behaviour. Behavioural finance attempts to explain these inconsistencies between traditional assumptions and actual market performance by examining the behaviour of market participants (Singh and Bahl, 2015). According to traditional finance theory, investors behave in a manner that conforms with the classic model of rational choice. This model accepts that investors are rational, risk-averse and utility-maximising agents who process all available information when making investment decisions. Market participants are assumed to instantly absorb this information, which is reflected in their expectations of future share returns. However, the observation of numerous market anomalies implies that the asset pricing models associated with traditional finance might not always accurately reflect a security's intrinsic value.

To provide a better understanding of share price movements, researchers (Simon, 1957; Kahneman, 2003) have suggested that the assumptions of investor behaviour might be broader in scope than those proposed by traditional finance theory. These authors also considered the role of socio-psychological factors on the decision-making behaviour of investors and their potential effect on the market. Simon (1957) argued that the normative theory of decision-making does not provide an accurate account of the behaviour of financial practitioners, where an individual's ability to make rational decisions is constrained by their cognitive limitations and access to information. Kahneman (2003) attempted to explain market anomalies by considering the role of heuristics and biases during

the decision-making process. He developed a two-system model of cognitive processing and found that individuals are prone to biases when faced with uncertainty. Specifically, biases that might influence investment decisions are identified, which contrasts with the traditional theory of rational choice. By considering investor behaviour from a psychological and sociological standpoint, researchers in the field of behavioural finance (Kahneman and Tversky, 1979; Shiller, 1981; De Bondt and Thaler, 1990; Baker and Nofsinger, 2010) attempted to explain the reasons for market inefficiency by reconciling the restrictive assumptions of traditional finance theory with the actual behaviour of market participants (Suryawanshi and Jumle, 2016).

The rest of this section is structured as follows. Firstly, a description of the normative theory of decision-making is presented. Thereafter, Simon's (1957) theory of bounded rationality is discussed. Lastly, Kahneman's (2003) two-system model of cognitive processing is provided, where the role of heuristics and biases are explained.

3.3.1 The normative theory of decision-making

Traditional finance theory assumes that investors make decisions following the classic model of rational choice. This model offers a normative theory of investor behaviour, where the term normative refers to "the use of a rule when there is a consensus among formal scientists that the rule is appropriate for the particular problem" (Nisbett and Ross, 1980:13). The normative theory holds that a rational investor will correctly analyse the probability and expected outcome of each possible option and will then select the combination that will allow them to maximise their expected value. This classic model of rational choice, in turn, assumes that the investor will have access to an unlimited set of resources that will allow them to process all available information when forming utility expectations (Gilovich, Griffin and Kahneman, 2002). However, this theory has been criticised as being psychologically unrealistic, as it assumes that decisions are made in a "comprehensively inclusive context", where all details about the present reality and expectations of future returns and risk are considered (Kahneman, 2003:1459).

This ideal model of judgement accepts that the rational agent will not make any systematic errors when forming probability and return expectations. Gilovich *et al.* (2002) and Simon (1957), have questioned the accuracy of this assumption and have offered alternative theories to explain decision-making under uncertainty. These theories propose that the individual might make mistakes during the decision-making process that are not invoked by motivated irrationality, as explained in Simon's (1957) model of bounded rationality and Kahneman's (2003) two-system view of cognitive processes.

3.3.2 Bounded rationality

Simon (1957) proposed that the normative model of choice was not an accurate reflection of how market participants behaved and introduced the idea of bounded rationality. The author attempted to provide a more accurate description of the behaviour of financial practitioners by addressing the psychological limitations of the human mind and argued that "full" rationality, as supported in normative theories, represents an unrealistic standard of human behaviour.

Bounded rationality thus proposes that investors do not, due to the inherent limitations of the human psyche, form fully rational expectations using all available information. Rationality is therefore proposed to be "bounded" to the search and information processing capabilities of the individual investor. Investors are argued to make the most rational choice, within the constraints of their personal cognitive abilities and degree of access to information (Gilovich *et al*., 2002). Any human errors, or suboptimal choices, which might be made during the decision-making process are therefore argued not to be a result of deliberate irrationality but are suggested to be a consequence of the individual's cognitive limitations.

Building on Simon's (1957) model of bounded rationality, Kahneman (2003) developed an extended perspective of investor behaviour where he argued that the errors that might occur during the decision-making process arise from a complex interaction between two cognitive systems within the human psyche.

3.3.3 The two-system model of cognitive processing

Kahneman (2003) attempted to provide a more physiological explanation for the decision-making behaviour of market participants by examining the structure and dynamics of the human brain. The author proposes that the mind can be divided into two systems, where each system undergoes a different psychological process. Stanovich and West (2000) labelled these two categories System One and System Two. System One is described as automatic, fast, intuitive, often unconscious, and emotionally driven. Most decisions are determined by System One (Wilson, 2002; Epstein, 2003), where thoughts and actions are a result of habit and learnt associations, thereby making them difficult to control. System Two includes the slow, conscious, complex, and controlled operations that require more effort than those of System One (Kahneman, 2003).

Both systems are active when an individual is awake and interact with each other in a complex manner. System One is automatically active, functioning with little effort by following the individual's intuitive feelings. The impressions, feelings and intuitions generated by System One are assessed by System Two and, if endorsed, are turned into beliefs. Usually, the impressions and solutions formed by System One are correct as everyday problems are simple, therefore not requiring a detailed analysis by System Two. However, System One might encounter a more complex problem

to which an intuitive answer is not readily available. In this situation, the individual would be required to make more effort and consciously mobilise System Two in order to find an answer. Nevertheless, utilising System Two requires effort and System One might try to solve the answer to a complex question without engaging in a demanding analysis. In this situation, System One will use a mental shortcut to find a fast solution to a complex question. A related, simpler question that can quickly be answered will be generated. Kahneman (2003) defined this process as substitution, where the individual produces an easier heuristic question, which is answered instead of the actual assessment that was intended.

The process of using a heuristic question might help the individual to simplify the surrounding environment and quickly find answers to complex problems. However, heuristic alternatives might result in erroneous judgements, where, for example, the decision-maker might select a solution that feels good instead of choosing the most rational and value-optimising option. Kahneman (2011:99) made use of examples to illustrate the process of substitution. Individuals might encounter questions such as, “How happy are you with your life these days?” and “How popular will the president be six months from now?”. Rather than making use of the slower System Two to develop a rational answer, Kahneman (2011:99) suggested that the individual might instead address the problem by developing and answering a related heuristic question, for example, “What is my mood right now?” and “How popular is the president right now?”. The substitution question might be endorsed or rejected by System Two or modified by considering additional information. However, System Two is likely to endorse the heuristic question without considering whether it provides an accurate answer to the problem. Kahneman (2011) argued that the individual might not even be aware that the original assessment is substituted with a heuristic question or that the problem was complex, as the shortcut answer came quickly and intuitively to mind.

Kahneman (2011:5) suggested that the systematic errors that occur during the decision-making process are not due to the “corruption of thought by emotion” but are instead a result of the “design of the machinery of cognition”. By using heuristics to simplify the decision-making environment, systematic errors (i.e. biases) become a predictable manifestation of these mental shortcuts. However, Kahneman (2011) argued that not all intuitive judgements are made using heuristics. The intuitive decisions made by experts, such as a move by a chess master and a diagnosis by a physician, are performed quickly and precisely as a result of prolonged practice. Heuristics might produce suboptimal solutions when individuals use their intuitions that “do not all arise from true expertise” (Kahneman, 2011:9). In this situation an investor might choose to invest in the shares of a company because they like the product or how owning the shares would feel instead of considering if the security is undervalued. The “machinery of cognition” is thus argued to do best under

uncertainty; however, when the individual does not have the needed expertise, the use of heuristics might produce a predictable bias by answering a substitute question instead (Kahneman, 2011:5).

In the following section, the use of heuristics during decision-making will be discussed and the affect, availability, representativeness, and anchoring heuristics are described.

3.4 HEURISTICS

Individuals often make decisions in environments characterised by large amounts of information. Due to the cognitive limitations of the human brain (Kuran, 1991; Buschman, Siegel, Roy and Miller, 2011), the ability of an investor to process all available information and then form rational judgements has been questioned (O'Regan, 2016). When attempting to process information and make a decision within a limited time frame, an individual might try to reduce their cognitive load by employing heuristics. Heuristics refer to mental shortcuts, or a rule of thumb, which allow the individual to simplify and speed up their decision-making process by approximating available data while attempting to solve a problem.

However, Gigerenzer (1991) and Kahneman (2011) have highlighted that the use of these intuitive judgements might introduce errors during decision-making, where the term error may be used interchangeably with bias. Established literature has revealed that individuals make judgements that are commonly biased when faced with uncertainty (Tversky and Kahneman, 1973; 1974). The use of heuristics during decision-making is therefore suggested to provide the individual with a beneficial tool to make quick and accurate System One judgements (Kahneman, 2011). However, the ability of System One to generate accurate intuitive judgements is often limited to experts in a specific field. Heuristics that do not arise from expertise are thus argued to frequently result in systematic "erroneous" judgements or biases, where "the presence of an error of judgement is demonstrated by comparing people's responses with either a fact or with an accepted rule of arithmetic, logic, or statistics" (Kahneman and Tversky, 1982:3).

The "accepted rules" are modelled on assumptions found in the normative theories of traditional finance. However, Kahneman and Tversky (1973:237) argued that normative theory does not provide an accurate description of decision-making behaviour, as individuals often rely on heuristics when making decisions which "sometimes yield reasonable judgements and sometimes lead to severe and systematic errors".

Several behavioural heuristics have been identified; among the most widely researched are the affect heuristic, availability heuristic, representativeness heuristic and anchoring heuristic.

3.4.1 The affect heuristic

The affect heuristic is a mental shortcut that is influenced by the individual's current gut feeling or emotion. During decision-making, individuals might be automatically guided by their emotional response (i.e. affect) to a stimulus, which may precede or replace a cognitive and rational analysis of all available alternatives. The decision-maker's affective reaction might be positive or negative, thereby influencing how the associated risks and returns of the stimulus are interpreted. Slovic, Peters, Finucane and MacGregor (2005) argued that when individuals positively perceive an option, the associated risks are undervalued, while the returns are overvalued. Conversely, the returns of emotionally aversive options are undervalued, and their risks are overvalued.

Zajonc (1980:151) argued that judging whether a stimulus was either good or bad is often the "very first reaction" that an individual will have and might influence any subsequent decision-making. Arising from the limbic part of the brain, described as System One by Kahneman (2011), affective impressions are readily available. Conversely, cognitive judgements, often required to check affective reactions, involve effort and occur in System Two. Lewis (2008:54) contended that it is a "human tendency" to use affective shortcuts to simplify complex decisions. The author argued that emotion might offer an investor a means of making a quick and potentially correct decision; however, investors should be careful when analysing market information. Kahneman (2011) highlighted that investors under the influence of affect might select investments that make them feel good, without conducting a rational assessment to check whether the asset is under or overvalued. By attaching either a positive or negative label to an investment, the investor will evaluate the consequential return or risk factor by its associated emotion. Slovic *et al.* (2005) suggested that individuals experiencing a positive mood are more likely to engage in risky behaviour, as the associated risks of an investment are undervalued. Conversely, the behaviour of negatively biased investors might be more risk averse, where associated risks are overestimated. Lewis (2008) also argued that strong affects that are not cognitively supported might lead to exuberance, herd behaviour or panic.

3.4.2 The availability heuristic

The EMH assumes that individuals correctly calculate the probability of an outcome occurring. However, Pompian (2013) argued that decision-makers might use a heuristic that overestimates the probability of an outcome, based on how quickly and effortlessly that outcome comes to mind. A consequence of employing the availability heuristic is that individuals are led to unconsciously believe that easily available thoughts or recollections occur more frequently than other phenomena. This assumption might lead to errors in the calculation of statistical probabilities, as memories are often biased (Levesque, 2006). Some of the most common memory biases include retrievability, categorisation and resonance.

An individual exhibits retrievability bias if they select the first answer that comes to mind without rationally considering that other, harder-to-retrieve answers, might be correct (Tversky and Kahneman, 1973). An investor might therefore assume that easily retrievable events are more probable to occur. Categorisation occurs when the individual collects information according to the search strategy that is perceived as most applicable. A search strategy refers to the way that an individual retrieves information from his or her memory, where the strategy used will influence the speed and amount of data that are collected. For example, if an individual were to search for words in his or her memory starting with a specific letter, a list would probably come to mind easily. However, if that individual had to adopt a different search strategy and attempt to recall words containing the same letter in a different position, the list is likely to be shorter. Consequently, outputs of the former search strategy are more available and easier to retrieve, making the category seem more probable, although it might be an inaccurate conclusion (Serfas, 2011). Individuals exhibit resonance bias when they unconsciously judge an event by how it matches their circumstances. The probability of an event occurring might be overestimated if that event resonates with the decision-maker (Pompian, 2013). For example, opera lovers might overestimate the number of people who listen to opera.

If many investors exhibit the availability heuristic, it might threaten the efficiency of financial markets. For example, decision-makers might select the investment that first comes to mind as a result of advertising, while engaging in rational analysis might produce a better alternative. Additionally, investors might restrict their investment opportunity set by using familiar classification schemes. This might result in failure to sufficiently diversify as their choices are limited to their own experiences (Pompian, 2013).

3.4.3 The representativeness heuristic

Individuals might use the representativeness heuristic to simplify the assessment of a new stimulus by comparing it to a pre-existing category prototype. When presented with a new stimulus, the decision-maker might attempt to understand the event or object by placing it in the same category as a similar and familiar example (Hoyer and MacInnis, 2008). The pre-existing category is considered by the individual as an appropriate and accurate reference from which to judge the new stimulus. However, Tversky and Kahneman (1983) argued that when individuals judge an event with reference to their past experiences, its probability of occurring might be overestimated. Using an incorrect frame of reference from which to assess new information might thus introduce statistical errors and an inaccurate understanding of the new phenomenon. This incorrect perception of a new object or event is likely to persist and subsequently bias any associated reasoning in the future. Two types of representativeness bias applicable to financial practitioners include sample size and base-rate neglect.

Sample size neglect occurs when the individual assumes that the characteristics of a small sample accurately represent those of the larger population (Pompian, 2013). The individual accepts that events observed within a select few data points have the same probability of occurring in the population. Decision-makers might thus make errors when determining statistical probabilities that characterise the population as they overweigh the properties of the sample.

Base-rate neglect refers to a systematic error that decision-makers might make when attempting to simplify their cognitive load. In this scenario, the individual might under weigh the original or base information relating to the probability of a phenomenon, in favour of the arrival of new information. The probability of an event occurring is thus determined without considering all relevant data, where the most recent information is overweighed and original assumptions neglected (Kahneman and Tversky, 1973). Pompian (2013) argued that this type of neglect often occurs when financial practitioners fail to conduct enough research when evaluating investments. Instead, investment alternatives are often placed into and defined by stereotypical categories which might not accurately describe the assets. For example, a financial practitioner might use a familiar classification scheme and categorise Company X as a growth share. The practitioner might believe that some of Company X's information is characteristic of a growth company, while not considering the base probability that a company is a growth share.

3.4.4 The anchoring heuristic

The anchoring heuristic is an information processing error in which individuals estimate future probabilities by formulating an initial reference point or anchor, which is later adjusted up or down to yield final estimations (Bernstein, Penner, Clark-Stewart and Roy, 2011). Decision-makers exhibiting this heuristic might select an arbitrary number, often the first piece of information that they receive, that serves as the point of reference and is adjusted during subsequent analysis. However, Tversky and Kahneman (1974:20) argued that "adjustments are typically insufficient", where the anchoring number is inaccurately increased or decreased in response to the arrival of new information. Individuals tend to overweigh anchor values, where reference points are not adjusted enough, resulting in incorrect and biased future estimates. Decision-makers are therefore suggested to be anchored to their original judgements (Cretu, Stewart and Berends, 2011). For example, by using original estimates as reference points, market participants might fail to correctly adjust their share price forecasts in response to the arrival of new information. The investor might not sufficiently decrease their original earnings forecast in response to recent financial difficulties (Pompian, 2013).

Employing the above heuristics to simplify the decision-making process might result in systematic errors or biases. Some common biases include the conservatism, confirmation, illusion of control, mental accounting, framing, loss-aversion, overconfidence, self-control, status quo, endowment, regret-aversion, and herding biases.

3.5 BIASES

Kahneman (2011) described a bias as a predictable consequence of using heuristics during decision-making. When attempting to make quick and simple decisions, the individual might unintentionally display a systematic preference for a particular outcome over others. Market participants thus exhibit biases when they make decisions in support of their personal viewpoints, inhibiting their ability to make rational and impartial judgements (Dolan and Sharot, 2012). Holding an inclination for an outcome might cause a statistical sampling error, where the inferences of an entire population are drawn from a sample estimate which does not accurately reflect the true population value (Geelhoed, 2010). Numerous biases have been identified and have been grouped into two categories, namely cognitive errors and emotional biases.

Cognitive errors refer to information-processing biases, where individuals make mistakes while considering statistical probabilities and recalling specific events (Pompian, 2013). Some of the most widely researched cognitive errors include the conservatism bias, confirmation bias, illusion of control bias, hindsight bias, mental accounting bias and framing bias. Emotional biases refer to the errors that individuals make when making decisions that are influenced by their feelings or intuition (Moosa and Ramiah, 2017). Examples of emotional biases include loss-aversion bias, overconfidence bias, self-control bias, status quo bias, endowment bias, regret-avoidance bias, and herding.

3.5.1 Conservatism bias

Edwards (1968) suggested that investors might exhibit a belief perseverance bias when receiving news, where individuals try to maintain pre-existing beliefs by under weighing new information. Conservative behaviour might cause individuals to overweigh initial beliefs when calculating future outcomes and probabilities, leading to information-processing errors. This bias contrasts with the EMH where market prices are assumed to be informationally efficient. If investors display this bias, asset prices are delayed in incorporating new information and thus underreact.

Barberis *et al*. (1998) linked conservative behaviour to the anchoring heuristic. When an investor is anchored or attached to an original estimate, they are too conservative in adjusting previous judgements. In the case of share price forecasts, an investor might overweigh a history of high earnings and price increases, while failing to sufficiently decrease the share price upon receiving bad news. By being too conservative in their adjustments of an original estimate, investors tend to underreact.

3.5.2 Confirmation bias

Individuals who exhibit confirmation bias tend to find, recall and interpret information in a way that supports pre-existing beliefs. Data that do not support the decision-maker's views are often

undervalued or ignored. Initial beliefs are thus not rationally modified in response to information that contradicts original assumptions. There are three types of confirmation bias, namely memory bias, interpretation bias and information search bias. An individual exhibits memory bias when they specifically recall information that reinforces initial beliefs. Interpretation bias occurs when the decision-maker interprets data in a prejudiced manner that supports pre-existing views. Finally, an individual might exhibit confirmation bias by limiting their information search, only seeking data that confirms what they already believe (Acks, 2019).

Several potential consequences of confirmation bias have been highlighted. Firstly, investors might overlook profitable investments that do not meet specific screening criteria or accept poor investments that do meet the criteria. Secondly, investors might develop a positive bias towards specific companies and build a large shareholding in these companies. Negative information concerning these companies might thus be ignored and often lead to a poorly diversified portfolio. Additionally, employees of a company who display this bias are likely to hold a disproportionate amount of their employing company's shares due to their belief in its positive prospects (Pompian, 2013).

3.5.3 Illusion of control bias

An investor exhibits the illusion of control bias when they falsely believe that they have control or influence over a particular outcome or event when they do not (Offstein, Morwick and Griffith, 2009). Langer (1975) argued that market participants suffer from the illusion of control when they believe that they have control over events that occur by chance (i.e. an outcome over which they have no influence). The individual therefore inappropriately overestimates their ability to influence a situation more than "the objective probability would warrant" (Langer, 1975:311). Thompson, Armstrong and Thomas (1998) found that when individuals are placed in chance situations, where the associated tasks are related to their personal skills, competition, familiarity, practice and choice, the decision-maker will feel confident that the outcome was caused by their skill. The role of choice and competition are also suggested to increase one's illusion of control, where, for example, individuals are willing to pay a higher price for a lottery ticket when they are permitted to select their own ballot numbers (Langer, 1975). Decision-makers are also observed to perceive greater control when they are given a choice to roll a dice themselves instead of a stranger rolling it for them (Fleming and Darley, 1989).

Pompian (2013) highlighted that investors suffering from the illusion of control bias might make suboptimal investment choices. Firstly, biased traders assume that they have a degree of control over the returns of their investments, leading to the frequent trading of assets. Excessively buying and selling shares might subsequently produce lower returns in comparison to securities that are held over a longer period. Secondly, investors might feel the illusion of control over the prospects of

specific companies, such as their employer's company, which leads them to hold concentrated shareholdings. This illusion might thus lead to under-diversified portfolios.

3.5.4 Mental accounting bias

Researchers (Henderson and Peterson, 1992) have found that individuals tend to allocate their financial assets to separate mental accounts which are used to meet different needs or objectives. Investors who engage in mental accounting, therefore, do not treat all money equally, where factors such as its intended use and source influence how they discern between their funds. Investors who divide funds according to their intended use might pay for expenses, such as housing and food, from different mental accounts. These accounts might also be separated based on their source, where the income received from, for example, a regular salary and an inheritance are allocated into different categories. Dividing financial assets into separate mental accounts contrasts with traditional finance theory, which assumes that money is fungible (i.e. interchangeable) and that investors should thus consolidate their funds into a single lump sum (Bodie and Taqqu, 2011). By separating their funds, investors do not treat all financial assets as equally interchangeable and hold the view that "money in one mental account is not a perfect substitute for money in another account" (Thaler, 1999b:185).

Pompian (2013) highlighted some potential consequences of mental accounting. Investors who exhibit this bias might differentiate between funds that are received from income and those from capital appreciation (i.e. the principal). Any income generated by the principal, such as dividends, is often mentally categorised as spending income, while the principal amount is preferably preserved. To satisfy current needs, financial practitioners might pursue high-yield bonds that generate immediate returns but have a high-risk of losing principal value in the face of financial difficulty. The bias might thus encourage investors to purchase assets which offer a high return in the short-term, but that threatens to reduce the value of both the asset's income and principal in the long-term.

3.5.5 Framing bias

When making decisions under uncertainty, individuals are often prone to the systematic effect of framing bias. Decision-makers are influenced by framing when they respond differently to information, depending on how the information is presented or framed. The same piece of information might be presented in different ways, such as using alternative wording or situations, which could result in it being subjectively perceived and answered. By framing a piece of information, the same choice can be presented in either a positive or negative way (Cook, Noyes and Masakowski, 2007). Perceiving a stimulus as good or bad is argued to be driven by the emotional affect heuristic, where a decision-maker selects the option that makes them feel good, despite both alternatives having the same outcome (Glendon and Clarke, 2016).

Options that are framed as either positive or negative are also suggested to influence the individual's attitude to risk (Gordon-Lubitz, 2003). Tversky and Kahneman (1981) found that when decision-makers are presented with a positive frame, they tend to be more risk averse. Conversely, individuals are likely to be risk-seeking when the same information is represented and perceived negatively. For example, financial practitioners who exhibit this bias might be prone to choosing investments that are presented in terms of gains rather than losses. An investor might be presented with two options, each offering the same outcome, where Option A is described to increase in value by US$500 over the course of a year, while also experiencing a loss of US$200. Conversely, Option B is presented to increase in value by US$500, but due to market volatility, will decline and leave the investor with a US$300 gain. Despite offering equal returns, investors tend to select the positively framed Option B (Baker and Puttonen, 2019).

3.5.6 Loss-aversion bias

According to Kahneman and Tversky (1979), individuals do not value gains and losses equally. When faced with the prospect of gaining or losing something of equal worth, loss-averse decision-makers would prefer to avoid experiencing the loss over acquiring the gain. The pain of a loss is thus suggested to be felt more deeply than the pleasure of a gain of equal magnitude, where "losses loom larger than gains" (Kahneman and Tversky, 1984:346). Loss-averse investors might therefore accept a higher degree of risk when attempting to avoid losses while being more risk averse in accumulating gains (Guthrie, 2003). Loss-aversion has been linked to the disposition effect (Odean, 1998a) and has been presented as a possible explanation for the equity premium puzzle (Benartzi and Thaler, 1995).

The disposition effect refers to the tendency of individuals to delay selling losing investments by too long and to sell profitable assets too quickly (Shefrin and Statman, 1985). Investors exhibiting this behavioural bias use a share's purchase price as a reference point from which to interpret its relative performance. Selling shares that have increased in relative value allows investors the satisfaction of gains, while the pain of loss is avoided by delaying the sale of losing investments. This effect might have a negative impact on an investor's performance. By selling winning shares, the investor might not be able to benefit from share momentum, where investments which have historically performed well continue to exhibit positive returns while outperforming previously losing assets (Yan, Zhao and Sun, 2012). To prevent the disposition effect from harming investment performance, market participants should consider selling assets when they underperform, and hold onto winning shares for a longer period, thereby profiting from their future increases in value.

Researchers (Benartzi and Thaler, 1995; Burton and Shah, 2013) have highlighted the role of loss-aversion in explaining market anomalies. Specifically, the authors suggest that the equity premium puzzle, a phenomenon where the returns on shares far exceed the return on government bonds,

might be attributed to the influence of loss-aversion and myopic loss-aversion. As loss-averse investors consider the pain of a loss to be greater than the pleasure of a gain, shares might be viewed as riskier than they are. To be compensated for the potential pain of loss associated with perceived riskier shares, investors require a rate of return that exceeds the effective level of risk a share might present (Cruciani, 2017). The required return on equities might be further increased by a myopic investment approach. Myopic loss-aversion occurs when investors adopt an unduly short-term view of their investments, where the experience of short-term losses is followed by an overly negative response.

To investigate the effects of myopic loss aversion on investment behaviour, Metcalfe (2017) studied two groups of investors over a 14-day period. The first group received frequent, second-by-second access to share price information. The second group was restricted to infrequent information, that they could only access every four hours. The study revealed that the investors who had infrequent access to price information invested an average of 33 per cent more in risky securities in comparison to investors who frequently analysed changes in prices. At the end of the study period, those who had access to infrequent information earned an average of 53 per cent more in profits. This difference in investing behaviour based on how frequently price information was analysed revealed that investors adopting a myopic approach to investing will experience more losses.

Metcalfe's (2017) study highlighted that investors' desire for frequent, short-term information might negatively affect their long-term profits. As investors are risk averse, regular exposure to information might result in reduced investment in more volatile securities. The oscillating nature of volatile shares exposes myopic investors to numerous rises and falls in value, where the pleasure of each gain is overridden by the accumulative pain of each loss (Benartzi and Thaler, 1995). In response to the aversive volatility of certain securities, investors might adopt an overly conservative investment approach, where a preference for relatively stable instruments, such as bonds, is held while underinvesting in shares. Investors who underinvest in riskier instruments might consequently experience lower long-term profits (Hastie and Dawes, 2010). A myopic loss-averse investment view might therefore contribute to the demand for a higher equity premium, where risk-averse investors seek to be compensated for the pain of frequent losses.

3.5.7 Overconfidence bias

The overconfidence bias is exhibited when individuals overestimate the ability of their intuition and cognitive capabilities to solve a problem. Baker, Filbeck and Ricciadri (2017) argued that individuals are generally prone to overestimating their judgements and capabilities. In the investing context, portfolio managers have been observed to display high levels of overconfidence, which commonly manifest in two main forms, namely prediction overconfidence and certainty overconfidence (Barberis and Thaler, 2003). Financial practitioners exhibit prediction overconfidence when they

overestimate their ability to make future investment forecasts. These investors thus believe that their predictions are highly accurate and accordingly assign confidence intervals that are too narrow. By anticipating a particular return, a portfolio manager might underestimate the associated risks of an investment and be underprepared if it falls short of the predicted forecast.

Certainty overconfidence occurs when investors poorly assess the probability of an outcome occurring. Specifically, overconfident investors tend to overestimate the probability of realising their forecasts, often leading to an increase in trading activity (Odean, 1998b). Investors who feel too certain about their estimations and access to information often trade frequently in an attempt to beat the market. However, frequent trading might not lead to an increase in portfolio value and an increase in transaction costs and taxable activities might reduce an investor's total return (Baker *et al.,* 2017).

3.5.8 Self-control bias

Individuals exhibit self-control bias when they display low levels of self-discipline in the short-term, thereby preventing them from reaching their long-term goals. This tendency to prioritise immediate satisfaction over long-term utility may be a function of hyperbolic discounting, where investors prefer smaller rewards in the present over larger rewards in the future. Pompian (2013:74) argued that investors who exhibit myopic tendencies prefer to "spend today rather than save for tomorrow". A common consequence of a lack of self-control is a failure to sufficiently save for retirement (Baker and Ricciardi, 2014). Investors might try to compensate for their lack of savings by assuming too much risk in their portfolios. They may also prefer to invest in more assets that offer immediate returns over long-term investments, resulting in an asset allocation imbalance. Baker and Puttonen (2019) suggested that the influence of the self-control bias can be controlled by developing and following a budget that accounts for an investor's short, medium and long-term investing goals. The authors also argued that investors should ensure that their assets are sufficiently allocated and diversified to support their financial goals.

3.5.9 Status quo bias

Mevorach (2018) defined status quo bias as an emotional reaction to the prospect of change, where an individual will prefer to remain unchanged rather than alter their current position. Previous research has indicated that decision-makers disproportionately choose to maintain the status quo, even when presented with superior alternatives (Samuelson and Zeckhauser, 1988). Tremblay, Schroeder and Tremblay (2018) suggested three theoretical reasons for the status quo bias. Firstly, environments that are characterised by uncertainty and high switching costs might make any changes from the status quo costly. The option to remain unaltered might thus be perceived as being the most cost-effective choice. Secondly, decision-makers might be bounded by their cognitive limitations during uncertainty and select the status quo option as it comes to mind quickly and easily.

Individuals subsequently become anchored to the familiar status quo as their ability to assess all available options is limited.

Tremblay *et al*. (2018) also argued that individuals have a psychological commitment to their current state, where the role of regret avoidance and cognitive dissonance often motivate a decision-maker to remain unchanged. Individuals might choose to maintain the status quo to avoid regretting any future deviations from their current state that might result in a loss (Hatirli, Koc and Demirel, 2020), where losses are valued more highly than gains (Kahneman and Tversky, 1984). How a choice set is framed will thus affect an individual's decision. Individuals will be more likely to select an option that is presented in terms of avoiding loss, while the status quo is often the preferred alternative to changing in pursuit of increased gains (Mevorach, 2018). For example, an investor might choose to maintain their current portfolio, despite portfolio alternatives offering higher return potential. The status quo bias is also exhibited when individuals attempt to avoid cognitive dissonance (Chavez and O'Donnell, 1998), where a decision-maker is faced with the discomfort of two conflicting beliefs or inconsistent thoughts. Considering an alternative option to the status quo can cause cognitive dissonance between the value of the two alternatives. Investors thus often attempt to maintain cognitive consistency by upholding the status quo.

3.5.10 Endowment bias

Endowment bias occurs when individuals assign a higher value to something that they already own over something that they do not own (Zamir and Teichman, 2014). Ownership might bias an individual into irrationally believing that their asset is worth more than its intrinsic value. This perceived added value might lead to individuals requiring minimum selling prices that exceed the maximum price that a buyer is willing to pay, thereby contrasting the traditional assumption that selling and buying prices should equate (Pompian, 2013). The endowment bias might affect decisions relating to inherited and owned assets. Investors might continue to hold assets that are already in their possession, even if they face poor prospects, mainly because of emotional attachment. Samuelson and Zeckhauser (1988) highlight that investors exhibiting the endowment bias might also be susceptible to the status quo bias. The researchers observed that when individuals inherited a sum from a relative that had been invested in a specific company they would continue to hold the same inherited assets rather than selling and selecting more appropriate investments. The investors viewed the inherited securities as the status quo and displayed a degree of emotional attachment by assigning a higher value to the bequeathed assets.

3.5.11 Regret-aversion bias

Regret-aversion bias occurs when investors avoid making a decision out of fear that the resulting outcome will result in forfeiting gains or incurring a loss, thereby causing them to regret their choice.

Individuals try to avoid the emotional pain experienced due to regretting a suboptimal decision. Market participants exhibiting this bias might consequently be too conservative when making investment decisions, resulting in certain assets being held for too long (Singh and Sikarwar, 2015). Investors might hesitate to sell an asset if they believe there is a chance that its value will increase after the sale, resulting in forfeited gains. Regret-aversion might also cause investors to avoid a recently volatile market. A market presenting recent sharp losses might signal to the decision-maker that investing comes at high risk, thereby causing the investor to forego buying opportunities (Pompian, 2013). There are two types of mistakes made by regret-averse investors, namely error of omission and error of commission. Regret experienced as a result of inaction and missed opportunities are referred to as errors of omission. Errors of commission occur when individuals regret an unfavourable outcome that resulted from taking action and is the most strongly felt type of regret. Regret-averse investors thus mostly prefer to take no action (Singh and Sikarwar, 2015).

Regret-aversion is linked to herding, where regret-averse investors can stimulate herding behaviour. Regretful investors feel a sense of responsibility for the loss incurred. In an attempt to reduce the degree of responsibility felt for decisions taken, investments are often made in a similar pattern to fellow investors, and into the same securities that are popular among other decision-makers. This might lead to a preference for securities of well-known companies as less well-known organisations are perceived as riskier (Pompian, 2013).

3.5.12 Herding

Herding behaviour refers to market participants' tendency to imitate the decisions of a larger group (Saeedi and Hamedi, 2018). Duijm and Bisschop (2018) suggested that herding in financial markets is triggered by, inter alia, an information cascade and incentive structures. An information cascade refers to an apparent information imbalance, where investors believe that other market participants have access to superior information which is reflected in their investment choices. If individuals see a large number of investors adopting certain trading strategies, it might be assumed that those investors are basing their decisions on information to which they do not have access. Investors might, in turn, exhibit herd-like behaviour by adopting the same investment approaches as their peers.

Incentive schemes might also contribute to herding behaviour, where investors who are rewarded based on relative performance benchmarks might find it difficult to deviate from the investment strategies of their peers. Relative performance benchmarks might thus incentivise individuals to imitate other investors, causing share prices to deviate from their fundamental values (Rajan, 2005).

The tendency of individuals to exhibit herd-like behaviour predates investment decision-making theory and has been linked to early human evolution. Researchers (Grima, Özen, Boz, Spiteri and Thalassinos, 2019) suggested that herd-like behaviour is a response of the primitive limbic system

to external stimuli. The limbic system was one the first parts of the human brain to develop, existing as a prominent emotion and stress-processing component in our early ancestors (McCann, 2006). Balcerzak (2014) argued that the limbic system is responsible for most immediate reactions, including herd-like behaviour, which is suggested to remain a common impulsive response to the actions of other members of a group. While instinctual interclan herding might have played a role in the survival of our early ancestors, large-scale herding among modern-day market participants might have negative effects on the efficiency of financial markets (Güvercin, 2016). The occurrence of the tulip mania during the Dutch Golden Age in the seventeenth century serves as an early example of the effects of herding on the stability of financial markets. More recent examples of excess price volatility as a result of herding include the Internet bubble from 1995 to 2000, the global financial crisis of 2007 to 2008 and the Bitcoin bubble in 2017.

The relatively low degrees of herding behaviour exhibited by hunter-gatherer societies played an essential role in their survival; however, researchers (Suto and Toshino, 2005) have highlighted the potential consequences of large-scale herding behaviour when exhibited by modern-day individuals, particularly when paired with another bias, namely short-termism. Short-termism refers to the tendency of individuals to focus and plan over short-term horizons (Meyer and Kunreuther, 2017). When augmented by herding, myopic behaviour exhibited by investors and corporate management might have pronounced effects on the valuation of assets in capital markets. Information cascades might lead to investors imitating peers by adopting short-term investment strategies. By exhibiting herd-like behaviour and following other investors' myopic approaches, short-sighted investment decisions might be accentuated, thereby causing share prices to deviate from their fundamental values (Dallas, 2012).

In the following section, an overview of short-termism will be provided. Its role in both investor and managerial decision-making will be explained. Its possible impact on asset valuation models, as well as the potential effects on companies operating in different sectors, will also be discussed.

3.6 SHORT-TERMISM

> *Behaviours in this new environment have pushed short-termism to the point where it constitutes a crisis that threatens to undermine economic growth, individual well-being, and possibly even the free-market system.* (Rappaport, 2011:5)

Short-termism refers to the tendency of individuals to overvalue immediate financial results, often at the expense of forgone long-term security (Davies *et al.*, 2014). Rappaport (2011:4) defined short-termism as "choosing a course of action that is best in the short term, but that is suboptimal, if not out-and-out destructive, over the long term". Investors who exhibit short-term preferences value cash flows received immediately more highly than those received at a future point in time. This pressure

for instant rewards is transferred to corporate management, who, to satisfy myopic investors, focus on increasing short-term financial results. Myopic behaviour is not a recent phenomenon. Throughout human evolution, individuals have made decisions while focusing on the immediate benefit, such as hunger, with little consideration for long-term consequences (Rappaport, 2011).

Myopic behaviour has been linked to a specific part of the human brain. The brain is comprised of three layers, namely the central core, cerebral cortex and limbic system (Ikezu and Gendelman, 2017). Automatic and myopic reactions have been found to arise from the limbic system, which played a prominent role in the survival of our early ancestors and the evolution of Homo sapiens. Primitive societies prioritised fulfilling immediate requirements as life was “poor…brutish and short” (Martinich, 2002:96). The brain of the hunter-gatherer thus adapted to prioritise immediate consumption to survive with scarce resources. Members of these primitive groups also had no concept of the future, where they did not save but rather consumed resources as they found them (Ferguson, 2008). During this period of evolution, the limbic system was the largest of the brain’s three layers, but with the more recent increase of the cerebral cortex, it has decreased in relative size (Lee, 2000).

McClure, Laibson, Loewenstein and Cohen (2004) conducted a study to determine which regions of the brain were activated when participants were faced with a choice between intertemporal monetary rewards. He found that separate parts of the brain were activated when choosing to receive rewards at different points in time. The results showed that the limbic system, or System One, was activated when participants selected to receive rewards immediately, thereby engaging in instant gratification. When participants selected the option to receive rewards at a future point (i.e. delayed gratification), the more recently developed cerebral cortex, or System Two, was activated. The cerebral cortex is the most recently developed layer of the brain, which is responsible for patience and self-control (Logue, 1995). Kahneman (2011) suggested that the complex relationship between the cerebral cortex and the limbic system often leads to an individual exhibiting biases during decision-making when faced with uncertain future outcomes. Rappaport (2011:4) argued that individuals are not adept at making intertemporal decisions and frequently display short-sighted behaviour due to “uneven emotion, limited information and cognitive biases”.

The myopic behaviour of hunter-gatherers was necessary for a habitat that was characterised by limited food and short life spans; however, our current environment is vastly different to that of our ancestors. Present-day life has evolved from prioritising immediate survival to an environment characterised by complex economic and financial systems that require long-term reinvestment to remain sustainable. However, instead of investing in long-term value-generating projects, there is an increasing focus on fulfilling the immediate demands of myopic modern-day market participants. Corporate managers are pressurised and rewarded by investors into producing short-term results,

while any consequences of such myopic behaviour are often deferred (Erasmus, 2015). Rappaport (2011:3) argued that short-termism has reached “crisis proportions” as the financial system has failed to adapt its practices to an environment in which there is a separation between ownership and control.

In an efficient market, the market price of a security will be equal to its intrinsic value, which is calculated by discounting its expected cash flows with an appropriate discount rate that reflects the risk that the security might present (Chandra, 2020). If individual market participants exhibited short-term behaviour by overvaluing immediate cash flows, this deviation from the security’s intrinsic value would be corrected using arbitrage. However, the effects of myopic behaviour might be made more prominent by herding, where a large number of market participants exhibit a preference for immediate results. The resulting large-scale overvaluation of short-term expected cash flows might result in the mispricing of shares, where their market prices do not equate to their intrinsic values (Haldane and Davies, 2011). The problem of short-termism might be further increased when the preferences for immediate cash flows are displayed by both investors and corporate management (Rappaport, 2011).

3.6.1 Managerial myopia

It is argued that the short investment horizons of some market participants are placing corporate management under increasing pressure to produce immediate financial results (Aoki and Saxonhouse, 2000). To satisfy short-sighted investors, management might shift its focus from achieving long-term goals to optimising short-term financial performance (Erasmus, 2015). Managerial myopia, therefore, refers to “behaviour in which managers underinvest in long-term tangible investment projects in order to meet or exceed short-term financial goals” (Robinson, 2015:83). Walker (2010) suggested that managerial myopia is a result of, inter alia, investor pressure and managerial incentive schemes that reward short-term performance over long-term value creation. Corporate managers are rewarded for achieving quarterly earnings goals and increasing the current share price, while investment managers are incentivised to achieve their quarterly performance relative to competing funds and benchmarks. Both these parties are therefore rewarded for short-term performance, often at the expense of long-term sustainability which contrasts “to the fundamental principle that individuals should bear the consequences of their choices” (Rappaport, 2011:6).

There is usually a division between ownership and control in companies, where agents (i.e. managers) are appointed by principals (i.e. the shareholders) to make decisions on their behalf. Jensen and Meckling (1976) formalised the relationship between the principal and agent in the form of the agency theory. In agency relationships, the principal is the dominant party and delegates responsibilities to the agent via contractual agreement. Eisenhardt (1989) described the contract as

a tool that is designed to govern the relationship between the two parties by aligning the desired outcomes or behaviour of the principal with those of the agent. The goal of the principal is often to minimise agency costs, such as specifying and monitoring the behaviour of their agents, while agents typically strive to increase their decision-making autonomy and maximise their rewards (Fayezi, O'Loughlin and Zutshi, 2012). The efficient management of agency problems is essential to the principal-agent relationship, where conflict might occur if the interests of the two parties are misaligned (Eisenhardt, 1989). In an attempt to avoid a conflict of interest in agency relationships, incentive structures are often developed to reward the agent for acting in a manner that is conducive to achieving the goals of the principal (Delbufalo and Bastl, 2018).

In agency theory, a popular way to align the interests of the agent and principal is to establish pay-for-performance incentive structures as part of their overall remuneration. Share-based compensation is often used to link management's performance to the market price of the company's shares (Bryan *et al.*, 2000). Shareholders might use this form of compensation to motivate managers to pursue profit growth and long-term value, thereby offering executives the opportunity to gain from an increase in the share price (Hill, Schilling and Jones, 2017). However, an unintended drawback of using share-based compensation is that management might try to increase the price of the shares by pursuing high-risk strategies that might consequently have a negative impact on the company (Sappideen, 2011). Given that the average tenure of a corporate executive in a FTSE (Financial Times Stock Exchange) 100 company is only four years (Roberts, 2004), and an average of five years in a S&P 500 company in 2017 (Marcec, 2018), managers often do not have to bear any potential long-term consequences of risky decisions.

Managerial incentive schemes that are structured around short-term share performance might thus result in a misalignment of the interests of shareholders and management. In an effort to increase the immediate share price, managers might engage in real earnings management activities (Peng and Roell, 2008). Real earnings management refers to the phenomenon where managers "deviate from normal business practices" in an attempt to increase earnings, thereby assisting in meeting quarterly earnings targets (Roychowdhury, 2006:336). Reaching quarterly targets is, in turn, believed to increase the share price, for which managers are then rewarded (Graham *et al.*, 2005). Managers thus engage in real earnings management activities with the primary objective of increasing the company's reported earnings. Roychowdhury (2006) found that real earnings management activities typically include reductions in sales prices to increase short-term sales, overproduction to reduce the overall cost of goods sold and the delay in discretionary expenses, such as R&D, advertising costs and administrative costs. These activities allow managers to meet short-term earnings targets; however, Roychowdhury (2006) found that it is unlikely that they contribute to the development of the company's long-term value generation, where actions to delay current expenses or increase

short-term sales might have a negative effect on future cash flows and the overall sustainability of the company (Erasmus, 2015). For example, an overproduction of inventory results in a greater supply of goods that must be sold in future periods which, in turn, increases the company's inventory holding costs. Additionally, current price discounts imposed to increase short-term sales might lead customers to expect the same discounts in the future, thereby resulting in lower sales in future periods (Roychowdhury, 2006).

3.6.2 Investor short-termism

Investor short-termism refers to the tendency for individual and institutional investors to place excessive emphasis on immediate results, where investors prefer "smaller and sooner" cash flows above "larger and later" returns (Laibson, 1997). Investors exhibiting short-termism often base trading decisions on current news. This focus on near-term results contributes to the aforementioned pressures placed on managers to emphasise quarterly performance, as earnings disappointments might cause heavy share selling and a decrease in market prices (Callen and Fang, 2013).

According to traditional finance, investors discount all future cash flows using a constant discount rate. Cash flows received in the near and distant future are therefore assumed to be valued equally. However, Miles (1993) found that shareholders in the UK excessively discount future financial returns. Excessive discounting refers to the situation where asset owners and managers apply higher discount rates to more distant cash flows, given the uncertainties of long-term returns (Willey, 2019). Davies *et al.* (2014) argued that excessive discounting might lead to investors applying discount rates that exceed the investment's rate of return and return on debt. Bushee (2001) suggested that investors tend to apply deeper discount rates to future cash flows, where distant values are disproportionately discounted in comparison to near-term payments.

This disproportionate discounting of an asset's cash flows might cause market prices to deviate from their fundamental values. By displaying a preference for near-term returns by excessively discounting future cash flows, shares characterised by short-term cash flows will be overvalued relative to their intrinsic value. Conversely, shares with relatively longer return horizons will be undervalued. Investors who overvalue short-term cash flows might pressurise and incentivise management to take decisions that provide higher immediate returns. When management is rewarded with greater investor interest and share price increases over the short term, the consequences of such myopic behaviour might be overlooked and deferred. Consequently, by underinvesting in future projects, companies might fail to build long-term fundamental value, reflected by a later decrease in share prices (Willey, 2019).

In addition to excessive discounting, Dallas (2012) highlighted factors that contribute to myopic behaviour, namely an increase in trading volume, a decline in the average shareholding period and

an increase in share turnover. The Federal Register (2010) highlighted an increase in the average daily share trading volume of 181 per cent in NYSE-listed companies between 2005 and 2009. Likewise, the CFA Institute (2006:11) reported that the average annual share turnover of NYSE-listed companies increased from "ten per cent to thirty per cent during the 1940–1980 period to more than 100 per cent in 2005". Rappaport (2005) argued that there has been a significant decline in the average period of time that investors retain their investments in shares. The period for which investors hold shares has declined from "seven years in 1960 to two years in 1992 and seven and one-half months in 2007" (Dallas, 2012:14). Shorter holding periods, higher trading volumes and share turnover contribute to myopic behaviour as they are often coupled with the expectation of high end-of-horizon share prices. The short investment horizons of investors contrast with the relatively long investment periods that companies that operate in certain industries need to consider during their capital budgeting processes in order to create fundamental value.

3.6.3 Short-termism in different sectors

DesJardine (2016:20) argued that the definition of a short-term investment horizon cannot be used unanimously across all sectors, as "what is considered short in one industry might be considered long in another industry". The average return horizons of companies are thus suggested to vary widely according to the sector they operate in. For example, the average return horizon for petroleum refining companies is 21.52 years, while the average investment period for printing and publishing is 11.68 years (Souder, Reilly, Bromiley and Mitchell, 2016). DesJardine (2016:20) argued that companies within a specific sector are exposed to the same environmental factors as their competitors, thereby causing them to "fix their attention on a similar point in time". Haldane and Davies (2011) studied investor myopia within companies operating in the UK and US and found that the degree of short-termism differs between industrial sectors. These findings suggest that investors might differentiate between investments that fall within long and short-term sectors when forming return expectations.

McCallion and Warner (2010) argued that long-term sectors, such as mining and infrastructure which require larger initial investments, might experience deferred returns. Conversely, investments that have lower capital requirements might have shorter time horizons, such as retail services and management consultancies, where cash flows are expected to be received in a timelier manner. Industry-specific time horizons are thus an important factor for investors to consider when forming return expectations. The findings of Haldane and Davies (2011) reveal that, despite the long-term nature of the industry, investors in the UK and US materials sector displayed higher degrees of short-termism in comparison to investors in the consumer sector between 1995 and 2004. These results suggest that myopic return expectations might not be limited to short-term sectors. Investor short-

termism in sectors that require long investment horizons might result in a mismatch between the return objectives of corporate and investment managers.

Given the rise of agency theory within modern capital markets, institutional investors have become influential market participants. Traditionally, institutional investors, such as pension and mutual funds, are characterised by long-term investment horizons due to the nature of their liabilities. Institutional investors, therefore, provide large amounts of long-term capital, financing projects within long-term sectors such as venture capital and infrastructure initiatives. Bushee (2004; 2001) argued that institutional investors do not display short-term tendencies. However, Della Croce, Stewart and Yermo (2011) criticised institutional investors for exhibiting myopic tendencies, where herd-like behaviours manifest in a large degree of short-term return expectations. The potential impact of institutional investor short-termism on companies operating in relatively more capital-intensive sectors is thus expected to be more pronounced, given their high bargaining power and the misalignment between expected return horizons of shareholders and corporate management.

These findings become significant when considering potential investor short-termism in the local context. South Africa has well-established institutional investors in comparison to other non-OECD (Organisation for Economic Co-operation and Development) countries. In particular, South Africa has well-developed pension and mutual funds, where the local pension fund industry, at over 80 per cent of GDP, constitutes one of the largest among non-OECD countries (OECD, 2015). Pension funds offer a major source of long-term capital investment for developing countries, which require high long-term investments in, inter alia, infrastructure and development capital. Among developing countries, South African pension funds, along with Mexico and Peru, have the highest investment in infrastructure projects (OECD, 2015). Investor short-termism exhibited by institutional investors might thus have pronounced effects on the South African infrastructure sector. South Africa's need for long-term financing is also increased by an established mining sector, which accounted for 7.3 per cent of South Africa's GDP and 25 per cent of total export revenue in 2018 (DTI, 2020). Investors with short-term return expectations might therefore hold widespread consequences for the South African economy. Myopic tendencies would be particularly disruptive in the long-term mining industry which has experienced a drop of 20.5 per cent% in global mining exploration in 2020, thereby threatening the growth of a significant sector of the South African economy (Vandome and Khama, 2021).

3.7 CONCLUSION

Throughout financial history, capital markets have been characterised by movements in asset prices that cannot be accounted for by the assumptions of traditional finance theory. Some of the major anomalies that have been observed in financial markets include excess volatility, share price

overreaction and underreaction, the weekend effect, the neglected firm effect and the equity premium puzzle. These anomalies challenge the assumptions found in traditional finance theory, where asset values follow a random walk, fully reflect all available information and investors make decisions in a rational utility-maximising way. Behavioural finance attempts to explain the inconsistencies between observed market performance and traditional assumptions by examining the behaviour of market participants. Behavioural researchers argue that the assumptions pertaining to investor behaviour might be broader in scope than those offered by traditional finance theory, and have, in turn, offered alternative theories to explain investor behaviour, such as the theory of bounded rationality (Simon, 1957) and the two-system model of cognitive processing (Kahneman, 2003). In his two-system model, Kahneman (2003) questioned the assumption of investor rationality, as accepted by traditional finance theory, and argued that investors contribute to the inherent instability of the financial markets by exhibiting heuristics and biases during the decision-making process. Some of the heuristics and biases that have been identified include the affect heuristic, availability heuristic, representativeness heuristic, anchoring heuristic, conservatism bias, confirmation bias, herding bias and short-termism.

The observed market anomalies imply that the asset pricing models in traditional finance theory might not correctly calculate a share's fundamental value. Haldane and Davies (2011) found that when investors exhibit short-termism during decision-making, the discount rate which is used to determine the intrinsic value of a share might be adjusted to overvalue cash flows received in the near term while undervaluing long-term returns. A consequence of this hyperbolic discounting is the mispricing of shares, where shares that experience near-term cash flows will be overvalued relative to their fundamental values, while shares that experience returns over the long term will be undervalued. The problem is that myopic return preferences might be increased when a large number of market participants simultaneously display a preference for near-term returns and subsequently pressurise and incentivise corporate managers to produce immediate financial results. Companies that adopt a myopic approach by prioritising short-term cash flows might consequently underinvest in long-term value-generating projects. When considered in the local context, myopic preferences might have augmented consequences on the South African economy, which is characterised by well-developed pension funds, an established mining sector and a need for investment in infrastructure development. Short-termism displayed by investors and managers in these fields, which are characterised by long-term capital investment requirements, might thus threaten the sustainability and growth of significant contributors to the South African economy.

CHAPTER 4
RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The previous two chapters provided a comprehensive overview of traditional and behavioural finance theory. Chapter 2 offered a detailed description of the traditional finance assumptions that are applied to determine the value of financial assets, while Chapter 3 provided a behavioural finance perspective on share price movements and highlighted the potential role of biases, specifically short-termism, in influencing asset prices. The two literature review chapters were used to provide a theoretical background to the study and to identify the research problem.

The objective of this study is to investigate the presence of investor short-termism in South Africa. This chapter describes the research methodology that was employed to test the study's hypotheses, where a systematic research process was followed to solve the identified research gap.

The rest of this chapter follows the structure of the business research process and consists of eight interrelated sections. Firstly, the business research process is defined (Section 4.2), followed by the first step in this process, namely, to define the research problem of the study (Section 4.3). Thereafter, the research objectives and hypotheses are defined (Section 4.4) and the different types of research are explained (Section 4.5). The research design is then presented (Section 4.6), followed by an explanation of the data collection process (Section 4.7). The variables that were included in the study are subsequently described (Section 4.8) and the data analysis is defined (Section 4.9). Finally, a summary of the chapter is offered (Section 4.10).

4.2 BUSINESS RESEARCH

Business managers are often faced with the challenge of making decisions in environments that are rapidly changing and characterised by informational uncertainty. A need for the correct information to guide managerial decision-making thus exists. Management might employ business research as a tool to acquire the information about the organisation and external environment that is needed to solve business problems. Business research refers to the "systematic and objective process of collecting, recording, analysing and interpreting data for aid in solving managerial problems" (Wilson, 2014:3). Conducting business research is also important as it identifies opportunities and potential threats, defines alternative options, and can be used to assess current and future programs and strategic decisions. Coldwell and Herbst (2004) stated that when data are collected systematically and objectively, the influence of personal biases is likely to be reduced, resulting in better decisions.

The research process that was adopted in this study to answer the research problem consisted of the nine interrelated steps suggested by Cant, Gerber-Nel, Nel and Kotzé (2003). Figure 4.1 presents the nine-step business research process, and the sections are explained in this chapter.

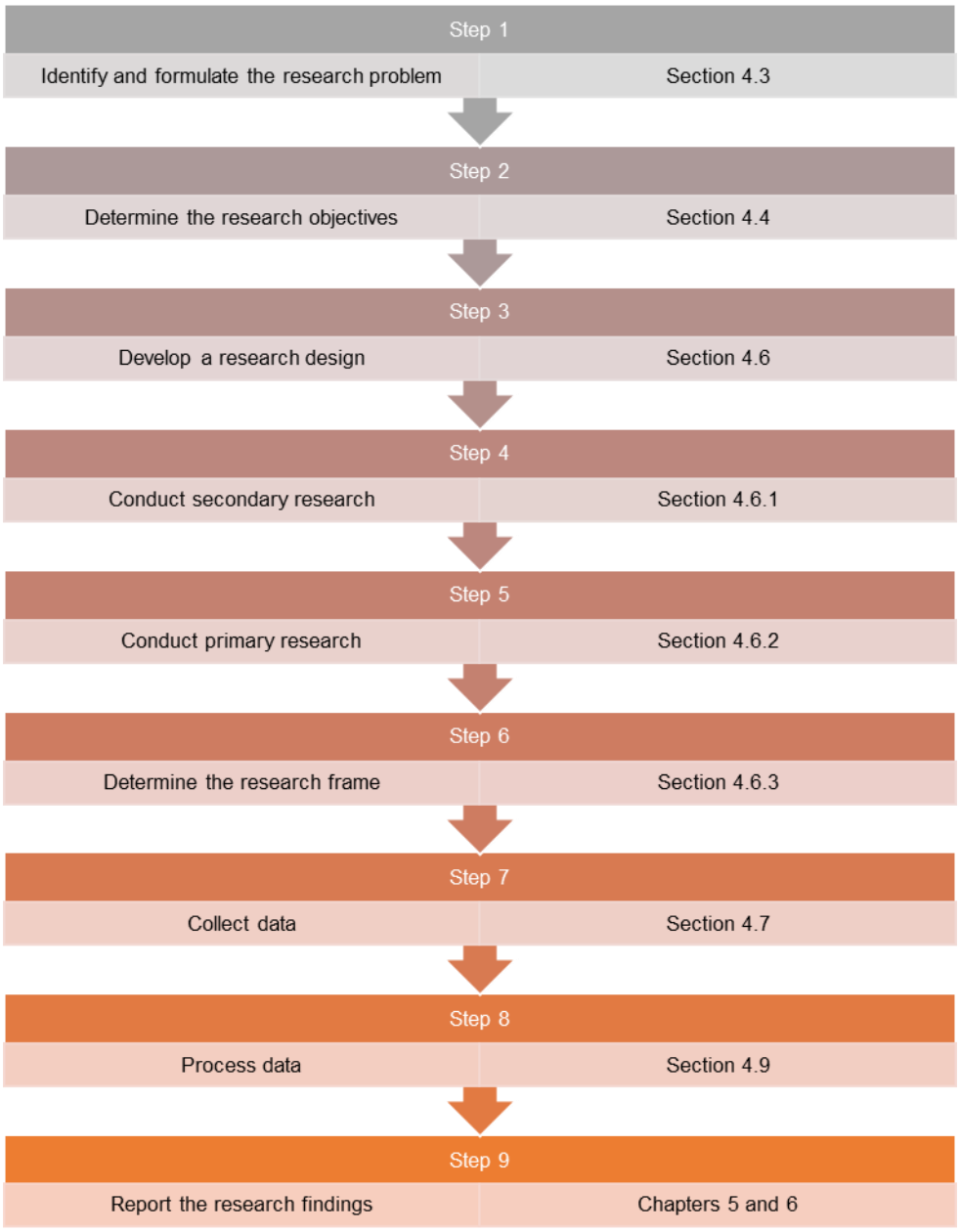

Figure 4.1: The nine-step business research process

Source: Adapted from Cant *et al.* (2003)

4.3 BUSINESS RESEARCH PROBLEM INVESTIGATED IN THIS STUDY

Traditional finance theory assumes efficient markets, where shares are priced at their intrinsic value. The intrinsic value of a share is determined by discounting the expected dividends and future price

associated with an investment in the share, using a suitable discount rate (Els *et al.*, 2020). Cash flow expectations are assumed to be formed by rational investors who have access to perfect information; thus, supporting the view that expectations are correctly estimated and that the intrinsic value of a share equates to the current market price. However, Baker and Nofsinger (2010) argued that empirical market patterns are not fully explained by the assumptions of an efficient market and that investors might exhibit certain behavioural biases when estimating returns. Laibson (1997) suggested that investors tend to prefer "smaller and sooner" returns over those received at a later stage. This short-term behaviour is, in turn, believed to result in the excessive discounting of expected cash flows by myopic investors, distorting the estimation of intrinsic values. The question, therefore, arises whether market prices accurately reflect the intrinsic value of shares.

Haldane and Davies (2011) found that investors in the UK and US exhibited short-termism from 1985 to 2004. Over this period, the bias became more prominent during the second decade of the study, suggesting an increasing trend in the level of short-termism displayed by investors. Myopic behaviour was further revealed to be most significant in the materials sector. Given that companies operating in the mining industry constitute a significant part of the national GDP (Vandome and Khama, 2021), potential investor short-termism in the local context might come at a considerable cost. Since mispricing resulting from excessive investor short-termism would inflate a company's cost of capital, reinvestment in long-term value-generating projects might suffer.

Given the lack of research on short-termism in the local context, this study was conducted to investigate potential short-termism among South African investors from 1995 to 2014. The study aimed to establish if there is a difference between the intrinsic and actual market prices of JSE-listed companies, and whether any differences can be attributed to investor short-termism.

4.4 RESEARCH OBJECTIVES AND HYPOTHESES

After the research problem has been identified, the research objectives and hypotheses are usually specified. Research objectives describe what the study aims to achieve and may be linked with hypotheses. A hypothesis is a "tentative answer to a research problem" (Krysik, 2018:76) that is specific and testable. The primary research objective, the secondary research objectives and the hypotheses of this study are provided below.

4.4.1 Primary research objective

In line with the research problem identified for the current study, the primary research objective is to investigate investor short-termism in South Africa from 1995 to 2014.

4.4.2 Secondary research objectives

To address the study's primary objective, the following three secondary research objectives were formulated:

i) **Secondary objective one:** To establish whether short-termism is exhibited by South African investors for the period 1995 to 2014.

ii) **Secondary objective two:** To assess whether the degree of short-termism differs between sectors for the period 1995 to 2014.

iii) **Secondary objective three:** To determine whether the degree of short-termism changes over time for the period 1995 to 2014.

4.4.3 Hypotheses

To address the study's primary research objective, the following hypotheses were formulated in terms of the short-termism parameter $\hat{x}$, as proposed by Davies *et al.* (2014):

H_0: $\hat{x} = 1$ (i.e. no short-termism or long-termism is observed)

H_{a1}: $\hat{x} > 1$ (i.e. long-termism is observed, as reflected by moderate discounting)

H_{a2}: $\hat{x} < 1$ (i.e. short-termism is observed, as reflected by excessive discounting)

4.5 TYPES OF RESEARCH

When conducting research, the researcher should adopt a research strategy that will assist in meeting the study's objectives. Informing this strategic decision is the philosophical paradigm and related research approach that the investigator will apply to the study. In the remainder of this section, the three main research strategies are explained (Section 4.5.1), followed by a description of the two predominant research paradigms (Section 4.5.2) and their associated research approaches (Section 4.5.3).

4.5.1 Exploratory, descriptive and causal research

Nath (2007) defined a research strategy as a generalised plan that is developed to solve a research problem. The research strategy provides a structure for collecting and interpreting data in order to realise the research objectives. Babin and Zikmund (2016) have identified three main research strategies, namely exploratory, descriptive and causal research.

A researcher might engage in exploratory research by collecting and analysing qualitative data via, inter alia, observations and in-depth interviews. The primary goal of explorative research is to clarify an ambiguous research environment and develop a conceptual framework for a study's variables. Exploratory research is often conducted to help improve the design of ensuing descriptive and causal

studies, thereby acting as a preliminary step to subsequent conclusive research (Hyman and Sierra, 2010).

Descriptive research is often used to expand on the variables or results of an exploratory study (McNabb, 2021). The researcher might use descriptive research to describe via, inter alia, observation or survey methods, the characteristics of previously identified variables, such as groups, environments or objects. This collected data is used to develop and test the study's hypotheses, where potential correlations and associations between variables are examined (Thyer, 2010).

Causal research might be used to further analyse the relationship between a study's variables. This research strategy aims to identify whether a cause-and-effect relationship exists between two or more variables. Researchers using this strategy often conduct experiments where the independent variable is manipulated in order to test for associated changes in the dependent variable while controlling for external influences. Any observed variations of the dependent variable are subsequently measured and used to test the study's hypotheses (Wrenn *et al.*, 2007).

A descriptive research strategy was used in this study. To investigate the presence of short-termism in South Africa, the nature and characteristics of the identified financial variables were first determined. The relationship between these variables was then examined via the testing of the study's hypotheses.

4.5.2 Research paradigms

A research paradigm is a perspective on assumptions, values, concepts and research methodologies that are shared by a group of researchers (Johnson and Christensen, 2014). The two predominant research paradigms that could be followed when conducting research are a phenomenological or a positivistic paradigm. These paradigms are often used in conjunction with a specific research approach, where phenomenological studies are associated with a qualitative research approach and positivistic research with a quantitative approach (Babin and Zikmund, 2016).

The phenomenological paradigm holds that the world cannot be viewed objectively, as each situation is believed to be unique, and its interpretation is dependent on the people involved. Researchers adopting the phenomenological paradigm thus consider the study's variables, the context in which they occur and the role that the researcher might play in analysing the data (Remenyi, Williams, Money and Swartz, 1998). The researcher is actively involved in investigating situations by intuitively interpreting phenomena and drawing conclusions (Saee, 2006). The primary objective of this research paradigm is to examine a phenomenon in a manner that is free from presuppositions, where the results are researcher dependent and subjectively interpreted. Dana (2004:754) argued that the phenomenological paradigm stems from the belief that data are not objective as they are "socially constructed and given meaning by people". The phenomenological approach transpires as the

research process commences, where early data collection informs subsequent collection and interpretation. A qualitative research approach that involves the interpretive description of data is therefore often used within phenomenological studies. Qualitative research is explained in more detail in Section 4.5.3.1.

The positivistic paradigm is based on the belief that “the world is external and objective” (Carson, Gilmore, Perry and Gronhaug, 2001:5). Positivists aim to independently observe and measure phenomena, where the role of the researcher is to rationally interpret data while remaining emotionally neutral. This paradigm assumes that the world exists as a single reality, which is determined by natural mechanisms. According to this research paradigm, a formalised method is often followed when collecting and measuring data, where researchers aim to objectively describe variables via the testing of hypotheses. Quantitative data are typically used in positivistic studies, which are measured via mathematical techniques (Carson *et al.,* 2001). Quantitative research is described in Section 4.5.3.2.

This study employed a positivistic approach, whereby the researcher objectively collected and measured financial data via a formalised research method. The relationship between the study’s variables was identified and explained using hypothesis testing, which offered an empirical assessment of the data.

4.5.3 Research approaches

Two main research approaches could be used to generate valid and reliable information, namely qualitative and quantitative research. In some research studies, both approaches might be used in the form of a mix-method study, while other studies might employ only one of the two approaches to solve a research problem (Oflazoglu, 2017).

4.5.3.1 Qualitative research approach

Qualitative research is often used as an exploratory tool in phenomenological studies to develop an understanding of a study’s subject matter. Researchers following a qualitative approach seek to draw meaning from phenomena by studying a subject(s) in its natural setting (Denzin and Lincoln, 1994). Open-ended interviews, observations and focus groups are some of the methods commonly used to collect qualitative data. This research approach thus describes a phenomenon using non-numerical data, where the data could be in textual, oral or visual forms (Thomas, 2003). A qualitative research approach is not intended to test hypotheses but rather assists in the development of hypotheses that might be tested by subsequent quantitative studies (Braun and Clarke, 2013).

4.5.3.2 Quantitative research approach

Quantitative research uses numerical measurements to record and analyse aspects of phenomena. When conducting quantitative research, the researcher objectively observes and measures the subject matter. An inherent benefit of quantitative research is therefore the lack of researcher bias (Cleland and Durning, 2015). Numerical results allow the researcher to test hypotheses and draw conclusive findings. The approach often employs measures and analyses that can be replicated by other researchers, while the results are usually used to make generalisations about the wider population (King, Keohane and Verba, 1994).

In this study, a quantitative research approach is employed. Numerical data were obtained from the IRESS (2020) database and the website of the South African Reserve Bank (SARB, 2019). These financial data were used to empirically test the study's research hypotheses via statistical analysis, thereby obtaining conclusive results.

4.6 RESEARCH DESIGN

The research design of a study refers to the strategy for collecting, measuring and interpreting the data in a manner that directly addresses the research problem (Gorard, 2013). The subsequent two sub-sections distinguish between primary and secondary research, justifying the research design employed in the current study.

4.6.1 Secondary research

To solve a research problem, a researcher could conduct secondary research to obtain secondary data. Secondary data refer to data that have already been collected before the commencement of the study at hand, such as industry studies, trade association reports and company records. Secondary research thus offers the benefit of being more cost-effective to conduct in comparison to primary research. Another advantage of using secondary data is the speed and ease at which it can be obtained. However, as the data were not collected by the researcher using a methodology that was designed to specifically address the current research questions, it might be outdated, incomplete and exist in an archival format that is incompatible with the study at hand (Collins, 2018).

For the purposes of this study, secondary research was conducted. An assessment of existing literature covering themes of traditional finance theory, market anomalies, decision-making behaviour and short-termism was performed. The literature was summarised and interpreted to construct a comprehensive literature review that was used to provide a theoretical background to the study and to identify the research gap. The sources that were used to collect this data include pertinent textbooks, academic journal articles, government publications, inaugural addresses and

corporate publications. The textbooks were identified via Google Books, while Google Scholar was used to access the journal articles and other sources of secondary data.

Secondary data were also collected to empirically test the study's hypotheses. Existing financial records and market-based information were used to obtain the quantitative data required to measure the variables required to assess potential short-termism via multiple regression analysis. The IRESS (2020) database was used to obtain the financial ratios, beta estimates, dividend, earnings and share price data for the companies that were included in the study, while the SARB (2019) website was consulted to acquire the forward risk-free rate per annum. These variables are discussed in greater detail in Section 4.8.

4.6.2 Primary research

Researchers might engage in primary research by directly collecting new data from research participants via, inter alia, questionnaires, observations and experiments, to address a study's research question(s). Primary research, therefore, involves the collection of data that have not been collected before the study at hand (Rugg and Petre, 2007). An inherent advantage of using primary research to solve a research problem is that data can be collected using a methodology that is designed to answer the specific study's research question. Additionally, the newly collected data are current and obtained from a known source. A disadvantage of conducting primary research is the time-consuming and often costly nature of the data collection process (Lamb, Hair and McDaniel, 2009). Since all the data required for the current study could be obtained using secondary research, it was not necessary to engage in primary research.

4.6.3 Sampling design

Sample design refers to the method that the researcher followed when selecting a sample from a defined population, and informs the technique used for the statistical calculation of the sample size (Kabir, 2016). Before a sample can be selected, the study's target population must be clearly defined first.

A study's population refers to the total number of individuals or objects under consideration. A researcher might make inferences about the population by collecting information from each member via a census. However, conducting a census is often costly and time-consuming, especially if the population is large. Therefore, a sample might be used as an alternative to a census. A sample refers to a subset of the population that has been selected for investigation (Neelankavil, 2015). A researcher draws a sample from a sampling frame, consisting of a list of the units in the population, such as an electoral register, telephone directory or postal code address file. The population and sampling frame might differ as some population units might be over-registered, resulting in a sampling frame that contains the entire population and additional units. Conversely, a sampling

frame might be under-registered and contain fewer units than the population. The researcher must employ a sampling frame that accurately reflects the population, ensuring that differences between the sampling frame and population are minimised (Bajpai, 2010).

After the sampling frame has been determined, the appropriate sampling method should be selected. Sampling is the act of selecting a part of the population that accurately represents the characteristics of the entire population (Coldwell and Herbst, 2004). A distinction is made between two main types of sampling methods, namely random and non-random sampling methods (Bajpai, 2010).

4.6.3.1 Random sampling methods

In random sampling, each individual or object in the population has the same known nonzero probability of being included in the sample. Random sampling allows the researcher to obtain a sample that can be used to make unbiased and reliable projections about the population. The four most widely used random sampling methods are simple random sampling, stratified random sampling, systematic sampling and cluster sampling (Neelankavil, 2015).

When a sample is selected using simple random sampling, each unit in the population has an equal chance of being included in the sample. A list of all the members of the population is compiled first, where each unit is numbered. The number of units that will be included in the sample is then specified and randomly selected from the list (Thompson, 2012). In stratified sampling, the population is first divided into homogeneous strata. Members are then collected from each stratum using simple random sampling and combined into one final sample. Systematic samples are compiled by selecting members from the entire population list at regular intervals. In cluster sampling, the population is divided into heterogeneous groups, where each group accurately represents the population. A researcher then selects a representative group as a sample of the population (Daniel, 2012).

4.6.3.2 Non-random sampling methods

Units of non-random samples are selected without considering their probability of being included in the sample. This method of sampling offers the benefit of being easier and more cost-effective to conduct in comparison to random sampling techniques. However, as these sampling methods employ subjective methods to select sampling units, the resulting sample is subject to researcher bias and might not offer an objective representation of a population. The four commonly used non-random sampling methods are convenience sampling, judgement sampling, quota sampling and snowball sampling (Neelankavil, 2015).

Convenience sampling involves selecting sampling units that are most easily accessible to the researcher. The benefits of convenience sampling include ease and cost-effectiveness; however, the method is least likely to produce a sample that accurately represents the population. Judgement samples are collected based on the researcher's existing knowledge or familiarity with the

characteristics of the population. Sample units are selected according to some pre-stated criteria which are determined at the discretion of the researcher. A quota sample is selected by distributing the population among strata which are defined according to specific characteristics. The final sample is then compiled by selecting members from each stratum to meet an assigned quota. Snowball samples are compiled by locating an initial set of respondents who meet the required characteristics, who then locate other respondents who might also be suitable sampling candidates (Coldwell and Herbst, 2004; Neelankavil, 2015).

4.6.3.3 The sample for the current study

For the purposes of this study, a non-random judgement sampling method was employed. The study's sample included only companies that had been listed on the JSE from 1995 to 2014, representing a study period of 20 years.

As already mentioned, this study aimed to estimate the theoretical intrinsic value of a company's shares based on the principles of traditional finance theory and to investigate whether differences between intrinsic and actual market values can be explained by excess discounting. In order to estimate the intrinsic share price for each year from 1995 to 2014, dividends per share (D), market price per share (P) and earnings per share (E) values for each company lagged over the previous five years were required. These lagged values were then used to estimate the expected dividend (E(D)) and expected price (E(P)) values for the following five years. The data required to estimate the intrinsic price for 2013 ($\widehat{P}_{2013}$) can therefore be represented as reflected in Figure 4.2 below:

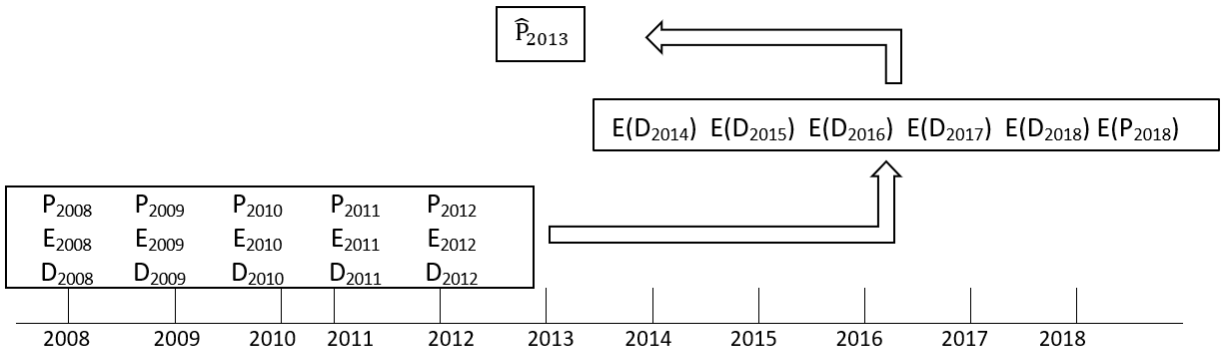

Figure 4.2: Estimation of intrinsic prices

Given the estimation procedure adopted, the study collected data from JSE-listed companies from 1990 to 2019. The resulting study period (1995 to 2014) is illustrated by the following timeline:

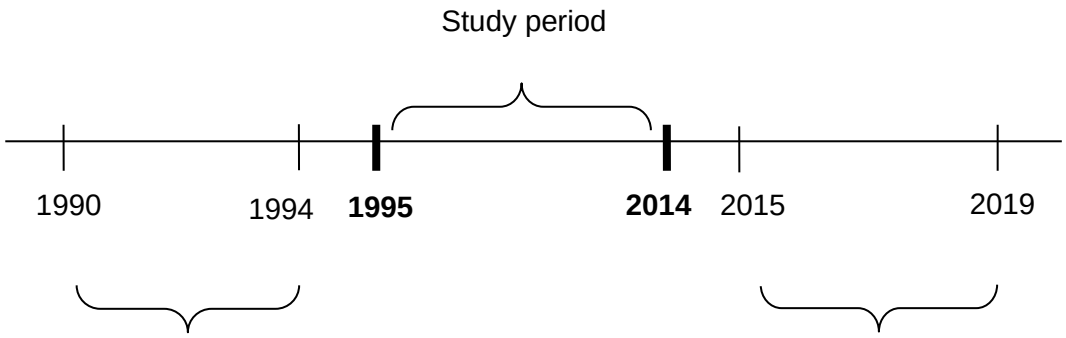

Figure 1.3: Data collection period

All companies that provided the complete dataset for a continuous period of at least 11 years within the timeframe from 1990 to 2019 were included in the sample. Only those companies that published all the required data continually for 11 years provided five years of lagged and future values respectively, thereby allowing for the estimation of these companies' intrinsic value for at least one year of the study period.

Given the estimation process employed to estimate future dividend and share price values, the study is therefore exposed to survivorship bias. Only those companies that were listed on the JSE from 1990 to 2019 and that published the complete set of company-specific variables that are required for the purposes of the study for a minimum of 11 consecutive years were considered. In an attempt to reduce survivorship bias, listed as well as delisted companies were included in the sample. The relatively long period over which companies were required to provide continuous data may also have resulted in the exclusion of more financially volatile companies, as these financially unstable companies often did not publish the complete set of data required for the study. Exposure to survivorship bias, however, was unavoidable as companies with incomplete data could not be included in the data analysis.

Since one of the secondary research objectives of the study was to assess the prevalence of short-termism for companies operating in different industries, companies listed across all the sectors of the JSE were included in the sample. Some sectors of the JSE, however, are characterised by a relatively small number of listings, resulting in relatively small sub-samples for these sectors. Since small sample sizes could negatively impact the reliability and validity of results (Vasileiou, Barnett,

Thorpe and Young, 2018), the inferential analyses (as outlined in Section 4.9.2) could not be completed for each of the sectors individually.

To conclude, companies across all the sectors of the JSE that were listed for a continuous period of at least 11 years between 1990 and 2019 were included in the final sample. Since data for five years at both the start and the end of each year were required to estimate the intrinsic value for that particular period, the study period covered 20 years from 1995 to 2014. Based on these selection criteria, a final sample consisting of 280 companies was obtained.

4.7 DATA COLLECTION

After a study's sample has been defined, the data can be collected from the sampling units. The process of data collection refers to the systematic gathering of information, which can be done by either human observers or machines (Babin and Zikmund, 2016). In this study, the required data were manually extracted from the relevant databases and converted into a format that could be used for statistical analysis. Secondary quantitative data were used to address the research question, and the financial ratios, beta estimates, dividends, earnings, share prices, and forward risk-free rates required to achieve the primary and secondary research objectives of the study had to be collected and calculated.

The above-mentioned quantitative data were collected by means of an analysis of existing corporate financial records and market-based data. The corporate records of the companies that were included in the sample were accessed via the IRESS (2020) database, an external database that is available to all researchers at Stellenbosch University. The SARB (2019) website was also used to obtain the forward risk-free rate for each year of the study period.

In the next section, a description of each of the variables included in the study is provided. The measurements used to quantify the variables, the calculation that they were included in, and the source used to collect the data required to calculate these variables for each of the companies included in the sample are explained.

4.8 VARIABLES INCLUDED IN THE STUDY

The main purpose of this section is to provide a detailed description of the variables included in the study. For this purpose, each variable is first defined in terms of its interpretation and calculation before the focus is shifted to the data required for its calculation.

When conducting business research, variables are often used to represent the characteristics of, inter alia, an item, entity or individual under consideration. A variable refers to something that varies in value or changes from one instance to another. The differences among variables can be described

in terms of numerical differences, identified category memberships and potential causes or effects (Zikmund *et al*., 2013). In quantitative research, it is important to identify the variables of a particular study and to determine how the variables within the study relate to each other.

If markets are efficient, the current market price of a company's shares should be equal to the intrinsic value, which is estimated by calculating the present value of the expected future cash flows that will be received from investing in the share (Davies *et al*., 2014):

$$P_{jt} = \sum_{i=1}^{5} \frac{E_t(D_{jt+i})}{(1+r_{t1}+\propto_1 \beta_{jt}+\propto_2 Z_{jt})^i} + \frac{E_t(P_{jt+5})}{(1+r_{t1}+\propto_1 \beta_{jt}+\propto_2 Z_{jt})^5} \quad \textbf{Eq. 4.1}$$

In this study, the current share price (P_{jt}) of a company (*j*) is estimated at a specific point in time (*t*) by discounting the expected future dividends $(E_t(D_{jt+1}),\ E_t(D_{jt+2}), \text{etc.})$ and share price $(E_t(P_{jt+5}))$ over a holding period of five years. To estimate the expected values, lagged dividend $(D_{jt-1}, D_{jt-2}, \text{etc.})$, earnings $(E_{jt-1}, E_{jt-2}, \text{etc.})$ and share price $(P_{jt-1}, P_{jt-2}, \text{etc.})$ values over the preceding five years are used as a set of instrument variables. The discount rate used consists of the sum of the forward risk-free rate (r_{t1}) and a company-specific risk premium, which is estimated by using two company-specific variables, namely beta (β_{jt}) and leverage (Z_{jt}). A more detailed discussion on the estimation of the intrinsic value is provided in Section 4.9.2.5, where the regression model is explained.

Based on the model employed in the current study, a distinction is therefore made between the following dependent, independent, and instrumental variables, as discussed in the following sections.

4.8.1 Dependent variable

Table 4.1 provides a description of the study's dependent variable, the calculation that it was included in, its measurement and its source.

Table 4.1: Dependent variable considered in this study

Variable	Measurement	Source	Included in
$\boldsymbol{P_{jt}}$: Current MPS	Measured in cent per share; Calculated per company p.a.	IRESS	Estimation of intrinsic share price

The dependent variable is the outcome or effect that is explained by other variables. During experimental investigations, the dependent variable is expected to change as a result of the manipulation of the independent variables (McArdle, Katch and Katch, 2006). For the purposes of this study, the dependent variable was the current MPS for each sample company that had an observation for a specific year.

4.8.2 Independent variables

Table 4.2 describes the independent variables that were included in this study. The calculations that they were included in are also explained, followed by a description of their measurement and the source they were obtained from.

Table 4.2: Independent variables considered in this study

Variable	Measurement	Source	Included in
Z_{jt} : Gearing	Debt: equity ratio; Calculated per company p.a.	IRESS	Estimation of company-specific risk premium as part of the discount rate
β_{jt}: Beta estimate	Estimated using monthly returns over five years; Calculated per company p.a.	IRESS	Estimation of company-specific risk premium as part of the discount rate
$E_t(D_{jt+i})$: Expected future DPS	Measured in cents per share; Estimated per company for the next five years	Estimated using the previous five years' lagged dividends, earnings and prices	Expected future cash flow items discounted to estimate a share's intrinsic value
$E_t(P_{jt+5})$: Expected future MPS	Measured in cents per share; Estimated per company after a holding period of five years	Estimated using the previous five years' lagged dividends, earnings and prices	Expected future cash flow items discounted to estimate a share's intrinsic value

Independent variables are presumed to be the cause of an outcome. In an experiment, an independent variable is expected to influence the dependent variable, while remaining unaffected by the other variables in the study (Zikmund *et al.,* 2013). Following Haldane and Davies (2011), Miles (1993) and Chou and Guo (2004), company-specific characteristics, namely a company's beta estimate, gearing, expected future dividends and share prices were considered as the independent variables for this study. These independent variables are differentiated between exogenous and endogenous predictors. The values of exogenous predictors are determined outside a statistical model and are considered fixed. In this study, the exogenous predictors are the gearing and beta of a company as these variables influence the model without being affected by it. Conversely, predictors that are determined inside a statistical model are endogenous, where their values are dependent on other variables in the model (Brandt and Williams, 2007). For this study, the endogenous predictors are the expected future dividends and price per share, which were instrumented using five years of lagged values.

4.8.3 Instrumental variables

The instrumental variables that were included in this study are presented in Table 4.3. The calculations that they were included in are explained, as well as their measurements and sources.

Table 2.3: Instrumental variables considered in this study

Variable	Measurement	Source	Included in
$(D_{jt-1}, D_{jt-2}, \text{etc.})$: Lagged DPS	Measured in cents per share; Calculated per company for the previous five years	IRESS	Estimation of expected future dividends and prices
$(E_{jt-1}, E_{jt-2}, \text{etc.})$: Lagged EPS	Measured in cents per share; Calculated per company for the previous five years	IRESS	Estimation of expected future dividends and prices
$(P_{jt-1}, P_{jt-2}, \text{etc.})$: Lagged price per share	Measured in cents per share; Calculated per company for the previous five years	IRESS	Estimation of expected future dividends and prices

Instrument variables might be used in regression models when there is an error term that is correlated with the independent variable (Chow, 2018). The instrument variable is a third variable(s) considered when a regression analysis contains variables that are influenced by other variables in the model. In this study, the instrument variables that were considered consisted of five years of lagged share prices, dividends and earnings, and were used to instrument expected future dividends and share prices. In Section 4.9.2.6, a more detailed discussion of the instrument variables is provided as part of the regression model employed.

4.8.4 Constant variable

The constant variable that was included in this study is presented in Table 4.4. The calculation that it was included in, its measurement and its source are also provided.

Table 4.4: Constant variable considered in this study

Variable	Measurement	Source	Included in
r_{t1}: Forward risk-free rate	Return on government bonds p.a.	SARB (2019)	As part of the discount rate

A constant variable is a variable that does not change during a study (Zikmund *et al*., 2013). For this study, the forward risk-free rate for each year of the study period represented a constant variable.

4.8.5 Other variables

To further investigate the nature of the companies included in the sample, the dividend yield, earnings yield and dividend payout ratio of the sample companies were also calculated in addition to the above-mentioned variables. Table 4.5 provides a description of these additional variables, as well as their measurement and source.

Table 4.5: Other variables considered in this study

Variable	Measurement	Source	Included in
Dividend yield	Dividend: / Price; Calculated per company p.a.	IRESS	Descriptive statistical analysis
Earnings yield	Earnings / Price; Calculated per company p.a.	IRESS	Descriptive statistical analysis
Dividend payout ratio	Dividend / Earnings; Calculated per company p.a.	IRESS	Descriptive statistical analysis

The variables presented in Table 4.5 were included only as part of the descriptive statistical analysis. Although the nominal values for the variables presented in Tables 4.1 to 4.4 are included in the model used to empirically test the study's hypotheses, it might be problematic to use them to understand the nature of the companies included in the sample. In order to make comparisons between companies, information is required in addition to the nominal values. By considering the dividend yield, earnings yield and dividend payout ratio per company, information such as the percentage of earnings that the sample companies paid out as dividends (as reflected by the dividend payout ratio), the yield that investors received on their investments in the form of dividends (as reflected by the dividend yield) and the yield received for each Rand invested in a company (as reflected by the earnings yield) can be used to make comparisons between companies and sectors.

4.9 DATA PROCESSING

After the required data for a study have been collected, it must be prepared to allow for efficient data analysis. Data preparation refers to the process of transforming raw data into a format that can be used for analysis (Babin, D'Alessandro, Winzar, Lowe and Zikmund, 2017). The accuracy and quality of the collected data are also checked during this stage, where errors or missing values are corrected for. For this study, secondary quantitative data were collected from the IRESS (2020) external database and the SARB (2019) website. The data were initially collected in a raw form and were thereafter checked for completeness and accuracy. Microsoft Excel 365 was used to convert the data into a suitable format to be analysed.

Once the relevant data have been prepared, they can be analysed. The main purpose of data analysis is to organise and draw meaning from the collected data (Grove, Gray and Burns, 2014). There are two main approaches to analysing data, namely via descriptive and inferential statistics. For the current study, both approaches were employed.

4.9.1 Descriptive statistical analysis

Descriptive statistical analysis refers to the process of analysing, summarising or describing raw data in a meaningful way, thereby presenting the data in a simple format that can be easily understood.

This type of statistics provides an elementary analysis of the data and is not used to draw empirical conclusions. Researchers often employ descriptive statistics to organise raw data in a way that reflects the basic characteristics of the variables (Holcomb, 2017). Typically, measures of central tendency, dispersion and shape are used to describe a dataset.

4.9.1.1 Measures of central tendency

Researchers might use measures of central tendency to determine the "typical numerical point" in a dataset (Allen, 2017:951). Measures of central tendency can provide valuable information about the characteristics of a group of people, objects or variables included in a dataset, where frequently occurring values are interpreted to indicate normal or common behaviour displayed by the members of the dataset. These measures also allow the researcher to make comparisons between different datasets. Two commonly employed measures of central tendency, namely the mean and the median, can be used to determine the central value of a dataset.

The mean reflects the average value of a variable that is included within a dataset. The mean of a sample is often considered to provide the most accurate indication of the larger population mean (Allen, 2017). However, if the elements of a dataset do not have a symmetric distribution where the data are skewed, the mean might not provide an accurate representation of the average values found within the sample and/or the population. Outlier values within a dataset also affect the accuracy of the mean, where a few observations with values that are either considerably higher or lower than the values of the other observations might cause the mean to reflect an average that is too large or small, respectively (Healey, 2016).

The mean is calculated by adding all the observations within a dataset. The total is then divided by the number of observations that comprise the dataset. The equation for calculating the mean is as follows (Zikmund *et al*., 2013):

$$\bar{x} = \frac{\sum_{i=1}^{N} x_i}{N} \qquad \textbf{Eq. 4.2}$$

where:

$\bar{x}$ = Mean value of the observations in the dataset

$\sum_{i=1}^{N} x_i$ = Sum of all the observations in the dataset

N = Number of observations in the dataset

The median is reflected by the observation that occurs in the middle of a ranked distribution of observations, with half of the remaining observations located below the median value and the other half above it. In the case of an even number of observations, the values of the two observations located in the middle of the dataset are added together and divided by two to determine the median.

The median enables the researcher to make assumptions when analysing skewed data, as the midpoint is not affected by outlying elements (Allen, 2017).

In this study, mean and median values were calculated for all variables included in the dataset. Mean and median values were determined for the overall sample. In order to investigate potential within-period variation, the mean values of the variables were determined for each year of the study period. The study period was also divided into two ten-year subperiods representing the first and last ten years of the study period, respectively. The mean values for the variables included in the study for both decadal sub-samples were also determined. Finally, the mean values for the variables included in the study were also determined for each JSE sector.

4.9.1.2 Measures of dispersion

The dispersion within a dataset refers to the degree of variation among the values of the observations. A highly dispersed dataset will contain observations that vary greatly in value from each other (Srivastava, Shenoy and Sharma, 1989). Conversely, a dataset with a low measure of dispersion will contain observations that have relatively similar values. The variability of a dataset can be measured by the minimum and maximum values, the range, as well as by the standard deviation (Jha, 2014).

The minimum value refers to the lowest value of an observation within a dataset, while the maximum value refers to the highest value of an observation. The range is used to measure the difference between the minimum and maximum values, where a large range indicates a higher degree of variation among the values of the observations. However, the range is sensitive to outliers as it takes into account observations with extreme values that might not accurately represent the average observation (Allen, 2017).

The standard deviation indicates the average degree of variability within a dataset, where variability is measured by calculating how far the numerical values deviate from the mean. A higher standard deviation thus reflects a higher average distance per observation from the mean. Conversely, a lower standard deviation indicates that the observations included in a dataset are more similar in value (Beri, 2010). An inherent benefit of using the standard deviation as a measure of dispersion is that it is resistant to outliers.

The equation for the standard deviation is as follows (Beri, 2010):

$$s = \sqrt{\frac{\sum_{i=1}^{N}(x_i - \bar{x})^2}{N}} \qquad \textbf{Eq. 4.3}$$

where:

s = The standard deviation

x_i = Value of each observation in the dataset

$\bar{x}$ = Mean value of the observations in the dataset

N = Number of observations in the dataset

As part of the descriptive analysis for this study, the minimum value, maximum value, range and standard deviation of all the variables that were included in the sample were determined. These measures of dispersion were determined for the overall sample.

4.9.1.3 Measures of shape

The shape of a distribution refers to its peakedness and symmetry compared to a normal distribution. Skewness and kurtosis are two statistics that are commonly used to compare a distribution to the distribution of a normal or symmetric curve. Skewness offers a measure of how far a distribution deviates from the symmetry of a bell curve, where data that are positively skewed are characterised by a long tail on the right-hand side of the graph and vice versa. Kurtosis compares the height of the peak of a distribution to the normal curve. Peaks with a positive kurtosis are taller than the normal distribution (i.e. very peaked), while peaks characterised by a negative kurtosis are shorter in comparison. Kurtosis also measures the height of a distribution's tails in comparison to the normal distribution (Morgan and Griego, 1998).

This study used kurtosis and skewness to describe the shape of the distribution of all the variables included in the sample. The measures of shape were determined for the overall sample.

4.9.2 Inferential statistics

Inferential statistics involves the use of empirical methods that directly address a study's research objective(s) via the testing of statistical hypotheses (Zikmund *et al*., 2013). For this study, the GMM (Hansen, 1982) estimation method was used to estimate the theoretical model developed by Davies *et al*. (2014), which was used to test for short-termism. The results of this estimation process were then used to test the study's hypotheses.

The rest of this section is structured as follows. Firstly, regression analysis is explained, followed by a description of the assumptions underlying the standard linear regression model. Thereafter, an explanation of panel data is presented. A discussion on the GMM estimation method is then provided, followed by a description of the diagnostic tests considered. Lastly, the adjusted asset pricing equation that was used to test for short-termism is explained.

4.9.2.1 Regression analysis

Regression analysis is a statistical technique that is used to measure the relationship between a study's dependent variable and independent variable(s). The independent variable(s) is known and

is used to predict the dependent variable (Coldwell and Herbst, 2004). This study investigated the relationship between the current share price (dependent variable) and the expected future dividends, expected future share prices, gearing and beta estimates (independent variables). Therefore, regression analyses were employed to explain the nature of the relationship between the study's variables.

There are two main types of regression analysis, namely simple regression analysis and multiple regression analysis. Simple regression analysis measures the relationship between a dependent variable and only one independent variable, where the value of the dependent variable is predicted from the values of the independent variable. Multiple regression analysis is an extension of simple regression analysis and considers the influence of multiple independent variables on the value of the dependent variable. Multiple regression analysis thus increases the accuracy of the estimate by considering additional factors that could affect the dependent variable (Zikmund *et al*., 2013). Since this study included four independent variables, multiple regression analyses were conducted.

4.9.2.2 The assumptions of the standard linear regression model

The standard linear regression model has several underlying assumptions. If a linear regression model satisfies these assumptions, the ordinary least squares (OLS) estimation method is the procedure that is likely to produce the most accurate results when estimating the unknown parameters in the model. However, if a study uses a regression model that does not satisfy these assumptions, then other estimation methods should be used to estimate the regression to produce more accurate results.

One of the most important assumptions of the standard linear regression model is that the errors are uncorrelated random variables with a constant variance. When errors are characterised by a constant variance, the condition is referred to as homoscedasticity. Conversely, if the variance among errors changes, heteroscedasticity occurs. The second assumption is that there is no perfect linear relationship between two or more independent variables. Fitting a regression model to test hypotheses also requires that the errors be normally distributed. Additionally, the order of the model is assumed to be accurate, where the phenomenon being measured behaves in a linear manner. Finally, the model assumes that the error has a population mean of zero (Montgomery and Runger, 2018; Berry 1993).

Given the assumptions of standard linear regression, not all datasets are suitable for an OLS regression analysis. The statistical properties of a study's data should thus inform the selection of the estimation model that is employed.

4.9.2.3 Panel data

The dataset for this study consists of both time-series and cross-sectional dimensions. Time-series data refer to observations that are taken over a period of time at specific intervals. Cross-sectional data implies that the observations were taken at a single point in time from a range of observational units. A dataset that includes both of these dimensions is referred to as panel data (Wooldridge, 2009). For this investigation, the panel data consisted of observations that were taken for different companies (cross-sectional) for each year of the 20-year study period (time-series). This observation is important as it informs the type of estimation method that will be suitable for estimating the regression analysis.

It is also important to consider the nature of the variables that are included in the dataset, as their statistical properties might also influence the type of estimation method that is appropriate for the study. The panel data for this study included exogenous, endogenous and instrument variables (explained in Section 4.9.2.6). The dataset was thus not suitable for the OLS estimation method, as endogenous variables used in this method might result in biased or inconsistent parameter estimates (Anderson, 2018). A popular way to address endogenous variables is to use the two-stage nonlinear least-square (2SLS) estimation method (Miles, 1993; Haldane and Davies, 2011). However, for this study, the GMM (Hansen, 1982) estimation method was used to estimate the modified present value model (Section 4.9.2.6), as it is more efficient and robust than the 2SLS method (Chou and Guo, 2004). Due to the nature of the study's data, the GMM was thus considered a more appropriate estimation method than the 2SLS as it is sensitive to endogeneity and heteroscedasticity.

4.9.2.4 The generalised method of moments estimation method

The GMM estimation method was proposed by Hansen (1982) and is a popular model used to statistically analyse economic and financial data. The GMM method can be applied to time-series, cross-sectional and panel data. This estimation method produces estimates of the unknown parameters of an economic model by combining economic data with the information on population moment conditions. These moment conditions are functions of the model parameters and the data, where their expected value is zero at the parameters' true values. A certain norm of the sample averages of the moment conditions is then minimised. The GMM estimators are consistent, efficient and asymptotically normal in the category of estimators that do not require additional information, apart from that contained in moment conditions (Zsohar, 2012; Sharma *et al.*, 2020).

A benefit of the GMM estimation method is that it does not require complete knowledge of the distribution of the data. The method only requires that a certain number of specified moments be derived from an underlying model (Zivot and Wang, 2003). However, the effectiveness of the GMM

estimations depends on the assumption that the instrument variables are valid, and the error terms of the model are not autocorrelated (Sharma *et al*., 2020).

Three diagnostic tests were employed to determine whether the GMM estimation method was suitable for the current study by considering the nature of the variables included in the regression model. A description of the diagnostic tests employed is provided in the following section.

4.9.2.5 Diagnostic tests

The GMM estimation method requires that some of the independent variables are replaced with instrument variables. For instrument variables to produce valid parameter estimates, the replaced independent variables must be endogenous and the instrument variables appropriate. Three diagnostic tests are used to determine the suitability of the GMM estimation method by firstly considering the endogeneity of the independent variables and, secondly, whether the instrument variables employed are appropriately independent of the error process. The final test is used to determine whether the instruments used in this study are weak.

(a) The Wu-Hausman Endogeneity Test

The first diagnostic test employed is the Wu-Hausman endogeneity test. The purpose of the Wu-Hausman test is to test for endogenous regressors in a regression model. A regression model containing endogenous regressors cannot be estimated using the OLS estimation method, as one of the assumptions of the OLS method is that there is no correlation between a predictor variable and the error term (Montgomery and Runger, 2018). A popular solution to endogeneity is to replace endogenous variables with exogenous instrument variable estimators. The Wu-Hausman test will test for the presence of endogenous variables by comparing OLS coefficient estimates to instrumental variable estimates. If the results of the test reveal that the two estimates are of similar value, it indicates that the model's regressors are exogenous. However, if a large difference between the instrument variable estimator and the OLS estimator is observed, the variables are endogenous and should be replaced with instrument variables (Ao, 2009).

The Wu-Hausman test is in the form of an *F*-test that entails the statement of a null hypothesis and a predetermined level of significance. In this study, an α-level of 0.05 is used and the following null hypothesis is stated:

H_o: There is no statistically significant difference between the OLS and instrument variable estimates.

If the determined *p*-value of the Wu-Hausman test statistic is less than the α-level of 0.05, the null-hypothesis is rejected. However, if the *p*-value exceeds the α-level of 0.05, the null-hypothesis is not rejected. In this study, rejection of the null hypothesis would indicate that the independent variables

included in the model are endogenous. If the null hypothesis is not rejected, the test results would indicate that the independent variables are exogenous and that OLS could have been used as an efficient estimation method (Anderson, 2018).

(b) Sargan's Test of Overidentifying Restrictions

The second diagnostic test performed is the Sargan (1958) test of overidentified restrictors. If an equation is overidentified, the number of instrument variables included in the model exceeds the number of endogenous regressors. The Sargan (1958) test can be used to determine whether these excluded instrument variables are suitable. The test determines if the instrument variables are valid by considering whether they are appropriately independent of the model's error term. The test regresses the residuals from an instrument variable regression on all instruments.

In the regression model used in this study, 15 instrument variables (five years of lagged share prices, dividends and earnings) were employed to estimate six endogenous regressors (expected future dividends and the price per share over a five-year period). The Sargan (1958) test was used to assess the suitability of the additional nine instrument variables. The test is in the form of a chi-square (χ_2) test and entails the statement of a null hypothesis and a determined level of significance.

The following null hypothesis is stated:

H_o: All excluded instrument variables are exogenous.

In this study, an α-level of 0.05 is used to test the null hypothesis. If the determined *p*-value of the Sargan test statistic is less than the α-level of 0.05, the null hypothesis is rejected. If the determined *p*-value exceeds the α-level of 0.05, the null hypothesis will not be rejected. In this study, rejection of the null hypothesis would indicate that the excluded instruments might not be suitable as they are correlated with the error term. However, if the null hypothesis is not rejected, the additional instrument variables are valid and can be included in the study's regression model.

(c) The Cragg-Donald Weak Instrument Test

The final aspect considered is whether the instrument variables included in the study's regression model are good or weak instruments. Weak instruments arise when the correlation between at least one of the instrument variables and the endogenous regressor in a model is too small for the given sample size (Mikusheva, 2013). A weak identification between a model's instrument and endogenous variables can produce biased instrument variable estimators and hypothesis tests with large size distortions (Stock and Yogo, 2002).

Cragg and Donald (1993) proposed a test statistic that can be used to determine whether the instruments in a model with multiple endogenous regressors are weak. The Cragg-Donald weak

instruments test is in the form of an *F*-test and entails the statement of a null hypothesis and a determined level of significance.

The following null hypothesis is stated:

H_o: At least one of the instrument variables is weak.

The null hypothesis is tested by comparing the α-level of 0.05 with the determined *p*-value of the test statistic. If the *p*-value is less than the α-level of 0.05, the null hypothesis is rejected. If the *p*-value exceeds the α-level of 0.05, the null hypothesis is not rejected. In this study, rejection of the null hypothesis would indicate that none of the instrument variables included in the model is weak. Conversely, not rejecting the null hypothesis would indicate that the instruments are weakly correlated with the included endogenous variables.

If the results of the diagnostic tests indicate that the independent variables are endogenous and that none of the instrument variables employed is weak and correlated with the model's error term, the GMM can be used as a suitable estimation method in the current study.

4.9.2.6 The asset pricing equation

For this study, a theoretical model developed by Davies *et al*. (2014) was used to test for short-termism. Equation 4.1 was adjusted to include a measure for short-termism, namely parameter $\hat{x}$. The study's hypotheses were then tested using the following equation:

$$\hat{P}_{jt} = \sum_{i=1}^{5} \frac{E_t(D_{jt+i})\hat{x}^i}{(1+r_{t1}+\pi_{jt})^i} + \frac{E_t(P_{jt+5})\hat{x}^5}{(1+r_{t1}+\pi_{jt})^5} \qquad \textbf{Eq. 4.4}$$

Based on the above equation, the presence of short-termism was assessed, whereby $\hat{x}$= 1 would imply that South African investors do not exhibit short-termism.

When estimating this model, several variables were considered. These variables are explained in the rest of this section. Firstly, the estimation of expected future dividends $(E_t(D_{jt+1}),\ E_t(D_{jt+2}),\text{etc.})$ and share prices $(E_t(P_{jt+5}))$ is explained. This is followed by a description of the variables that were included in the discount rate, namely the risk-free rate (r_{t1}) and the company-specific risk premium (π_{jt}).

(a) Expected future dividends and share prices

The use of expected values adds to the complexity of the inferential analyses employed in this study. Using expected inputs, however, are necessary to avoid the error of including information that would not have been available to investors at that time, often referred to as *look-ahead bias* (Chan, 2009). When conducting research based on secondary data, it is important to remember that although the researcher has access to a complete set of historical time-series data points for a certain period,

those observations would not have been available to an investor that had to make an investment decision during that period.

For this study, the intrinsic share price of a company at a specific point in time was estimated based on the expected future dividends and share price over a holding period of five years. Look-ahead bias would therefore involve discounting the actual (historical) future dividends and market prices that the researcher has access to at the time that the study is being conducted. However, to include the actual values of these variables would result in an inaccurate estimation of intrinsic values, as intrinsic prices are determined based on investor expectations.

Furthermore, the use of the actual future values would result in *endogeneity*. Endogeneity occurs when an independent variable included in a regression analysis correlates with the model's error term. Endogeneity may stem from situations where a model's dependent variable is not simply a response to the independent variable, but also a predictor of the independent variable (Lynch and Brown, 2011). In this study, the actual future dividends and prices are influenced by the same factors that determine the dependent variable (i.e. the price per share), as current prices influence future prices, and thus cannot be included in the regression model. If actual values were included to estimate a share's intrinsic value, the variables on both sides of Equation 4.4 would be influenced by the same factors, which might produce biased coefficients that overestimate the effect of the actual future values on the price per share.

It is important for a study to address the threat of endogeneity, as it influences the ability to produce valid model estimates (Anderson, 2018). To avoid both endogeneity and look-ahead bias, the intrinsic share price for each year within the study period was thus estimated based on expectations about future dividends and share prices at that specific point in time.

Following Wickens (1982), the substitution approach was used to address endogeneity by replacing the expected future values with the actual future values, which were then adjusted by the forecast error. However, actual prices cannot be used as they were not available to investors at that time and are correlated with the error term. These actual future values were thus determined by using a set of instrument variables. Instrument variables are variables that are correlated with an endogenous independent variable but are uncorrelated with the model's error term (Lynch and Brown, 2011). In this study, five years of lagged MPS, lagged DPS and lagged EPS were used as a set of instruments for actual future dividends and share prices. These lagged variables are correlated with the study's dependent variable (i.e. the price per share) and are independent of the company-specific excess forecasting errors. The information on lagged DPS, EPS and MPS would also have been available to an investor at that time, thereby allowing the researcher to avoid potential look-ahead bias.

A multiple linear regression model was used to calculate the forecast error associated with the estimation of actual future DPS and share price values. As lagged DPS, EPS and MPS values over the preceding five years were used as a set of instrument variables to estimate the actual future dividends for each of the next five years in this study period, the actual future dividend for some future period was expressed as a function of the previous five years' DPS, EPS and MPS values. A similar process was followed in the estimation of actual future share prices.

The equation for the multiple linear regression used to estimate expected (actual future) dividends is as follows (Davies *et al*., 2014):

$$E_t(D_{t+i}) = a + b_1\begin{bmatrix} DPS_{t-1} \\ EPS_{t-1} \\ MPS_{t-1} \end{bmatrix} + b_2\begin{bmatrix} DPS_{t-2} \\ EPS_{t-2} \\ MPS_{t-2} \end{bmatrix} + b_3\begin{bmatrix} DPS_{t-3} \\ EPS_{t-3} \\ MPS_{t-3} \end{bmatrix} + b_4\begin{bmatrix} DPS_{t-4} \\ EPS_{t-4} \\ MPS_{t-4} \end{bmatrix} + b_5\begin{bmatrix} DPS_{t-5} \\ EPS_{t-5} \\ MPS_{t-5} \end{bmatrix} + \varepsilon_t$$

Eq.4.5

where:

$E_t(D_{t+i})$	=	the expected (actual future) dividend for year *t+i*, as estimated in year *t,* with *i* = 1 to 5
a	=	the intercept
b_i	=	slope coefficients associated with each of the sets of instrument variables
$\begin{bmatrix} DPS_{t-i} \\ EPS_{t-i} \\ MPS_{t-i} \end{bmatrix}$	=	actual lagged DPS, EPS and MPS values
ε_t	=	error term

Based on the results obtained from these regression analyses, the forecast error associated with the estimation process employed can be determined. The forecast error (U_{jt+i}) represents the difference between the actual historical values (i.e. actual DPS and market prices) and the expected (actual future) values estimated by the regression, where the difference is attributed to the exclusion of additional independent variables from the regression analysis (Berry, 1993).

Following Wickens (1982), the expected (actual future) dividends and share prices that were instrumented using five years of lagged DPS, EPS and MPS were then adjusted by the ex-post forecast errors (U_{jt+i}).

The equation for the expected dividend for company *j* is, therefore (Haldane and Davies, 2011):

$$E_t(D_{jt+i}) = D_{jt+i} + U_{jt+i}$$ **Eq. 4.6**

where:

$E_t(D_{jt+i})$ = Expected dividend at the end of year *i*+*t*, as estimated at the end of year *t*

D_{jt+i} = Actual future dividend at the end of year *i*+*t*

U_{jt+i} = Forecast error

A similar process was followed in the calculation of expected share prices. The equation for the expected share price for company *j* is (Davies *et al.*, 2014):

$$E_t(P_{jt+5}) = P_{jt+5} + U_{jt+5} \quad \textbf{Eq. 4.7}$$

where:

$E_t(P_{jt+5})$ = Expected share price at the end of year *t*+5, as estimated at the end of year *t*

P_{jt+5} = Actual future share price at the end of year *t*+5

U_{jt+5} = Forecast error

Following Davies *et al.* (2014), the traditional DCF model is amended by substituting the above equations to be written in the generalised form of:

$$\hat{P}_{jt} = \sum_{i=1}^{5} \frac{E_t(D_{jt+i})}{(1+r_{t1}+\pi_{jt})^i} + \frac{E_t(P_{jt+5})}{(1+r_{t1}+\pi_{jt})^5} \quad \textbf{Eq. 4.8}$$

The intrinsic share price ($\hat{P}_{jt}$) is therefore determined by discounting the expected dividends and expected terminal share price over a holding period of five years.

(b) The discount rate

The discount rate used to discount the expected future dividends and share price was calculated as the sum of the forward risk-free rate (r_{t1}) and a company-specific risk premium. Following Miles (1993), the forward risk-free rate (r_{t1}) was used as a measure of the nominal risk-free return and measured by determining the return on government bonds on an annual basis, based on data from the SARB (2019).

The company-specific risk premium is estimated by using two company-specific variables, namely beta (β_{jt}) and leverage (Z_{jt}) (Davies *et al.*, 2014):

$$\pi_{jt} = \alpha_1\beta_{jt} + \alpha_2 Z_{jt} \quad \textbf{Eq. 4.9}$$

where:

π_{jt} = The company-specific risk premium

β_{jt} = The company-specific beta

Z_{jt} = The company-specific debt-to-equity ratio

Following Miles (1993), the company-specific risk premium is based on an amended version of the standard CAPM. Firstly, the simple CAPM was adapted to consider the uncertainty over future inflation. Friend, Lanskroner and Losq (1976) suggested that if uncertainty over future inflation matters to investors, a known nominal yield is an inappropriate proxy for a risk-free rate. When uncertainty over future inflation exists, risk premia are likely to depend negatively on betas, as the more correlated a company's returns are with the returns on other risky assets, the lower the risk relative to an asset with fixed nominal returns. The authors suggest that negative betas should be expected if a diversified portfolio of risky assets (e.g. shares) is a hedge against unexpected inflation.

Secondly, the standard CAPM was adjusted to include leverage (Z_{jt}) by drawing on Merton's (1973) dynamic model of asset pricing. Merton (1973) argued that the simple CAPM should be amended to consider the correlation between the returns of company *j* and alterations in future interest rates. As the level of debt that is held by company *j* would influence this correlation, debt gearing is expected to have a positive effect on the company-specific risk premium (π_{jt}).

The company-specific risk premium π_{jt} was estimated using regression analyses. The regression coefficients for beta and leverage are α_1 and α_2, respectively. If the standard CAPM is valid and uncertainty over future inflation does not influence an investor's required rate of return, coefficient α_1 should equate to the difference between the expected return on the market and the risk-free rate, and α_2 will be insignificant. Conversely, if investors believe that uncertainty over future inflation is important and shares are viewed as a good hedge against inflation, α_1 may be negative. Finally, if uncertainty over future interest rates matters to investors, α_2 is expected to be positive.

4.10 SUMMARY

This chapter provided a comprehensive explanation of the research methodology that was followed in order to address the study's research objectives. For this study, the business research process was employed and consisted of nine interrelated steps. The research problem was defined, and the research objectives and hypotheses of the study were stated. A descriptive research strategy was followed to investigate the presence of short-termism in South Africa. A positivistic approach was employed, and the associated quantitative research approach was used to collect the required numerical data. Secondary research was conducted to collect the secondary data used to empirically test the study's hypotheses. A non-random judgement sampling method was employed to collect the sample for the study. The data collection process was defined, and a description of the variables collected from the sample units was provided. Descriptive and inferential analyses were used to

analyse the collected data. In the following chapter, the results of the descriptive and inferential analyses are offered.

CHAPTER 5
EMPIRICAL RESULTS

5.1 INTRODUCTION

In Chapter 4, the research methodology that was employed to test the study's hypotheses was specified. A systematic research process was followed, in which a descriptive research strategy was used to investigate the presence of short-termism in South Africa. The study adopted a quantitative research approach, where the IRESS (2020) database was used to obtain financial ratios, beta, dividend, earnings and share price data, while the South African Reserve Bank (SARB, 2019) website was used to acquire the forward risk-free rate per annum. A non-random judgement sampling method was employed to select the sample for the study and resulted in a final sample consisting of companies that had been listed for a continuous period of at least 11 years on the JSE from 1995 to 2014. After the data were collected for the sample, it was analysed via descriptive and inferential statistics.

This chapter reports on the results of the descriptive and inferential analyses. The descriptive analysis was used to provide an initial summary of the data, where the data were described in a meaningful way. The inferential analysis was then conducted, where multiple regression analyses were used to determine the relationship between the study's variables and to test the study's hypotheses.

The rest of this chapter is structured as follows. Firstly, the sample of the study is discussed (Section 5.2). Thereafter, the descriptive statistics for the sample are presented (Section 5.3.1), where the MPS, EPS and DPS, as well as the earnings yield, dividend yield, dividend payout ratio, risk-free rate, beta estimations and the debt-to-equity ratio for sample companies are described. The annual descriptive statistics of all the variables included are then explained (Section 5.3.2). Subsequently, the average of all the variables is described per JSE sector (Section 5.3.3). Thereafter, the results of the inferential analyses are presented (Section 5.4), where the results of the diagnostic tests are explained (Section 5.4.1), as well as the results of the regression analyses (Section 5.4.2). Finally, a summary of the results of the study is offered (Section 5.5).

5.2 SAMPLE

This section describes the sample of companies obtained by using the non-random judgement sampling method (explained in Section 4.6.3.3). The study's sample included companies that had been listed on the JSE from 1995 to 2014, representing a study period spanning 20 years.

The distribution of the sample companies between the different sectors of the JSE over the 20-year study period is provided in Table 5.1.

Table 5.1: Number of companies in each sector per year

	Sectors									
Years	**Basic materials**	**Consumer goods**	**Consumer services**	**Financial**	**Health**	**Industrial**	**Oil & gas**	**Technology**	**Telecom**	**Number of companies per year**
1995	31	23	27	29	5	34	0	3	5	157
1996	31	23	28	30	5	34	0	3	5	159
1997	33	24	28	30	5	34	0	3	5	162
1998	33	24	29	30	5	36	1	5	5	168
1999	33	24	31	30	5	39	1	5	6	174
2000	34	24	32	32	6	40	1	5	6	180
2001	33	23	30	29	4	35	1	6	5	166
2002	33	22	33	31	4	34	1	8	4	170
2003	32	23	33	33	4	36	1	12	4	178
2004	32	23	32	35	4	36	1	12	4	179
2005	30	21	31	37	3	33	1	12	4	172
2006	30	21	30	39	3	32	1	12	5	173
2007	29	19	27	42	3	32	1	12	5	170
2008	29	19	29	44	3	32	1	12	5	174
2009	32	18	29	43	3	32	2	12	4	175
2010	35	19	30	46	4	34	2	12	4	186
2011	39	19	30	46	4	46	2	12	7	205
2012	41	20	30	49	5	47	2	12	7	213
2013	40	18	30	50	5	46	2	12	7	210
2014	39	17	30	50	5	46	2	12	5	206
Number of companies per sector	50	28	41	65	8	63	2	13	10	280

The sample consisted of 280 companies over the 20-year study period, providing a total of 3 577 company-year observations. The average number of observations per company included in the sample was 12.775. A total of 88 companies provided the required data for the full 20-year period considered in the study (i.e. were listed continuously for a period of 30 years from 1990 to 2019). Table 5.1 shows that the number of sample companies varied per year, reflecting an increase towards the end of the study period.

The JSE contains nine sectors, and each sector is comprised of a different number of companies. According to Listcorp (2021), each sector accounted for the following percentage of the JSE: basic materials (15.27 per cent), consumer goods (5.99 per cent), consumer services (13.47 per cent), financials (36.23 per cent), health care (2.99 per cent), industrials (17.04 per cent), oil and gas (1.2 per cent), technology (5.99 per cent) and telecommunications (1.8 per cent). The difference in the number of companies listed across the JSE sectors contributed to a large difference between the number of companies included in the sample at a sector level.

Sample companies were spread across the above-mentioned nine sectors of the JSE. As can be seen in Table 5.1, some sectors contributed a much larger number of sample companies in comparison to others, where the financial, industrial and basic material sectors combined constituted 60.44 per cent of the sample companies over the study period. Conversely, the three sectors containing the lowest number of companies, namely oil and gas, health and telecommunications account for only 5.87 per cent of the sample companies over the study period. This uneven distribution of sample companies across the different sectors resulted in a relatively small number of observations in some sectors. It should be noted that this prevented inferential analysis from being conducted at the sector level for all nine sectors represented in Table 5.1.

5.3 DESCRIPTIVE STATISTICS

The results of the descriptive statistics that were used to summarise and describe the variables that were collected from the sample companies are presented in this section.

In traditional finance theory, the intrinsic value of a company's shares is determined by estimating the expected future dividends and share price that an investor would receive from this investment over a certain holding period, and then discounting these cash flows using a discount rate that reflects the level of risk that the investment presents. Therefore, accurately forecasting expected future dividends and share prices is an important step in estimating a share's intrinsic value. This study used a company's lagged DPS, EPS and MPS values over the preceding five years as a set of instrument variables to estimate its expected future dividends and share price for the following five years. Another important step in calculating fundamental share values is to select an appropriate discount rate that accurately reflects the level of risk that the investment might present. In this study, a company's beta and debt-to-equity ratio were used to estimate its risk premium and then added to the forward risk-free rate to obtain the relevant discount rate.

In this section, a discussion of the mean, median, standard deviation, kurtosis, skewness, range, minimum and maximum values that were calculated for the variables collected from the sample companies is provided. Descriptive statistics are first reported for the overall sample. Thereafter, annual average values for each year, as well as for the two ten-year subperiods included in the study

period are presented. Lastly, average values across each of the nine different JSE sectors are discussed.

5.3.1 Descriptive statistics for the sample

The overall sample provided a total of 3 577 company-year observations. Following Davies *et al*. (2014), the variables collected from sample companies consisted of annual values for their MPS, EPS and DPS. Based on these variables, annual earnings yield, dividend yield and dividend payout ratios were calculated. Annual beta estimations and debt-to-equity ratios for sample companies were also included in the dataset. Finally, annual values for the forward risk-free rate were obtained.

In the following sub-sections, descriptive statistics are reported for the main variables included in the study. The focus is first placed on the variables considered when estimating the expected cash flows associated with an investment in a company's shares. Following that, the emphasis shifts towards the variables included in the estimation of the discount rate.

5.3.1.1 Market price per share

The descriptive statistics for the MPS, EPS, DPS, earnings yield, dividend yield and dividend payout ratio are indicated in Table 5.2.

Table 5.2: Descriptive statistics for the market price, earnings and dividend variables

	MPS	EPS	DPS	Earnings yield	Dividend yield	Dividend payout ratio
Mean	3 983.61	313.25	137.38	12.57	5.24	34.16
Median	1 350.00	106.80	30.00	8.08	2.61	30.78
Standard Deviation	7 746.01	685.17	376.51	40.93	14.94	57.43
Kurtosis	69.05	79.62	140.21	90.32	98.84	68.41
Skewness	6.22	6.59	9.35	5.98	8.88	3.26
Range	151 506.00	15 821.00	8 700.00	1 106.87	233.33	1 651.79
Minimum	6.00	-2 049.00	0.00	-428.24	0.00	-714.29
Maximum	151 512.00	13 772.00	8 700.00	678.63	233.33	937.50
N	3 577	3 577	3 577	3 577	3 577	3 577

In the second column of Table 5.2, the descriptive statistics for the MPS are provided. This variable plays an important role in the model employed in the current study. The current year's MPS is included as dependent variable, while lagged values over the preceding five years are used as instrument variables to estimate future DPS and market price values.

Table 5.2 indicates a large difference between the mean and median values of the MPS, where the median is nearly one-third of the value of the mean. The large difference between the two values might be attributed to outlier values, which can influence the mean and misrepresent the typical MPS over the study period. Table 5.2 reveals a large range between the relatively low minimum value and

the relatively high maximum value. The relatively large standard deviation also indicates a wide distribution of the observations. Finally, a positive kurtosis and skewness confirm that the dataset is more peaked in comparison to a normal distribution.

It should be noted that a panel dataset was compiled for the purposes of the current study. Observations for different companies (cross-sectional) were reported for different years (time-series). The large deviation between observations may therefore be observed across time, or between different companies. This is investigated in more detail in Sections 5.3.2 and 5.3.3, where average values are reported per year and per sector, respectively.

5.3.1.2 Earnings

Lagged EPS values were included as instrument variables to instrument expected future dividends and market prices. Descriptive statistics for the EPS are indicated in the third column of Table 5.2. The descriptive statistics of the EPS reveal a similar distribution to the MPS. There is a large difference between the mean and median, which is typically an indication of outlier values. The large range reveals a significant difference between the relatively low minimum value and the relatively high maximum value. The relatively large standard deviation further reveals a highly varied distribution, where the EPS of the companies included in the sample varied considerably over the study period. Lastly, the positively skewed distribution indicates a longer tail on the right-hand side, compared to a normal distribution, while a positive kurtosis reveals that the distribution is more peaked than a normal curve.

In the fifth column of Table 5.2, the descriptive statistics for the earnings yield are provided. Earnings yield is calculated by dividing the EPS by the MPS and is used to determine the percentage of earnings earned for every Rand invested in a company's shares. Expressing the earnings yield as a percentage allows for a more standardised comparison between companies, as the value of the ratio is not dependent on the size of the company. Table 5.2 indicates a large difference between the mean and median value of the earnings yield variable. The large range provides evidence that the difference between the mean and median may be attributed to outliers, where a relatively low minimum value, as well as a relatively high maximum value, is observed. The large standard deviation also points towards a wide distribution of the observations. The earnings yield is positively skewed, where the distribution is characterised by a longer tail on the right. A positive kurtosis also indicates that the curve is more peaked in comparison to a normal distribution.

5.3.1.3 Dividends

The descriptive statistics of the DPS are indicated in the fourth column of Table 5.2. The mean and median DPS differ significantly. The large difference between the two values might be attributed to outliers in the dataset, which could distort the mean. The large range reveals a significant difference

between the relatively low minimum value and the relatively high maximum value. Table 5.2 further reveals a large standard deviation, indicating a dispersed distribution, where the amount of dividends issued by the companies differed considerably. The positive kurtosis indicates a more peaked curve in comparison to a normal distribution. The distribution is also positively skewed, revealing a longer tail on the right-hand side of the curve relative to the left.

Comparing DPS between companies might not always produce conclusive findings as the amount of dividends paid may differ depending on the size of the company. The dividend yield allows for a more standardised comparison between companies by expressing the dividends paid as a percentage of the company's market price. The descriptive statistics of the dividend yield are presented in the sixth column of Table 5.2. Table 5.2 reveals a large difference between the mean and median values of the dividend yield. A large range between the relatively low minimum value and the relatively high maximum value indicates that the difference between the two measures of central tendency may be attributed to outlier values. The large standard deviation also reveals a dispersed distribution, thereby indicating that the median might be the most reliable measure of central tendency. Finally, a positive skewness and kurtosis reveal that the distribution is characterised by a longer tail on the right-hand side and is more peaked in comparison to a normal distribution.

The dividend payout ratio is another standardised measure that might be used to make comparisons between companies. The dividend payout ratio refers to the total dividends distributed to shareholders relative to the total amount of net income of the company. It can be determined by dividing the yearly DPS by the EPS of a company. The descriptive statistics of the dividend payout ratio are indicated in the seventh column of Table 5.2. The mean and median dividend payout ratios differ marginally. However, the large range provides evidence of a significant difference between the relatively low minimum value and the relatively high maximum value. The large standard deviation also reveals a highly dispersed distribution, where the percentage of dividends that were distributed relative to net income varied considerably between the companies included in the study. Lastly, positive kurtosis and skewness confirm that the distribution differs from a normal curve.

5.3.1.4 Discount rate

The descriptive statistics of the variables included in the estimation of the discount rate are indicated in this section.

(a) Beta estimations

Following Davies *et al*. (2014), this study employed an adapted version of the CAPM model when estimating the rate that was used to discount expected future cash flows. A company-specific risk premium was calculated using beta and leverage as company-specific independent variables.

Annual betas were estimated for each company using monthly returns over five years. The descriptive statistics for the beta estimations of the companies included in the sample are presented in Table 5.3.

Table 5.3: Descriptive statistics for beta estimations

Mean	0.645
Median	0.620
Standard Deviation	0.530
Kurtosis	15.637
Skewness	1.441
Minimum	-3.115
Maximum	6.457
Range	9.573
N	3 577

Beta measures the level of systematic risk of a company, where systematic risk refers to how much the returns of a company vary in sync with the return of the overall market (Da Rin and Hellmann, 2020). The mean value of the beta estimates for companies included in the study's sample was 0.645, indicating that the average return of a company was less volatile than the return of the overall market. A reason for the relatively low average beta may be the comparatively long study period that required companies to be listed for a minimum of 11 consecutive years, thereby including more financially stable companies with lower systematic risk (i.e. betas lower than one).

The range of 9.573 reveals the significant difference between the relatively low minimum value and the relatively high maximum value. The relatively large standard deviation also indicated that there was a high degree of variation in the beta estimates. Figure 5.1 is provided to investigate the distribution of the beta estimates in more detail.

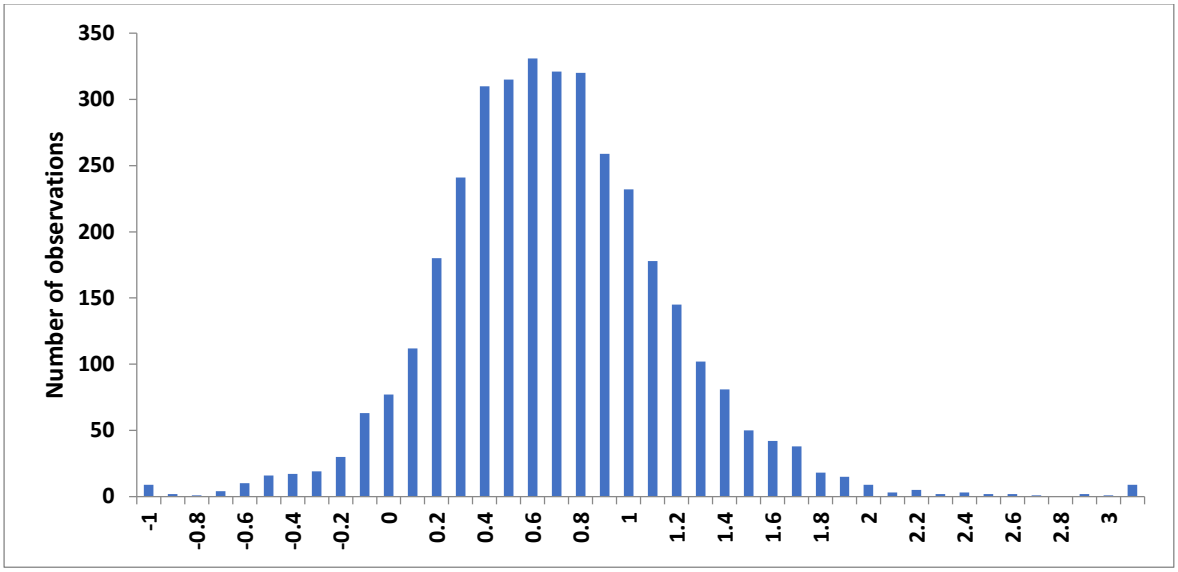

Figure 2.1: Distribution of beta estimates

Figure 5.1 illustrates the distribution of beta estimates for the sample companies, where the market beta of one is used to indicate the mid-point of the histogram. A beta of one means that a company carries that same amount of systematic risk as the market (Da Rin and Hellmann, 2020). From Figure 5.1, it can be seen that the majority of the sample carried less risk than the market since most of the beta estimates were lower than one. The beta estimates were thus positively skewed and more peaked (kurtosis of 15.637) than a normal distribution, indicating a leptokurtic curve.

Figure 5.1 also reveals that some of the beta estimates had negative values. A negative beta means that the returns of a company move in the opposite direction to the returns of the market (Da Rin and Hellmann, 2020). From a CAPM perspective, negative betas would result in a negative risk premium and the expected rate of return would be less than the risk-free rate. However, investing in projects that yield a negative return could provide a hedge against potential losses in other investments in a portfolio, where companies with inverse covariances with other investments lower the overall risk of the portfolio (Schoemaker, 2011). Conversely, Figure 5.1 also shows that a number of beta estimates had a value of more than one, where a beta of greater than one means that the returns of the share are more volatile than the market (Da Rin and Hellmann, 2020). A few beta estimates had a value greater than six, thereby indicating that some companies included in the sample were highly volatile and moved more than six times as much as the market.

Haldane and Davies (2011) compiled the beta estimates of companies listed on the S&P 500 Index in the US and on the FTSE in the UK from 1980 to 2009. For comparison, the distribution of the US and UK betas is presented in Figure 5.2.

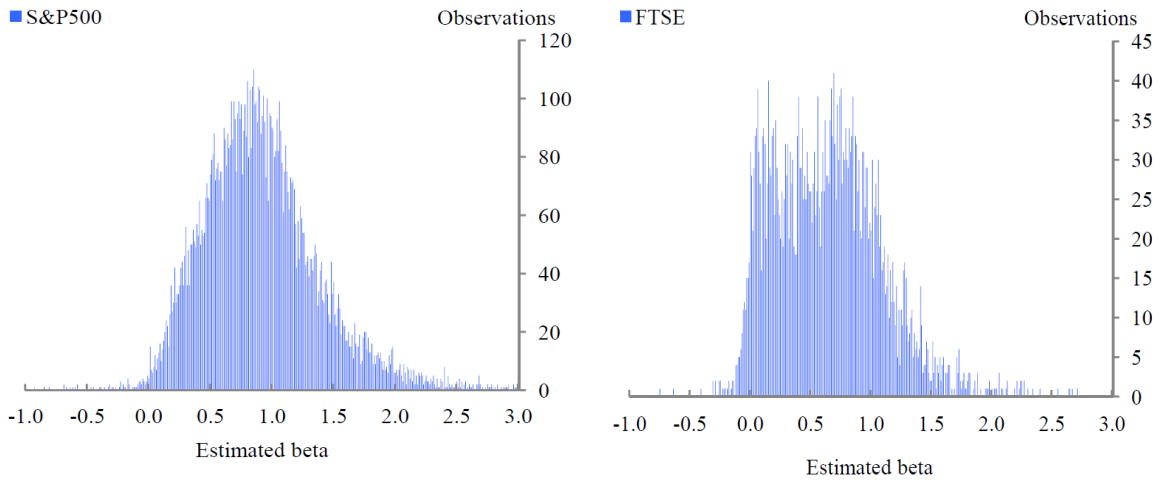

Figure 5.2: Distribution of betas – US and UK

Source: Haldane and Davies (2011)

Haldane and Davies (2011) found that the mean estimated beta for the S&P 500 Index over their study period was 0.91, while the mean estimated beta of the FTSE was 0.63. Compared to the distribution reported in Figure 5.1, these results reveal that the JSE-listed companies included in this study (with a mean beta of 0.645) and the S&P 500 Index and FTSE-listed companies considered in Haldane and Davies's (2011) study are all less volatile than the overall market. Additionally, the estimated betas of both the S&P 500 Index and FTSE companies were positively skewed, where the majority of the data points fell below one. Figure 5.2 also reveals a large degree of variation in the beta estimates of S&P 500 Index and FTSE listed companies, with standard deviations of 0.49 and 0.45, respectively. These results are comparable to the standard deviation of the beta estimates of the current study, where the values were also relatively dispersed with a standard deviation of 0.530.

(b) Debt-to-equity ratio

The second component included in the company-specific risk premium is leverage, which was measured via the debt-to-equity ratio of each company. The debt-to-equity ratio is calculated by dividing a company's total liabilities by its total equity (Damodaran, 2002). The descriptive statistics of the debt-to-equity ratios that were collected for this study are presented in Table 5.4.

Table 3.4: Descriptive statistics for the debt-to-equity ratio

Mean	1.956
Median	0.870
Standard Deviation	4.045
Kurtosis	45.568
Skewness	5.262
Range	82.500
Minimum	-20.780
Maximum	61.720
N	3 577

Table 5.4 indicates a large difference between the mean and median debt-to-equity ratio. The mean debt-to-equity ratio indicates that an average company's capital structure is comprised of 1.956 times more debt than equity. The large range suggests that there is a significant difference between the relatively low minimum value and the relatively high maximum value. The relatively large standard deviation also indicates a wide distribution of observations. Lastly, the positive kurtosis and skewness reveal a curve that is more peaked, with a longer tail on the right-hand side, in comparison to a normal distribution.

(c) Forward risk-free rate

The forward risk-free rate is the final variable included as part of the estimation of the discount rate used to determine the intrinsic value of a share. The forward risk-free rate is the rate of return that an investor could expect to receive on an investment with no default risk, such as Treasury Bills. For this study, the yield on South African government bonds was used, based on data retrieved from the SARB (2019) website.

The descriptive statistics for the forward risk-free rate are presented in Table 5.5.

Table 5.5: Descriptive statistics for the forward risk-free rate

Mean	9.56
Median	8.87
Standard Deviation	3.41
Kurtosis	-68.04
Skewness	64.19
Minimum	4.94
Maximum	16.91
Range	11.97
N	3 577

The mean and median forward risk-free rates over the study period differed marginally. However, the large range reveals that there is a large difference between the relatively low minimum value and the relatively high maximum value. The standard deviation further indicates that the data are somewhat dispersed. The negative kurtosis value indicates a platykurtic distribution, which has a flatter peak and thinner tails in comparison to a normal distribution. Finally, Table 5.5 shows that the data were positively skewed, thereby confirming that the data were not normally distributed.

5.3.2 Descriptive statistics per year

The previous section indicated that the values of the variables included in the study were widely dispersed over the study period. To further investigate the variation among the variables, the average values of the variables were calculated for each year of the study period. The study period was also divided into two ten-year subperiods, representing the first and last ten years of the 20-year study period, respectively. The average values for the variables for both decadal subperiods were also calculated, thereby allowing for further investigation of potential within-period variation.

In this section, annual average values for the variables, as well as the average values for the variables for both decadal subperiods included in the study are presented and discussed. The results are first reported for the variables considered when estimating the expected cash flows associated with investing in a share of a company. Thereafter, the results are presented for the variables that were included in the estimation of the discount rate.

5.3.2.1 Market price, earnings and dividend per share per year

The annual average values of the MPS, EPS and DPS between 1995 and 2014 are indicated in Figure 5.3.

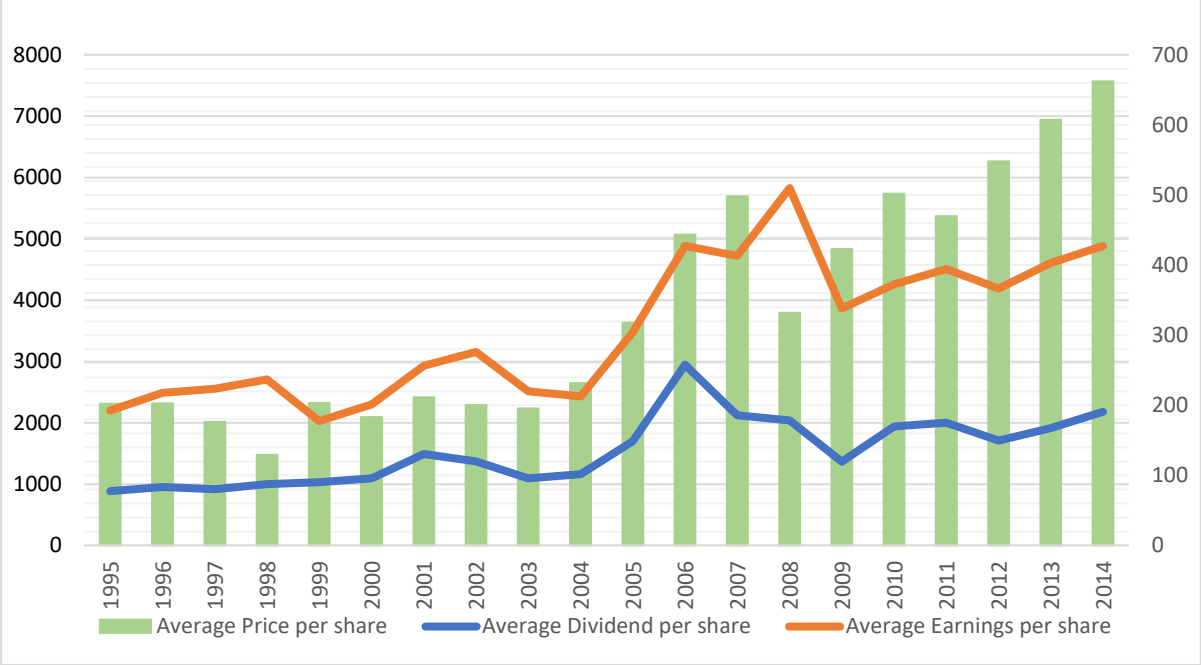

Figure 5.3: Average market price, earnings and dividend per share values per year

Figure 5.3 indicates that the annual average MPS displayed an overall increasing trend over the study period, apart from a decline in value during 2008. Between 2007 and 2008, the annual average MPS dropped in value due to the global financial crisis, where a housing bubble and subprime mortgage crisis in the US led to a global decline in share prices. In order to assess for changes in MPS over time, the study period was also divided into two ten-year subperiods. The average MPS for the first ten years of the study period was 2 215.83 cents, which increased to an average of 5 572.16 cents in the second ten-year period.

In line with the MPS, the annual average EPS also displayed an overall increasing trend over the study period. The average EPS for the first ten years of the study period was 221.49 cents. This average increased to 395.70 cents for the second ten years of the study period. The financial crisis in 2008 also resulted in a sharp fall in the average EPS of sample companies between 2008 and 2009, indicating a decrease in the average amount of earnings that a company made per share. The average DPS for the first ten years of the study period was 69.63 cents and increased to an average of 173.99 cents in the second ten-year period, indicating an increasing trend in the amount of dividends paid out per ordinary share outstanding.

To further investigate the data, the annual average earnings yield, dividend yield and dividend payout ratio over the study period are illustrated in Figure 5.4.

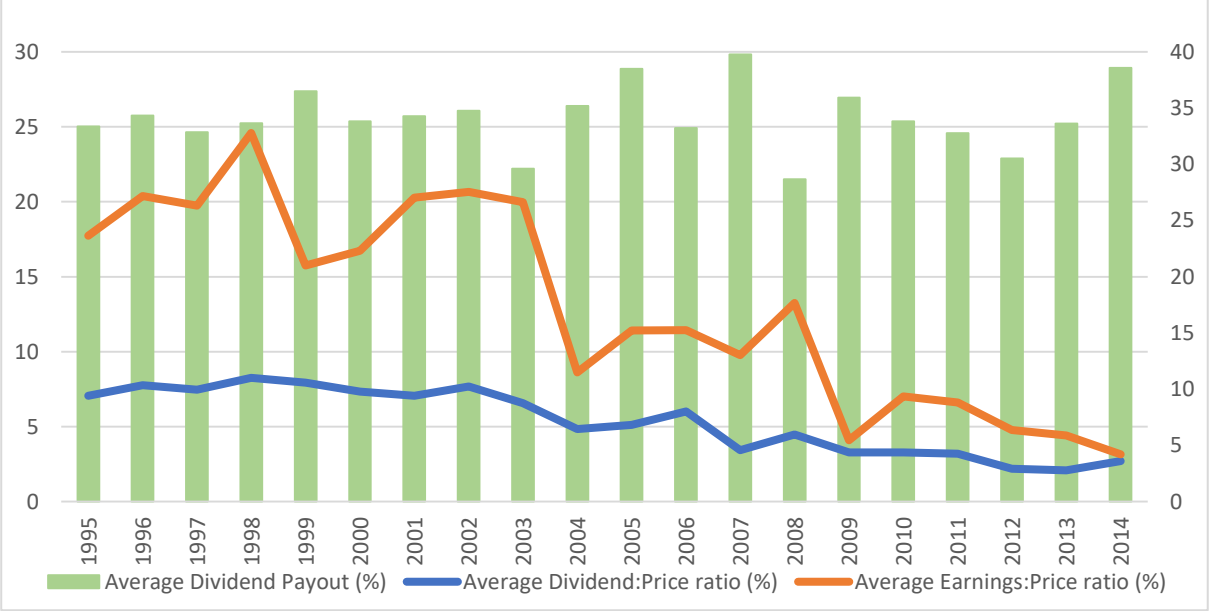

Figure 5.4: Average earnings yield, dividend yield and dividend payout per year

Figure 5.4 reveals that the annual average dividend payout ratio remained relatively consistent over the study period, apart from a decline between 2007 and 2008, once again as a result of the 2008 financial crisis. The average percentage of earnings paid out as dividends by the companies in the sample over the first ten years of the study period was 33.84 per cent. The average dividend payout ratio increased by 0.62 per cent to 34.46 per cent over the second ten-year period.

Figure 5.4 also indicates that the annual average earnings yield of the sample companies decreased over the study period. The average earnings yield over the first ten years of the study period was 18.36 per cent, which decreased to 7.37 per cent over the second ten years. The average dividend yield also decreased over the study period, where an average of 7.18 per cent was recorded over the first ten years of the study period, which decreased to an average of 3.50 per cent over the second half.

5.3.2.2 Beta estimates per year

In this study, the first variable that was used to estimate the company-specific risk premium was a company's beta estimate. The company-specific risk premium was included in the discount rate used to calculate the intrinsic value of a share. Variation in beta estimations over time is thus important as it will influence the fundamental values obtained. The annual average beta estimates for each year of the study period are presented in Figure 5.5.

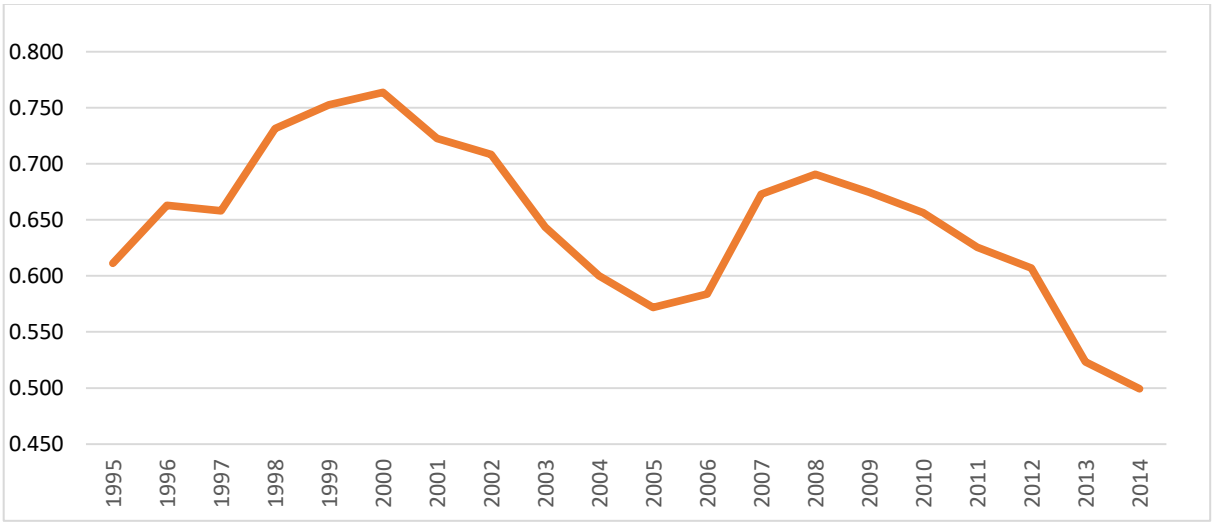

Figure 5.5: Average beta estimates over the study period 1995 to 2014

The figure above shows an overall decreasing trend in beta estimates over the study period. The average beta estimates over the first and second ten-year subperiods differ, where the average beta is 0.686 and 0.607, respectively. Figure 5.5 indicates that the annual average beta estimates decreased after 2000 and again after 2008, possibly as a result of the financial recessions in 2000 and 2008 and subsequent market volatility. The figure also shows that annual average beta estimates were positive and below one, indicating that the companies included in the study had a lower average amount of systematic risk in comparison to the overall market.

5.3.2.3 Debt-to-equity ratio per year

The second variable included in the estimation of the company-specific risk premium is leverage, which was measured by using the debt-to-equity ratio per company. Variation in the amount of debt that is used relative to equity per year is important, as it will influence the discount rate that is used to determine the intrinsic value of a share. The average debt-to-equity ratio for each year of the study period is illustrated in Figure 5.6.

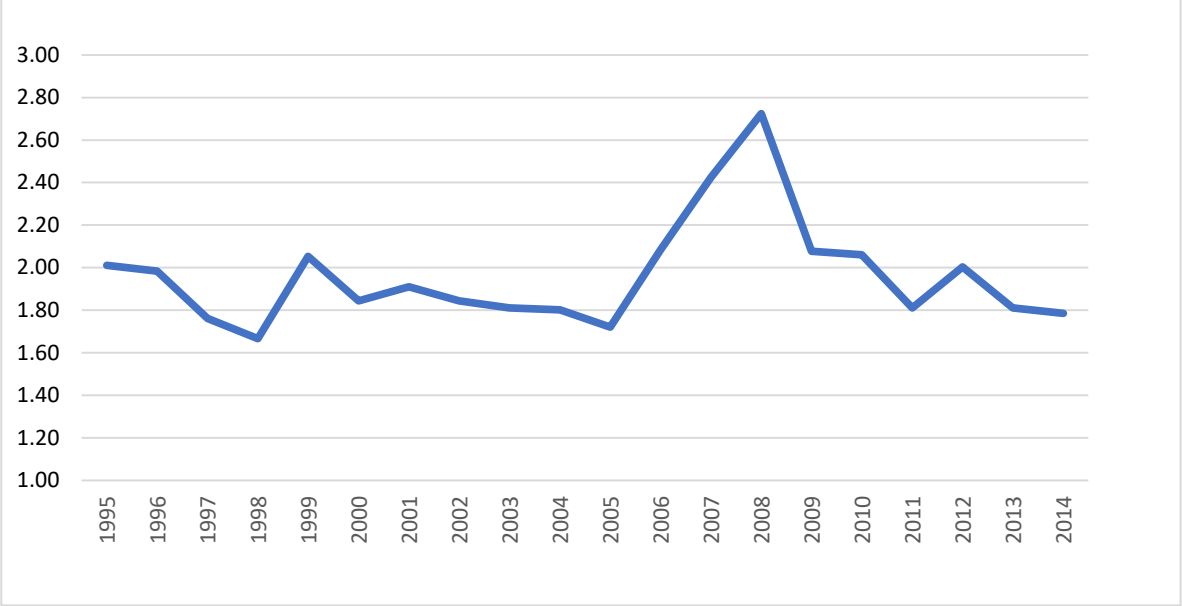

Figure 5.6: Average debt-to-equity ratio over the study period 1995 to 2014

Figure 5.6 reveals that the average debt-to-equity ratio differed significantly between the first and second ten-year subperiods included in the study period. The average debt-to-equity ratio was 1.867 for the first ten-year period and increased to 2.036 in the second ten-year period, indicating that companies had an average of R2.036 in debt for every R1 of equity. Figure 5.6 also shows that the highest average debt-to-equity ratio of 2.72 was observed in 2008, while the lowest average value of 1.67 occurred in 1998.

The period preceding the financial crisis of 2008 was characterised by a substantial increase in leverage in the financial sector and households in the US, which triggered a global increase in securitised and mortgage debt. This increase in debt is also observed in Figure 5.6, where a continuous rise in the debt-to-equity ratio is shown between 2005 and 2008. During this period, the average debt-to-equity ratio increased from 1.72 to 2.72, indicating that the amount of debt to equity increased by 58.14 per cent over the three-year period.

5.3.2.4 Forward risk-free rate per year

The discount rate that was used in this study is the sum of the forward risk-free rate and the company-specific risk premium. The average forward risk-free rate per year over the study period is illustrated in Figure 5.7.

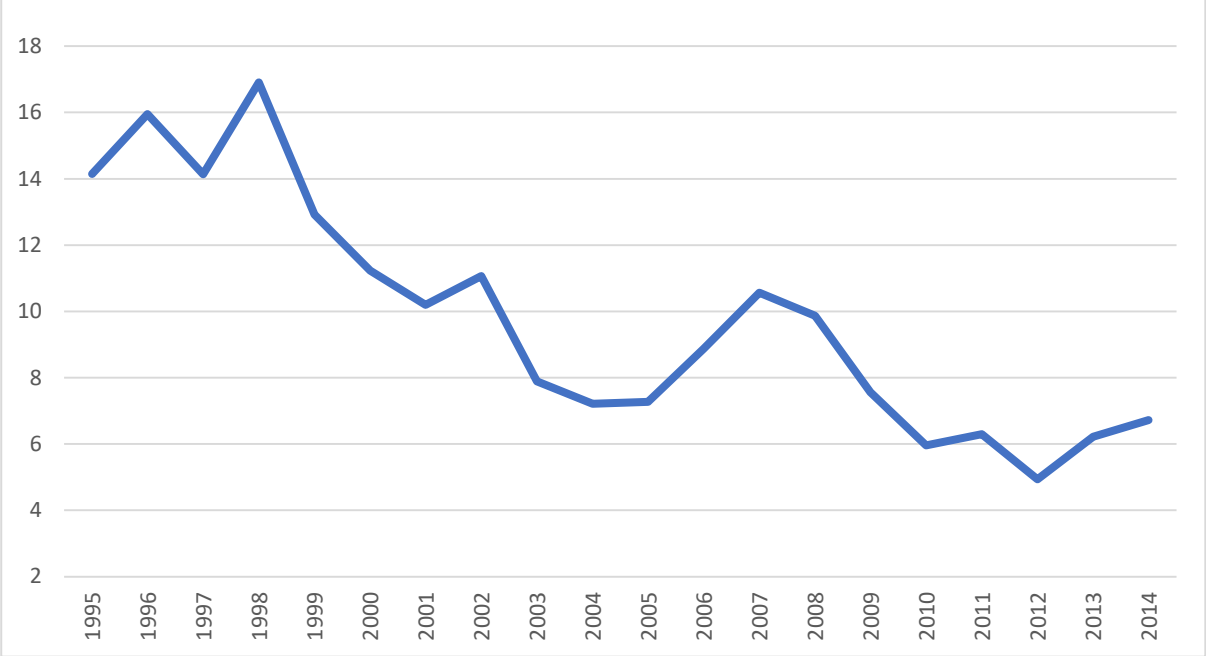

Figure 5.7: Average forward risk-free rate over the study period 1995 to 2014

Figure 5.7 reveals the highest forward risk-free rate of 16.91 per cent in 1998 and the lowest of 4.94 per cent in 2012. The figure also shows that the forward risk-free rate dropped significantly between 2007 and 2010 as a result of the global financial crisis of 2008. In order to observe for any changes over time, the average forward risk-free rate over the first and second ten-year period was also determined. The average forward risk-free rate over the first ten years of the study period was 12.2 per cent. This average declined to 7.4 per cent over the second ten-year period of the study, reflecting a decreasing trend. From a CAPM perspective, lower forward risk-free rates may lead to lower required rates of return, where the pressure for the market risk premium to increase relative to the forward risk-free rate is reduced (Bodie, Kane and Marcus, 2014).

5.3.3 Descriptive statistics per JSE sector

The previous two sections indicated that there is a high degree of variation among the variables included in the total sample, as well as for each year of the study period. To further investigate the variation among the variables, the average values for the variables included in the study were determined for the JSE sectors individually, thereby allowing for a comparison between average variables at a sector level.

The average values of the variables included in the study for each of the sectors that make up the JSE are presented in this section. Firstly, the results are reported for the variables included in the estimation of the expected cash flows associated with investing in a share of a company. Thereafter, the results of the variables that were included as part of the estimation of the discount rate are presented.

5.3.3.1 Average dividend, earnings and market price per share per JSE sector

The average DPS, EPS and MPS values per JSE sector are indicated in Table 5.6.

Table 5.6: Average dividend, earnings and market price per sector

	Basic materials	Cons goods	Cons services	Financial	Health	Industrial	Oil gas	Technology	Telecom	Overall
Number of observations	669	424	599	755	85	738	23	182	102	3577
DPS	277.31	187.18	88.88	116.85	22.05	78.26	1.81	35.39	183.04	137.38
EPS	601.24	351.44	206.12	291.13	121.68	207.34	-4.27	139.84	359.00	313.25
MPS	7351.62	4845.22	2905.39	3308.75	2670.04	2281.30	412.65	3736.48	4296.44	3983.61

Table 5.6 reveals that the basic materials sector had the highest average DPS (277.31 cents), EPS (601.24 cents) and MPS (7 351.62 cents). The basic materials sector includes companies involved in mining, forestry, chemical and metal production. South Africa has a relatively large supply of raw materials and many of the companies listed in the basic materials sector are large, established and already have the infrastructure required to undertake expeditions and generate a return to investors. The sector is also a significant contributor to the energy supply in South Africa, where coal remains the largest form of energy, contributing 28 per cent of the mining revenue in 2019 (PwC, 2019).

Conversely, the oil and gas sector had the lowest average DPS (1.81 cents), EPS (-4.27 cents) and MPS (412.65 cents). The oil and gas sector contributed only 18 per cent to the South African energy supply in 2021 (Timm, 2021). An increasing trend away from oil and gas as energy sources is further expected as more renewable energy sources are adopted domestically, thereby reducing the return on investment for oil production (Halsey and Schubert, 2017).

To further investigate the differences in earnings and dividends between sectors, the average earnings yield, dividend yield and dividend payout ratio per sector are illustrated in Figure 5.8.

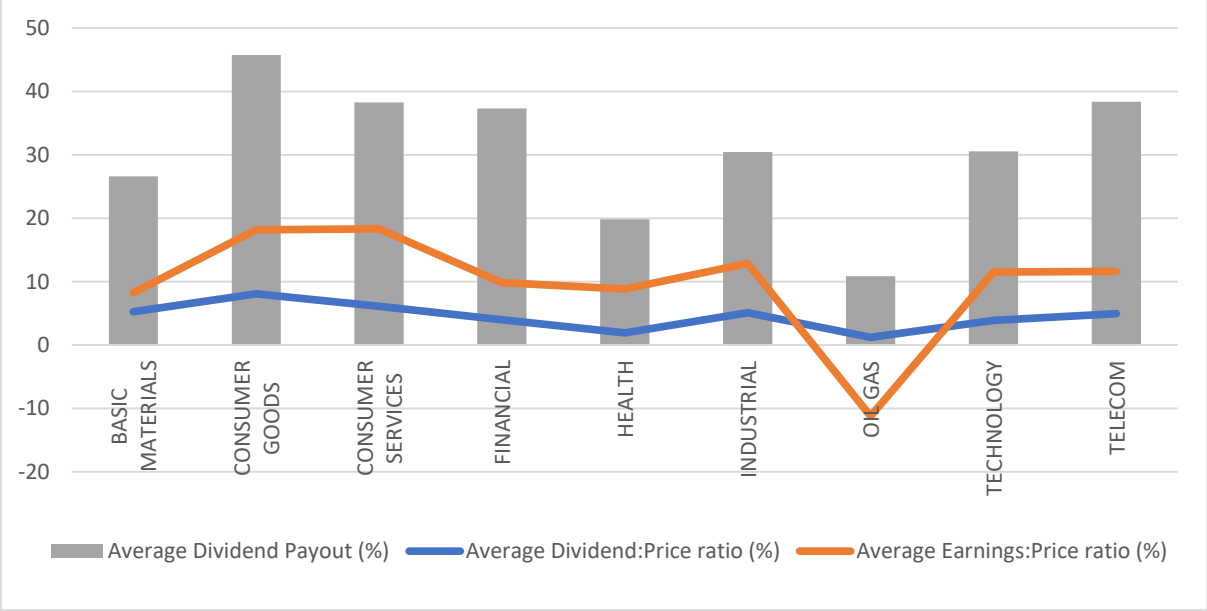

Figure 5.8: Average earnings yield, dividend yield and dividend payout ratio per sector

Figure 5.8 shows that the consumer goods sector had the highest average dividend payout ratio and a dividend yield of 45.78 per cent and 8.11 per cent, respectively. In global markets, the consumer goods sector has shown to be more resilient to economic volatility in comparison to other manufactured products, where the low-cost nature of the goods and high inventory turnover rates allow for relatively consistent earnings (KPMG, 2020). In line with the results illustrated in Figure 5.8, Nyere and Wesson (2019) found that among JSE-listed companies from 1999 to 2014, companies in the consumer services and consumer goods sectors had the highest probability of paying dividends.

Figure 5.8 reveals that the oil and gas sector had the lowest average dividend payout ratio, indicating that companies in this sector paid an average of only 10.87 per cent of their net income to their shareholders. The oil and gas sector also experienced the lowest average earnings yield (-11.21 per cent) and dividend yield (1.2 per cent) over the study period. Halsey and Schubert (2017) argued that the oil and gas sector in South Africa is experiencing a decline as a result of aging and highly polluting oil refineries (exceeding the SO_2 emission limit stipulated by the World Health Organisation (WHO)). The authors also state that South Africa has sufficient renewable and non-renewable energy resources, apart from oil and gas. The majority of oil is thus imported, exposing companies in the sector to exchange rate losses. Additionally, domestic gas reserves are almost depleted, and the majority of South Africa's gas requirements (around 75 per cent) are now being imported.

5.3.3.2 Average debt-to-equity ratio and beta estimates per JSE sector

To investigate the leverage and volatility of each of the JSE sectors, the average debt-to-equity ratio and beta estimates per sector over the study period are illustrated in Figure 5.9.

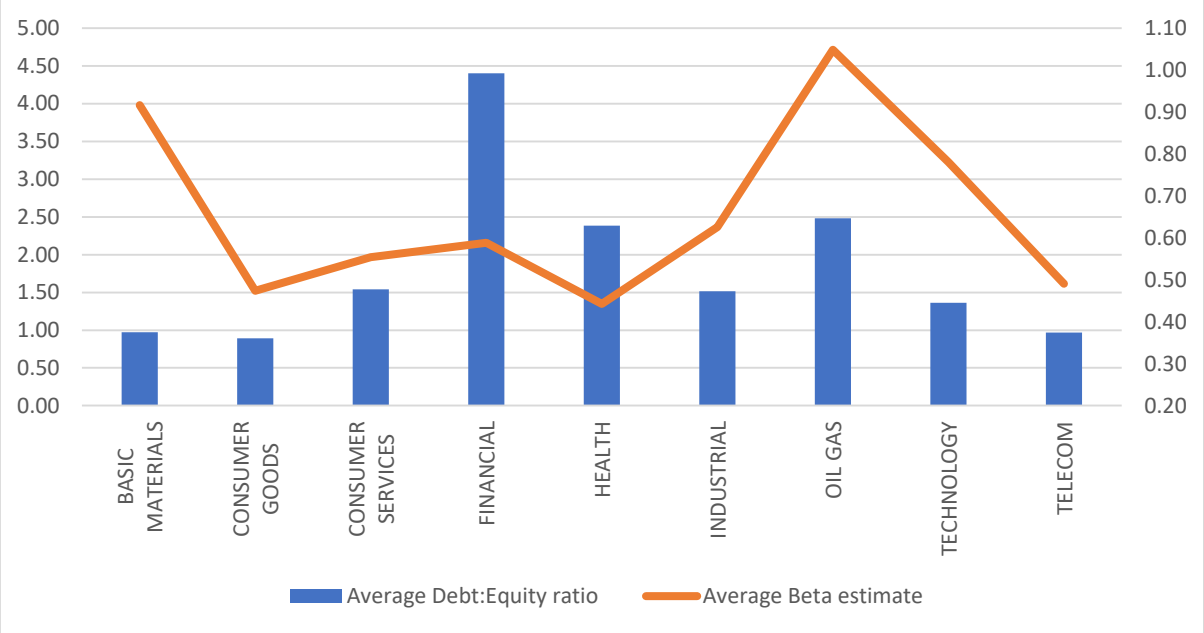

Figure 5.9: Average debt-to-equity ratio and beta estimates per sector

Figure 5.9 shows that the oil and gas sector had the highest average beta estimate of 1.05, indicating that the sector had the largest degree of systematic risk compared to the market as a whole. The oil and gas sector had the second-highest debt-to-equity ratio, revealing that oil and gas companies used an average of R2.48 in debt for every R1 of equity. The financial sector had the highest average debt-to-equity ratio of 4.40. However, companies operating in the financial sector are commonly characterised by high leverage ratios that are not necessarily correlated to their level of risk.

The descriptive results provided an overview and description of the basic characteristics of the data that was collected for the purposes of this study. In the following section, the results of the inferential analyses that were used to directly address the study's research objectives are provided.

5.4 INFERENTIAL RESULTS

The results of the inferential analysis are presented in this section. In this study, the GMM (Hansen, 1982) estimation method was used to address the study's research objectives by estimating the model developed by Davies *et al*. (2014) to test for short-termism.

Before the results of the regression analyses are presented, the results of three diagnostic tools first need to be indicated. These diagnostic tests were used to determine the suitability of the estimation method by considering the endogeneity of the independent variables and the appropriateness of the instrument variables. Once the results of the diagnostic tests indicated that the estimation method was suitable, the results of the regression analyses are presented.

The rest of this section is structured as follows. Firstly, the results of the three diagnostic tests are presented (Section 5.4.1). Thereafter, the results of the regression analyses that were conducted over the full study period (Section 5.4.2.1) and the two decadal sub-samples are provided (Section 5.4.2.2). The results of the regression analyses that were conducted for each year of the study period are then explained (Section 5.4.2.3). Finally, the results of the regression analyses that were conducted on a sectoral basis are presented (Section 5.4.2.4).

5.4.1 Diagnostic test results

In this study, the GMM estimation method employed required that some of the independent variables are replaced with instrument variables. The instrument variables used must be correlated with the study's endogenous independent variables while remaining independent of company-specific excess forecasting errors (Lynch and Brown, 2011). It is therefore important to determine whether the independent variables are indeed endogenous and if the instrument variables used are suitable.

In the following sub-sections, the results of the Wu-Hausman test that was employed to test the endogeneity of the independent variables are provided (Section 5.4.1.1), followed by the results of the Sargan test, which was used to test for over-identifying restrictions in a statistical model (Section 5.4.1.2). Lastly, the results of the Cragg-Donald test that was used to test for weak instruments are presented (Section 5.4.1.3). The results of these three diagnostic tests are presented for the full period (1995–2014), and the two decadal subperiods (1995–2004; 2005–2014) investigated in the study.

5.4.1.1 The Wu-Hausman endogeneity test

The Wu-Hausman test is used to test for the presence of endogeneity by comparing ordinary least squares (OLS) estimates to instrument variables estimates. The test is often used to decide whether to use an instrument variable analysis or the OLS estimation method (Guo, Kang, Cai and Small, 2016). The Wu-Hausman test entails the statement of a null hypothesis of no statistically significant difference between the OLS and instrument variable estimates. The test is in the form of an *F*-test, with the value of the first degree of freedom (df1) referring to the number of endogenous variables included in the model. If the associated *p*-value is less than the α-value of 0.05, the null hypothesis is rejected. This indicates that the independent variables are endogenous, and the use of instrument variables is therefore justified. The results of the Wu-Hausman test for the full study period are indicated in Table 5.7.

Table 5.7: Results of the Wu-Hausman test for the full period (1995–2014)

Diagnostic test	df1	df2	Test statistic	*p*-value
Wu-Hausman test for endogeneity	6	3 561	193.267	0.000

Table 5.7 reveals that the Wu-Hausman statistic of 193.267 has an associated *p*-value of 0.000. The test statistic was compared to the *F*-critical value of 2.101 for six and 3 561 degrees of freedom at the *p*-value of 0.05. The test statistic of 193.267 thus exceeds the *F*-critical value of 2.101. Therefore, the null hypothesis is rejected ($p<0.05$), indicating that the independent variables are endogenous. The use of instrument variables is thus justified.

The Wu-Hausman test statistic was also determined for each of the two decadal sub-samples within the study period. In Table 5.8, the results of the Wu-Hausman test for each of these decades are presented.

Table 5.8: Results of the Wu-Hausman test for the two decades

Panel A: 1995–2004				
	df1	**df2**	**Test statistic**	***p*-value**
Wu-Hausman test for endogeneity	6	1 677	39.928	0.000
Panel B: 2005–2014				
	df1	**df2**	**Test statistic**	***p*-value**
Wu-Hausman test for endogeneity	6	1 868	103.041	0.000

Table 5.8 indicates that the sub-samples representing the first and second decade of the study period have Wu-Hausman statistics of 39.928 and 103.041, respectively. The test statistics for both decades have associated *p*-values of 0.000. Focusing on Panel A, the test statistic reported was compared to the *F*-critical value of 2.104 for six and 1 677 degrees of freedom at the *p*-value of 0.05. The test statistic of 39.928 thus exceeds the *F*-critical value, indicating that the null hypothesis is rejected ($p<0.05$), and that the independent variables are endogenous during the first decade of the study period.

Similarly, the results reported in Panel B were interpreted by comparing the test statistic to the *F*-critical value of 2.103 with six and 1 868 degrees of freedom at the *p*-value of 0.05. The Wu-Hausman statistic of 103.041 thus exceeds the *F*-critical value. Therefore, the null hypothesis is rejected ($p<0.05$), indicating that the independent variables included in the final decade of the study period are also endogenous.

5.4.1.2 Sargan's test of overidentifying restrictions

The Sargan (1958) test is often used to test the validity of over-identifying restrictions in a statistical model. The test statistic has an χ_2 (Chi-squared) distribution with the degrees of freedom equal to the number of overidentifying restrictors (Paxton, Hipp and Marquart-Pyatt, 2011). The Sargan test

entails the statement of a null hypothesis that the overidentified instruments are exogenous. If the α-value of 0.05 exceeds the determined *p*-value, the null hypothesis is rejected. Rejection of the null hypothesis would indicate that the excluded instrument variables are invalid and should not be included in the regression model. The results of the Sargan test of overidentifying restrictions for the full study period are indicated in Table 5.9.

Table 4.9: Results of the Sargan test for the full study period (1995–2014)

Diagnostic test	**df**	**Test statistic**	***p*-value**
Sargan's test of overidentifying restrictions	9	11.689	0.231

From Table 5.9, it can be seen that the Sargan test statistic of 11.689 has a *p*-value of 0.231. In the model employed for the current study, a total of 15 instrument variables were included to account for the six endogenous independent variables. The degrees of freedom value of nine reported in Table 5.9 thus refers to the number of instrument variables in excess of the number of endogenous variables included in the model. Considering the χ_2-critical value of 16.9 obtained for nine degrees of freedom at the *p*-value of 0.05, the reported test statistic of 11.689 does not exceed the χ_2-critical value. Therefore, the null hypothesis was not rejected ($p>0.05$), indicating that the extra instruments are valid and including them in the model is thus justified.

To determine whether the extra instruments included in the study are valid during both decades covered by the study period, the Sargan test was also conducted for each of the study's two decadal sub-samples. The results of the Sargan test for each decade are indicated in Table 5.10.

Table 5.10: Results of the Sargan test for the two decades

Panel A: 1995–2004			
	df	**Test statistic**	***p*-value**
Sargan's test of overidentifying restrictions	9	14.009	0.122
Panel B: 2005–2014			
	df	**Test statistic**	***p*-value**
Sargan's test of overidentifying restrictions	9	11.918	0.218

As seen in Table 5.10, the Sargan test statistics reported in Panel A and B are 14.009 and 11.918, respectively. The *p*-value reported in Panel A is 0.122, and 0.218 in the case of Panel B. The test statistics for both decadal sub-samples were compared to the χ_2-critical value of 16.9 with 9 degrees of freedom at the *p*-value of 0.05. Neither of the test statistics exceeded this χ_2-critical value. Based on the results reported in both Panels A and B, the null hypotheses are therefore not rejected ($p>0.05$), indicating that the extra instruments are valid during both decades of the study period.

5.4.1.3 Cragg-Donald weak instruments test

The Cragg-Donald weak instrument test is often used to evaluate the overall strength of the instrument variables included in a statistical model (Sanderson and Windmeijer, 2016). The test can be used to determine if any of the instrument variables are weakly correlated with the model's endogenous regressors. The Cragg-Donald test evaluates the null hypothesis that at least one of the instrument variables is weak. The test is in the form of an *F*-test, with the value of the first degree of freedom (df1) referring to the number of instrument variables included in the model. The *p*-value for the test statistic is compared to the study's α-value of 0.05. If the α-value of 0.05 exceeds the *p*-value, the null hypothesis is rejected. Rejection of the null hypothesis would indicate that none of the instruments is weak. The results of the Cragg-Donald test for the full study period are indicated in Table 5.11.

Table 55.11: Results of the Cragg-Donald test for the full study period (1995–2014)

Diagnostic test	df1	df2	Test statistic	*p*-value
Weak instruments: $E_t(D_{jt+1})$	15	3 558	15.012	0.000
Weak instruments: $E_t(D_{jt+2})$	15	3 558	9.452	0.000
Weak instruments: $E_t(D_{jt+3})$	15	3 558	8.264	0.000
Weak instruments: $E_t(D_{jt+4})$	15	3 558	7.638	0.000
Weak instruments: $E_t(D_{jt+5})$	15	3 558	5.901	0.000
Weak instruments: $E_t(P_{jt+5})$	15	3 558	12.736	0.000

Table 5.11 reveals that the Cragg-Donald test statistics for $E_t(D_{jt+1})$ to $E_t(D_{jt+5})$, as well as the test statistic for $E_t(P_{jt+5})$, all have *p*-values of 0.000. Each of the test statistics reported exceeds the *F*-critical value of 1.669 for 15 and 3 558 degrees of freedom at the *p*-value of 0.05. The null hypothesis is thus rejected ($p<0.05$), indicating that none of the instrument variables is weak. The use of these instrument variables in the study's regression model is thus justified.

The strength of the instrument variables employed in the study's model were also tested for each of the study's decadal sub-samples. In Table 5.12, the results of the Cragg-Donald test for each of the two decades covered by the study period are indicated.

Table 5.12: Results of the Cragg-Donald test for the two decades

Panel A: 1995–2004				
	df1	**df2**	**Test statistic**	***p*-value**
Weak instruments: $E_t(D_{jt+1})$	15	1 674	7.626	0.000
Weak instruments: $E_t(D_{jt+2})$	15	1 674	8.929	0.000
Weak instruments: $E_t(D_{jt+3})$	15	1 674	7.698	0.000
Weak instruments: $E_t(D_{jt+4})$	15	1 674	6.641	0.000
Weak instruments: $E_t(D_{jt+5})$	15	1 674	2.707	0.000
Weak instruments: $E_t(P_{jt+5})$	15	1 674	10.600	0.000
Panel B: 2005–2014				
	df1	**df2**	**Test statistic**	***p*-value**
Weak instruments: $E_t(D_{jt+1})$	15	1 865	8.086	0.000
Weak instruments: $E_t(D_{jt+2})$	15	1 865	5.534	0.000
Weak instruments: $E_t(D_{jt+3})$	15	1 865	5.349	0.000
Weak instruments: $E_t(D_{jt+4})$	15	1 865	5.198	0.000
Weak instruments: $E_t(D_{jt+5})$	15	1 865	4.963	0.000
Weak instruments: $E_t(P_{jt+5})$	15	1 865	6.889	0.000

Table 5.12 reveals that, during both decades of the study period, the Cragg-Donald test statistics for $E_t(D_{jt+1})$ to $E_t(D_{jt+5})$, as well as the statistic for $E_t(P_{jt+5})$, yielded *p*-values of 0.000. To assess the strength of the instrument variables during the first decade, an *F*-critical value of 1.672 with 15 and 1 674 degrees of freedom at the *p*-value of 0.05 was determined. All the test statistics in Panel A exceed this *F*-critical value. Similarly, an *F*-critical value of 1.672 with 15 and 1 865 degrees of freedom at the *p*-value of 0.05 was also determined. All the test statistics reported in Panel B once again exceed this *F*-critical value. The null hypothesis is thus rejected for both decadal sub-samples ($p<0.05$). During both decades, none of the instrument variables employed are thus considered weak.

The results of the diagnostic tests reported in this section, therefore, reveal that the independent variables included in the current study's model are endogenous, confirming that they should be replaced with instrument variables. The instrument variables employed to replace the endogenous variables were determined to be valid, as they are not correlated with the model's error term. Finally, it was found that none of the instrument variables included in the study are weak. The inclusion of the instrument variables in the model is thus justified and the regression model employed in the study is considered suitable. The results obtained from the model are reported in the following section.

5.4.2 Regression analysis

Regression analysis is a technique that could be used to determine the relationship between the dependent variable and independent variable(s) included in a study. The value of the dependent variable can be predicted in response to a change in the independent variable(s) (Coldwell and Herbst, 2004). The two main types of regression analysis distinguish between simple and multiple regressions. A simple regression analysis determines the relationship between a dependent variable and only one independent variable. A multiple regression analysis evaluates the influence of multiple independent variables on the value of the study's dependent variable (Zikmund *et al*., 2013).

In this study, multiple regression analyses were conducted to test the relationship between the study's dependent variable (i.e. the price per share) and four sets of independent variables (i.e. expected future dividends, expected future share prices, gearing and beta estimates). The dataset for this study consisted of panel data and included exogenous, endogenous and instrument variables. The GMM estimation method was used to test for short-termism by estimating the regression model proposed by Davies *et al*. (2014):

$$\hat{P}_{jt} = \sum_{i=1}^{5} \frac{E_t(D_{jt+i})\hat{x}^i}{(1+r_{t1}+\pi_{jt})^i} + \frac{E_t(P_{jt+5})\hat{x}^5}{(1+r_{t1}+\pi_{jt})^5} \qquad \textbf{Eq. 5.1}$$

A confidence interval of 95 per cent was used to determine whether any significant relationship exists between the study's dependent and independent variables.

In the rest of this section, the results obtained from the regression analyses are offered as follows. The estimation results for the full study period are presented first, followed by the results for the two decadal sub-samples. Thereafter, annual estimates of the regression coefficients are provided. Lastly, the estimation results for individual sectors are indicated.

5.4.2.1 Regression analysis conducted over the full study period (1995–2014)

The GMM estimation method was first employed for the entire sample, covering the full study period. Pooled data covering all companies included in the sample from 1995 to 2014, representing a total of 3 577 company-year observations over the 20-year study period, were considered. In Table 5.13, the regression coefficients obtained by using the GMM estimation method are provided.

Table 5.13: Estimation results for the full period (1995–2014)

		Estimate	Standard Error	*t*-value	*p*-value
Constant	$\hat{\alpha}_0$	4.439 *	0.166	2.669	0.008
β_{jt}	$\hat{\alpha}_1$	0.119 *	0.036	1.981	0.048
Z_{jt}	$\hat{\alpha}_2$	-0.010	0.012	-0.332	0.740
Short-termism parameter	$\hat{x}$	0.988 *	0.036	2.160	0.031

Note: * reflects statistical significance at the 5% level

Table 5.13 indicates that the regression coefficients obtained for the constant and beta were both statistically significant using a 95 per cent confidence interval. The regression coefficient for gearing, however, was found not to be statistically significant.

The estimate of 0.988 for short-termism reported in Table 5.13 is less than one, with an associated p-value below the α-value of 0.05. This estimate is thus statistically significant below unity, thereby indicating that short-termism is observed for the full period. This result is comparable to studies done by Davies *et al.* (2014), Miles (1993) and Chou and Guo (2004), who investigated the presence of short-termism in the UK and US.

Davies *et al.* (2014) conducted a study to test for short-termism in both the UK and US between 1980 to 2009. Their sample included 624 companies listed on the UK FTSE and US S&P 500 Index. The authors tested for the presence of short-termism in this sample by using a nonlinear two-stage least square estimation method and found evidence of short-termism. The results of their study also revealed that the degree of short-termism increased during the study period, where eight of the nine years where short-termism was found to be significant occurred in the final decade of the study period.

Miles (1993) investigated the presence of short-termism in the UK market from 1975 to 1989. The author's sample included 477 non-financial companies chosen from the EXSTAT database. Similar to Davies *et al.* (2014), the nonlinear two-stage least squares estimation method was used to test for the presence of short-termism in the sample. The results of the study indicated evidence of short-termism, where the discount rates that were applied to longer-term cash flows were approximately double the rates that were applied to shorter-term cash flows. The degree of short-termism exhibited was also found to have increased during the study period, with investors displaying the highest degree of short-termism from 1983 to 1989.

The existence of short-termism in the NYSE was investigated by Chou and Guo (2004). The sample for their study consisted of 735 non-financial companies between 1980 and 1989. The GMM estimation method was employed to test for short-termism. The results of the regression analysis indicated that there is statistically significant evidence of short-termism for each year of the study period. However, no increasing or decreasing trend could be identified over the nine-year study period.

In order to investigate any within-period variation in the current study, regression coefficients were also determined when distinguishing between the two ten-year subperiods contained within the overall study period. The results of these analyses are indicated in the following section.

5.4.2.2 Regression analysis conducted on the two decadal sub-samples

All observations included in the full sample were subdivided into two sub-samples, reflecting the decades 1995 to 2004 and 2005 to 2014. The sub-samples covering the first and the second decade included 1 693 and 1 884 company-year observations, respectively. The GMM estimation method was used to determine the regression coefficients for the variables included in the current study's model, and the results for the two decadal sub-samples are provided in Panel A and Panel B of Table 5.14 respectively.

Table 5.14: Estimation results for the two decades (1995–2004; 2005–2014)

Panel A: 1995–2004		**Estimate**	**Standard Error**	***t*-value**	***p*-value**
Constant	$\hat{\alpha}_0$	4.545 *	1.491	3.049	0.002
β_{jt}	$\hat{\alpha}_1$	-0.045	0.091	-1.710	0.087
Z_{jt}	$\hat{\alpha}_2$	0.065	0.173	0.725	0.469
Short-termism parameter	$\hat{x}$	1.028	0.049	1.634	0.102
Panel B: 2005–2014		**Estimate**	**Standard Error**	***t*-value**	***p*-value**
Constant	$\hat{\alpha}_0$	1.119	4.008	0.279	0.780
β_{jt}	$\hat{\alpha}_1$	0.174 *	0.136	2.844	0.004
Z_{jt}	$\hat{\alpha}_2$	-0.024	0.194	-0.366	0.714
Short-termism parameter	$\hat{x}$	0.953 *	0.062	2.375	0.018

Note: * reflects statistical significance at the 5% level

Panel A of Table 5.14 reveals that during the first decade of the study period, the only regression coefficient that is statistically significant using a 95 per cent confidence interval is reported for the constant. Results for the second decade of the study period reported in Panel B of Table 5.14 indicate that the regression coefficients for beta and short-termism are statistically significant.

The results of the regression analysis reveal that the short-termism parameter is above unity for the first decadal sub-sample. A value greater than one for $\hat{x}$ indicates that long-termism was observed during that decade. This implies that shareholders displayed moderate discounting in the first half of the study period. However, the coefficient was found not to be statistically significant.

For the second decadal sub-sample, the short-termism parameter is below unity and statistically significant, thereby indicating that investors' preferences became increasingly myopic over the latter part of the study period. The simple average of $\hat{x}$ across the two decades is close to one (0.990). These results echo the outcome of a study by Davies *et al.* (2014), who, employing a similar regression model, found that the value of $\hat{x}$ declined from 1.001 in the first decade of their study, to 0.938 in the final decade. Miles (1993) followed a similar quantitative model and found that the

parameter measuring short-termism in the UK was below one in every year (except 1981) over the study period, and became statistically significant in the final seven years of the study.

The results presented in Table 5.14 thus reveal that the value of $\hat{x}$ differed between the first and second decade of the study period, indicating that the discount rates applied to the cash flows varied over the period. The results of the regression analyses used to determine the estimates of the company risk premium and discount rates are indicated in the following section.

5.4.2.3 Average estimated company risk premium and discount rates

The average estimated company risk premium and discount rates were determined for the full period, as well as for each of the study's decadal sub-samples. These values were calculated based on the estimated coefficients from the pooled regressions, together with the mean values of beta, gearing and the risk-free rate over the respective periods. The results of these calculations are indicated in Table 5.15.

Table 5.15: Estimated discount rates

	$\hat{\propto}_1$	$\bar{\beta}_{jt}$	$\hat{\propto}_2$	$\bar{Z}_{jt}$	**Average company risk premium** $\bar{\pi}_{jt} = \hat{\propto}_1 \bar{\beta}_{jt} + \hat{\propto}_2 \bar{Z}_{jt}$	**Average risk-free rate** $\bar{r}_{t1,t+i}$	**Average discount rate** $(1 + r_{t1,t+i} + \pi_{jt})$
Full period	0.119	0.645	-0.010	1.960	5.74%	9.80%	15.30%
1995–2004	-0.045	0.686	0.065	1.700	8.99%	12.17%	21.06%
2005–2014	0.174	0.607	-0.024	2.040	5.65%	7.43%	12.95%

Table 5.15 reveals that the coefficient for beta is negative in the first decade of the study period. In terms of results reported by Friend *et al*. (1976), the negative relationship between beta and the risk premium indicates that from 1995 to 2004, uncertainty over future inflation mattered to investors and equities were perceived to be a good inflation hedge. During the same decade, the coefficient for gearing was positive, indicating that investors perceived uncertainty over future interest rates to be important. An increase in the level of debt held by a company during this decade might thus result in an increase in the company risk premium.

The degree to which investors perceived shares as a hedge against inflation varied over the study period. The coefficient for beta became positive in the second decade of the study period, indicating that uncertainty over future inflation did not affect investors' required rate of return. The impact of gearing on the risk premium also changed between the first and second decade of the study. In the second decade, the relationship between the company risk premium and gearing became negative. A negative α_2 indicates that investors did not perceive uncertainty over future interest rates to be significantly important and an increase in gearing might thus not result in a higher risk premium (Merton, 1973).

The average discount rate was 21.06 per cent over the first decade and decreased to 12.95 per cent in the second decade. The difference in the average discount rate between the two decades can be ascribed largely to the significant decrease in the average forward risk-free rate over the study period. Figure 5.7 indicates that, between 2007 and 2010, the risk-free rate declined considerably, again as a result of the global financial crisis that occurred in 2008.

Table 5.15 reveals that there are notable differences in the value of the estimates when comparing the first and second decades of the study period. In the following section, the results of the regression analyses are presented for each year of the study period to investigate these changes in greater detail.

5.4.2.4 Regression analyses conducted for each year of the study

To further investigate any within-period variation, annual regression coefficients over the study period were also determined. In Table 5.16, the results of the GMM estimation method employed to estimate the annual regression coefficients are presented.

Table 5.16: Estimation results for each individual year

Year	Short-termism $\hat{x}$	Constant $\hat{\alpha}_0$	β_{jt} $\hat{\alpha}_1$	Z_{jt} $\hat{\alpha}_2$	Firm-year observations
1995	1.117 * (0.100)	7.900 (6.451)	0.045 (0.022)	-0.077 (0.042)	157
1996	0.922 (0.070)	-6.265 (7.925)	0.048 (0.038)	-0.020 (0.035)	159
1997	0.901 (0.013)	-7.232 (19.698)	0.061 (0.064)	0.136 (0.072)	162
1998	0.987 (0.011)	-3.773 (1.104)	0.014 (0.055)	0.046 (0.030)	168
1999	0.975 * (0.026)	30.875 (1.294)	-0.033 (0.058)	0.122 (0.143)	174
2000	1.018 (0.076)	5.422 (3.745)	0.084 (0.032)	0.154 (0.103)	180
2001	1.022 (0.011)	8.179 (6.782)	0.079 (0.026)	-0.017 (0.077)	166
2002	1.091 (0.017)	9.640 (8.826)	-0.030 (0.023)	-0.018 (0.109)	170
2003	0.894 * (0.015)	37.090 (12.460)	-0.012 (0.017)	-0.015 (0.031)	178
2004	0.876 * (0.023)	18.610 (10.109)	-0.039 (0.010)	-0.013 (0.037)	179
2005	0.936 * (0.020)	38.229 (12.093)	-0.134 (0.018)	0.187 (0.085)	172
2006	0.926 * (0.024)	24.480 (10.064)	-0.071 (0.017)	0.164 (0.071)	173
2007	0.959 * (0.019)	13.325 (9.876)	-0.128 (0.027)	0.198 (0.126)	170
2008	0.967 * (0.010)	-7.509 (10.734)	0.052 (0.041)	0.104 (0.087)	174
2009	1.015 (0.022)	-2.656 (15.164)	0.104 (0.058)	0.150 (0.220)	175
2010	0.974 * (0.022)	-1.305 (9.387)	0.112 (0.047)	0.082 (0.148)	186
2011	0.987 * (0.020)	4.584 (7.912)	0.058 (0.037)	-0.014 (0.118)	205
2012	0.924 * (0.018)	25.143 (8.876)	-0.009 (0.066)	-0.017 (0.115)	213
2013	0.984 * (0.016)	21.869 (8.503)	0.040 (0.035)	-0.249 (0.150)	210
2014	0.947 * (0.014)	32.743 (10.187)	0.036 (0.038)	-0.164 (0.176)	206

Notes:

Results shown obtained by using the GMM estimation method

Pooled data covering all firms subdivided into individual years (1995–2014)

(Standard errors in parentheses)

* = Significant using a 95% confidence interval

Mean $\hat{x}$ across the years is 0.971

Table 5.16 reveals that during the first decade of the study period, the short-termism parameters were statistically significant using a 95 per cent confidence interval for only four years, namely 1995,

1999, 2003 and 2004. During the second decade, however, the short-termism parameters were statistically significant for nine of the ten years from 2005 to 2014, with only 2009 not being statistically significant.

When considering the first decade, four of the ten years reflect short-termism parameters exceeding a value of one. Only in 1995, however, was the regression coefficient statistically significant above unity, suggesting that investors exhibited long-termism. In the remaining six years of the first decade, estimates below one are reported. The value of $\hat{x}$ was statistically significant below unity for three of these years, indicating investor myopia. During the second decade, only one year yielded an estimate above one but was not statistically significant. The remaining nine years all reflect statistically significant values below unity, pointing to the continued presence of meaningful levels of investor myopia during this decade.

The mean value of $\hat{x}$ across all the years is 0.971. Table 5.16, however, highlights important within-period variation. Out of the 13 years that the coefficient for $\hat{x}$ is statistically significant, nine are located in the second decade of the study period. These results reiterate the message derived from Table 5.14. Overall, there appears to be statistically significant evidence of sustained short-termism in the final decade of the study period.

Cosh *et al.* (1990) suggested that the level of investor short-termism exhibited might also be influenced by the return expectations of the sector in which a company operates. In the following section, the results of the regression analyses are presented according to the individual sectors.

5.4.2.5 Regression analyses conducted for individual sectors

To determine the possible occurrence of short-termism on a sectoral basis, the regression coefficients were also estimated by categorising companies according to the sector in which they operate. The regression analyses were only conducted for companies listed in the basic materials, financial, industrial and consumer services sectors. For the remaining sectors, problems in terms of insufficient observations being available were experienced, resulting in the exclusion of these sectors. In Table 5.17, the results obtained using the GMM estimation method for each of the four sectors are presented.

Table 6.17: Estimation results per sector

Panel A: Basic Materials					
Period	**Short-termism** $\hat{x}$	**Constant** $\hat{\alpha}_0$	$\boldsymbol{\beta_{jt}}$ $\hat{\alpha}_1$	$\boldsymbol{Z_{jt}}$ $\hat{\alpha}_2$	**Firm-year observations**
1995–2004	0.903 * (0.063)	7.369 (4.215)	0.115 * (0.051)	-0.028 (0.021)	325
2005–2014	0.879 * (0.056)	9.695 * (5.704)	0.060 * (0.029)	-0.163 (0.104)	344
All years	0.896 * (0.025)	8.901 (5.805)	0.107 * (0.085)	0.134 * (0.067)	669
Panel B: Financial					
Period	Short-termism $\hat{x}$	Constant $\hat{\alpha}_0$	$\boldsymbol{\beta_{jt}}$ $\hat{\alpha}_1$	$\boldsymbol{Z_{jt}}$ $\hat{\alpha}_2$	Firm-year observations
1995–2004	0.989 * (0.078)	-12.031 * (4.756)	-0.078 (0.083)	-0.399 * (0.009)	309
2005–2014	0.879 * (0.063)	-8.049 * (1.774)	-0.194 (0.006)	-0.009 (0.006)	446
All years	0.981 * (0.063)	-11.917 * (2.853)	0.069 (0.044)	0.018 * (0.087)	755
Panel C: Industrial					
Period	Short-termism $\hat{x}$	Constant $\hat{\alpha}_0$	$\boldsymbol{\beta_{jt}}$ $\hat{\alpha}_1$	$\boldsymbol{Z_{jt}}$ $\hat{\alpha}_2$	Firm-year observations
1995–2004	1.031 (0.035)	-1.173 (6.321)	0.116 * (0.027)	-0.010 (0.016)	358
2005–2014	0.986 * (0.063)	19.530 (6.244)	0.042 * (0.022)	-0.056 (0.068)	380
All years	0.989 * (0.047)	4.896 (2.359)	0.088 * (0.074)	-0.133 (0.155)	738
Panel D: Consumer Services					
Period	Short-termism $\hat{x}$	Constant $\hat{\alpha}_0$	$\boldsymbol{\beta_{jt}}$ $\hat{\alpha}_1$	$\boldsymbol{Z_{jt}}$ $\hat{\alpha}_2$	Firm-year observations
1995–2004	0.988 * (0.069)	-5.317 * (1.343)	-0.117 (0.020)	-0.155 (0.014)	303
2005–2014	0.971 * (0.055)	9.469 (2.884)	0.090 (0.022)	0.117 (0.028)	296
All years	0.973 * (0.047)	-1.157 * (3.606)	0.130 * (0.031)	-0.073 (0.078)	599

Notes:

The results shown were obtained by using the GMM estimation method.

Only estimated for firms listed in the basic materials, financial, industrial and consumer services sectors; other sectors experienced problems in terms of their data.

(Standard errors in parentheses)

* = Significant using a 95% confidence interval

Mean $\hat{x}$ across the sectors is 0.960

Table 5.17 indicates that for the full period, the short-termism parameters for the four applicable sectors were statistically significant using a 95 per cent confidence interval. Apart from the first decade for the industrial sector, the results reveal that both decades of the remaining three sectors were characterised by a significant degree of short-termism.

Table 5.17 furthermore reveals that the value of $\hat{x}$ decreased across all the applicable sectors from the first decade to the second, thereby reiterating the results reported in Table 5.14 and Table 5.16 where short-termism was also observed to be an increasing phenomenon. The value of $\hat{x}$ for the full period is 0.896 for the basic materials sector, revealing that investors in this group exhibited the highest degree of short-termism among the applicable sectors. This result is comparable to the findings of Davies *et al.* (2014), that in the UK and US, investors in the materials sector (where $\hat{x}$ = 0.875) also exhibited the highest levels of short-termism among the seven sectors considered in their study. Given that South Africa has an established mining industry that contributes significantly to the country's total export revenue, myopic preferences in the long-term basic materials sector could threaten the sustainability of a major sector in the local economy.

The second highest degree of short-termism was observed in the consumer services sector, followed by the financial and industrial sectors, respectively. McCallion and Warner (2010) argued that sectors that require large initial investments, such as basic materials, are characterised by long-term return horizons, while sectors with lower capital demands, such as consumer services, might receive payments over the shorter term. Cosh *et al.* (1990) proposed that the level of short-termism exhibited by an investor is formed according to the expected pay-back period of an investment group. However, the results presented in Table 5.17 suggest that South African investors do not distinguish between long and short-term sectors when forming return expectations, as investors in the long-term basic materials sector displayed a higher degree of short-termism in comparison to investors in the shorter-term consumer services sector.

5.5 SUMMARY

In this chapter, the researcher aimed to investigate the presence of short-termism in South Africa by employing the GMM estimation method to estimate the regression model developed by Davies *et al*. (2014). The regression model was used to determine the relationship between the price per share and four sets of independent variables, namely the expected future dividends, expected future share price, gearing and beta estimates.

Descriptive statistics were employed to summarise and describe the basic characteristics of the data collected from the sample. Inferential analyses were then used to directly address the study's research objectives. The results of the Wu-Hausman test revealed that the independent variables included in the model were endogenous. Therefore, the endogenous variables were replaced with instrument variables. The results of the Sargan test indicated that the extra instrument variables included were valid and including them in the regression model was thus justified. The results of the Cragg-Donald test indicated that none of the instrument variables included in the model was weak. The use of these instrument variables in the regression analyses was therefore justified.

The results obtained using the GMM estimation method over the entire sample revealed that the short-termism estimate was statistically significant below unity. Short-termism was thus observed for the full sample over the period 1995 to 2014. The results of the GMM estimation method conducted on the two decadal sub-samples and for each year of the study furthermore indicated that the degree of short-termism increased during the study period. Finally, the GMM estimation method was conducted for individual sectors. The results of these regression analyses indicated that investors in the basic materials sectors displayed the highest degree of short-termism over the study period.

In the following chapter, conclusions are drawn and recommendations are offered, based on the results presented in this chapter.

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The assumptions of traditional finance theory have been described as an “abstraction from reality” (Ball, 2009:12). The current study revealed that these assumptions cannot fully explain empirical market patterns, where observed market anomalies suggest that shares do not follow a random walk. It was also indicated in the literature reviews that researchers (Simon, 1957; Kahneman, 2003) challenged the traditional assumption that investors are rational agents and suggested that individuals might be prone to heuristics and biases when making investment decisions. The current study was based on research conducted by Haldane and Davies (2011), Miles (1993) and Chou and Guo (2004), who found evidence of short-termism in the US and UK. Furthermore, the degree of short-termism was found to differ over time and between certain industrial sectors (Haldane and Davies, 2011).

If a large number of investors exhibit short-termism in the local context, managers of JSE-listed companies might be pressurised into reaching quarterly targets while underinvesting in long-term value-generating projects. Additionally, higher degrees of short-termism at a sector level might be particularly destructive in local industries characterised by long-term capital requirements. The current study, therefore, aimed to investigate short-termism among South African investors, as well as to determine whether myopic tendencies differed between periods and sectors.

The rest of this chapter consists of six sections. The first section provides an overview of the study (Section 6.2). In the second section, the conclusions that are based on the literature reviews and the empirical results are discussed (Section 6.3). The third section presents the reconciliation of the research objectives (Section 6.4). The fourth section consists of several recommendations that are made based on the results of the study (Section 6.5). The fifth section indicates the limitations of the current study, as well as suggestions for future research (Section 6.6). The final section offers some concluding remarks on the study (Section 6.7).

6.2 OVERVIEW OF THE STUDY

The primary objective of the current study was to investigate investor short-termism in South Africa between 1995 and 2014. This objective was addressed by employing the multiple regression model suggested by Davies *et al.* (2014) to determine if there was a difference between intrinsic and actual share prices, where short-termism was assumed to account for any differences between expectations and reality.

A descriptive research strategy was followed, where the financial variables that were relevant to the study were identified and their nature and characteristics determined. A positivistic paradigm was adopted, where the researcher followed a formalised research method to objectively collect and measure the identified financial variables. Accordingly, a quantitative research approach was employed, which involved the collection of numerical data from the IRESS (2020) database and the website of the South African Reserve Bank (SARB, 2019). These quantitative data were then used to empirically test the study's hypotheses via statistical analysis.

A non-random judgement sampling method was employed and resulted in a sample including companies that had been listed on the JSE from 1995 to 2014. The final sample consisted of 280 companies over the 20-year study period, providing a total of 3 577 company-year observations. Both descriptive and inferential statistics were used to analyse the data collected from the sample. The descriptive analysis was used to conduct an elementary analysis of the data. The inferential analysis was used to make inferences about the population and involved the use of multiple regression analyses, where the relationship between the study's dependent and independent variables was investigated using the GMM estimation method. The following two sections provide a discussion of the main findings of the literature review and empirical data analyses.

6.3 CONCLUSIONS BASED ON THE LITERATURE REVIEW AND EMPIRICAL RESULTS

Conclusions based on the literature review covering the main themes, namely the assumptions of traditional finance theory, market anomalies, heuristics and short-termism are first presented. Thereafter, the conclusions drawn from the empirical results are discussed.

6.3.1 Conclusions based on the literature review

The fundamental value of a company is determined by using present-value analysis, where the future cash flows that the company is expected to generate are discounted back to the present. The discount rate that is used to discount the future cash flows should reflect the risk that the investment might present. The CAPM is frequently used to determine the shareholders' required rate of return and is based on the assumptions of traditional finance theory, where investors are rational and accurately forecast future earnings and discount rates. However, the CAPM only accounts for market risk and the assumptions on which the model is based have been criticised (Ward and Muller, 2012; Abbas *et al.*, 2011). Alternative asset pricing models have thus been developed, such as the FF3 model, the Carhart four-factor model, the FF5 and the APT. Pratt (2002) contended that the univariate CAPM remains more widely used in comparison to the APT, while Cochrane (2005) argued that the FF3 model is often used as an alternative to CAPM.

However, the large number of market anomalies suggest that the CAPM, FF3 model, Carhart four-factor model, FF5 model and the APT might not accurately determine shareholders' required rate of return. Some of the market anomalies that have been identified include excess volatility (Shiller, 1979), share price overreaction and underreaction (Frank, 2004), the weekend effect (Cross, 1973), the neglected firm effect (Arbel *et al.*, 1983) and the equity premium puzzle (Mehra, 2006). Ferguson (2008) argued that humans might not make rational utility-maximising decisions, as assumed in traditional finance theory, and proposed that one of the fundamental reasons for the inherent instability of financial markets is human behaviour. Research has shown that humans are prone to employing heuristics and behavioural biases to simplify financial decision-making, where emotion is used to make fast judgements and reduce mental effort (Gigerenzer,1991; Kahneman, 2011). Some of the most widely researched heuristics include the affect heuristic, availability heuristic, representativeness heuristic and the anchoring heuristic. Established literature has revealed that the use of heuristics commonly manifests in errors or biases during decision-making (Tversky and Kahneman, 1974).

Short-termism was identified as a behavioural bias that has a role in both investor and managerial decision-making. Short-termism refers to the tendency of individuals to value rewards that are received immediately more highly than those received at a future point in time (Rappaport, 2011). Myopic tendencies were found to arise from the limbic system, which was activated when participants in a study chose to receive rewards immediately instead of delaying to a future point in time (McClure *et al.*, 2004). The possible impact of short-termism on asset valuation models was also highlighted. When exacerbated by the effects of herding, a large number of myopic investors might overvalue short-term expected cash flows and thereby cause shares to be overvalued relative to their intrinsic value (Haldane and Davies, 2011).

Researchers (Walker, 2010; Aoki and Saxonhouse, 2000) have reported that myopic investors might pressurise and incentivise management to make decisions that provide higher short-term returns. To satisfy myopic investors, managers might engage in real earnings management to meet quarterly targets, for which managers are then rewarded. Managerial incentive schemes that are structured around short-term share performance might also encourage myopic decision-making. Bryan *et al.* (2000) highlight that share-based compensation is often used as a way to link management's performance to the market price of the company's shares. An unintended drawback of share-based compensation is that management might try to increase the market price of the company's shares over the short-term by pursuing high-risk strategies or by underinvesting in long-term projects, thereby having a negative impact on future cash flows and the sustainability of the company (Sappideen, 2011).

Haldane and Davies (2011) found that, in the UK and US, investors in the materials sector exhibited a higher level of short-termism when compared to investors in the consumer sector, suggesting that myopic preferences might not be limited to sectors with short-term investment horizons. Researchers (Della Croce *et al*., 2011) argued that institutional investors also exhibit myopic tendencies, where herd-like behaviour by large-scale capital providers contributes to short-term return expectations. Short-term preferences might thus be particularly destructive in the South African economy which is characterised by well-developed pension funds, an established mining sector and a need for infrastructure development, which all require long-term capital investments.

The literature review conducted for the purposes of this study confirmed that short-termism is a bias that is frequently displayed during intertemporal decision-making. Specifically, myopic preferences have been identified during financial decision-making, where cash flows received sooner are valued more highly than those received at a later point in time. Therefore, the researcher followed the model suggested by Davies *et al.* (2014) to investigate short-termism in the local context.

6.3.2 Conclusions based on the empirical results

To address the study's research objectives, numerous statistical tests were employed. The GMM estimation method was used to estimate the multiple regression model developed by Davies *et al*. (2014) to test for short-termism. Before the regression analyses were conducted, three diagnostic tests were employed to assess whether the estimation method used was suitable. The diagnostic tests considered the endogeneity of the independent variables and whether the instrument variables used were appropriate. This section provides the conclusions for each statistical test.

6.3.2.1 Conclusions based on diagnostic test results

The Wu-Hausman test is in the form of an *F*-test and was used to determine whether the independent variables included in the study are endogenous (Montgomery and Runger, 2018). The test was conducted over the full study period, as well as for both of the study's decadal sub-samples. The Wu-Hausman test statistics for the full period and each decade covered by the study exceeded the *F*-critical values. The null hypotheses of the tests were thus rejected, indicating that the independent variables included for the full period, as well as during each decade of the study, are endogenous. The results of the Wu-Hausman tests, therefore, indicated that the independent variables are not exogenous, and these were therefore replaced with instrument variables.

The Sargan (1958) test is in the form of an χ_2 (Chi-squared) test and was used to assess the validity of over-identifying restrictions in the statistical model. The test was conducted over the full study period and for each of the study's two decadal sub-samples. The Sargan test statistics for the full period and two decades did not exceed the χ_2-critical values. The null hypotheses of the tests were thus not rejected, indicating that the excluded instrument variables are appropriately independent of

the model's error term. These results revealed that the extra instrument variables are valid over the full study period, as well as during both decades covered by the study.

The Cragg-Donald test was used to evaluate the strength of the instrument variables included in the study (Cragg and Donald, 1993). The test is in the form of an *F*-test and was used to determine whether any of the instrument variables are weakly correlated with the model's endogenous regressors. The Cragg-Donald test was conducted for the full study period, as well as for each of the study's two decadal sub-samples. The Cragg-Donald test statistics for the full period and both decades exceeded the *F*-critical values. The null hypotheses of the tests were thus rejected, revealing that none of the instrument variables employed are considered weak. The inclusion of the instrument variables in the study's regression model was thus justified.

6.3.2.2 Conclusions based on the results of the regression analyses

The short-termism estimate that was determined using the GMM estimation method was statistically significant below unity over the full study period. This result reveals that over the 20-year study period, investors in JSE-listed companies undervalued cash flows received at a future point in time. The regression analyses were also conducted on the two decadal sub-samples contained within the overall study period. The results indicated that the degree of short-termism exhibited by investors differed between the two decades included in the study. The value of the short-termism estimate decreased from 1.028 in the first decade of the study period, to 0.953 in the second ten-year period. These results revealed that investors displayed moderate discounting during the first decade but became increasingly myopic over the final decade of the study.

To further investigate any within-period variation, the short-termism estimates were also determined using the GMM estimation method for each individual year of the study. The results of the regression analyses indicated that the degree of short-termism exhibited by investors increased during the 20-year study period, where nine of the 13 years that the short-termism estimates were statistically significant occurred in the second decade of the study. These results thus indicated that investors continually undervalued future cash flows during the final decade of the study period.

The results of the regression analyses conducted on companies listed in the basic materials, financial, industrial and consumer services sectors indicated that investors in these investment groups displayed significant levels of short-termism during the study period. The degree of short-termism exhibited was also found to have increased across all four sectors during the second decade of the study. The results also indicated that investors did not consider the nature of sectors when they formed their return expectations, as investors in the long-term basic materials sector displayed the highest levels of short-termism during the study.

6.4 RECONCILIATION OF THE RESEARCH OBJECTIVES

In Table 6.1, it is indicated that all the research objectives of the current study were addressed. References to the relevant sections in the study are also offered.

Table 6.1: Reconciliation of the research objectives

Secondary objectives	How objectives were addressed	Reference in study
To establish whether short-termism is exhibited by South African investors for the period 1995 to 2014.	South African investors exhibited a significant degree of short-termism over the study period.	Sections 1.2.2.1, 3.6, 4.9.2.6 and 5.4.2.1
To assess whether the degree of short-termism differs between sectors for the period 1995 to 2014.	The degree of short-termism differed between the sectors included in the study.	Sections 1.2.2.1(c), 3.6.3 and 5.4.2.4
To determine whether the degree of short-termism changes over time for the period 1995 to 2014.	There is statistically significant evidence that the degree of short-termism exhibited by South African investors increased during the final decade of the study period.	Sections 5.4.2.2 and 5.4.2.3

The null hypothesis (i.e. $\hat{x} = 1$) of the study was thus rejected. The value of $\hat{x}$ for the full sample was statistically significant below unity, indicating that short-termism was observed (Section 5.4.2.1).

6.5 RECOMMENDATIONS

Based on the main findings, recommendations for reducing short-termism are offered for several stakeholders, including managers, investors and government.

6.5.1 Recommendations for managers

The recommendations offered to managers are presented in this section. The recommendations focus on a company's corporate culture, reporting and communication, executives' remuneration, the participation rights of shareholders, and the degree of managerial stability in a company.

6.5.1.1 Corporate culture

The Aspen Institute (2007) suggested that a company's management should adopt a corporate culture that facilitates and promotes sustainable long-term value creation. The institute has identified three factors that are fundamental in developing a long-term orientation within a company, namely forward-looking metrics, communications (explained in Section 6.5.1.2) and compensation (explained in Section 6.5.1.3). The forward-looking metrics should focus on, inter alia, the productivity and retention of human capital, innovation and new product developments, stakeholder relationships and a high standard of ethical and legal conduct. Similarly, Kurznack and Timmer (2019) identified R&D spending (the ratio of total R&D spending to total annual revenue), a company's total investments (ratio of capital expenditure to total annual revenue), talent retention (ratio of employees who remained at a company during a book year compared to the start of the

book year) and the amount spent on marketing and customer experience (CX) (ratio of total marketing and CX spent to total annual revenue) as forward-looking indicators that can be used to measure the long-term orientation of a company. Management is encouraged to identify and implement forward-looking metrics that are relevant to the company's long-term strategy. The identified metrics should then be used as a measure of the company's long-term performance and be linked to incentives that reward managers for creating long-term value.

6.5.1.2 Reporting and communications

To reduce the perceived pressure from investors and financial intermediaries on management to deliver short-term results, Willey (2019) argued that quarterly reporting of financial performance should be discouraged. Reporting every quarter is suggested to promote excessive short-term focus, where managers may feel pressurised to consistently generate positive short-term results to meet the expectations of myopic shareholders. In addition to quarterly reporting periods, it is suggested that the content of reports might be too focused on short-term considerations. The increasing frequency with which information is released into the market might also make it challenging for investors and institutional investors to discern the information required to determine if a company is meeting its long-term objectives. To improve the content of company reports and shift the focus to long-term value creation, Cox (2013) suggested that reports should include a description of the company's long-term strategy and the actions that are being taken towards achieving previously declared long-term objectives. He also argued that company reports should include a description of corporate actions and investments made in pursuit of achieving stated long-term objectives. Willey (2019) added that in addition to financial measures of performance, reports should also emphasise environmental, social and corporate governance (ESG) criteria and corporate social responsibility (CSR) factors.

6.5.1.3 Remuneration and performance assessment

Short-termism might be reduced by incentivising executives to emphasise long-term value creation. The board of directors (BOD) can structure executive remuneration schemes in a way that links compensation to the long-term performance of the company. Olesinski, Opala, Rozkrut and Toroj (2014) suggested that boards should incorporate long-term incentive plans or deferred compensation arrangements into remuneration schemes. The vesting periods of long-term incentives should be long enough to encourage executives to make decisions that support sustainable long-term value creation during their tenure. The Investment Leaders Group (2016) suggest that long-term remuneration schemes be structured to link the vesting period of share-based compensation to the performance of forward-looking metrics such as the return on invested capital. The group also recommends including cash bonuses that are based on three-year performance periods, vesting periods for share-based remuneration that are more than three years, and requiring

managers to make a material long-term investment in the company by buying and holding shares for at least ten years. In contrast, share-based remuneration with vesting periods that are too short might encourage short-term behaviour, where executives attempt to increase the share price in the short term and subsequently sell their holdings before the value of the share declines over the long term.

Williamson, Koller and Babcock (2020) suggested that adding qualitative criteria to the performance assessment of executives might also assist in incentivising sustainable decision-making. The authors argue that assessing executives based on the quality and execution of the company's long-term strategy, the quality of the management team and the long-term orientation of the corporate culture could encourage long-term value creation. Finally, The Aspen Institute (2007) argued that companies should fully disclose in clear language all compensation paid to executives, the compensation philosophy of the company and the forward-looking performance targets that are used to promote sustainable long-term value.

6.5.1.4 Shareholder participation rights

Haldane and Davies (2011) suggested that management could offer enhanced shareholder participation rights to long-term investors to incentivise longer holding periods. The Aspen Institute (2009) recommended that a company's management adopt a policy that requires shareholders to have held their shares for a minimum period to be eligible to vote in annual shareholder meetings. Time-based share vesting is also suggested as a way in which management can enhance participation rights for long-term shareholders, where the rights to participate become available to a shareholder over or after a set period. The US Securities and Exchange Commission (2009) proposed that shareholders be required to hold their shares for a minimum of one year to be eligible to nominate a directorial candidate for election. The commission also proposed that for a shareholder to have their nominees included in the proxy materials, shareholders should be required to sign a statement that proclaims their intent to continue to hold their shares in the company.

6.5.1.5 Managerial stability

Research has shown that longer CEO tenures are conducive to higher investment in projects that perform well over the long term, which, in turn, increases the long-term value of the company. The BOD is thus encouraged to consider longer CEO contracts. The results of a study conducted by Olesinski *et al*. (2014) revealed that an increase in the length of CEO tenure has a positive influence on a company's profitability and market capitalisation. However, literature has indicated that the average length of a CEO's contract is shortening, as well as the intervals between periodic performance evaluations. CEOs are thus incentivised to prioritise short-term outcomes, as a large portion of their performance assessment is dependent on meeting short-term targets. A

consequence of this short-term focus is underinvestment in long-term projects, as the initial investment required might result in a short-term deterioration in financial indicators and the share price. Olesinski *et al*. (2014) thus highlighted that management stability is an important factor in contributing to long-term value creation, where longer CEO contracts are correlated to higher investment outlays in the company.

6.5.2 Recommendations for investors

Recommendations offered to investors are presented in this section. The recommendations consider active ownership and investor beliefs and mandates as mechanisms to reduce short-termism.

6.5.2.1 Active ownership

Atherton, Lewis and Plant (2007) argued that shareholders should act like long-term owners by increasing their holding periods, trading less and engaging in stewardship activities that encourage executives to focus on long-term value creation. The Investment Leaders Group (2016) contends that by exercising stewardship, shareholders can strengthen their ability to enhance long-term value by holding executives accountable and influencing decision-making on issues of sustainability. The United Nations Principals for Responsible Investing (UNPRI) (2019) advocated for active ownership and stated that it offers the most direct platform from which investors can influence companies and economies and thereby indirectly impact society as a whole. The UNPRI (2019) highlighted the importance of shareholders advocating for ESG issues, as these factors, in turn, influence the long-term performance of companies and investment portfolios.

6.5.2.2 Investor beliefs and mandates

Investors are encouraged to assert their beliefs about the importance of long-term investments and sustainability to the BOD to encourage executives to make decisions that are in line with their long-term interests. The Investment Leaders Group (2016) stated that investment beliefs with a focus on sustainability are likely to include, inter alia, themes about the importance of long holding periods of ESG investments, not making short-sighted investment decisions in response to market fluctuations and considering that share prices will likely return to their fundamental values over the long-term. Investment mandates might also be used to encourage sustainable, long-term investment management. By exercising stewardship, shareholders can communicate their preference for long-term investment strategies by providing executives with a mandate to prioritise sustainable investment decisions. Investors can use investment mandates to define and formalise a long-term investment approach and their relationship with the associated asset managers. An investor mandate can thus be used as a legal contract to align asset managers' behaviours with the long-term objectives of investors (Tang and Greenwald, 2016).

6.5.3 Recommendations for government

The recommendations offered to government are explained in this section. Recommendations on taxation treatment, education and fiduciary duties are included.

6.5.3.1 Taxation

Taxation has been suggested as a way in which government could incentivise long-term shareholding or discourage short-term shareholding by both individual and institutional investors in the equities market. The Aspen Institute (2009) has suggested that capital gains tax could be used to reward long-term share ownership by taxing shareholders according to the number of years that a share is held. The authors proposed tapering capital gains tax on shares, where the percentage of tax charged is lower on long-term capital gains relative to short-term capital gains. Cox (2013) suggested that capital gains should be taxed on a descending scale, where a rate of 50 per cent is charged in year one and is thereafter reduced to ten per cent after year ten. The author also proposes that a reduction in dividend tax according to the number of years that a share is held could further incentivise long-term shareholding, where the prevailing income tax rate is applied in year one and decreased to zero per cent after year ten. To encourage long-term investment in smaller companies, Cox (2013) suggested the taper on dividend tax could be reduced to five years for Alternative Investment Market (AIM)-listed companies, or AltX-listed companies in the local context.

He, Jacob, Vashishtha and Venkatachalam (2019) investigated whether an increase in capital gains tax on short-term profits helped to reduce the pressure that myopic shareholders placed on management to prioritise short-term earnings at the expense of investment in R&D. The authors collected data from 30 countries and considered 21 occasions between 1990 and 2006 when countries revised capital gains treatment to distinguish between short- and long-term capital gains tax rates. He *et al*. (2019) found that companies in countries that increased the tax rate on short-term profits invested more in long-term projects over the study period. The number of patents filed in the US Patent and Trademark Office by countries supplying technology to the US market was used as a measure of R&D investment. The authors considered how the registration of patents by foreign companies in the US was influenced by the capital gains tax treatment in their home countries. The results of the study revealed that about three years after a country increased its short-term capital gains tax rate relative to long-term capital gains, the number of patents registered in the US by the countries considered in the study increased by three per cent annually.

6.5.3.2 Education

The Aspen Institute (2009) highlighted that myopic behaviour is a system-wide bias that is prevalent among market participants, such as corporate managers, providers of capital and pension fund trustees, and at a societal level. Atherton *et al*. (2007) argued that there is a need for greater

awareness of short-termism and the potential consequences of the bias. The authors suggested improving financial education, where basic financial literacy programmes are incorporated into school curriculums. These financial literacy programmes should include short-termism issues, long-term sustainability considerations and relevant value-based metrics, such as the DCF model. Government bodies, such as The Financial Sector Conduct Authority (FSCA) in South Africa, are encouraged to actively promote financial education that includes themes about corporate sustainability in finance and accountancy courses. Research has shown that incorporating topics relating to ESG criteria and long-term value creation into existing educational programmes results in students viewing the topics as more important (Atherton *et al*., 2007).

6.5.3.3 Fiduciary duties

Improved or new laws and regulations on the fiduciary duties of financial intermediaries are suggested as a way to better align the long-term interests of shareholders and society with the interests of institutional investors and other financial intermediaries. The Aspen Institute (2009) recommended that government should require enhanced disclosure on compensation and incentives by financial intermediaries that indicate compatibility with both the funds and investors' long-term goals. In South Africa, the King IV Report provides a voluntary set of corporate governance guidelines to listed companies. The report recommends that a company's remuneration policy should address both short- and long-term incentives and deferred compensation. However, companies are not legally required to comply with the King IV Report's recommendations, as the report is not law.

Cox (2013) argued that government should require that remuneration packages of both executive and non-executive directors be extended to include adequate long-term incentives. He suggested that regulation should require that a portion of an executive director's remuneration should be deferred, where at least 30 per cent is based on long-term (five-year) results. The Aspen Institute (2009) also argued that government should require that investment advisors adequately consider and advise investors of any tax changes that might be implemented to incentivise long-term holding and penalise short-term investments. Finally, government is encouraged to create regulation that requires that the remuneration of long-term fund managers be based on the fund's long-term performance. The remuneration of long-term fund managers should also be subject to the same disclosure requirements as publicly listed companies.

6.6 LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Several limitations were identified while conducting the current study. The first limitation relates to the number of companies included in the sample. The companies considered included only those that provided the complete dataset for a continuous period of at least 11 years within the timeframe from 1990 to 2019. The relatively long period over which companies were required to present the

data needed for the purposes of this study resulted in survivorship bias, where more financially volatile companies were excluded from the sample. As a result, the considered companies do not represent all the companies that were listed on the JSE over the study period. The findings might therefore not be generalisable to all companies listed on the JSE. Future research on short-termism could consider a greater number of JSE-listed companies to produce more generalisable results.

A second limitation is the relatively small number of listings that characterise some of the sectors of the JSE. The large difference in the number of companies listed across industries resulted in a relatively small number of observations in some sectors. Since small sample sizes could negatively impact the reliability and validity of results, inferential analyses for each of the nine JSE sectors could not be completed. Given the lack of research on short-termism at a sector level, future researchers could investigate investor myopia between sectors in developed markets, such as in the US, UK, Germany and Japan, which are characterised by a significantly higher number of listed companies. Researchers could also compare the degree of short-termism exhibited at a sector level among these developed markets to determine whether differences are driven by sectoral trends, cultural influences or whether they are affected by government policies.

Another limitation identified is that the considered companies for the current study are limited to those that are or have been publicly listed. Future research could investigate the relationship between ownership structure and short-termism, where the degree of myopic preferences is compared between private and publicly listed companies. Research could include an analysis of forward-looking metrics, such as R&D spending, talent retention, and a company's total investments, in private companies and compared to the company-specific factors that are used to create long-term value in public companies.

6.7 CONCLUDING REMARKS

Short-termism is a bias that has played a vital role in the survival and evolution of Homo sapiens by prioritising the immediate consumption of critical resources. The human brain has since evolved, but researchers (McClure *et al.*, 2004) have indicated that myopic preferences might still arise when choosing between intertemporal monetary rewards. Previous studies (Davies *et al.*, 2014; Miles, 1993; Chou and Guo, 2004) have shown that investors in the UK and US displayed short-termism when valuing cash flows received at different points in time. The results of the current study revealed that investors in JSE-listed companies exhibited significant levels of short-termism by overvaluing short-term cash flows. It is important to highlight the impact of myopic preferences on companies and investors, as the disproportionate discounting of an asset's future cash flows might result in market prices deviating from their fundamental values. Additionally, corporate managers who are

pressurised by myopic investors into producing short-term cash flows might fail to build long-term fundamental value, thereby threatening the sustainability of a company.

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