Developing a systematic risk model for JSE listed companies

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DECLARATION

I, **N ROBBETZE**, declare that ***Developing a systematic risk model for JSE listed companies*** is my own work and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references. This thesis has not previously been submitted by me or any other author to any other university.

Signature: _____

Date: 4 November 2022

PROOF OF LANGUAGE EDITING

TAALPRAKTISYN | LANGUAGE PRACTITIONER

10 October 2022

I, Elmarie Viljoen-Massyn, hereby state that I have language edited the thesis *Developing a systematic risk model for JSE listed companies* by N Robbetze.

I am a language practitioner registered at the South African Translators' Institute (member number 1001757) and my highest qualification in this field is an MA Language Practice.

Sincerely,

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NOTES TO THE READER

The reader should take note of the following:

The literature review performed in this thesis is based on a plethora of sources ranging from the 1950s to 2022. This was done to ensure that the most relevant research findings were taken into account and to present as many theories as possible regarding the research topic.

All sources were referenced according to the Harvard style as set out in the 2020 version of the North-West University referencing guide.

This thesis is presented in the thesis format according to the policies of the North-West University.

The following research articles were submitted and accepted for publication in international accredited, peer-reviewed academic journals:

Robbetze, N. & Swanepoel, M.J. 2022. Viability of risk-return trade-off within a South African context. *Journal of Accounting and Investment*, 23(3):413-430.

Robbetze, N. 2023. Evaluating share price behaviour as a dependent of basic earnings per share and dividends per share. *Journal of Applied Business Research*. [Unpublished]. Please refer to Appendix A as proof of journal acceptance.

The following article was submitted, accepted and presented as part of the proceedings of the Social Sciences International Research Conference (SSIRC):

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Please refer to Appendix B to view the abstract.

DEDICATION

I dedicate this thesis to my late grandmother, Ouma Makkie, who passed away in 2021. Although I greatly regret her not being witness to the completion of this thesis, I was fortunate enough to inherit her love of books and her spirit of persistence. Her mantra ‘oefen, oefen, oefen’ (‘practise, practise, practise’) will forever remind me of the importance of perseverance and repetition.

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Compiling a thesis of any sort, is never a simple task. It is a task that cannot be completed successfully without the support of others. With this submission, I would like to sincerely thank the following individuals for their intellectual, emotional and financial investment in this study:

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ABSTRACT

Title: Developing a systematic risk model for JSE listed companies

Key words: Financial management; financial markets; financial returns; JSE; modern portfolio theory; portfolio management; risk-return trade-off; systematic risk; systematic risk model

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Since 1952, the modern portfolio theory (MPT) has dominated academic thought on the estimation of systematic risk. The MPT puts forward that systematic risk and return are positively and linearly interrelated. Although this notion has been widely accepted in financial theory and modelling, researchers have empirically questioned its viability since the 1960s. While the MPT has proven to be scientifically inadequate because it generalises the risk-return trade-off principle, some studies have yielded diverse findings, indicating that the type of market and the type of sample influence the degree to which risk and return are related and/or unrelated. Furthermore, the MPT does not provide explicit details on the quantification of 'systematic risk' or 'return'. This leaves gaps for different interpretations, as users of financial information may quantify these concepts differently, which could, naturally, lead to diverse conclusions.

This study was undertaken to determine whether systematic risk and return are interrelated for a sample of JSE listed companies. It set out to explore whether the assumed association between systematic risk and return has empirical substance from a South African standpoint, and whether other accountancy-related measures are able to better predict behaviour in systematic risk, in relation to sampled South African companies. The primary objective of the study was *to develop a new systematic risk model, which consists of accountancy-related items other than returns, to predict leveraged and unleveraged systematic risk in selected JSE listed companies*

A mixed research methodology was applied, in the form of a triangular mixed research design. Specifically, the study applied a qualitative method (in the form of a systematic review) to seek support for the quantitative models constructed. The research objectives

(both primary and secondary) were fulfilled through the execution of three research stages. The first stage empirically tested the relationship between systematic risk and accountancy-related return measures. It was statistically found that these return measures were not necessarily well associated with systematic risk proxies in the sample of JSE listed companies.

To address this predicament, the second stage of the research process identified alternative measures which associate with systematic risk. These alternative measures were quantitatively modelled by applying multiple regression analysis. Stage 2 of the research found that aspects such as liquidity, cash flow per share, market value added, gearing, debt to assets, price to book value, price to net assets and return on external investments could predict both leveraged and unleveraged systematic risk in sampled companies.

The third stage of the research process was undertaken to seek qualitative validation for the empirical findings of the study. This was done by qualitatively analysing similar research in order to explore whether previous studies could confirm the empirical findings. This means that other researchers have also observed similar patterns in the execution of their statistical analysis. Qualitative analysis was applied through systematic reviewing of peer-reviewed research articles published in accredited academic journals.

This thesis contributes to financial theory by reminding the reader that generalised financial theories should not necessarily be accepted as gospel. Systematic risk is a complex concept and there is no ‘one-size-fits-all’ definition to enable the user to comprehend it. Users of financial statements will need to do on-going research in order to keep track of how systematic risk and its behaviour change under different circumstances, over different time spans and in different markets. Where financial managers and stock brokers adopt the risk-return trade-off oblivious of scientific and empirical findings, systematic risk and its estimation may not be tracked in a manner that is helpful to the investor. Ultimately, only statistical analysis can reflect the true state of systematic risk behaviour within a given time frame.

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LIST OF ABBREVIATIONS

APT	:	Arbitrage pricing theory
CAPM	:	Capital asset pricing model
CF	:	Cash flow
CR	:	Current ratio
DA	:	Debt to assets
DDM	:	Dividend discount model
DE	:	Debt to equity
DFL	:	Degree of financial leverage
DOL	:	Degree of operating leverage
DPS	:	Dividends per share
DY	:	Dividend yield
EBIT	:	Earnings before interest and tax
EPS	:	Earnings per share
EY	:	Earnings yield
FCF	:	Free cash flow
GPM	:	Gross profit margin
IUP	:	Indiana University of Pennsylvania
JSE	:	Johannesburg Stock Exchange
LB	:	Leveraged beta
MPT	:	Modern portfolio theory

MV	:	Market value
MVA	:	Market value added
NPM	:	Net profit margin
NPV	:	Net present value
OPM	:	Operating profit margin
Par.	:	Paragraph
PE	:	Price earnings
QUAL	:	Qualitative
QUAN	:	Quantitative
QR	:	Quick ratio
R	:	Correlation coefficient
ROA	:	Return on assets
ROAA	:	Return of average assets
ROCE	:	Return on capital employed
ROE	:	Return on equity
ROAE	:	Return on average equity
ROEI	:	Return on external investments
ROI	:	Return on investment
UB	:	Unleveraged beta
UK	:	United Kingdom
USA	:	United States of America
WACC	:	Weighted average cost of capital

CHAPTER 1:
INTRODUCTION AND STATEMENT OF THE PROBLEM

It is important not to get caught up in madness. Do your own homework.
– Warren Buffet

1.1 INTRODUCTION

The behaviour of financial markets can be difficult to comprehend, as returns may reflect volatility (Lettau & Ludvigson, 2010:618; Seal *et al.,* 2019:607; Vigario *et al.,* 2014:144). For this reason, investors are greatly concerned about the risk that is associated with such uncertainty (Marx *et al.,* 2017:107; Reilly & Brown, 2011:66). The Merriam Webster Dictionary (2020) defines the term 'risk' as any possibility of loss, injury, danger or adverse consequence. From a business perspective, the term 'risk' is often used to describe volatility within a market which can lead to financial losses (Faulkenberry, 2020). From the preceding definitions, it can be concluded that 'risk' refers to the possible incurrence of losses or adverse financial outcomes when a market is behaving volatilely.

In order to create some degree of reassurance within financial markets, risk is measured and monitored by means of scrutinising market volatility. Such risk, often referred to as 'systematic risk', is concerned with macroeconomic factors and the way such factors affect financial market behaviour (Szczygielski & Chipete, 2015:47; Vaidya, 2021). Macroeconomic factors include, for example, changes in inflation and interest rates, changes in fuel prices, changes in employment stability and the ability to sustain international trade (Ijaz, 2019).

From the investor's perspective, systematic risk is unavoidable and investment portfolios cannot be diversified in order to eliminate this type of risk (Vaidya, 2021). As can be concluded, investors are keen to understand this type of risk, for it cannot be eradicated by any means, as its source (collective economic circumstances) is not within the control of any specific individual or entity at any given time (Bhavana, 2021; Chawana, 2011:2).

Systematic risk is measured through comparing the return volatility of the entity to the return volatility of the industry. This leads to the argument that, if an entity's returns have been historically more volatile than the industry, a higher return is expected in future (Womack, 2003:3). Piccoli *et al.* (2018:3) support the seminal view of Womack (2003:3) and state that increases in volatility of asset returns, in relation to the selected portfolio benchmark, lead to the expectation of greater future returns to compensate for the absorption of greater risk. The following question thus arises from the preceding literature: Is it realistic for an investor to expect higher future returns when earnings have proved to be volatile in the past? According to the risk-return trade-off hypothesis, it may very well be, as this concept posits that risk taking is rewarded by higher potential returns (Anspach, 2021).

1.2 THE THEORY OF RISK-RETURN TRADE-OFF

When managing investment portfolios, the aim is to ensure that the highest possible returns are rendered at certain levels of systematic risk. As a foundational concept, the modern portfolio theory (MPT) dominates thought regarding how returns and systematic risk levels are interrelated (Miller, 2019). The MPT was developed in 1952 by a Wall Street broker named Harry Markowits (Rusoff, 2019). The theory first postulated that, if all factors are equal, systematic risk and return are directly related – the higher the risk, the higher the return on an investment, and vice versa (Rusoff, 2019). This principle is visually represented in Figure 1.1.

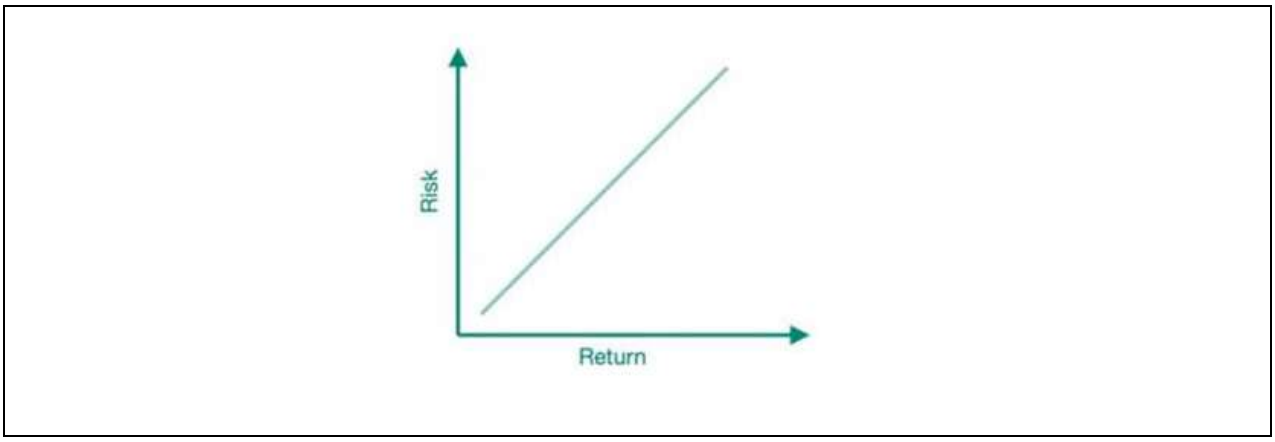


Figure 1.1: The risk-return trade-off

Source: WallStreetMojo (2021)

From Figure 1.1, it can be observed that a linear and positive relationship is generally obtained between risk and return. This postulation has been universally adopted throughout financial markets (Miller, 2019) and, consequently, other financial management principles have been based on the hypothesis that risk and return are related linearly. These are:

The Capital Asset Pricing Model (CAPM): This quantitative principle concludes that the cost of equity can be measured by adding the risk-free rate and the reward of the risk-bearing rate together. This model adopts the belief that higher systematic risk leads to a higher risk-bearing reward (Piccoli *et al.*, 2018:7; Womack, 2003:4);

Capital investment valuations through net present value (NPV) measurement: When evaluating the potential of capital investments, future cash flows are discounted by applying the weighted average cost of capital (WACC) percentage. This percentage represents the average of all costs to obtain funding (Imegi & Nwokoye, 2015:167). If the WACC is calculated by applying the CAPM, a linear relationship between risk and return is again presumed, and the WACC percentage can consequently be affected or distorted by this postulation;

Free cash flow (FCF) valuations: An entity can opt to be evaluated by discounting future cash flows to a present value. In this instance, the cost of equity percentage represents the applicable discount rate (Correia, 2019:6-21). If the CAPM is applied as discount rate, it is again possible that the risk-return trade-off principle can affect such a valuation;

Dividend discount model (DDM): Ordinary shares can be valued through the application of the dividend growth model. This model divides the dividend in the following year by the difference between the cost of equity and dividend growth rate (Correia, 2019:17-11). If the cost of equity is measured in terms of the CAPM, the risk-return trade-off principle can have an impact on the value generated by the DDM; and

The Arbitrage Pricing Theory (APT): This theory posits that risk cannot be expressed by one singular measure. It therefore identifies several ways to measure systematic risk, by calculating several different betas. All identified betas are assumed to relate to return measures (Chawana, 2011:4; Szczygielski, 2018:9).

Although these financial management theories are widely known and understood, in most cases, there is no guarantee that the adoption of higher risk investments does in fact accumulate improved returns. The risk-reward trade-off is highly simplistic and does not accommodate many changing factors in the investment environment (Taillard, 2020). Wang and Yang (2012:2-5) confirm the argument of Taillard (2020) by indicating that systematic risk is influenced by factors such as:

- Share repurchases;
- Share splits;
- Liquidity position;
- Sensitivity to market competition; and
- Quality of financial reporting.

Wang and Yang (2012:2-5) claim that the preceding factors influence systematic risk more so than earnings, returns and earning announcements. Taillard (2020) supports the opinions of Wood (2016) by positing that historical data do not support the risk-return trade-off assumption. Wood (2016) even suggests that the opposite is true: that higher risk investments are associated with lower returns.

Between 1968 and 1985, several seminal studies were performed in which the relationship between risk and return was analysed. These studies are summarised in Table 1.1.

Table 1.1: Seminal research

Researcher(s)	Date of publication	Location	Research finding
Conrad and Plotkin	1968	United States of America (USA)	The researchers sampled 59 listed companies and found a significant and positive relationship between risk and return measures.
Fisher and Hall	1969	USA	The researchers proved that there was a positive significant association between risk and return, after sampling 11 companies.
Cootner and Holland	1970	USA	A significant and positive relationship was found when the researchers sampled 39 American companies.

Researcher(s)	Date of publication	Location	Research finding
Hurdle	1974	USA	The researcher sampled 85 companies and tested whether risk and return were well associated. A positive and significant relationship was established.
Armour and Teece	1978	USA	The researchers sampled 28 companies within the petroleum industry and found that risk and return were inversely related.
Neumann *et al.*	1979	Germany	A total of 334 industrial German companies were sampled to determine whether risk and return were related. Findings showed a significant positive relationship between risk and return measures.
Treacy	1980	USA	Treacy (1980) sampled 54 American companies and found that risk and return measures were inversely related – the higher the risk, the lower the returns.
March and Swanson	1984	USA	The researchers sampled 135 American companies in 1984, but were unable to find any association between risk and return.
Fiegenbaum and Thomas	1985	USA	The study sampled 1 283 companies to examine the association between risk and return. A negative and significant relationship was uncovered.

Source: As listed in the table

From Table 1.1, it can be observed that researchers have drawn different conclusions on the association between risk and return. It is also evident that the majority of earlier research was undertaken in the USA. Five of the studies found a positive and significant relationship between risk and return measures. Two of the studies found an inverse relationship between risk and return, while one study was unable to prove that any relationship exists between these factors. The sample sizes among the studies differed significantly and ranged between 11 and 1 283 companies.

Although these studies have paved the way for more recent research, it could be argued that their findings are outdated. Table 1.2 was constructed to display more recent findings. The more recent studies emphasise the industry type, the sampling size and the time frame of the research.

Table 1.2: Research since 2000

Researcher(s)	Date of publication	Location	Research findings
Lettau and Ludvigson	2010	USA	For the 92 companies sampled, it was found that the relationship between risk and return depends on the industry. The more volatile the industry, the smaller the relationship between risk and return.
Abbes	2012	Dubai	The researcher sampled 35 listed companies and found a significant and positive relationship between risk and return measures.
Wang and Yang	2012	Australia	A total of 371 companies from different industries were sampled. A linear and positive association was established between risk and return.
MacMillan	2013	United Kingdom (UK)	This researcher tested for findings under different conditions of sample quantity and found that smaller samples (sample = 52 companies) lead to the finding of a non-linear relationship between risk and return. When the number of observations in the sample was increased (to 772 companies), a positive linear relationship was found.
Cheng *et al.*	2014	USA	The study sampled 1 626 companies and indicated that findings depend on time series. In times of financial crisis, there was no relationship between risk and return measures. When financial crisis subsided, a positive and linear relationship was obtained.
Salvador *et al.*	2014	Europe	The researchers sampled 1 219 companies from 11 stock exchanges and found no significant relationship between risk and return.
Aslanidis *et al.*	2016	Europe	The researchers sampled 1 151 companies from 13 stock exchanges and imitated the research design and methods of Salvador *et al.* (2014). They found an inverse relationship between risk and return.

Researcher(s)	Date of publication	Location	Research findings
Lui *et al.*	2016	China	Researchers sampled 44 companies. Generally, a positive and linear relationship was found. It was also highlighted that crisis influenced this relationship and caused it to be weaker.
Ghysels *et al.*	2016	Switzerland	The researchers were unable to find an association between risk and return, but posited that time and sample influenced findings. The study included a small sample of 16 companies.
Wang and Khan	2017	USA	A sample of 37 companies was tested. This research proved that findings vary with time. In the short run, risk and return measures were not related. In the long run, risk and return were somewhat related, depending on the industry.

Source: As listed in the table

From Table 1.2, it can again be observed that researchers were unable to reach consensus when it comes to the substance of the risk-return trade-off hypothesis. Two of the studies indicated that a significant and positive relationship was obtained between risk and return factors. Another two studies found no significant correlation between risk and return measures. One study posited that the industry in which a company operates, affects correlations between risk and return, while another argued that the sample size has an impact on findings. Two of the studies found that the time frame for which data are collected impacts the findings. Lastly, one study found an inverse relationship between risk and return. Paragraph 1.3, hereafter, focuses on related research performed in developing countries.

1.3 RELATED RESEARCH IN DEVELOPING COUNTRIES

Developing countries (also referred to as 'emerging economies') are countries that generate low gross domestic product per capita. These countries rely on primary industries such as mining and agriculture. Such countries deliver a low economic output in comparison to developed countries (Kuepper, 2020).

McKinnon (1976), Stiglitz (1993) and Islam and Watanapalachaikul (2005) posit that financial markets of developing countries differ significantly from that of developed

countries. Emerging financial markets are described as fragile, unstable, imperfect and fragmented. Researchers such as Humpe and Macmillan (2007), Adam and Tweneboah (2008) and Pilinkus (2009) further argue that share price volatility and its relation to macroeconomic factors are well understood and researched in developed countries, but less so in developing countries. Table 1.3 summarises similar research in developing countries.

Table 1.3: Similar research in developing countries

Researcher(s)	Date of publication	Location	Research findings
Natarajan	2011	India	A total of 66 listed companies were sampled and data from 2007 to 2010 were collected. It was concluded that risk and return are positively associated when markets are less volatile, but when volatility increases, there is no association between risk and return.
Hunjra *et al.*	2011	Pakistan	The researchers indicated that the Pakistani markets were volatile and that the relationship between risk and return was non-linear, rather than linear. The sample consisted of 103 companies.
Chawana	2011	South Africa	The researcher sampled 14 random investment portfolios in order to test the risk-return trade-off. It was concluded that returns generated by the selected portfolios were not sensitive to macroeconomic variables. Thus, systematic risk was not considered an influence on returns.
Piccoli *et al.*	2018	Brazil	The researchers collected data for 87 listed companies for the period 2002 to 2015. It was found that the relationship between risk and return measures was positive during times of low investor sentiment, but negative during periods of high investor sentiment. Thus, when investors were more eager to invest in the particular market, the relationship between risk and return was less substantial.

Source: As listed in the table

Table 1.3 indicates four studies performed in developing countries, all of which generated different findings. Findings ranged from arguments that volatility and investor sentiment affect risk and return correlations, to the existence of non-linear relationships and even no relationship at all. Again, a wide range of conclusions were obtained. Only one South African study was found, and its methodology was geared towards drawing conclusions from a very small sample. Clearly, a gap in research is reflected by this scarcity.

1.4 PROBLEM STATEMENT AND RESEARCH QUESTIONS

Since 1952, it has been generally accepted that there is a trade-off between systematic risk and return (refer to Figure 1.1). As mentioned earlier, systematic risk is measured by comparing the return volatility of the entity to that of the industry. If the entity proves to have more volatile earnings than those of the general industry, it is posited that future returns should be higher than those of the industry (refer to par. 1.1).

Although financial scholars have widely adopted the MPT, researchers have questioned its empirical substance since the 1960s. In early studies, researchers obtained conflicting findings in this regard (refer to Table 1.1). In later studies (Table 1.2) some researchers found a positive correlation between the variables, some found none, and others posited that findings are affected by timing (short vs long run), sampling size and industry type.

In developing countries, little theoretical and empirical research has been performed to uncover whether the risk-return trade-off actually manifests in stock markets. Moreover, the research that has been performed delivered opposing results (refer to Table 1.3).

It is submitted that financial managers universally adopt the risk-return trade-off, oblivious to whether this relationship exists empirically within the respective investment markets. This leaves a gap in the ability to understand systematic risk and the factors that are truly indicative thereof. But in a discussion such as the current one, the timing and origin of the MPT cannot be ignored. The theory was developed in the 1950s and never aimed to comprehend developing markets. Furthermore, the MPT pays no attention to the *type* of systematic risk that is measured, and it is unclear whether accountancy-related return measures should presumably be related to leveraged or unleveraged systematic risk, or both. The MPT does not define the term ‘return’ clearly either, and interpretation is left to the discretion of the user.

Evidently, new perspectives should be developed to establish a clearer understanding of the factors that reflect leverage and unleveraged systematic risk. In addition, there is a gap in the existing literature, as South African markets and their relationship to systematic risk have not been a point of interest to researchers. In a nutshell the research problem can be summarised as: There is uncertainty around the viability of the risk-return trade-off within the South African market, while there also exists ambiguity pertaining to how the terms ‘risk’ and ‘return’ should be empirically interpreted.

From preceding arguments, the following research questions arose:

- Are measures of risk and return related to each other, when JSE listed companies are sampled?
- Can the MPT be replaced by new models that explain the behaviour of systematic risk?
- Are the same accounting factors indicative of changes in both leveraged and unleveraged systematic risk?
- How would newly developed models compare to the existing MPT?

This study was undertaken to fill the gap in research by developing new empirically substantial models consisting of accountancy-related factors that predict leveraged and unleveraged systematic risk, based on sample from JSE listed companies.

1.5 RESEARCH OBJECTIVES

A primary objective and secondary objectives were identified for the study. The primary objective indicates the overall goal of the study, while the secondary objectives support the fulfilment of the primary objective.

1.5.1 Primary objective

The primary objective of the research was to develop a new systematic risk model, which consists of accountancy-related items other than returns, to predict leveraged and unleveraged systematic risk in selected JSE listed companies.

1.5.2 Secondary objectives

The secondary objectives were divided into two categories: theoretical and empirical.

1.5.2.1 Theoretical objectives

1) Analyse existing traditional literature to determine how risk is categorised and quantified;

2) Analyse existing traditional literature in order to obtain an understanding of how returns are defined and quantified;

3) Explore the findings from existing research to observe how the concepts of 'risk' and 'return' have been interpreted by other researchers; and

4) Compare the findings of existing studies and the current study qualitatively in order to validate quantitative research outcomes.

1.5.2.2 Empirical objectives

1) Perform statistical analysis of sampled data to determine whether leveraged and unleveraged systematic risk are related to accountancy-related return measures;

2) Develop a new leveraged systematic risk model, consisting of accounting factors, for sampled JSE companies. These factors include: liquidity measures, the debt to equity measure, market value added (MVA), return on external investments, price-per-share to book value-per-share, price-per-share to net asset value-per-share, and total assets to capital employed.

3) Develop a new unleveraged systematic risk model, consisting of accounting factors, for sampled JSE companies. These factors include: liquidity measures, price-per-share to book value-per-share, return on external investments, MVA, and the debt to assets measure.

4) Compare the newly developed systematic risk models to the existing MPT model.

1.6 CONTRIBUTION OF THE RESEARCH

This study strives to assist the investor and portfolio manager in finding new perspectives when searching for investment opportunities. In the field of financial management, it is assumed that investors are risk averse and that shareholders are to avoid investments that are too risky for their investment profiles (Rusoff, 2019). In order to determine such

'riskiness', systematic risk should be thoroughly understood. The purpose of this study was thus to determine whether returns generated by sampled entities are a quantitative reflection of the associated systematic risk. The study also contributes to the existing literature by examining how systematic risk behaves and searching for trends within the South African stock market.

Ultimately, the research attempted to question the risk-return trade-off hypothesis within the JSE South African stock market and put forward new models that better explain systematic risk behaviour. For this purpose, models were constructed that explicitly indicate how both leveraged and unleveraged systematic risk can be quantitatively estimated.

Should this research prove that systematic risk and return are not related, the application of several general financial management principles to the sampled companies could be brought into question (refer to par. 1.2). Among these are:

CAPM: This principle posits that higher systematic risk leads to a higher risk-bearing reward. If risk and return are not related, this assumption is not true. Furthermore, the CAPM often forms part of other calculations and estimations such as:

- Discounting capital investments through the application of the NPV;
- Applying the FCF model when ordinary shares are valuated; and
- Applying the dividend growth model.

If risk and return measures are not related, the reliability of the preceding list of calculations can also be brought into question.

MPT: This theory submits that the willingness to accept greater risk leads to higher returns and vice versa. If risk and return are unrelated, this principle carries no substance; and

APT: This theory posits that risk should be measured through the identification of several different beta measures. Such beta measures are assumed to be related to returns. If risk and return are unrelated, the assumptions are not substantiated.

New systematic risk models can potentially change the way these financial management principles are perceived and pave the way for renewed thinking and methods within the subject scope.

1.7 RESEARCH METHODOLOGY

The research methodology consisted of a traditional literature review and a mixed method approach.

1.7.1 Traditional literature review

According to Dewey and Drahota (2016), a traditional literature review is a process by which literature is identified and critically selected to successfully solve the research problem. Traditional literature reviews present and summarise what is known about the research topic. These reviews rely heavily on the judgment of the researcher, as no explanations or criteria are required as to why certain sources are used and others not (Hart, 2018:5).

For the purpose of this research, traditional literature was collected from the following sources:

- Published newspaper articles and books;
- Electronic books and journal articles; and
- Published dissertations and theses.

Literature sources were collected from the following search engines:

- Google Scholar;
- EBSCOhost;
- Sabinet;
- Scopus;
- ProQuest;
- JSTOR; and
- Emerald Insight Journals.

The analysis of traditional literature is provided in Chapter 2 of this research (refer to the chapter layout). The purpose of the analysis was to:

- Obtain an understanding of systematic risk and how it is quantified, and identify possible measures with which it is associated; and
- Obtain an understanding of how return is quantified by identifying measures that are typically used to measure investor returns.

1.7.2 Mixed method approach

To fulfil the primary objective of the study, a mixed method approach was followed. The study was thus executed in three research stages, as represented by Figure 1.2.

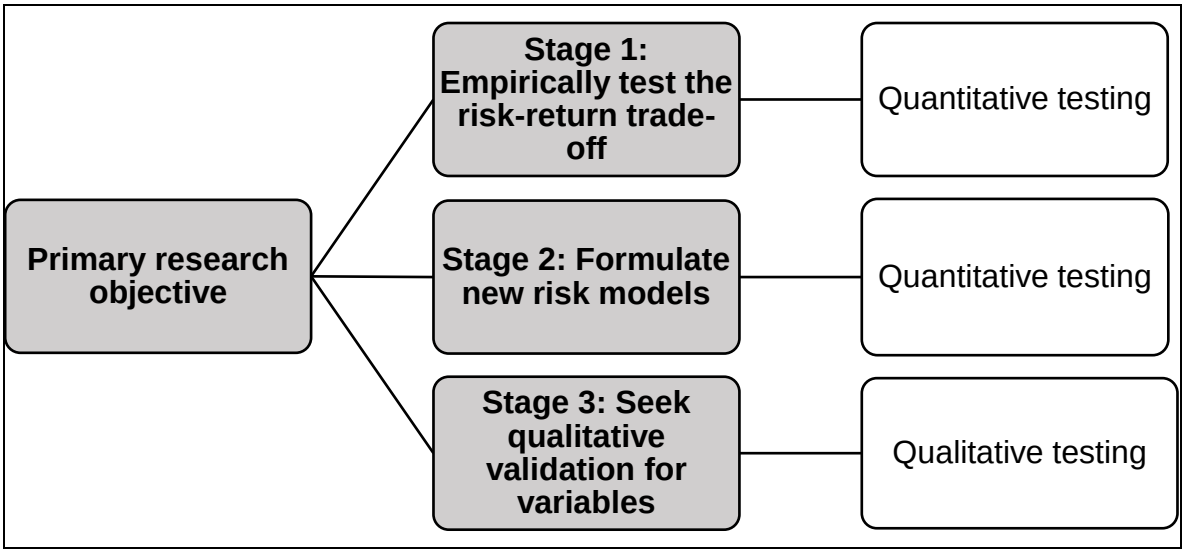


Figure 1.2: Overview of the mixed method study

Source: Author

Figure 1.2 indicates that the primary objective (as stated in par. 1.5.1) divided the research into three endeavours: stage 1, stage 2 and stage 3. Stage 1 intended to empirically test whether systematic risk and return are linearly associated with each other, in the case of the sampled companies. Stage 2 was undertaken to identify and model alternative accounting factors that are related to leveraged and unleveraged systematic risk. Stage 3 was aimed at seeking qualitative validation for the variables applied during stage 2.

Paragraph 1.7.2.1, hereafter, explains the quantitative approach that was followed in this study (stages 1 and 2). Paragraph 1.7.2.2 discusses the core elements relating to the qualitative analysis (stage 3).

1.7.2.1 Quantitative analysis

This section provides a broad overview of the key concepts of quantitative analysis and how they related to the current study. As indicated in Figure 1.2, quantitative analysis related to stage 1 and stage 2 of the research. In par. (a) to (d), the research population, sampling method, data collection method and statistical analysis approach are discussed.

a) Population

The term 'population' is defined as a group, event or phenomenon that is of interest to a researcher (Mouton, 2013:110). The researcher aims to draw conclusions about the population through data collection (Babbie, 2013:115). The population of this study was represented by the top 100 entities listed on the Johannesburg Stock Exchange (JSE). These entities were selected as an appropriate population for the following reasons (Bosiu *et al.*, 2018:5):

- These entities hold the highest market capitalisations; and
- These entities represent 95% of all market capitalisation reflected on this stock exchange.

This research investigated the relationship between systematic risk and return. For this reason, the study relied heavily on the premise that populated entities are able to generate returns. Market capitalisation and returns are interrelated, as indicated in Figure 1.3:

Figure 1.3: Relationship between returns and market capitalisation

Source: Adapted from Killian (2019)

Figure 1.3 illustrates how investor returns and market capitalisation are interrelated. From this figure, it is apparent that the demand for a share is stimulated by the ability of the entity to pay returns to the shareholder. Should the demand for a share increase, its market price would also increase, as there is a direct relationship between demand and the value of shares. Once the share price rises, the entity can account for a higher market capitalisation, as market capitalisation is obtained by multiplying the number of shares issued with the market price (Killian, 2019; Vigario *et al*., 2014:19).

From the preceding arguments, it is submitted that holding high market capitalisations attest to the ability to pay returns to investors. In the case of this research, issuing returns to investors is of importance. Based on Figure 1.3, it may be posited that the top 100 JSE listed companies are able to issue returns to investors because they hold the highest market capitalisation, in the form of representing 95% of all capitalisation on the stock exchange. For this reason, it is submitted that the top 100 JSE listed companies are an appropriate population for fulfilling the empirical objective as set out in stage 1 of the research (refer to Figure 1.2).

The same population was selected for the process of constructing a model of alternative factors that are associated with systematic risk (as per stage 2 of the research, explained in Figure 1.2). Selecting the exact same population for the different research stages was essential in ensuring consistency in findings.

b) Sampling method

A sample is a group of individuals, events or objects that are selected for testing in order to make assumptions about the population (Flick, 2020:137). The sampling frame of the study was determined by means of non-probability sampling, specifically homogenous purposive sampling. Non-probability sampling represents those sampling techniques that are used under circumstances in which all units of a population do not have an equal chance of being selected (Creswell, 2014:37). Purposive sampling or judgment sampling requires that the researcher selects a sample based on its specific characteristics (Bell, 2015:149). Homogeneous purposive sampling entails that the units of the sample have shared characteristics and commonalities. These characteristics can be determined by setting of criteria (Creswell, 2014:38).

For the purpose of this research, the following sampling criteria were established for the empirical analysis:

Criterion 1: All applicable data for the sampled entity should be readily available on IRESS for all years under review;

Criterion 2: The entity should be listed on the JSE for all years under review; and

Criterion 3: The entity should not operate within the financial sector, as such entities do not publish accountancy-related measures that are consistent and comparable to those of other sectors (Chabalala, 2015:52).

It should be noted, again, that the same sampled companies were used for both stage 1 and stage 2 of the research (refer to Figure 1.2). This ensured consistency in the empirical testing and modelling.

c) Data collection

It is important that data are collected from recognised and reliable sources, as the data collection can greatly impact statistical findings. It is a classic case of 'rubbish in, rubbish out' (Bell, 2015:177). To ensure the efficient collection of data, data were retrieved from a recognised database, IRESS, which contains financial data about listed companies in South Africa (IRESS, 2020). This database was used to retrieve the financial data required to fulfil the empirical research objectives, as stated in par. 1.5.2.2. It is, thus, posited that the study was oriented towards the collection of secondary data.

As with all other research, this study relied on a number of assumptions regarding data collection:

- That the financial information published on IRESS has been audited and that such information is free from material error and misstatement;
- That accountancy-related measures (such as financial ratios) are calculated in a consistent manner by IRESS; and
- That IRESS publishes financial information in its entirety, as originally published by the listed company. Thus, no relevant data are omitted.

The data collection time frame spanned between 2015 and 2019. According to Field (2009:30), data should be collected for at least five years if the researcher wishes to draw conclusions from it. The business environment is often seen as a fast-changing milieu (Vermeulen, 2020), and for this reason, it is argued that the collection of data pertaining to recent financial years can better reflect relevant trends and findings.

d) Statistical analysis

As indicated by Figure 1.2, the research was undertaken in three stages. Two of these stages required statistical testing. Figure 1.4 was constructed as explanation:

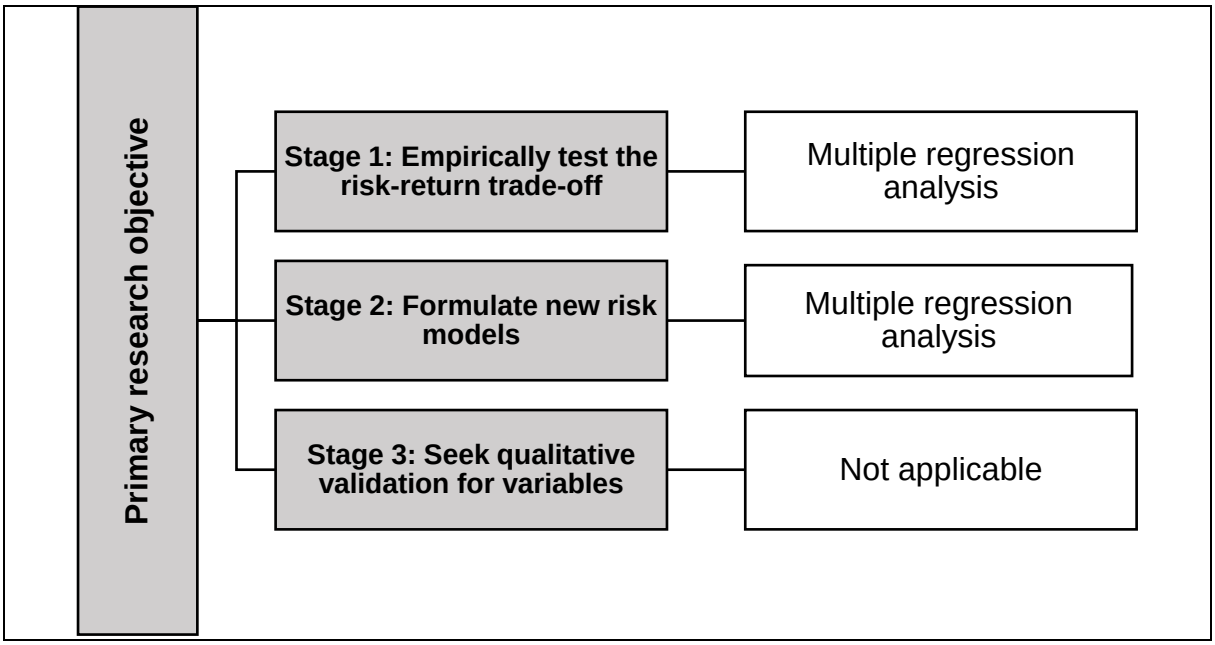


Figure 1.4: Stages of empirical testing

Source: Author

Figure 1.4 shows the statistical analysis applicable to the three stages. Stage 1 tested whether systematic risk and accountancy-related return measures are associated with one another. To execute this, multiple regression was performed to observe whether accountancy-related return measures can predict systematic risk. Multiple regression is a process of selecting several independent variables to predict a dependent variable (Dowd, 2016:65; Field, 2009:129). For the current study, two sets of data had to be collected to satisfy stage 1:

- Leveraged beta and unleveraged beta as dependent variables; and
- Financial performance measures relating to returns, as identified in Chapter 2, per theoretical objectives 2 and 3. Accountancy-related return measures served as independent variables.

Stage 2 set out to model accountancy-related factors, through multiple regression testing as well. For stage 2, the type of systematic risk was again considered the dependent variable. The identified accounting measures that were used to predict systematic risk were considered the independent variables. This was done to identify and sequence the most appropriate accountancy-related factors which can predict systematic risk. Quantitative analysis was performed by applying SPSS (version 26).

1.7.2.2 Systematic review as qualitative analysis

As demonstrated in Figure 1.2, qualitative analysis was performed in stage 3 of the research. The aim of the qualitative analysis was to seek validation for the quantitative findings by comparing them with the findings of other researchers. A systematic review was utilised for qualitative analysis purposes.

Boland *et al.* (2017:2) define the term 'systematic review' as a review designed to identify and synthesise available research evidence in such a manner that research outcomes can be compared for integrated knowledge. Systematic reviews should ultimately lead to advancements in a field and improve future practices. Cooper (2017:9) posits that 'research synthesis' is a method used by social scientists who wish to collect and integrate findings of multiple studies on the same research problem or topic. Research synthesis forms an integral part of a systematic review (Cooper, 2017:10). Gough *et al*. (2018:16) mention that systematic reviews are performed in an organised manner by means of sequenced steps. These steps are explained in Figure 1.5.

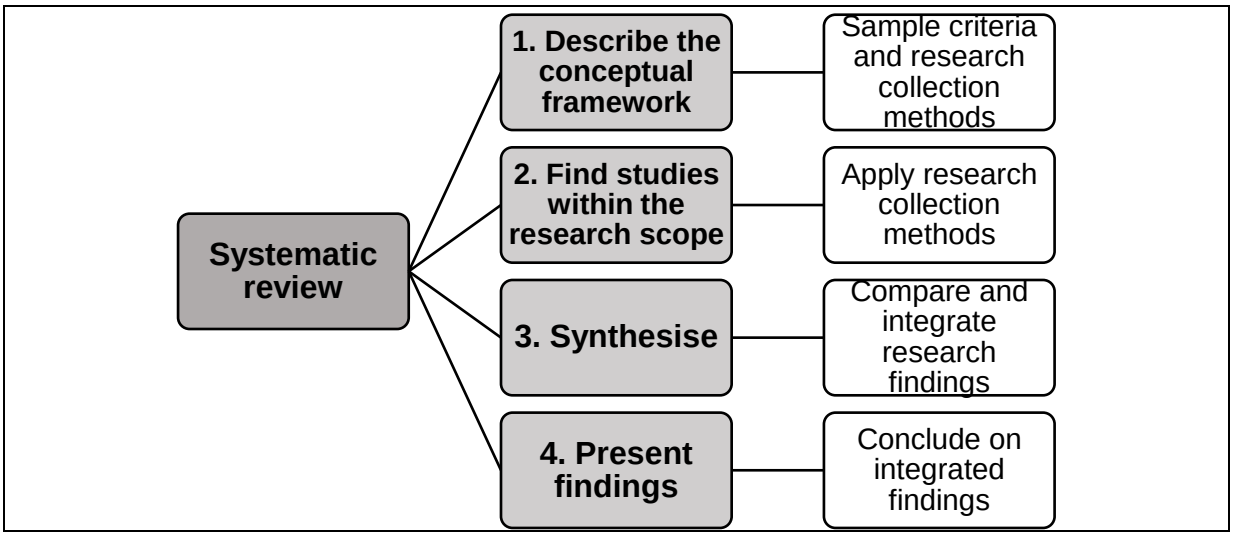


Figure 1.5: Steps to systematic reviews

Source: Adapted from Gough *et al.* (2018:16-18)

It is clear from Figure 1.5 that systematic reviews are performed through four different steps. Step 1 requires the identification of a sample, as well as the data collection method to be applied. According to Fink (2020:53), it is not effective to search for all research related to a topic. The researcher may fall into a time-consuming, never-ending information rabbit hole. Alternatively, sampling criteria can be constructed to serve as a filter for research collection. These criteria should focus on three factors (Fink, 2020:54):

- The relevance of the research, as it should focus on the same problem that the researcher intends to study;
- The research publication date, as outdated findings may no longer apply to the research problem; and
- Research quality, as the reputation of the source affects the quality of the research. Typically, research should be collected from peer-reviewed journals.

The following sampling criteria were developed for the systematic review of this study:

Criterion 1: The aim/goal/objective/hypothesis of the sampled studies should be to predict/estimate systematic risk by means of financial ratios/financial models/financial concepts. This criterion allowed for research synthesis

to be performed and for relevant comparisons to be drawn among research findings.

Criterion 2: Sampled articles should be selected from peer-reviewed academic journals. This criterion maintained the quality aspect of the qualitative research process; and

Criterion 3: The publication date of sampled journal articles should not be older than three years. This criterion served as a control measure of relevance of the qualitative research findings.

For step 3, as presented in Figure 1.5, research had to be collected within the scope set by the sampling criteria. This was done through searching applicable databases (Xiao & Watson, 2017:103). Step 3 also entailed that research findings be compared and integrated. According to Boland *et al.* (2017:131), research synthesis requires the researcher to recognise and summarise patterns within textual data through tabling or charting. The final step involved conclusions on the research integration. In the current study, the outcome in step 4 was of great importance, as the factors identified in this step were subjected to empirical testing so that a new model could be formulated.

It should be noted that a systematic review is not a qualitative method that is often applied to accounting research. This type of review is more often used in medical research (Park *et al.*, 2020; Stout *et al.*, 2017) and educational research (Karabulut *et al.*, 2018; Rodrigues *et al.*, 2019). It is therefore submitted that the researcher followed an unconventional approach to the current study, making strides towards the expansion of research methods available to solve accounting problems.

1.8 ETHICAL CONSIDERATIONS

Ethics concerns itself with right and wrong doing. The ultimate goal of research is to seek truth. In order to establish what is true, the research process needs to be conducted in an ethical manner (Mouton, 2013:239). Social interventions may raise ethical concerns if the research intends to harm participants in any possible form or manner (Babbie, 2013:382).

In the case of this study, secondary data were collected by means of a recognised database. Data were analysed through SPSS and the assistance of qualified statisticians

was employed. Furthermore, the research activities were approved by the North-West University's Ethics Committee, who issued a letter of approval (see Appendix C). As the researcher had little control over the research findings (as secondary data were collected and analysed) and analysis was done by an independent statistician, few ethical dilemmas were foreseen in the execution of this research.

1.9 CHAPTER CLASSIFICATION

This study is presented in seven chapters.

Chapter 1: Introduction and problem statement

Chapter 1 created a backdrop against which the problem statement was formulated. The chapter explored the risk-reward trade-off hypothesis and questioned its applicability from an empirical standpoint. Findings of several preceding studies were explored, and emphasis was placed on the lack of similar South African research compared to data from developing countries. Subsequently, the problem statement was posed. In short, the problem statement posits that the risk-return trade-off hypothesis dates back to 1952, which could indicate that it is possibly outdated, and that new and more detailed perspectives should be developed.

Furthermore, Chapter 1 identified the research objectives, both theoretical and empirical, and explained the methodology applied in the research. The chapter concluded by providing the ethical considerations and chapter classification.

Chapter 2: An overview of risk and return quantification

The purpose of Chapter 2 is to fulfil the theoretical research objectives 1, 2 and 3 (as stated in par. 1.5.2.1) and to lay the theoretical groundwork to satisfy empirical research objective 1 (par. 1.5.2.2). This chapter establishes a clear understanding of how risk is categorised and measured and discusses the concept of 'return' thoroughly by analysing existing literature. The chapter also explores possible factors that could be classified as 'returns' for the purpose of testing in Chapter 4.

Chapter 3: Research design and methodology

The purpose of Chapter 3 is to provide an in-depth understanding of the research design and methodology that were applied in the research. This chapter provides detailed

explanations of the research design elements, as well as the population, sample, data collection process and analysis, for both the quantitative and qualitative research aspects. The purpose of this chapter is to set out the research methods that supported the fulfilment of the objectives of the study and indicate how these methods were structured to draw logical conclusions.

Chapter 4: Stage 1 – Viability of the risk-return trade-off

Chapter 4 fulfils empirical objective 1, as stated in par. 1.5.2.2. This chapter presents the empirical testing of the factors identified in Chapter 2. The aim of the chapter is to show proof that the risk measures (as per Chapter 2) and the accountancy-related return measures (as per Chapter 2) were not related in the instance of the sampled companies.

Chapter 5: Stage 2 – Developing new risk models

Chapter 5 fulfils empirical objectives 2, 3 and 4, as stated in par. 1.5.2.2. In this chapter, alternative measures associated with systematic risk are identified and tested to construct two systematic risk models: one to estimate a leveraged systematic risk model and another to estimate an unleveraged systematic risk model. The chapter also provides a comparison between the newly developed models and the existing MPT.

Chapter 6: Stage 3 – Seeking qualitative validation

Chapter 6 provides the systematic analysis of research articles by means of a qualitative approach. The purpose of this chapter is to compare the findings of existing studies with the findings of the current study in order to validate the quantitative research outcomes obtained in Chapter 5. This chapter fulfils theoretical research objective 3 (as stated in par. 1.5.2.1).

Chapter 7: Research conclusion

The final chapter explains how the research objectives were fulfilled and how the problem statement was addressed. Chapter 7 includes recommendations for further research and lists possible limitations of the newly proposed model.

1.10 EXPECTED LIMITATIONS TO THE RESEARCH

As with all research, this study was expected to have a number of limitations. These include the following:

- As sampling was applied to the research, findings may not be universal. Thus, the model that was developed cannot be generalised for use on all JSE listed companies, but only those companies that were included in this research;
- The use of the IRESS database posed a limitation with regard to sampling, as the database was frequently unable to present a complete set of data needed for statistical testing. Consequently, only 33 companies were sampled, as IRESS only made a complete set of required data available for these entities; and
- This research focused on the collection of data from only one stock exchange, the JSE. The model constructed in this study may not necessarily apply to other stock exchanges.

1.11 CHAPTER SUMMARY

In 1952, the MPT put forward that there is a trade-off between risk and return. This theory implies that, when a portfolio is managed, accepting higher risk leads to the accumulation of higher returns (Rusoff, 2019). Although this theory is widely accepted, there are no consistent empirical findings that suggest that this is the case (refer to Tables 1.1 to 1.3). In the measurement of systematic risk, it is argued that risk is indicated by means of comparing the volatility of returns in the market with that of the entity, and if the entity's returns prove to be more volatile, the expectation is that higher returns will be generated in future (Womack, 2003:3-4). This assumption may not be correct, as financial markets are not simplistic (Wood, 2016). Furthermore, there seems to be a limited number of studies aimed at understanding the risk-return trade-off hypothesis in developing countries (refer to Table 1.3).

This chapter provided the problem statement and research objectives, as well as a broad overview of the research methodology that was applied. In par. 1.4, the problem statement was put forward, which indicated that the research sought to question the applicability of the risk-return trade-off hypothesis to the sampled JSE companies. It also suggested that alternative measures, which associate with systematic risk, should be investigated. In par. 1.5.1 and 1.5.2, the primary and secondary research objectives were formulated in support of the problem statement. Theoretical and empirical objectives were identified.

With regard to the methodology, it was stated in par. 1.7 that the research undertook both traditional literature collection and mixed method testing. Figure 1.2 was constructed to indicate that the mixed method testing was divided into three stages:

- Testing the relationship between risk and return (stage 1);
- Modelling accounting measures to construct new systematic risk models (stage 2); and
- Qualitatively identifying reasons that validate quantitative relationships obtained in stage 2 of the research (stage 3).

It was also indicated that empirical testing was done by means of multiple regression modelling. Paragraph 1.7.2.1 (a) stated that the top 100 JSE listed firms were selected as population for testing, while Figure 1.3 was constructed as an explanation as to why this population was sufficient for testing. Paragraph 1.7.2.1 (b) indicated the sampling method and posited that homogenous purposive sampling was applied, according to the following criteria:

- All applicable data for the sampled entity should be readily available on IRESS for all years under review;
- The entity should be listed on the JSE for all years under review; and
- The entity should not operate within the financial sector, as such entities do not publish accountancy-related measures that are consistent and comparable to those of other sectors (Chabalala, 2015:52).

With regard to data collection, par. 1.7.2.1 (c) indicated that secondary data (in the form of financial data) were retrieved from IRESS for statistical testing.

Stage 3 of the research was qualitatively oriented (par. 1.7.2.2). It sought to apply systematic reviewing to find qualitative validation for the quantitative relationships identified in stage 2 of the research. The following criteria were set out for selecting the systematic review sample:

- The aim/goal/objective/hypothesis of the sampled studies should be to predict/estimate systematic risk by means of financial ratios/financial models/financial concepts;
- Sampled articles should be selected from peer-reviewed academic journals; and
- The publication date of sampled journal articles should not be older than three years, as at the date of writing Chapter 6 (which is May 2022). According to Wolf (2019), literature sources older than 10 years are not useful any longer, but for faster-paced research fields, literature sources are ideal when not older than three years. The business environment is fast changing, as Vermeulen (2020) argues. Therefore, this sampling criterion was applied to accommodate the nature of fast-paced change.

This research focused on the collection of secondary data as described above. It entailed few ethical considerations, as natural persons were not involved in the sampling and testing process. Lastly, the chapter classification was indicated, which showed that seven chapter were written to fulfil the research objectives, together with a summary of limitations to the research.

As indicated in par. 1.9, the following chapter aims to provide an in-depth analysis of the concept of risk and return.

CHAPTER 2:
AN OVERVIEW OF RISK AND RETURN QUANTIFICATION

All things are subject to interpretation. Whichever interpretation prevails at a given time, is a function of power, not a function of truth. – Friedrich Nietzsche

2.1 INTRODUCTION

It was established in Chapter 1 that the MPT is the most prominent theory relating to the estimation of systematic risk. This theory posits that systematic risk can be predicted by assuming a direct and positive relationship with returns. In the problem statement (par. 1.4, Chapter 1) it was made apparent that the MPT has an obvious flaw: It lacks a precise description of the interpretation and quantification of both concepts, 'risk' and 'return'.

In undertaking the current research, it was of great importance that the exact meaning and quantification of these terms be uncovered. Firstly, this enabled the researcher to establish an in-depth theoretical understanding of the possible ways in which the terms can be made sense of. Secondly, it assisted with establishing the necessary mathematical approaches that were quantitatively applied, as set out in Chapters 4 and 5.

In essence, Chapter 2 explores the terms 'risk' and 'return' in order to obtain an in-depth understanding of these concepts and how they should be quantified. The chapter aims to fulfil theoretical objectives 1, 2 and 3, as stated in Chapter 1, par. 1.5.2.1. Chapter 2 commences with a theoretical analysis of 'risk' in par. 2.2 and of 'return' in par. 2.3. To obtain an understanding of existing research, previous studies are analysed in par. 2.4.

Chapter 2 lays the theoretical groundwork for fulfilling empirical objective 1, as stated in Chapter 1, par. 1.5.2.2. The chapter contributes both theoretically and empirically to the undertaken research, as set out by Figure 2.1.

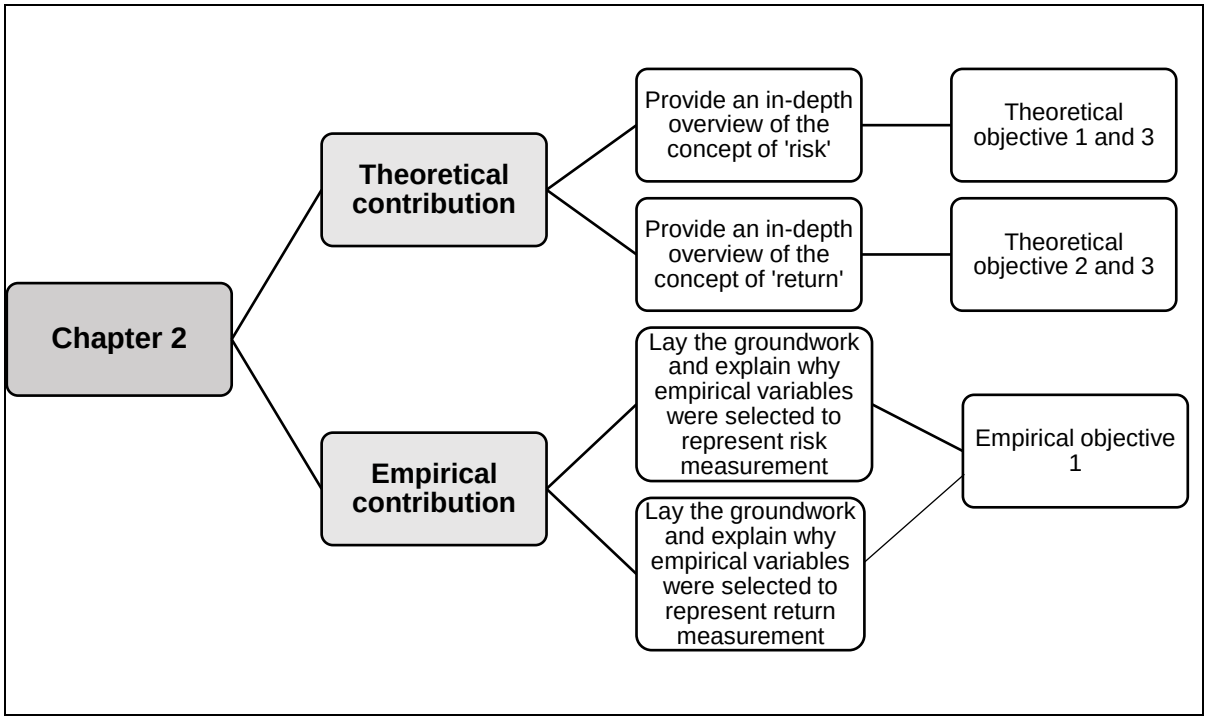


Figure 2.1: Chapter 2's theoretical and empirical contribution

Source: Author

Figure 2.1 indicates that Chapter 2 serves several purposes. It provides an in-depth theoretical analysis of the term 'risk' in par. 2.2, which fulfils theoretical objective 1. This objective sought to obtain an understanding of how systematic risk can be quantified. In par. 2.2, an extensive analysis of risk quantification and interpretation is provided.

Chapter 2 also fulfils theoretical objective 2 (in par. 2.3). This objective sought to understand how the term 'return' can be quantified. In par. 2.3, an in-depth analysis of the interpretation of 'return' is provided. This chapter also fulfils theoretical objective 3 which sought to understand how other researchers interpret the terms 'risk' and 'return'. Table 2.8 was compiled as a complete summary of such interpretations.

It should also be noted that Chapter 2 contributes to the fulfilment of empirical objective 1. Empirical objective 1 was to quantitatively test whether systematic risk and accountancy-related return measures of sampled companies are associated with one another. Although Chapter 2 does not concern itself with the quantitative testing, it contributes to empirical objective 1 by clearly defining the quantification of systematic risk and accountancy-related return measures. Had Chapter 2 not lain this theoretical

groundwork, the specific variables (systematic risk variables) to be collected for quantitative testing in Chapters 4 and 5 would have remained unclear.

Table 2.5 and par. 2.2.2.3 clearly describe which variables would serve as proxies to systematic risk in this study, together with the theoretical reasons for this. Table 2.6 and par. 2.3.2 clearly describe which variables would serve as proxies to accountancy-related return measures in this study, also with theoretical support. As can be deduced, this theoretical groundwork played a key role in ensuring that variables selected for quantitative testing were in fact valid and logical.

As mentioned above, Chapter 2 commences with a theoretical analysis of the concept of risk in par. 2.2.

2.2 THE CONCEPT OF RISK

Collins Dictionary (2021) defines the word ‘risk’ as ‘the possibility that something unpleasant may happen’. According to Longman Dictionary (2021), ‘risk’ implies that something is likely to cause harm. From the preceding definitions, it may be submitted that a ‘risk’ is any possible circumstance that results in an unpleasant outcome which causes harm. From a financial viewpoint, ‘risk’ relates to the level of uncertainty posed by an investment, and how it may result in losses to the investor (Ahmad & Ramzan, 2016:37).

It has long been known that society is loss averse. Human nature seeks certainty and optimisation. It is generally assumed that the unknown potentially holds unfavourable outcomes, and to overcome such misfortune, it has become essential to understand and quantify risk (Marx *et al*., 2017:109). Although the concept of ‘risk’ has become a general one, relating to an infinite set of situations, it especially applies to the financial environment.

The goal of all businesses is to create shareholders wealth, and to do so, certain decisions need to be taken (Damodaran, 2011:57). These decisions are often accompanied by risk. Should too much risk be absorbed, the entity could fail. Should too little risk be accepted, shareholders may opt to invest money elsewhere, as shareholders wealth might not be created at a desired pace. Thus, the management of risk is a fragile balancing act (Damodaran, 2011:58-60). It is put forward that concerns regarding ‘little risk’ and ‘too much risk’ imply that the quantification of risk

remains a predecessor to making investment decisions. The quantification of risk depends on the *type* of risk at hand.

According to Vigario *et al.* (2014:119) and Chhapra *et al.* (2020:52), there are two forms of risk: 1) risk that is controllable and can be overcome, and 2) risk that is uncontrollable and cannot be overcome. 'Controllable risk' refers to risk circumstances which the entity can affect or control. 'Uncontrollable risk' refers to risk circumstances that the entity cannot affect or control (Dedunu, 2017:2313). These controllable and uncontrollable risks are respectively referred to as 'unsystematic risk' and 'systematic risk'.

2.2.1 The concept of unsystematic risk

Unsystematic risk is the risk pertaining to micro factors within an entity. Micro factors are fully within the control of the entity (Thakur, 2020a). As these risks can be managed, companies can take strategic steps to prevent such risks from resulting in significant losses. This can be done through proper planning, insurance and pro-active actions (Marx *et al*., 2017:113). The literature indicates different types of unsystematic risks, which are summarised in Table 2.1.

Table 2.1: Types of unsystematic risks

Risk	Description	Source
Compliance risk	Compliance risk refers to the inability to comply with laws. This may include tax laws, employment laws, environmental laws, and health and safety regulations.	Blackman (2014); Christiansen (2021)
Reputational risk	Reputational risk is the risk of damaging the reputation of the entity to a degree that it can no longer maintain customer interest. This may be caused by product failure, negative press coverage, false advertising and customer lawsuits.	Blackman (2014)
Security risk	Security risk may refer to physical risk, where assets may be stolen or damaged; to information risk, where data breaches and hacking may occur; or to fraud risk, where no proper internal controls and auditing processes are being implemented.	Boitnott (2022)

Risk	Description	Source
Competition risk	Competition risk is the risk of not keeping proper track of competitor behaviour and products. It often happens when an entity reaches a level of comfort and does not realise that the competitor's product has become appealing to the customer. This risk goes hand-in-hand with a lack of innovation, which leads to 'brand fatigue'. Brand fatigue refers to circumstances where the customer is no longer interested in a product or brand because it has not proven to be as innovative as that of the competitor.	Christiansen (2021); Henderson (2020)
Governance risk	Governance risk is the risk of appointing and employing directors and senior managers who are incompetent or unable to display ethical behaviour by participating in fraudulent activities in and around the company. This may also include conflicts of interest and corporate nepotism. The entity should establish a recruitment policy that prevents such risks from materialising.	Boitnott (2022)
Strategic risk	Strategic risk is the risk that the company's overall strategy is ineffective and the goals of the company cannot be fulfilled. Strategic risk can occur owing to changes in customer demands, increases in prices of raw material or labour and technological changes.	Blackman (2014)
Technological risk	Technological risk entails the risk of not upgrading technology in order to keep up with modern trends. Such a risk can affect production potential and information security (in instances of cyberattacks or service outages). Technological risks are managed through strategic investment in technological upgrades.	Kirvan (2021)
Project risk	Project risk refers to circumstances where the entity accepts a project or a combination of projects that are not most profitable and consequently rejects other projects that may generate more income. This risk is closely connected to the entity's capacity for output. This risk can be managed through proper resource allocation and recruiting additional resources where necessary.	Kirvan (2021)

Risk	Description	Source
Quality risk	Quality risk is the risk of producing a product that does not meet the quality expectations set by consumers. This risk can be overcome by ensuring that quality control measures are in place and that the product carries a quality guarantee for return in case the product does not meet expectation.	Boitnott (2022)

Source: As listed in the table

Unsystematic risk is unique to a business or industry. Thus, unsystematic risk is not universal (Vaidya, 2021). In undertaking this study, the researcher did not intend to investigate risks that are unique to an entity or industry, but rather risks that affect all industries universally. For this reason, the research did not include unsystematic risk as an empirical variable (refer to Chapters 4 and 5). Only systematic risk was selected as an empirical variable. This concept is discussed in par. 2.2.2.

2.2.2 The concept of systematic risk

Systematic risk is an uncontrollable inherent risk. Chhapra *et al.* (2020:52) refer to systematic risk as 'distress risk', because this risk is caused by market fluctuations that are beyond a firm's control and can be harmful to firms, placing them in financial distress. Systematic risk cannot be mitigated through diversification, as this risk originates from fluctuations in market conditions, which, in turn, are affected by external economic factors (Puspitaningtyas, 2017:47). An overview of external factors is presented in Table 2.2.

Table 2.2: External factors that influence systematic risk

External factor	Description	Sources
Gross Domestic Product (GDP)	GDP is one of the most significant macroeconomic factors. It is a measurement that represents an economy's ability to increase productivity and bring about economic growth. The growth of an economy supports the potential to generate revenue, invest in assets and pay for outstanding debts. On the other hand, lowered GDP rates discourage investment and stimulate unemployment. As the GDP represents the collective 'health' of an economy, it cannot be influenced by a single investor or business venture. It is the sum of all productivity efforts within a country's borders.	Brueckner and Lederman (2017:2); Pilinkus (2009); Putyinceva and Steffe (2016:4)
Inflation rates	Inflation is the consequence of overspending, which leads to a surplus of money being circulated within an economy. In times when demand increases, prices increase as well. Evidently, overspending leads to the lowering of purchase power. Inflation lowers capital investment returns and has a negative effect on fixed income investments. Inflation is often stimulated by a weak credit policy. Governments attempt to control inflation through limiting access to credit and increasing the interest rate. Inflation is the result of collective spending in an economy. It therefore represents a systematic risk factor, because it cannot be controlled by a single business enterprise.	De Villiers (2016:25); Muritala (2011:5); Sturges (2000:24)
Interest rates	Governments distinguish between two different interest rates: repo rates and prime interest rates. The repo rate is the rate at which commercial banks borrow money from the Reserve Bank. Prime rates are the lowest rates at which commercial banks are willing to lend money to consumers. Normally, consumers borrow money at a 'prime plus rate'. This represents the prime lending rate, plus an additional percentage to compensate for individual risk. Governments adjust repo rates in order to stimulate or decrease access to money. Consequently, prime interest rates are similarly affected. Governments use interest rates as a control measure over inflation. As can be deduced, businesses have no power over changes in repo rate adjustments by government.	Nielsen (2017:2); Pape (2010:2); Saac (2016)

External factor	Description	Sources
Taxation	When taxation is increased, the access to money is decreased and, consequently, there is less liquidity to go around in an economy. Similarly, decreasing taxation has an opposite effect. More money in economic circulation can lead to inflation escalations. Increases in taxation have a negative effect on investors' returns and discourage investment both foreign and locally. As taxation measures are managed by the fiscal and monetary policy of a government, it is a macroeconomic phenomenon which is not within the business's control.	Darby and Roy (2018:18); De Villiers (2016:29)
Cost of capital goods	The cost of capital goods impacts the ability to start businesses. This cost is influenced by market forces of supply and demand. In instances where there is great demand for capital goods, the cost thereof increases, and growth is generated. Similarly, if an oversupply of capital goods exists, business confidence is higher. As no single party can affect market forces, the individual business is vulnerable to the affect that market forces have on the availability and price of capital goods.	El-Wassal (2005); Rittenberg and Tregarthen (2017:12)
Political uncertainty	Political uncertainty affects the functioning of an economy as a whole. Where political unrest exists, investment potential is low. As investors cannot predict the outcome of political dysfunction, they avoid investment and generating potential losses. The stock market is also affected in times of political election. A pattern in stock market movement is usually observed. Before polls, stock investment tends to decline. After the publication of election outcomes, stock markets systematically recover. Political outcomes cannot be affected by businesses on an individual basis, and is not a controllable factor.	Darby and Roy (2018:22); Goodell and Vahamaa (2013:1109)

External factor	Description	Sources
Exchange rates	Countries do not function in isolation. Imports and exports play an important role in generating wealth and sustainability in an economy. When a currency trades strongly against its trading alliance, the cost of obtaining foreign goods and services is cheaper than locally produced goods or services. This stimulates foreign investment, but leaves the host country with fewer local investment opportunities. The opposite is also true: When a currency trades poorly against its export alliance, opportunities for local investments and production arise. Such exchange rate variation is the result of international supply and demand dynamics, and is not within the control of the local business enterprise.	Ahmad and Ramzan (2016:41)
Commodity prices	When commodity prices change in a manner that brings about economic losses, investment potential is negatively affected. For example, when the supply of crude oil is decreased on the international market, price increases occur. This affects businesses dramatically as it can cause price hikes in many of their expenses. Consequently, liquidity and profits decline. Changes in commodity prices are not within the control of a business enterprise because they variate in relation to market forces.	Ahmad and Ramzan (2016:43)

Source: As listed in the table

In reflecting on Table 2.2, it is evident that companies cannot control the external factors listed, which are all uncontrollable macroeconomic issues. From a business perceptive, these inherent risk factors hold financial implications and influence financial prospects (Puspitaningtyas, 2017:45). Analysis of financial information is the fundamental prerequisite to making investment decisions (Puspitaningtyas, 2017:46). In par. 2.2.2.1, the concept of systematic risk is explored. Here, light is shed on how systematic risk is estimated and how financial information is connected to systematic risk evaluation.

2.2.2.1 Systematic risk and volatility

The estimation of systematic risk is a key factor in making investment decisions (Puspitaningtyas, 2017:46). Systematic risk is measured by means of volatility in share price behaviour (Ahmad & Ramzan, 2016:37; Mokoka, 2019:8). It is therefore argued that

systematic risk is determined through the analysis of share prices and share price movements. Such analysis entails the estimation of volatility. Volatility is defined as the level and regularity of fluctuations in share prices (Ahmad & Ramzan, 2016:37). Nasstrom (2013:37) contends that volatility is the magnitude by which share prices decrease and increase within a specific time frame. According to Tsay (2010), volatility measures the dispersion of a share price around its mean value. From the preceding definitions, it is submitted that volatility is the extent to which share prices variate, resulting in a distribution of share price values around the share's mean value.

The concepts of 'macroeconomic indicators' (Table 2.2), 'share price volatility' and 'systematic risk' have been discussed thus far. But it remains somewhat ambiguous how these concepts relate to one another. Figure 2.2 was constructed to show this relation by indicating the sequence of events which ultimately result in the observation of systematic risk.

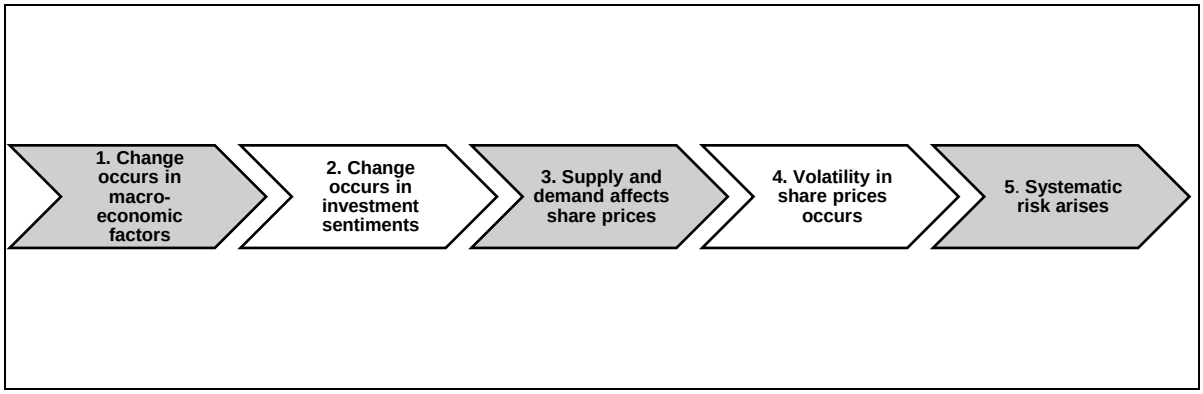


Figure 2.2: Macroeconomic factors, share price volatility and systematic risk
Source: Author

Figure 2.2 illustrates that changes can occur in macroeconomic factors (as described in Table 2.2). These factors affect the financial prospects of the entity, which, in turn, leads to changes in investment decisions, namely investors selling shares (supply increases) or demanding shares. When constant change in investment sentiment occurs, market forces bring about increases and decreases in the share price value, known as 'volatility' (Marx *et al.,* 2017:159). Ultimately, systematic risk is caused by share price volatility owing to changes in investor sentiment, which are brought about by macroeconomic factors not within the control of the entity or the investor. Mokoka (2019:17-19) highlights that there are three types of share price volatility.

Table 2.3 serves as a summary of the different types. Thereafter, the type of share price volatility measured by this study is explained

Table 2.3: The types of share price volatility

Volatility type	Description	Source
Historical volatility	Historical volatility is the measurement of volatility based on past trends. It incorporates the premise that past share price behaviour is a good predictor of future events. Historical volatility is a useful tool when researchers intend to compare different types of stock performance over a period of time. Historical volatility is the most popular type of volatility and is often applied by stock brokers and market researchers.	Berman (2007); Kotze and Joseph (2009:4); Mokoka (2019:17)
Relative volatility	Relative volatility is measured when the volatility of the specific share is compared to the volatility of the market within which the share is traded. In measuring relative volatility, the premise is that the market maintains a volatility expressed by '1'. If the specific share proves to be less volatile than the market, its volatility is expressed by a figure smaller than 1, relative to its relationship to market volatility. For example, its volatility can be expressed by 0.7. If the specific share price is more volatile than the market, its volatility is expressed by a value greater than 1, for example, 1.25. Relative volatility is often used in financial modelling.	Britten-Jones and Neuberger (2000:850); Radtke (2014:5)
Implied volatility	Implied volatility demonstrates the market's anticipation of future volatility in share prices. Implied volatility is often reflected by yields-to-maturity (YTM) calculations. The present value (per the YTM) and the current market value of the share are compared. Should the present value deviate from the market value, it is an indication of implied volatility. Implied volatility is a subjective measure and is often criticised for being less efficient than historical volatility measures.	Aljaid and Zakaria (2020:28); Mokoka (2019:18)

Source: As listed in the table

From Table 2.3, it is clear that different types of share price volatility exist. For the purpose of this research, relative volatility applied. As indicated by the research objectives in Chapter 1, par. 1.5, this study was geared towards understanding systematic risk. Systematic risk is described as the comparison between the return volatility of an entity and the return volatility of the market (Piccoli *et al.*, 2018:3; Womack, 2003:3). Thus, it can be deduced that systematic risk measures one type of volatility relative to another. Therefore, it is posited that relative volatility applied to this research. In order to further understand the relevance of share price volatility to the study, it is important to explore the mathematical measurement thereof, which is the focus of par. 2.2.2.2.

2.2.2.2 The measurement of share price volatility

Volatility is measured by means of mathematical expression. The calculation of volatility can be performed through four approaches (Gupta & Narang, 2019:6; Mokoka, 2019:20-24; Ramji, 2017:11):

- measuring standard deviations of share prices;
- measuring an alpha coefficient;
- measuring a beta coefficient; or
- estimating R-squared based on investment returns.

These measurement alternatives are summarised in Table 2.4, which lists a description of each method, the advantages and disadvantages, and the type of volatility that is measured by means of the method. In addition, it is important to establish an understanding of how these measurement alternatives relate to the current study. Table 2.5 elaborates on the measurement method that was selected for empirical purposes and provides reasons for the selection and non-selection of the different methods. In this way, theoretical support is given for the inclusion of the quantitative variables for testing later in this study, in Chapters 4 and 5.

Table 2.4: Measuring share price volatility

Measurement	Description	Advantages	Disadvantages	Type of volatility	Sources
Standard deviation	A standard deviation is an indicator of how share price data deviate from a mean score. The larger the standard deviation, the greater the volatility of share price behaviour. Investors use the standard deviation size to match their risk appetite. Investors who are less willing to face risk, will opt for shares that generate smaller standard deviations from the mean.	• It provides an explicit indication of how share price data are distributed; • It indicates whether data are clustered around the mean score; • It is a familiar mathematical principle, generally well known and understood.	• Higher standard deviations lead to less reliable predictor values; • Specific software is required for calculation; • It assumes that data are normally distributed; • Outliers affect the standard deviation and can cause data to be skewed.	Historical volatility	Levy (2002); Sofalof (2015)
Alpha	Alpha is a measure which compares the performance of a share to the performance of a benchmark (normally a share index). Alpha assumes a baseline of zero. Any alpha value above zero indicates that the share outperformed the index. Similarly, an alpha value below zero indicates that the share underperformed. An alpha value of 1%, for example, indicates that the share outperformed the index by 1%.	• Alpha can be calculated for a diversified portfolio for the elimination of unsystematic risk; • Alpha is a good indicator to the investor of whether the share investment fits their risk profile.	• Alpha does not necessarily indicate future trends; • Alpha is not generally used in financial modelling of systematic risk; • Index selection can affect the mathematical outcome of an alpha calculation.	Historical volatility	Sofalof (2015); Wilkinson (2013)

Measurement	Description	Advantages	Disadvantages	Type of volatility	Sources
R-squared	R-squared is used to model benchmark returns against share price returns. The higher the R-squared value, the closer the share returns are moving towards the benchmark. Similarly, lower R-squared values indicate deviation from the benchmark and potential investment distress.	• R-squared is a generally well-known mathematical concept; • It can be calculated when time-series data are made available (of which most companies keep record).	• There is no single generalised calculation for all R-squared values. The calculation will depend upon the data distribution; • Specific software is needed to perform accurate calculations; • R-squared is affected by the number of observations included in the calculation.	Historical volatility	Levy (2002); Wilkinson (2013)
Beta	Beta compares the performance of the entity to that of the industry. It assumes a baseline value of 1. If the entity has a beta value greater than 1, its share price behaviour is more volatile than the industry. A beta value less than 1 indicates that the share price behaviour is less volatile than the industry.	• It compares share volatility in relation to its entire market; • It measures a share sensitivity to changes in the market as a whole; • Beta values are accessible and published by IRESS.	• Beta can provide no insight into unsystematic risk factors; • The full data range on which beta values are based is not often made available.	Historical volatility; Relative volatility	Amihud and Goyenko (2018); Kiersz (2014)

Source: As listed in the table

As can be observed from Table 2.4, there are four possible methods to measure systematic risk. For the purpose of empirical analysis in this study, systematic risk was measured by means of applying beta values. Table 2.5 explains why beta was applied and other methods not.

Table 2.5: Reasons for including/excluding of measurements empirically

Volatility measure	Reasons for inclusion/exclusion	Sources
Standard deviation	Standard deviation calculations are not used for empirical purposes. In general, standard deviations are not considered as having great predictive value. Standard deviation has also not been applied by other researchers as a systematic risk variable in previous studies (please refer to Table 2.8, later in this chapter).	Levy (2002); Sofalof (2015)
R-squared	R-squared was not applied as systematic risk measurement in the empirical study to this research. R-squared is calculated by correlating benchmarked returns to share returns. As this research aimed to find factors other than returns to explain systematic risk behaviour, R-squared was found unsuitable for empirical testing.	Levy (2002); Wilkinson (2013)
Alpha	The alpha measurement is normally applied where unsystematic risk and its volatility have been eliminated. As this research focused on the modelling of systematic risk, alpha was not applied empirically.	Sofalof (2015); Wilkinson (2013)
Beta	Beta was applied as a systematic risk measurement in the empirical study. Beta is readily accessible because it is published by IRESS for all listed companies alike. No calculation is needed, which can carry the consequence of human error. It is also used as a risk measure in financial models such as the CAPM. Furthermore, previous research has applied beta as a systematic risk variable in empirical analysis (please refer to Table 2.8, later in this chapter).	Amihud and Goyenko (2018); Kiersz (2014)

Source: As listed in the table

In preceding paragraphs, systematic risk and its measurements were explored. In par. 2.2.2.3, the different types of systematic risk are further investigated to ensure that all types of systematic risks are theoretically explored.

2.2.2.3 Types of systematic risk

A peculiar association exists between financial leverage and systematic risk. A study by Nishat (2000) empirically demonstrated that leverage levels affected the volatility of share prices in Pakistan. Leary and Roberts (2005), as well as Kayhan and Titman (2007), undertook research to determine whether systematic risk causes distress for firms. Leary and Roberts (2005:2580) found that firms with lower leverage rates displayed greater distress, because these firms generated lower profits, exhibited lower rates of return on assets and equity; were less able to pay returns to investors; and endured decreases in share value. Similarly, Kayhan and Titman (2007:26) found that firms with higher leverage suffered less distress with regard to dividend payouts and share price declines. In their article, Chhapra *et al.* (2020:53) confirmed that the preceding findings are still relevant. It would seem that leverage levels affect the entity's ability to handle distress brought about by systematic risk. For this reason, beta calculations are adjusted for leverage. Vigario *et al.* (2014:124) illustrated that systematic risk can be leveraged (referred to as leveraged beta) or unleveraged (referred to as unleveraged beta). Paragraphs (a) and (b) provide an overview of the difference between the two types and the calculation methods for each.

a) Leveraged beta

Per the accounting equation (i.e., assets are equal to equity plus liabilities), a company's assets are funded in two ways: by issuing equity and by raising debt. The ratio used to describe the relationship between a company's debt and equity is referred to as 'leverage' (Vorster *et al.,* 2010:13). Leveraged beta is a beta measurement which accommodates the funding structure of an entity. It considers that systematic risk is increased when debt is obtained by the entity. Debt is often subject to risk factors such as demand, inflation and increased interest rates, which implies increased uncontrolled risk. For this reason, leveraged beta is somewhat higher than unleveraged beta (Lesseig & Payne, 2017). Leveraged beta is often applied in financial modelling, because researchers tend to avoid the assumption that a company will not raise debt (Sarmiento-Sabogal & Sadeghi, 2014). Formula 2.1 indicates the calculation for leveraged beta.

$$\beta = \frac{Cov(r_i, r_m)}{\sigma^2_m}$$

Formula 2.1: Expression for leveraged beta

Source: Jaafar *et al.* (2020:75)

β = leveraged beta

Cov = covariance

r_i = share return

r_m = market return

σ^2_m = variance in market return

As per Formula 2.1, leveraged beta is obtained by dividing the covariance between share return and market return by the variance of market return. The covariance between the share and its market is expressed as a fraction of the variance within the market. Thus, if the covariance is larger than the market variance, the fraction results in an answer larger than 1. If the covariance is smaller than the market variance, the factor results in an answer smaller than 1 (Abidin *et al.*, 2021:785). It can be observed that relative share price volatility is mathematically applied here (refer to Table 2.3).

b) Unleveraged beta

Unleveraged beta represents a beta measurement through which business debts are ignored. Unleveraged beta estimates systematic risk in the instance where the entity is funded only by means of equity contributions (Mehta, 2021). In effect, unleveraged beta measures the risk associated with shareholder expectations. Where the debt of an entity is equal to zero, the accounting equation indicates that assets equal equity. Without debt, the only risk faced by the entity is the inability to apply assets effectively to generate profits. If profits are not generated to the desire of shareholders, desired dividends cannot be declared and the share price value is negatively affected (Perreiro, 2010:111). Evidently, without debt funding, an entity is heavily subject to the whims of its shareholders. But it should be noted that the expectations of shareholders are not considered a systematic risk to the entity (Perreiro, 2010:112).

Unleveraged beta is normally a lower risk figure than leveraged beta. When debt is not incorporated into a beta measure, systematic risk decreases, because debt

renders the entity more vulnerable to macroeconomic effects (such as inflation and interest rates) (Abidin *et al.*, 2021:785-786). Formula 2.2 indicates the calculation of unleveraged beta.

$$\beta_U = \beta_L / [1 + (1 - T)(D/E)]$$

Formula 2.2: Expression for unleveraged beta
Source: Jaafar *et al.* (2020:75)

In Formula 2.2, the following is represented:

βu = unleveraged beta

β_L = leveraged beta

T = tax rate in decimal

D = total debt

E = total equity

From the formula, it is evident that unleveraged beta is calculated by adjusting leveraged beta through the elimination of the gearing factor. The gearing factor (debt to equity ratio) is adjusted for the taxation rate. Thereafter, leveraged beta is divided by 1 + the tax adjusted gearing factor (Abidin *et al.*, 2021:786).

For the purpose of empirical analysis (refer to Chapters 4 and 5), the researcher included both leveraged and unleveraged beta for testing and modelling. This was done for two reasons:

- The researcher did not want to make assumptions about the value that financial analysts and financial statement users place on the gearing of systematic risk. While some may perceive the debt-carrying of the company as ‘cheap funding’ and an ultimate tax saving, others may perceive the accumulation of debt as a financial burden to the entity. In empirically testing and modelling both leveraged and unleveraged systematic risk, both perceptions are accommodated; and
- Empirical testing (refer to Chapter 5) proved that leveraged and unleveraged systematic risk are not necessarily predicted (within the selected sample) by identical accounting factors. Consequently, the study ran the risk of being unclear

as to the type of systematic risk being predicted by the proposed model in Chapter 5. By constructing a model for predicting both leveraged and unleveraged systematic risk, all possible grounds were covered.

In par. 2.3, the focus shifts from the concept of risk to the concept of return. As indicated by Figure 2.1, the sections hereafter provide an in-depth theoretical explanation of how returns can be measured.

2.3 THE CONCEPT OF RETURN

When investors purchase shares, they obtain a portion of ownership within a company (Anthanasius, 2012:1). Financial performance assists investors in deciding where and when to invest (Surwanti & Agustianata, 2019:176). Through the investment process, investors aim to invest in shares which provide high returns. The Financial Dictionary (2022) interprets the term 'return' as *a profit or loss on an investment.* According to Fadjar *et al.* (2021:7355), a return is the output or yield obtained through investing. Thus, returns are the measured difference between the value of a portfolio at an earlier time versus the current point in time. From the preceding definitions, it is posited that a 'return' is the yield generated by the investor when investments are made, leading to increases in the value of an investment portfolio. Barnes (2003:3), however, highlights that there is no singular definition relating to the term 'return' and that the concept should remain open ended and all inclusive, depending on the investment, the investor and the investment portfolio. According to the JSE (2022), returns are mainly influenced by two elements. These elements are set out in Figure 2.3.

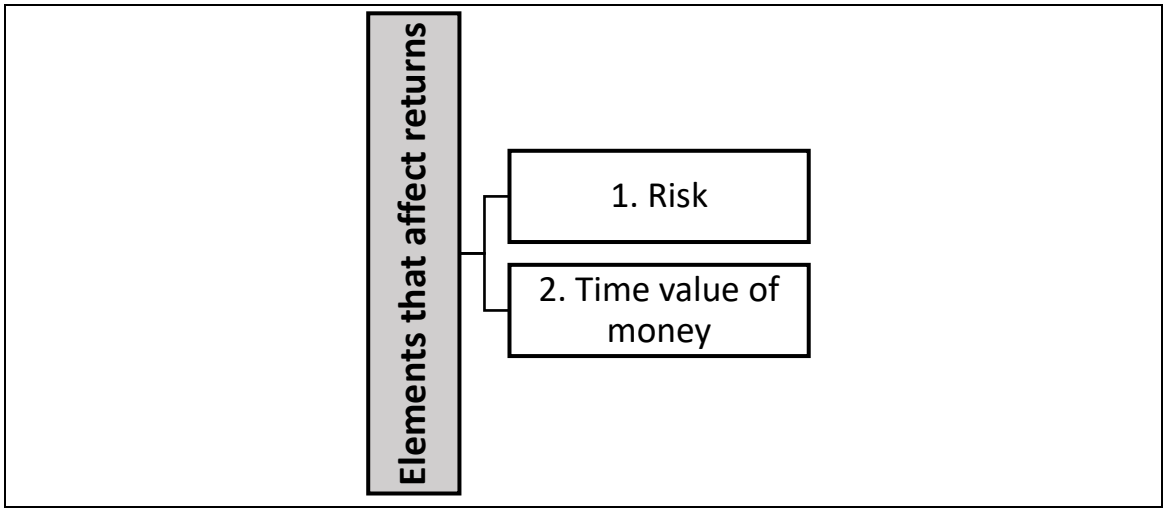


Figure 2.3: Elements that affect returns

Source: JSE (2022)

Figure 2.3 demonstrates that risk and time value of money are the most significant elements that affect returns. With regard to the concept of risk, it is linked back to the MPT. Per financial theory, portfolio management adopts the notion that systematic risk and returns are linearly and positively related (Miller, 2019). As indicated by the problem statement (Chapter 1, par. 1.4) and empirical objective 1 (Chapter 1, par. 1.5.2.2), this research was undertaken to determine whether the MPT can be generalised for application to the sampled companies. Systematic risk was discussed in detail in par. 2.2.2 of this chapter.

'Time value of money' is a phrase used to explain that money loses value over time. Inflation causes prices to rise, implicating that currency has lesser purchase power as time goes by. Time value of money holds consequences for the investor (Lovemore & Brummer, 2013:127):

- Firstly, there is a cost associated with the deferral of spending. If the investor does not invest today, the cost of utilising the investment opportunity later may entail much higher capital; and
- Secondly, the opportunity cost of idle capital results in losses to the investor. Most investors intend to invest as quickly as possible and to receive a return as soon as possible to ensure that the investment is profitable within the shortest possible time.

For the purpose of this research, time value of money was accommodated through the application of inflation adjusted ratios, in addition to ordinary published ratios. In Table 2.7 later in this chapter, it can be observed that five different inflation adjusted ratios were included for testing in Chapter 4. The calculation of inflation adjusted returns to overcome the effect of inflation is a solution to the problem of time value of money suggested by the JSE (2022).

Based on financial theory, a distinction should also be made between estimated returns and actual returns. Actual returns are returns which have been generated historically and recorded as such. Expected returns are the anticipated returns based on the expected rate of return (Marx *et al.,* 2017:106). Figure 2.4 was constructed for explanatory purposes.

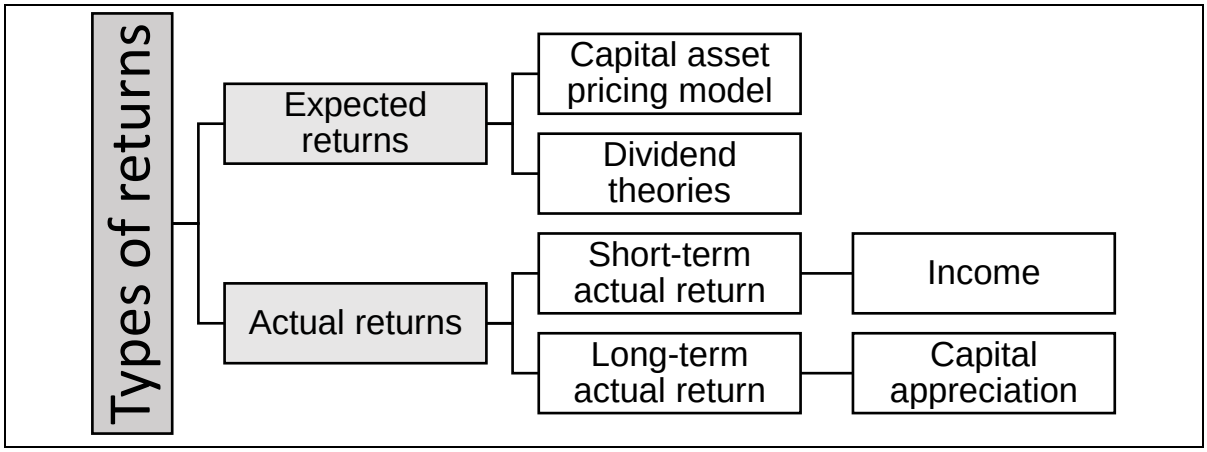


Figure 2.4: Types of returns

Source: Author

Figure 2.4 will be used as an outline for the discussions to follow hereafter. Expected returns are addressed in par. 2.3.1, while actual returns are discussed in par. 2.3.2.

2.3.1 Expected returns

Figure 2.4 demonstrates that returns are either expected or actual in nature. With regard to expected returns, return rates can be estimated by means of the capital asset pricing model (CAPM) (Marx *et al.,* 2017:117-119). The CAPM posits that the expected return on a company's equity is equal to the risk-free investment rate plus the risk-bearing rate. The risk-bearing rate is based on the entity's potential to be shielded against systematic risk exposure within the industry.

The CAPM demonstrates the cost of equity to the entity and thus indicates the minimum expected rate of acceptable return in order to make the equity investment worthwhile. The investor does not intend to earn a lower return than what it costs the entity to obtain the capital investment (Elbannan, 2015:216-217). Formula 2.3 indicates how the CAPM is calculated.

$$Ra = Rrf + Ba(Rm - Rrf)$$

Formula 2.3: Capital asset pricing model

Source: Thakur (2020b)

In Formula 2.3, the following is represented:

R_a = cost of equity

R_{rf} = risk-free rate

B_a = leveraged beta

R_m = required rate of return

Formula 2.3 demonstrates that the CAPM is calculated by means of multiplying the systematic risk factor (beta) by the market premium. Thereafter, the risk-free rate is added to the equation (Thakur, 2020b). In her doctoral thesis, Konarasinghe (2016:20) highlighted that the CAPM has been subject to scrutiny for a number of reasons, among which the following:

- It ignores investment taxation such as dividend taxes;
- It assumes a constant and ever-present risk-free rate;
- It assumes that all information relating to the risk of securities is known and accessible; and
- It assumes that the association between systematic risk and expected returns is always linear in nature.

From the list of reasons for scrutiny, it would seem that the CAPM entails assumptions that may not be suited for all possible empirical scenarios, yet Correia (2019:4-27) indicated that the CAPM is predominantly used as valuation method in South Africa, the USA, the UK and Australia. There does not seem to be discrepancies between the theory and the professional judgement applied in practice.

As per Figure 2.4, dividend theories are also often applied as arguments for estimating expected returns. These theories include (Mwangi, 2017:95-97):

- The dividend signalling theory, which posits that dividend declaration signals prospects regarding future earnings. Thus, dividend declarations by an entity is also an indication of possible future returns;
- Firm life cycle theory, which theorises that dividend payments are expected to grow over the lifespan of the firm. Thus, growth rates are related to the ability to generate earnings and continue to pay dividends; and
- The bird-in-hand theory, which indicates that investors prefer current dividends to future dividends. Dividend payments reduce investment uncertainty and increase the value of a share. Consequently, it is posited that a firm's value and its capability to pay dividends are related. From this theory, a DDM was postulated.

From the DDM, it can be inferred that the entity's dividends will continue to grow at an expected growth rate, into perpetuity (Damico & Blasis, 2020:2).

$$r = \frac{D1}{PV0} + g$$

Formula 2.4: Dividend discount model

Source: Correia (2019:17-11)

In Formula 2.4, the following is represented:

r = cost of capital

PV_0 = present value of the share

D_1 = dividend receivable during the next period

g = estimated growth rate

Like the CAPM, the DDM can be used to estimate the cost of equity. The cost of equity is the minimum expected rate of return which is deemed acceptable by the investor, as a rate of return lower than the cost of obtaining equity implies losses (Elbannan, 2015:216-217). The DDM puts forward that the cost of equity to the company is next period's dividends receivable divided by the present value of the share, plus the growth rate. The DDM is also sometimes referred to as 'Gordon's growth model' (Smart & Graham, 2012:167). It should be noted that the estimation of future return rates heavily depends on the accuracy of the MPT. If systematic risk and return are not linearly related, the accuracy of applying the CAPM and DDM to estimate future returns can be brought into question. In addition, the DDM applies only where an entity pays dividends at a rising rate. Refer to Chapter 1, par. 1.2, for a full explanation.

2.3.2 Actual returns

Figure 2.4 indicates that actual returns consist of two components: short-term and long-term compensation. Returns in the form of short-term compensation are directed towards the collection of income normally paid within a year (i.e., annually, semi-annually or quarterly). Examples include interest, dividends and royalties (Feeny, 2021). Long-term compensation refers to share value growth, represented by capital appreciation over the longer term. Such capital gains can be realised only upon the sale of the stock (Feeny, 2021). Thus, the quantification of actual returns needs to consider both short- and longer-term compensation for the investment. Prior research (Bower & Bower, 1969; Chen & Shen, 2009; Lewellen, 2004; Zahir, 1992) has focused on profitability, dividends, earnings and share price analysis as the main source of

analysing actual returns. Figure 2.5 was created to explain how the concepts of profits/earnings, dividends and share price value are interrelated.

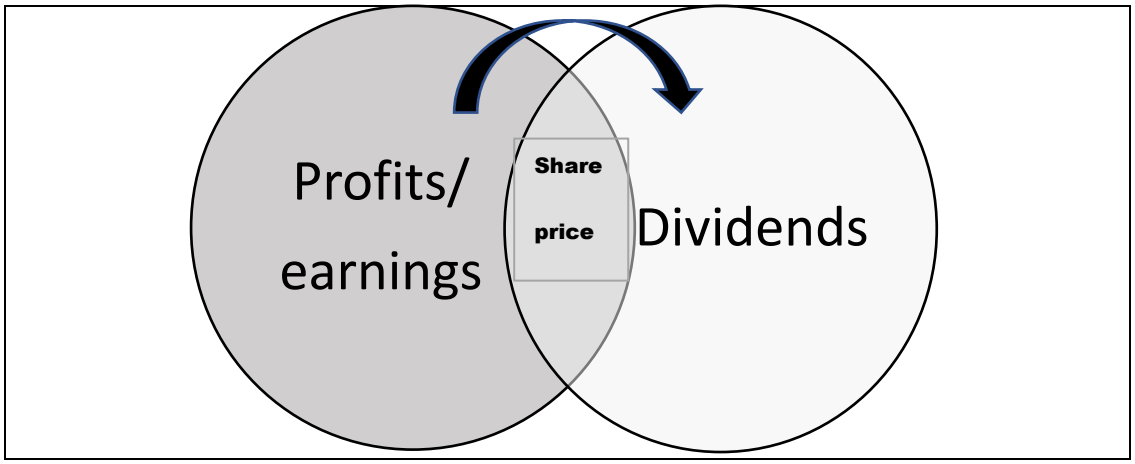


Figure 2.5: Interrelation of profits/earnings, dividends and share price value
Source: Author

Figure 2.5 indicates that the generation of profit or earnings leads to the ability to distribute dividends to shareholders. Researchers such as Dimitropoulos and Asteriou (2009), Farsio *et al.* (2004), and Skinner and Soltes (2011) postulate that there is a causal relationship between earnings and dividends. In the case of being able to both generate earnings and distribute dividends, the market value of the share should be stimulated for share price growth, otherwise known as the creation of shareholders wealth (Bhasin & Shaikh, 2013:107-109). As systematic risk is measured through volatility in share prices (Ahmad & Ramzan, 2016:37), there can potentially be an association between systematic risk behaviour and shareholder wealth creation.

Panda and Nanda's (2017:1-3) research concluded that short-term and long-term returns were interrelated on stock exchanges for sampled countries like Britain, Denmark, Finland, Germany, Portugal, Spain, Sweden, Switzerland, Greece, Ireland, Luxembourg and Norway. It would seem that short-term profits and long-term value creation are not independent from each other, and it should be noted that the unsustainable generation of short-term earnings will eventually lead to the plundering of long-term value creation (McKinsey & Company, 2017; Smart & Graham, 2012:159).

Based on preceding arguments, it can be posited that profitability can potentially affect shareholder wealth creation and, thus, share price behaviour and systematic risk. In

addition, it can be argued that, if a relationship exists between earnings and dividends – while short-term profits and long-term value creation depend upon each other – there should also be an association between dividends and long-term value creation. Consequently, dividends and systematic risk could be associated with each other.

From the preceding arguments, it can submitted that earnings, dividends and share price values are interrelated and representative of both short-term returns (income) and long-term returns (capital gains). As capital appreciation and risk are often associated with each other (McKinsey & Company, 2017), the fundamental assumption of the MPT (that risk and return measures are related) is again reflected here. It seems that the MPT is deeply enmeshed in the determination of expected returns (per the CAPM and DDM, see par. 2.3.1), as well as actual returns.

In relation to mathematical expression, researchers such as Fahmi (2015), Tupe (2014), Mohammed and Ali (2018), and Donaldson (2015) highlight that historical financial data, especially financial ratios, are used to analyse historical actual return data. Several research papers published between 2015 and 2021 have provided evidence that, in academic literature, returns are often measured by means of earnings, profits, dividends and share prices through identifying certain representative financial ratios. Table 2.6 was constructed to provide an overview.

Table 2.6: Important ratios relating to analysis of actual returns

Researcher(s)	Finding	Category of analysis identified through the research finding	Source
Babi (2015)	Earnings per share (EPS) was an important factor in the analysis and comprehension of returns.	Earnings	Babi (2015:167)
Wijaya (2015)	It was found that ROA, dividend yield and earnings yield associated well with patterns in historical return movements.	Profitability, earnings and dividends	Wijaya (2015:270)
Bannigidadmath and Narayan (2015)	The PE ratio, dividend payout ratio, dividend yield ratio and dividend-to-share price ratio were analysed in order to comprehend actual returns.	Earnings, dividends and share price value	Bannigidadmath and Narayan (2015:43)
Pech *et al.* (2015)	ROE, dividend yield and EPS are well associated with historical actual returns.	Profitability, earnings and dividends	Pech *et al.* (2015:590)
Muhammad and Ali (2018)	The ROA ratio can provide insight into actual return fluctuations.	Profitability	Muhammad and Ali (2018:91)
Indrayono (2019)	Factors of profitability and dividend payments are fundamental to understanding return behaviour. The pricing earnings ratio (PE ratio) was pointed out as a key ratio when obtaining an understanding of financial returns.	Profitability, earnings, dividends and share price value	Indrayono (2019:1901-1903)

Researcher(s)	Finding	Category of analysis identified through the research finding	Source
Surwanti and Agustianata (2019)	Fundamental data relating to analysis of returns are the consideration of a company's revenue, profit, dividends and financial prospects.	Profitability, earnings and dividends	Surwanti and Agustianata (2019:177)
Aldiena and Hakim (2019)	Variables such as ROA and NPM were identified as closely associated with return movements.	Profitability	Aldiena and Hakim (2019:147)
Schippers (2020)	The dividends-to-share price ratio, dividend yield, PE ratio and dividend payout are related to historical actual returns.	Earnings, dividends and share price value	Schippers (2020:12)
Sulastri *et al.* (2021)	It was empirically demonstrated that the dividend payout ratio was related to movements in actual returns.	Dividends	Sulastri *et al.* (2021:96)

Source: As listed in the table

Table 2.6 indicates a category of analysis (relating to historical returns), the study's findings and the source of the research finding for 10 research papers. It is apparent from Table 2.6 that previous studies have resorted to the collection of financial ratios relating to earnings, profits, dividends and share price in order to analyse actual returns.

For the purpose of this research, *historical actual returns* were included for empirical testing in Chapter 4. Actual returns were applied for the following reasons:

- Deviations occur between expected returns and actual returns, as the returns expected by the investor may not materialise when financial data are published by the entity. Deviations can occur owing to poor management of assets and debt on the part of the entity and its stewards, unexpected changes brought about by macroeconomic factors, or investors' overestimating the return that an entity can generate with the resources that it has at its disposal (Abdullah *et al.*, 2015:10; Marx *et al.*, 2017:107); and
- The collection of historical data relating to past sales, income, dividends and earnings forms the basis of estimating the future rate of return. Thus, historical information remains fundamental even in the attempt to predict future expected rates of return (Fadjar *et al.,* 2021:7356). For the empirical analysis of actual returns (refer to Chapter 4), the study applied financial ratios relating to earnings, profitability ratios, dividends and market value as variables. This was done because financial ratios pertaining to these concepts have been identified as key indicators of return behaviour by other researchers (refer to Table 2.6). The ratios selected for empirical analysis were determined by ratios made available by IRESS. As IRESS was used as a data collection tool (refer to Chapter 1, par. 1.7.2.1 (c), all ratios (relating to earnings, dividends, profits and share prices) published by IRESS were included for empirical analysis. This ensured comparability and consistency among research findings. It should be noted that the dividend payout ratio was not included for testing because it is not published by IRESS. Table 2.7 summarises the ratios (by title) which were included for testing in Chapter 4.

Table 2.7: Ratios selected for empirical testing

Ratio title	Ratio description	Source
Gross profit margin (GPM)	The GPM indicates the percentage of sales that is retained of revenue after the cost of sales have been deducted. This ratio is less popular than NPM and OPM, because it ignores other business expenses. It exclusively focuses on the deduction of cost of goods sold. This ratio is useful only when it can be compared to a benchmark or to the historical GPM figures of the entity.	Lovemore and Brummer (2013:100)
Net profit margin (NPM)	The NPM expresses the net profit of the entity as a percentage of sales. It indicates how much of sales is eventually retained after all expenses have been subtracted. This ratio requires that expenses be properly managed when sales are increased, because an increase in sales without a simultaneous increase in net profits will reflect a downward trend in this ratio.	Parrino and Kidwell (2008:34)
Operating profit margin (OPM)	The OPM differs from the NPM in the sense that it divides profit before interest and tax by the sales to result in a percentage figure. This ratio ignores non-core business activities to indicate the profit which results from only the main business activities of the entity. The OPM is an important indicator of the financial health of the entity because it relates to its main trade.	Bowman (2021); Carlson (2020a)
Return on assets (ROA)	The ROA ratio divides the net profit of the entity by the value of its total assets. This ratio provides useful information relating to how efficiently a company uses its assets to generate profit. Large investment in new assets may lead to a lower ROA if new assets are not applied for profit generation.	Moles *et al.* (2011:133)
Return on equity (ROE)	ROE is a ratio which expresses the entity's net profits as a percentage of its common stock. ROE is the product of the 'Du Pont' analysis, where the NPM, ROA and financial multiplier are multiplied with one another. It is a widely recognised measure against which industry norms can be compared.	Brigham and Gapenski (1988:779); Nasdaq (2022a)

Ratio title	Ratio description	Source
Return on capital employed (ROCE)	ROCE expresses the entity's annual net profit as a fraction of total capital invested. It measures how efficiently an entity has invested its capital in order to generate profits. This ratio is often viewed as a fundamental ratio because it indicates returns earned before any distributions are made to equity participants.	Oxford Reference (2022); Riley (2012)
Return on average assets (ROAA)	ROAA entails the division of net profit for a particular period by the average of assets held over a selected period of time. Generally, average assets are calculated by adding the total assets of the two most recent financial years together and averaging them out (i.e., multiplying by half). ROAA provides the investor with insight as to whether the entity has continuously applied its assets efficiently in order to generate net profit.	Mukhopadhyay and Vaidya (2022a)
Return on average equity (ROAE)	ROAE is calculated by dividing the net profit of the entity by the average ordinary equity. Average equity can be calculated by adding the equity of recent years together and dividing it by the number of recent years under review. It indicates to the investor whether the equity of the entity, on average, was efficiently utilise in generate net profit.	Mukhopadhyay and Vaidya (2022b)
Inflation adjusted return on assets	Inflation adjusted ROA adjusts the ROA for the inflation rate of a selected period of time (normally a selected financial year). Inflation adjusted ROA is useful when historical comparisons between ROA figures are made. It indicates the present day value of the ROA ratios of previous years. It is ideal to compare inflation adjusted ROA figures of previous financial periods to the ROA ratio of the current financial year.	Rist and Pizzica (2015:59)
Inflation adjusted return on equity	Inflation adjusted ROE adjusts the ROE ratio for the inflation rate of a specific financial period. This assists the investor in understanding how the historical ROE figures compare to the ROE figure of the current financial period.	Raiyani (2011:127)

Ratio title	Ratio description	Source
Inflation adjusted return on average assets	Inflation adjusted ROAA is the adjustment of the ROAA ratio for the inflation rate of a specific time frame. It eases comparisons between previous years' ROAA ratios and the current period's ROAA figure.	Rist and Pizzica (2015:60)
Inflation adjusted return on average equity	Inflation adjusted ROAE is the adjustment of historical ROAE figures for the inflation rate of a predetermined period. It provides the investor with a good idea of how current ROAE figures compare to those of the past.	Raiyani (2011:127)
Dividends per share (DPS)	DPS represents the portion of the entity's profit that is distributed to every ordinary share held. DPS is perceived as a great motivator for further investment in the entity, as investors tend to prefer investments that render continuous and growing dividends.	Nolan (2021); Smart and Graham (2012:161)
Dividend yield	The dividend yield ratio expresses the dividend per share as a percentage of the market price of a share. This ratio assumes that shareholders fundamentally value dividends and thus dividends are a primary determinant of market prices. It is difficult to assess whether a dividend yield is 'good' or 'bad'. In order for this concept to be useful, market benchmarks need to be published. An average dividend yield on the JSE measures around 4%.	Collier (2009:121); Nasdaq (2022b)
Earnings per share (EPS)	EPS is measured by dividing the company's profit by the total number of outstanding ordinary shares. Growth in EPS is perceived as one of the most important indicators of a company's financial prosperity. It signals not only the ability to pay dividends to shareholders, but also the availability to invest funds for future expansion. It should be noted that EPS is integrated into two other financial ratios: the PE ratio and earnings yield ratio.	Collins Dictionary (2022); Smart and Graham (2012:160)

Ratio title	Ratio description	Source
Earnings yield	The earnings yield ratio expresses the EPS as a fraction of the market value of the share. It is the inverse calculation of the PE ratio. This ratio indicates EPS as a portion of the share price. Basically, the earnings yield shows the investors how much the entity has earned per every R1 share value.	Lovemore and Brummer (2013:104); Nasdaq (2022c)
Inflation adjusted profit per share	Inflation adjusted profit per share is the EPS figure of the entity adjusted for the inflation rate of a particular time period. Inflation adjusted profits are useful in instances where figures are compared among different time frames. It overcomes one of the basic shortcomings of ratio analysis: that general ratio calculations ignore the fact that currencies lose value over time.	Rist and Pizzica (2015:56)
Price/earnings ratio (PE ratio)	The PE ratio is calculated by expressing the market price of a share as a fraction of its EPS. This ratio determines how many times the market price can cover the EPS of a share. It is a good indicator of shareholders' eagerness to obtain the share. It reflects the market's sentiment regarding possible future growth. The ideal PE ratio measures between 17 and 20 on the JSE.	Mittner (2020); Nasdaq (2022d)
Market price per share	The market price per share is sometimes referred to as the 'share price' of a share and is the most recent value at which a share can be traded on a public stock exchange. Share prices are measured daily, but focus is often placed on closing share prices on the last day of the entity's financial year. The market price per share is applied as a component of the PE ratio, dividend yield and earnings yield.	Carlson (2020b)

Source: As listed in the table

In the preceding section (par. 2.3.2), the researcher set out to determine how actual returns can be measured. It was found that earnings, dividends and share prices represent actual returns and can be expressed by means of financial ratios which contain these concepts. Paragraph 2.4 discusses how other researchers have interpreted the concepts of 'risk' and 'return' in their empirical studies. These studies have aimed to determine whether the selected risk and return proxies were indeed related as indicated by the MPT.

2.4 INTERPRETATION BY OTHER RESEARCHERS

The purpose of this section is to analyse previous research to determine how other researchers have interpreted the terms 'risk' and 'return' in studies similar to the current one. This section addresses theoretical objective 3, set out in Chapter 1, 1.5.2.1. In Table 2.8, 20 research studies between 2013 and 2022 are evaluated. This time frame was selected to ensure that this review of the literature is not outdated (i.e., older than 10 years at the time that this study was undertaken). All studies listed in the table hereafter had been executed to identify relationships between *both* risk and return measures (unlike studies listed in Table 2.6, which *only* focused on return measures). The table indicates the researchers, the date of publication, the location where the study was executed, how the measurement of 'risk' was interpreted, how the measurement of 'return' was interpreted, and the research finding.

Table 2.8: Previous research

Author(s)	Date	Location	Measurement of risk	Measurement of return	Research finding
Nimalathasan and Pratheepkanth	2013	Sri Lanka	Beta	Degree of financial leverage (DFL); Degree of operational leverage (DOL); NPM; ROCE; ROE	NPM, DOL and DFL were positively related to beta.
Akbari *et al.*	2013	Iran	Beta	EPS; ROE; ROI	Return measures affected beta significantly.

Author(s)	Date	Location	Measurement of risk	Measurement of return	Research finding
Mulli	2013	Kenya	Beta	NPM	There is no significant association between beta and NPM.
Adhikari	2015	Nepal	Beta	ROA; DPS; EBIT growth	DPS was inversely correlated to beta. Other return measures were not associated with beta.
Kouhian and Sharifabadi	2015	Iran	Beta	EPS; ROA; EBIT growth	All return measures were positively associated with beta.
Li	2016	Netherlands	Beta	ROE; EBIT growth	Beta was negatively associated with EBIT growth, but not associated with ROE.
Dedunu	2017	Sri Lanka	Beta	ROA; Dividend payout ratio	ROA was positively correlated with beta, while dividend payouts were negatively associated with beta.
Nawaz *et al.*	2017	Pakistan	Beta	ROA	ROA was significantly associated with beta.
Ramarow	2017	Malaysia	Beta	ROA; ROE; ROCE; EPS; ROI	ROA and ROCE were significantly associated with beta. Other return measures were not significantly related to beta.

Author(s)	Date	Location	Measurement of risk	Measurement of return	Research finding
Karakus	2017	Turkey	Beta	GPM; OPM	A negative correlation was found between beta and measures of return (GPM and OPM).
Rutkowska-Ziarko and Pyke	2017	UK	Beta	ROA; ROE	A positive association was found between ROA and beta, and ROE and beta.
Kamran and Malik	2018	Pakistan	Beta	Dividend payout ratio; EBIT growth	Return measures were negatively associated with beta.
Arora *et al.*	2019	Austria	Beta	NPM; Profit retention ratio	Return measures were found to be significant predictors of beta.
Varma and Selvarani	2019	India	Beta	ROA; OPM; NPM	ROA was positively correlated with beta, while OPM and NPM were negatively correlated with beta.
Ioannis	2019	Greece	Beta	ROA; and EBIT growth	Return measures negatively affected beta values.
Vongphachanh and Ibrahim	2020	Malaysia	Beta	EBIT growth; ROA; OPM	Return measures were insignificantly related to beta.
Nugroho *et al.*	2021	Indonesia	Beta	ROA; ROE; NPM	Return measures were able to predict beta values.

Author(s)	Date	Location	Measurement of risk	Measurement of return	Research finding
Tekin	2021	Turkey	Beta	ROA; ROE	ROA and ROE could not significantly predict beta.
Green and Zhao	2021	USA	Beta	ROA; OPM; ROE; EPS	Only EPS and OPM were significantly associated with beta.
Rutkowska-Ziarko	2022	Poland	Beta	ROA; ROE	Beta positively correlated with ROA.

Source: As listed in the table

From Table 2.8, it is apparent that all studies applied beta as a measure of systematic risk. With regard to return measurements, ROA, ROE, NPM, OPM, EPS and EBIT growth were most often interpreted as a return measure. As indicated in Table 2.5, beta was also applied as systematic risk measure in Chapters 4 and 5 of this thesis. As it relates to return measures, it was mentioned in par. 2.3 that the return measures were selected to be in line with return ratios available on IRESS. In the analysis presented in Chapter 4, ROA, ROE, NPM, OPM and EPS were included for analytical purposes. EBIT growth was not included for testing, because this ratio is not published by IRESS. However, EBIT movements are also reflected in the OPM, which was included for testing (refer to Table 2.7). A summary of Chapter 2 follows in par. 2.5 hereafter.

2.5 CHAPTER SUMMARY

Chapter 2 was undertaken to fulfil the theoretical objectives set out in Chapter 1, par. 1.5.2.1. In this chapter, theoretical objectives 1, 2 and 3 were fulfilled. The chapter commenced by providing an overview of how the study contributes to the theoretical understanding of the concepts 'risk' and 'return', as well as how these concepts were interpreted for the sake of empirical analysis.

Paragraph 2.2 provided a theoretical analysis of the types of risk, the measurement of risk and the types of systematic risk. It was established in par. 2.2 that two types of risk can be identified: unsystematic risk and systematic risk. Unsystematic risks are controllable by entities, while systematic risks cannot be controlled by entities. In par. 2.2.1, unsystematic risk was discussed. In this paragraph, Table 2.1 displayed and described the different types of unsystematic risk: compliance risk, reputational risk, security risk, competition risk, governance risk, strategic risk, technological risk, project risk and quality risk.

Paragraph 2.2.2 established an understanding of systematic risk and share price volatility. Table 2.2 summarised the external factors that constitute volatility in systematic risk, while Figure 2.2 showed the relationship among external economic factors, volatility and systematic risk. Paragraph 2.2.2.1 explained the types of volatility, which were described in Table 2.3, namely historical, relative and implied volatility.

Paragraph 2.2.2.2 provided an overview of how volatility is measured. In Table 2.4, the types of volatility measures (standard deviation, alpha, R-squared and beta) were summarised in terms of description, advantages, disadvantages and the type of volatility which each of them measures. Table 2.5 explained which of the volatility measures were to be used for empirical application (as explained in Figure 2.1). It was established that the beta measure was to be applied for empirical usage.

The final paragraph, relating to the concept of risk, explained that financial leverage affects systematic risk. When an entity is financially leveraged, it is more vulnerable towards systematic risk. Paragraph 2.2.2.3 explained that systematic risk can be leveraged or unleveraged. In the instance of unleveraged systematic risk, the effects of tax and gearing are removed from the risk calculation. The calculation method of both

leveraged systematic risk and unleveraged systematic risk were presented in Formula 2.1 and Formula 2.2, respectively. Lastly, the researcher explained the two main reasons as to why both leveraged and unleveraged beta were applied in the empirical analysis to the research.

The concept of 'return' was explored in par. 2.3. It was determined that returns refer to profits or losses generated by an investment. Figure 2.2 indicated that returns are affected by two elements: risk and time value of money. Here, it was argued that the relationship between risk and return has its origin in the MPT, and that stage 1 of this research had been undertaken to determine whether this theory applied to the sampled companies. Furthermore, it was argued that the effect of time value of money was managed through including inflation adjusted ratios for empirical analysis. This solution has been proposed by the JSE (2022).

Expected and actual returns were discussed in par. 2.3.1 and par. 2.3.2, respectively. It was indicated that minimum expected returns are equated to the cost of equity to the company. The investor will not accept a return lower than the cost to obtain equity. The CAPM and DDM were discussed as possible methods for estimating the cost of equity. But it was indicated that both these models adopt the assumption that risk and return are interrelated. Where risk and return are not empirically related, these models should not be adopted.

Paragraph 2.3.2 provided insight into the measurement of actual returns. It was found that actual returns are represented by both short-term income and long-term capital appreciation (Figure 2.4). Such short- and long-term returns are often proxied by earnings, profits, dividends and share prices values. These proxies are expressed by means of selected ratios that contain earnings, profits, dividends and share price components (Table 2.6). For the purpose of this research, all financial ratios which contain earnings, profits, dividends and share price components and are published by IRESS were included for empirical testing in Chapter 4. An overview of these ratios can be observed in Table 2.7.

To fulfil theoretical objective 3, par. 2.4 provided an overview of the interpretation of the concepts 'risk' and 'return'. As mentioned in the introduction to this chapter, the MPT does

not provide clear interpretations and quantifications for these terms. In order to establish an understanding of how previous researchers interpreted these concepts, Table 2.8 was constructed as a summary of interpretation. A total of 20 previous studies, dated between 2013 and 2022, were analysed to observe which financial concepts empirically represented 'systematic risk' and 'return' within the context of these research endeavours. It was found that 'beta' represented 'systematic risk' in every instance, while ROA, ROE, NPM, OPM and EPS most often represented the measurement of return. All these concepts were incorporated into the empirical analysis presented in Chapters 4 and 5.

Having fulfilled theoretical objectives 1, 2 and 3, this thesis can progress towards Chapter 3. The aim of this chapter is to provide an understanding of the research design and mixed methodology applied to execute the research.

CHAPTER 3:
RESEARCH DESIGN AND METHODOLOGY

If we knew what it was we were doing, it would not be called 'research', would it?
– Albert Einstein

3.1 INTRODUCTION

Research plays an integral part in creating new knowledge. Babbie (2013:3) posited that research is performed to understand the world better. Much of what is considered 'knowledge' represents only beliefs and opinions based on personal experience (Babbie, 2013:4). Research is a scientific process that accumulates facts through collection of evidence (Mouton, 2013:13). According to Newsome (2015:1), research is the process of acquiring knowledge in a systematic and organised manner. In accordance with these descriptions, it can be submitted that research is the systematic and organised process of accumulating facts and evidence in order to establish knowledge. Many different approaches may be applied to the research process (Creswell, 2014:3). This chapter aims to provide a detailed description of the research design and methods that were applied to this study. The paragraphs hereafter indicate the applicable philosophical worldview, the research process, research design and method, manner of data collection, as well as data analysis. Paragraph 3.2, which follows, explores the philosophies of research.

3.2 THE PHILOSOPHIES OF RESEARCH

Before the research process commences, the researcher needs to determine the underlying philosophical worldview of the proposed research. This includes pre-existing assumptions that are brought to the study and influence the research design and methods. According to Creswell (2014:5), the researcher should determine: 1) the philosophical worldview of the proposed study; 2) the basic ideas of the applicable worldview; and 3) how the worldview shapes the research approach. Mills and Birks (2014:5-9) identified four worldviews: post-positivism, constructivism, transformative, and pragmatism. Table 3.1 explains each worldview (Creswell, 2014:5-12; Czaja & Blair, 1998:13-15; Godwill, 2017:12-20; Mills & Birks, 2014:5-9).

Table 3.1: Philosophical worldviews

Philosophical worldview	Basic ideas of worldview	Implications for research approach	Why the worldview applied to the current research, or not
Post-positivism	This worldview holds the philosophy that there exists a definite relation between cause and effect. This is sometimes also called a 'scientific worldview', as it requires experimentation in order to reach outcomes. The development of research that suits this worldview requires the numerical collection of observations. Thereafter, observations are tested and findings verified.	This worldview applies to quantitative or mixed research methods.	This worldview applied to the current research because observations, which were collected qualitatively, were sampled for the purpose of numerical testing.
Constructivism	Supporters of constructivism believe that experiences are subjective and that individuals seek unique understanding of the world. Individual meanings, which are multiple and varied, are directed to objects. The researcher will aim to study the complexity of views, rather than their substantiality. Such research will mostly study how individuals live, work and interact within a specific context.	Constructivism is typically a worldview that supports qualitative research.	This worldview did not apply to the current research because it did not intend to seek individual understandings, but rather collective, objective patterns.

Philosophical worldview	Basic ideas of worldview	Implications for research approach	Why the worldview applies to the research, or not
Transformative	The transformative worldview emerged after individuals put forward that post-positivism imposes too many rules and restrictions that do not suit marginalised research within society. Such research may include participants who, e.g., are disabled or homosexual, hold a feministic view, or come from an ethnic minority. This worldview holds that oppression should be confronted at all levels.	This type of research may be qualitative or quantitative because it will strive not only to understand the views of marginalised participants, but also to establish relationships among different groups.	The current research was not concerned with the transformative worldview because no marginalised groups were sampled. On the contrary, the top performing listed companies were sampled, which cannot be described as disadvantaged.
Pragmatism	This worldview arises out of action, situation and consequence. Here, the main focus is directed towards the research problem, rather than solutions. Researchers commit to understanding the problem fully and focusing on methods and approaches that are available to understand the problem completely. Pragmatists do not consider truth to be inconsistent and believe that it differs across time frames.	Pragmatists normally prefer a mixed method approach when studying research problems.	The current research was not as much concerned with the research problem, but mainly directed towards finding a solution to the research problem. The study was ultimately aimed at assisting the investor and portfolio manager to find a solution to an investment dilemma.

Source: Adapted from Creswell (2014:5-12), Czaja and Blair (1998:13-15), Mills and Birks (2014:5-9), and Godwill (2017:12-20)

As indicated in Table 3.1, this study was performed within the post-positivist philosophy. Table 3.2 provides a breakdown of the components of this paradigm.

Table 3.2: Components of the post-positivist paradigm

Philosophical component	Description of component	Application to post-positivist paradigm
Ontology	Indicates the nature of reality.	Reality is an objective truth that exists independently from the observer.
Epistemology	Indicates how the researcher relates to the research.	The research and the researcher function independently from each other.
Methodology	Indicates the nature of the research process.	A deductive process is applied. Deduction takes place when conclusions are drawn from existing arguments or evidence.

Source: Adapted from De Villiers (2015:33)

In accordance with Table 3.2, for the current research to have been successfully executed, objective observation of reality was required. The research and researcher were not intertwined in any way, as the researcher served as an objective analyst of the data at hand. Research findings were arrived at through thorough collection methods and verification of observations. The approach of verification was scientific in nature, as the researcher intended to collect observations within a predetermined order and analyse them by means of appropriate techniques. The research conclusion was carefully deduced from the outcomes generated by the scientific process. This conclusion is submitted in Chapter 7. Paragraph 3.3 describes the scientific process followed to arrive at the ultimate conclusion.

3.3 THE RESEARCH PROCESS

As indicated in the introduction, research is an organised process. Thus, there are certain steps through which research execution is approached. According to Mouton (2013:114), the research process consists of six steps: identifying the research problem, studying existing literature, identifying the research design, deciding on the research method, collecting evidence, and reaching a conclusion. Similarly, Oliver (2010:2-9) has identified an order in which research is performed. According to Oliver (2010:2-10), research starts with a research idea, problem or question. Thereafter, the researcher collects as much existing literature as possible to obtain an understanding of the underlying topic or idea.

The researcher then decides on an applicable research design and method, after considering the thoughts, problems, designs and methods of other researchers from the literature. Finally, the researcher collects and analyses data, to draw a conclusion. Figure 3.1 serves as an illustration of the research process.

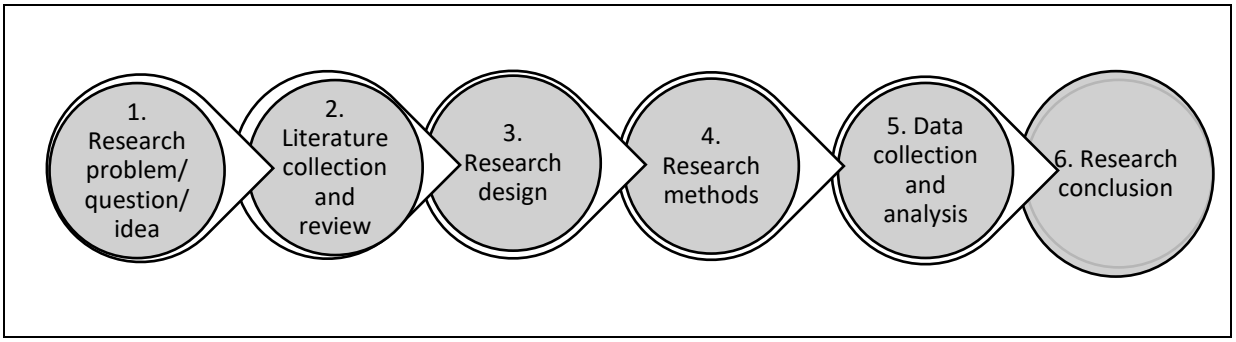


Figure 3.1: The research process

Source: Adapted from Mouton (2013:114) and Oliver (2010:1-10)

From Figure 3.1, it is evident that the research process is set out in six precise steps. In the first step, a research problem needs to be identified. According to Greener (2011:52), a research problem is a particular problem towards which the research focus is extended. Mouton (2013:115) adds that a research problem should be the unambiguous statement of a study's main objective.

The second step involves the reviewing of literature. A literature review is the process by which literature is identified and critically selected with the aim of addressing theoretical research objectives (Dewey & Drahota, 2016). Such a review should summarise relevant information and findings on what is already known about the research problem. It should also serve as foundation upon which the original idea of the research is based (Hart, 2018:5-6).

The third step in the research process is selecting a research design. Tan (2008:25) highlights that selection of the appropriate research design is the key to obtaining valid results. A research design can be described as the strategy for analysing and comprehending the sequence of events through which the research can be conducted. Research design and research methodology go together (Maree, 2010:145). While the research design emphasises the research strategy or blueprint, methodology refers to the

methods of actual research execution. Mouton (2013:115) describes research methodology as 'the exact tools and procedures to be applied during the execution of the research process'.

The fifth and penultimate step of the research process entails the collection and analysis of data. Brynard and Hanekom (2008:33) posit that data collection and analysis play an important role in ensuring that research findings are valid and reliable. It may require that the researcher defend their choice of population, sample, research instrument and statistical method (Greener, 2011:65-66).

After step 1 to step 5 of the research process have been carefully executed, the researcher can draw a conclusion, with the caveat of not overgeneralising findings (Greener, 2011:68). For the purpose of this study, these six steps were followed, as clearly reflected in the chapter layout (Chapter 1, par. 1.9). Table 3.2 serves as a summary of how each step was applied.

Table 3.3: Applying the research steps to the study

Research step	Applicable chapter of the study
Research problem	Chapter 1
Review of literature	Chapter 2
Research design and methodology	Chapter 3
Quantitative data collection and analysis – Stage 1	Chapter 4
Quantitative data collection and analysis – Stage 2	Chapter 5
Qualitative data collection and analysis – Stage 3	Chapter 6
Research conclusion	Chapter 7

Source: Author

Table 3.2 indicates that each chapter supports a step of the research process. Chapter 1 provided the research problem and objectives, while Chapter 2 provided the analysis of the supporting literature. Chapter 3 explains the research design and methodology in detail. Chapters 4, 5 and 6 will demonstrate the analyses of the quantitative and qualitative research data. Finally, Chapter 7 will provide the research conclusion.

The research problem and objectives were already extensively covered in Chapter 1, par. 1.4 and par. 1.5, and the literature collection and analysis were explored in depth in Chapter 2. In the current chapter, the research design and methodology are analysed in detail. Paragraphs 3.4 and 3.5 hereafter discuss the research design and methodology for the current study.

3.4 RESEARCH DESIGN

Research design is a plan or blueprint that is established to understand how research will be conducted (Godwill, 2015:40). Clough and Nutbrown (2012:178-186) explain that the research design consists of a research plan which enables the researcher to radically formulate a research strategy to ensure that the purpose of the study is fulfilled. It can therefore be submitted that a research design enables to researcher to fulfil the objective of the study by formulating a research strategy that establishes an understanding of the research execution.

As indicated in Chapter 1, par. 1.7.2, a mixed research approach was found to be suitable for the study; thus, a mixed research design was applied. In this section of Chapter 3, focus is placed on identifying and understanding the dimensions of research design, which are foundational to interpreting key concepts (par. 3.4.1), exploring the types of mixed research designs (par. 3.4.2), and integrating the concepts of research dimensions with the selected mixed research design for the study. The overall aim is to establish an in-depth understanding of the applicable research design and dimensions (par. 3.4.3).

3.4.1 Dimensions of research design

According to Mouton (2013:57), research design aims to determine three research dimensions: the nature of the research, the nature of data collection and the nature of the data itself. Figure 3.2 serves as a summary of these factors.

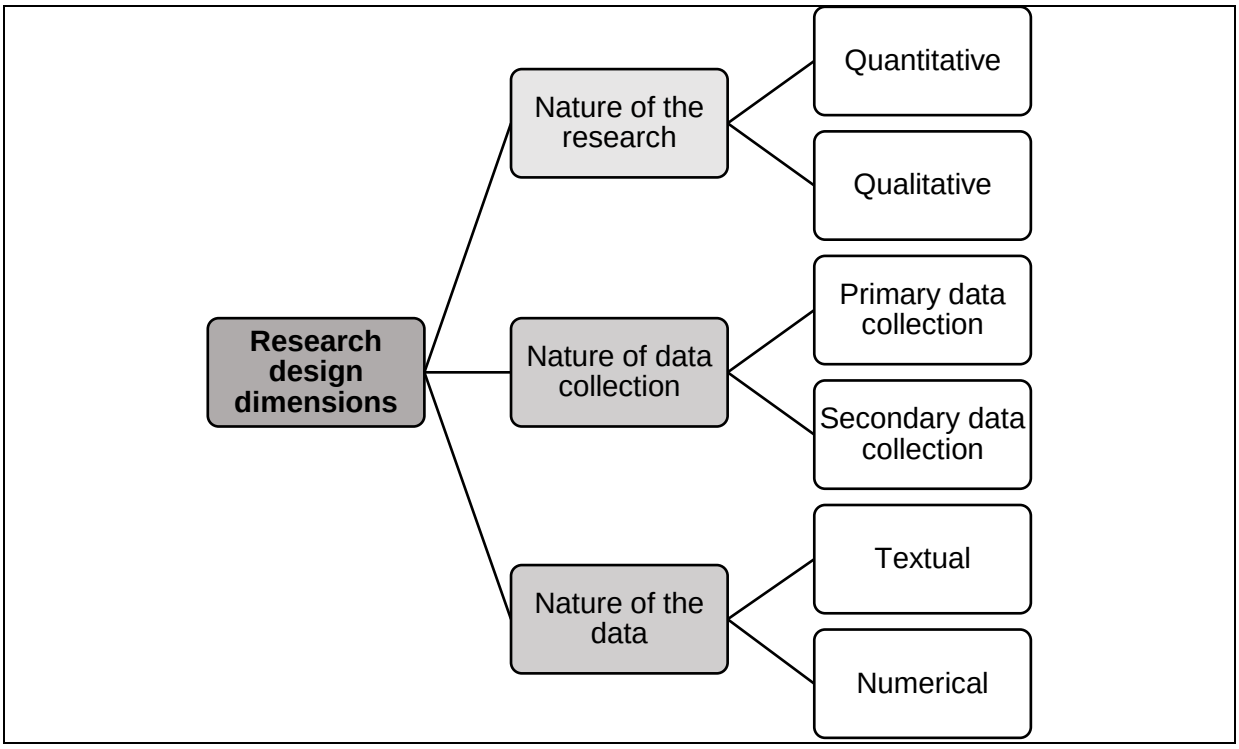


Figure 3.2: Research design dimensions

Source: Adapted from Mouton (2013:57)

Figure 3.2 demonstrates that each factor of research design can result in two possible outcomes. The nature of the research can be quantitative or qualitative, the nature of data collection can be primary or secondary collection, and the nature of the data can be textual or numerical. Paragraph 3.4.1.1 explores the nature of the research in detail.

3.4.1.1 Nature of the research

a) Quantitative research

Quantitative research involves the process of induction, where general theories are put forward through specific observation and experimentation (Flick, 2020:125; Goddard & Melville, 2012:32). According to Osborne (2009:1), research should be evidence based. Quantitative research methods aim to collect evidence that can be expressed in numerical terms (Goddard & Melville, 2012:52). Newsome (2015:229) and Flick (2020:126) suggest that quantitative research tends towards the collection of large data sets that require analysis through statistical application. In this sense, quantitative research can be described as the collection of numerical evidence in large quantities, which require

statistical analysis. Examples of quantitative analysis include interpretation of surveys, interviews or analysis performed on secondary data (Newsome, 2015:230).

Creswell *et al.* (2019:188) divide quantitative research designs into two main categories: experimental and non-experimental. Table 3.4 provides a complete explanation of these research designs.

Table 3.4: Quantitative research designs

Design type	Explanation	Example of research type
Experimental design	The researcher creates a controlled environment to examine the cause-and-effect of interventions. This design type tends to include pre-and-post testing to observe changes under different conditions or circumstances.	Experimental research
		Action research
		Explanatory research
Non-experimental design	This design type is suitable to descriptive studies, where the researcher aims to measure variables over a specific time frame. No interventions are required here, the design is simply directed towards analysing and understanding relevant variables.	Descriptive research
		Basic research

Source: Adapted from Creswell *et al.* (2019:188-193)

The current paragraph explored the empirical aspects of research design. Paragraph (b) investigates non-empirical research designs.

b) Qualitative research

According to Mouton (2013:55), qualitative research refers to the collection of data based on language, words and verbal communication. Flick (2020:23) states that qualitative data

are expressed in language and are not derived from mathematical approaches. Mills and Birks (2014:9) define qualitative research as the 'collection of experiential data that is either general or particular'. Godwill (2017:77) describes qualitative data as attributes, categorical intervals and characteristics that cannot be quantified, such as gender, race and geographical origin. From these views, qualitative research can be described as experiential data with attributes, characteristics and categories that cannot be quantified. Godwill (2017:78) further argues that qualitative research is only measureable in terms of two scales:

- Nominal scales, which require different categories to be expressed through mathematical meaning, e.g., where 'yes' is represented by the number 1 and 'no' is represented by the number 2; and
- Ordinal scales, where variables are organised in levels and ranked according to applicable attributes or stages, e.g., the stages of illness of HIV infection will require the identification of a predetermined order of how such illness occurs.

Qualitative research can also be categorised according to research designs, according to Creswell (2014:13-14) and Kumar (2014:155-159). These designs are summarised in Table 3.5.

Table 3.5: Types of qualitative research designs

Qualitative design type	Description
Narrative research	Such research is based on story telling. Here the researcher requires of participants to narrate a story with regard to personal experiences in order to identify and understand commonalities among the stories/experiences of the participants.
Phenomenological research	This type of research strives to understand unique experiences of research participants regarding a specific phenomenon. Such studies rely on philosophical underpinnings and are mostly conducted through interviewing.
Grounded theory	Grounded theory is a sociological research approach in which researchers strive to establish a general theory based on the grounded views of participants. This research is refined by applying several stages of data collection.

Qualitative design type	Description
Ethnography	Ethnography involves research into the anthropological aspects of human existence, such as shared patterns of communication and cultural practices within a natural setting over a prolonged period.
Qualitative case study	Here, the researcher performs an in-depth analysis of a case, event, process or activity in order to evaluate possible causes of and commonalities among general occurrences.
Focus groups	Focus groups are small groups of people who express opinions or attitudes about the problem that is studied. Social, political and behavioural researchers tend to take interest in this research design. The main tool for this design is interviews.
Participant observation	Participation observation provides the researcher with information regarding social interaction. Information is recorded in descriptive format. Here, oral interviewing is not necessary, as the researcher only intends to collect data on participant reactions to social interactions or real-life situations.
Historical research	This type of research is concerned with the past and seeks to establish an understanding of past events, processes and civilisations.
Systematic review	A systematic review is the collection and integration of research findings with the purpose of establishing extensive knowledge as it relates to the studied phenomenon. Thus, findings of different studies or researchers are synthesised.

Source: Adapted from Creswell (2014:32-33), Gough *et al.* (2018:5), and Kumar (2014:155-158)

From Table 3.5, it is apparent that qualitative research can be divided into several categories according to the type of topic or question that the researcher seeks to understand. Paragraph 3.4.1.2, hereafter, discusses the nature of data collection.

3.4.1.2 Nature of data collection

a) Primary data collection

According to Fink (2020:3), primary data refer to data that do not already exist or are not readily available to the researcher to retrieve. In other words, ‘primary data’ are the new data that the researcher collects in order to fulfil the research objectives (Mouton,

2013:71). From these descriptions, it is clear that data are primary in nature when the researcher is responsible for the collection thereof without expecting the data to be pre-existing.

Kent (2017:50) states that the collection of primary data causes certain challenges to arise. Among other things, Kent (2017:51) listed the following challenges in determining how:

- Primary resources will be accessed;
- The quality of the data will be assured;
- Data should be formatted and displayed; and
- The data will be captured.

Primary data can be collected through questionnaires, interviews or observation of participants (Kumar, 2014:173). Fink (2013:5) suggested that researchers who are unwilling to invest time to solve such challenges through interview or questionnaire design should collect data from a secondary source. Paragraph (b), hereafter, explores the collection of secondary data.

b) Secondary data collection

According to Clough and Nutbrown (2012:41), 'secondary data' refer to data that have been collected through secondary sources. These may include written sources, such as academic theses, dissertations or peer-reviewed academic journals. Sources may also be recognised databases such as INET BFA (Clough & Nutbrown, 2012:42). Kent (2017:52) states that secondary data provide the researcher with much convenience, as the data have already been collected, and in most instances, also sorted and grouped. The researcher should, however, be aware of risks that are associated with this form of data collection (Kent, 2017:54):

- The data may not have been collected in an appropriate or scientifically accepted manner;
- Data may have been manipulated in analysis; and
- Participants may not have been treated ethically in the data collection process.

Despite the risks associated with secondary data collection, it remains a data collection method that is often applied because of convenience (Mouton, 2013:76). Paragraph 3.4.1.3, hereafter, investigates the last dimension of research design: the nature of data.

3.4.1.3 Nature of the data

a) Textual and numerical data

According to Morlino *et al.* (2018), textual data are written, printed or electronically published words, typically transcribed from speech. Curtis and Curtis (2018:6) describe textual data as words that are collected through organised structure to fulfil a research objective. From these descriptions, it is submitted that textual data are data which are transcribed from language, with the intention of organising it into an order that fulfils a research aim. Such data may be coded when a statistical conclusion needs to be reached (Morlino *et al.,* 2018).

Kumar (2014:201) posits that numerical data are represented by numbers or data that are mathematical in nature. Curtis and Curtis (2018:7) add that numerical data aim to measure and express variables, for example, in terms of weight, monetary value, relative to one another, etc. Normally, such data are analysed statistically to reach a conclusion (Creswell *et al.,* 2019:185; Curtis & Curtis, 2012:7). It can, therefore, be stated that numerical data are expressed by numbers to measure variables in a statistical manner in order to reach a conclusion.

3.4.2 Mixed research designs

Shorten and Smith (2017:74) describe a mixed research design as a design that integrates qualitative and quantitative research simultaneously. Hafsa (2019:45) agrees by stating that this design refers to the merging of qualitative and quantitative research principles in the quest of obtaining research results. It is therefore submitted that a mixed research design consolidates the principles of qualitative and quantitative research approaches into a single study in the pursuit of research outcomes. There are several reasons why researchers would opt to apply this research design, among which the following:

- The research design draws on the strengths of both quantitative and qualitative approaches;

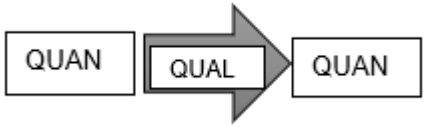
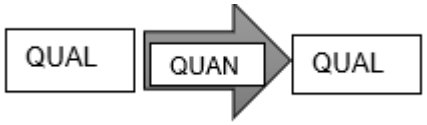
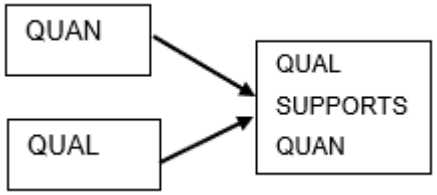
- It extends the research landscape as it explores and integrates diverse perspectives relating to a research problem; and
- It is considered a contemporary research design approach because it enables the researcher to solve complex problems that consist of multiple intricacies which require deep understanding.

A mixed research design was selected for this study for the following reasons:

- The problem of comprehending systematic risk is a complex one, and it would seem appropriate for such a complex problem to be explored from both a quantitative and qualitative perspective;
- The researcher did not want to put forward proposed quantitative models for systematic risk without obtaining at least some qualitative evidence that the model could have merit; and
- As indicated in par. 1.7.2.2 of Chapter 1, it is not traditional for accounting research to be subjected to qualitative testing in the form of systematic reviewing. Adding this qualitative aspect to the research could arguably bring an unconventional perspective to research outcomes.

There are mainly five types of mixed research designs (Creswell, 2006:63; Creswell & Clark, 2007:48; Creswell *et al.,* 2019:182), as explained in Table 3.6 hereafter.

Table 3.6: Types of mixed research designs

Mixed research design type	Brief description of the design process	Illustration of the design process
Embedded design	This design consists of three steps. Firstly, a quantitative pretesting is performed. Secondly, a qualitative intervention is introduced and, lastly, a quantitative post-test is performed.	
Sequential embedded design	The sequential embedded design consists of three parts. Firstly, qualitative pretesting is done, followed by the introduction of a quantitative intervention. Lastly, qualitative post-testing is done.	
Exploratory design	The mixed exploratory design commences with qualitative testing, followed by quantitative testing. The qualitative and quantitative findings are integrated for interpretation.	
Explanatory design	In the explanatory design, quantitative testing is performed first, thereafter qualitative testing. The results of the quantitative testing and qualitative testing are brought together for interpretation.	
Triangular design	The triangular research design commences with obtaining quantitative research results, followed by seeking qualitative support for quantitative findings.	

Source: Adapted from Creswell *et al.* (2019:182), Faulkner and Faulkner (2018:117-118)

For the purpose of this research, a triangular mixed research design was applied. As indicated in the problem statement and research objectives (Chapter 1, par. 1.4 and par. 1.5), this study aimed to bring the MPT into question. As the MPT is a quantitative model that attempts to explain the relationship between systematic risk and return, it seems obvious that the theory should be countered by quantitative testing and alternative quantitative models. Thus, a quantitative research design supported this endeavour.

In addition, few South African researchers have attempted to empirically model systematic risk from a South African perspective (as indicated in Chapter 1, par. 1.4). Owing to this research gap, the quantitative models (as per Chapter 5) were not based on any particular theories. To add substance to the quantitative models, qualitative support for the proposed quantitative models were sought (as per Chapter 6). In summary, a qualitative research approach was followed to support the quantitative findings of the study; therefore, it is put forward that a triangular mixed research design was applied.

In par. 3.4.3, hereafter, an explanation is provided of how the research dimensions (Figure 3.2) relate to the selected triangular mixed research design.

3.4.3 Integrating research design and dimensions

This paragraph explains how the research design dimensions discussed in par. 3.4.1 apply to the triangular mixed design of the current study. Figure 3.3 shows the relationship between these factors. It addresses the application research stages and the research dimensions and illustrates how these concepts were integrated within the triangular mixed research design of the current research. The types of mixed research designs and reasons for selecting a triangular mixed research design were elaborated on in par. 3.4.2, which precedes this paragraph. Figure 3.3 can be viewed hereafter.

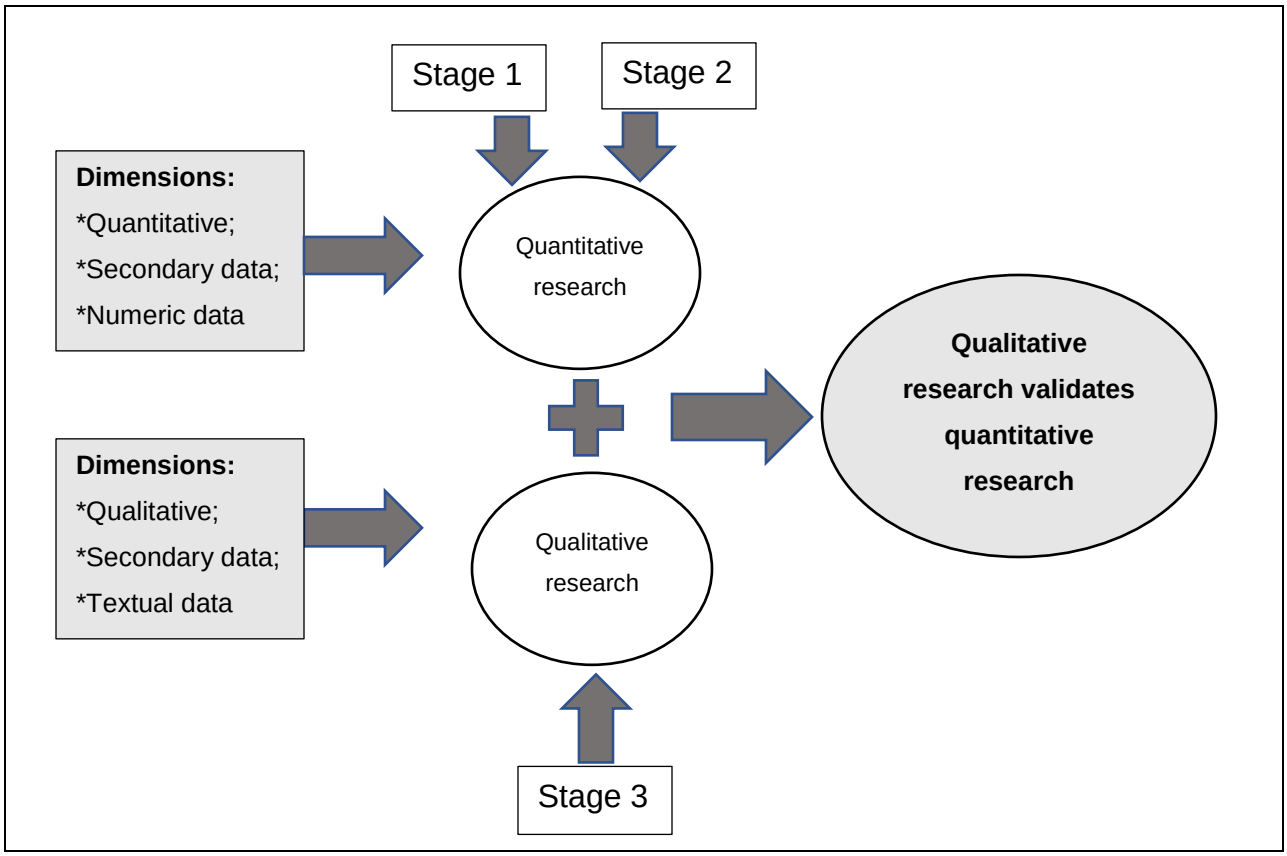


Figure 3.3: Integrating mixed research design with research dimensions

Source: Author

As indicated in Chapter 1, Figure 1.2, this study entailed the application of three research stages, each of which required different research designs. Figure 3.3 indicates that stages 1 and 2 of the study focused on quantitative testing, by collecting numerical secondary data from the financial information of sampled entities. Such secondary data were collected via IRESS. Statistical analysis was applied to the data to obtain two outcomes:

- To determine whether accountancy-related return measures and systematic risk are quantitatively associated with one another; and
- To explore and quantitatively identify accountancy-related measures that are better associated with systematic risk than return measures.

These outcomes were fulfilled by means of non-experimental testing in the form of a descriptive research design. Firstly, the quantitative testing was non-experimental in nature because the researcher did not intend to perform pre- and post-testing to reiterate

cause and effect. Rather, the intention was to describe the behaviour of selected variables over time, which necessitated a descriptive research design (refer to Table 3.4). Through this quantitative research design, the relationship between accountancy-related return measures and systematic risk, and other accountancy-related measures and systematic risk could be described.

Stage 3 of the research applied a qualitative approach, in which secondary textual data were collected for analysis. The data were collected from academic journal articles and subjected to systematic review. Systematic review (as described in Table 3.5) was selected as qualitative research design for the following reasons:

- It assisted the researcher in synthesising the findings of the current study with those of other similar studies, which was helpful, as there is a lack of South African research on the topic under review;
- It is a rigorous and transparent type of qualitative analysis;
- The fact that the data was derived from peer-reviewed academic journals gave credibility to the systematic review;
- It assisted in the identification of frequently used quantitative practices for comparison with the quantitative methods applied in stages 1 and 2 of the research (refer to Chapter 6, Table 6.7 for comparison); and
- Systematic review is not often used in accountancy-related research, and for this reason its application in this study can be considered novel to this field. Thus, the selection of systematic review contributes to the current study and the research field as a whole.

As indicated in par. 3.4.2 and Figure 3.3, the systematic review is utilised to support the quantitative findings of the study. In Chapter 5, newly developed quantitative systematic risk models are proposed. The systematic review, as set out in Chapter 6, was used to actively search for qualitative validation of the factors within the developed quantitative models. For this reason, a triangular research design applied.

The discussion of the research design above now turns to the research methodology of the study (Figure 3.2). In the latter paragraphs, it was indicated that this study included

both quantitative and qualitative research aspects, which means that different methodologies were applied for each approach. Paragraph 3.5 describes the quantitative methodology, while par. 3.6 focuses on the qualitative methodology.

3.5 QUANTITATIVE RESEARCH METHODOLOGY (STAGE 1 AND STAGE 2)

Researchers are methodologists concerned with finding the best possible methods to solve a problem or answer a research question (Mills & Birks, 2014:32). Broadly speaking, research methodology includes the identification of the research type, recruitment of a research sample, data collection, and the recording, analysis and reporting of results (Mills & Birks, 2014:33). In the paragraphs to follow, these research elements are explained in detail in the sequence as set out by Figure 3.4.

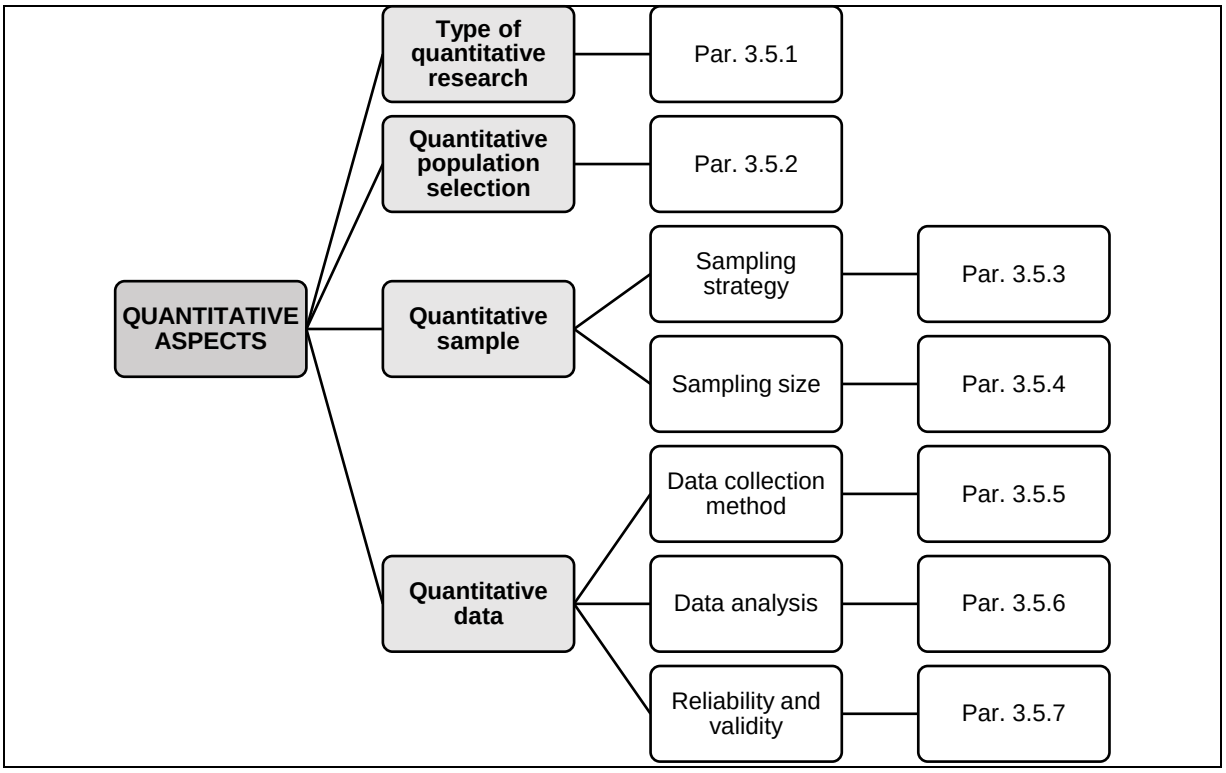


Figure 3.4: Sequence of discussion for quantitative methodological aspects

Source: Author

As per Figure 3.4, each paragraph hereafter discusses an element which relates to the quantitative aspects of research stages 1 and 2.

3.5.1 Quantitative research types

Mahmud (2013:33-38) refers to seven types of research: basic, applied, exploratory, descriptive, explanatory, experimental, and action research. These are explained in par. (a) to (g).

a) Basic research

Basic research is conducted in circumstances where there is no immediate need for research, but new theories are added to existing knowledge clusters for possible future use (Bairagi & Munot, 2019:6). This type of research does not necessarily have any practical application, but broadens the scope for applied research. Such research is normally rooted in mathematics or natural sciences (Kothari & Garg, 2019:2). In summary, it may be posited that basic research is scientific research that broadens the scope of knowledge which may later be required in order to execute applied research.

The current study does not fit the characteristics of basic research. The study is not concerned with natural sciences and does not enlarge the scope of knowledge for later application. Instead, it is rooted in understanding financial phenomena by collecting retrospective data.

b) Applied research

Applied research is directed towards solving an immediate problem that requires rapid attention (Kothari & Garg, 2019:3). Applied research is intended to find quick solutions for practical problems within society, business, health care or industry (Bairagi & Munot, 2019:7). From the preceding descriptions, it can be submitted that applied research is aimed at solving an immediate social, medical or business problem as quickly as possible.

The undertaken research did not aim to solve a problem immediately, but to analyse historical patterns within financial data in order to better interpret the behaviour of systematic risk over time. Thus, the current research cannot be classified as applied research.

c) Exploratory research

This type of research strives to find new research projects (Newsome, 2015:15). According to Newsome (2015:16), research is exploratory if:

- The research project has not been defined; or
- Several options exist, and the research project needs to be more narrowly defined.

Mahmud (2013:33) describes exploratory research as a method to commence a study, as it enables the researcher to obtain an understanding of previous knowledge regarding the research topic. Kumar (2014:370) posits that this type of research sets out to explore the possibilities for studying a particular area that is unexplored.

From these opinions, it is put forward that exploratory research seeks new research areas that have not been investigated within the realm of previous knowledge. With regard to this study, the research area has been studied previously and the intention was not to seek a topic that has not been investigated before. Therefore, it may be concluded that this study does not fall within this research category.

d) Explanatory research

Kumar (2014:370) describes explanatory research as an attempt to understand the 'what' and 'how' regarding phenomena by analysing the relationship among identified aspects. According to Creswell *et al*. (2019:12), this type of research focuses on providing reasons for observations regarding the characteristics of a population. Curtis and Curtis (2018:47) claim that explanatory research is undertaken with the objective of explaining certain phenomena, including why the phenomena exist and under what circumstances they will no longer be maintained.

Explanatory research, therefore, concerns itself with identifying explanations for the emergence and nature of a certain phenomenon. This form of research is normally conducted by analysing relationships or characteristics among a population. For this study, the researcher did not attempt to find explanations for empirical results, but to identify whether or not relationships exist among variables.

e) Experimental research

Kumar (2014:371) states that experimental research is an attempt to bring about change within a research environment, with the intention of measuring and observing the effect of the change before and after it was brought about. According to Kothari and Garg (2019:37), experimental research is mostly conducted within the realm of natural sciences, where scientists measure cause-and-effect relationships within laboratory settings. In this type of research at least two samples are required which are manipulated under different circumstances, after which the unique outcomes are studied extensively (Mahmud, 2013:38).

It can be submitted that experimental research intends to experiment under different circumstances to evaluate the results under different research conditions. It focuses on cause-and-effect relationships when samples are tested under manipulated conditions. This study did not measure the research outcome under different circumstances, as all variables were tested under identical circumstances. Therefore, this study does not fulfil the requirements of experimental research.

f) Action research

McNiff (2018:9) describes action research as an enquiry which enables the individual to improve the method with which everyday tasks or work is performed. According to McNiff (2018:10), action research asks three questions:

- How are participants trying to improve what they do?
- How does interventions give meaning to participants' work or lives?
- How does it influence others?

Mills and Birks (2014:257) concur by putting forward that action research aims to produce research-informed change to address everyday issues. Creswell (2014:55) further states that action research is action oriented and tests the research results after the change has been fully incorporated as intended.

The current research cannot be described as action research, as this research cannot influence the circumstances under which the sample functions. As the sampled entities

operate independently from one another, and from the researcher, no changes can be incorporated to execute 'before' and 'after' testing.

g) Descriptive research

According to Leedy and Ormrod (2012:182), descriptive research entails the measurement of the characteristics of certain phenomena or the quantification of possible correlations among two or more observations or variables. Descriptive research intends to examine circumstances as they are (Leedy & Ormrod, 2012:183). Similarly, De Vaus (2017:1) explains that descriptive research asks: 'What is happening?' instead of 'Why does it happen?' This type of research is fundamentally undertaken as an attempt to understand abstract phenomena and reach concrete evidence by means of studying patterns within a population (De Vaus, 2017:1). Mahmud (2013:35) posits that descriptive research is ideal in situations where the researcher investigates elements such as social behaviour or relationships. It is thus submitted that descriptive research intends to establish an understanding of abstract patterns within a population by measuring characteristics or correlations among related variables.

This study was based on descriptive research, as it sought to identify relationships between risk and accountancy-related return measures, as well as other measures that may describe risk behaviour in a better way. The nature of this study necessitated the identification of patterns and correlations among selected variables within the sample. The study sought to understand 'what is happening' in relation to risk and the measures that influence risk.

After focusing on the research type of the study, the chapter turns to the quantitative population of the study. Below, and as stated in the introduction to par. 3.5.2, the research population to this study is explained in greater detail.

3.5.2 Quantitative population selection

According to Godwill (2017:63), a population represents the collection of all possible sampling units. Kumar (2014:230) describes a 'population' as the sum total of all groups, phenomena or units which the researcher strives to study and understand. A population is, therefore, the collection of all the possible groups, phenomena or units that the researcher wants to draw conclusions about in the course of performing research.

According to Flick (2020:109), the researcher can select a single population or multiple populations if the intention is to draw comparisons among different populations.

For the purpose of this study a single population was selected, namely the top 100 JSE listed companies. This selection is in line with studies by Nardhamuni *et al.* (2022) and Bhana (2021). As explained in Chapter 1, par. 1.7.2.1 (a), these entities hold the highest market capitalisation and represent 95% of all market capitalisation represented by the JSE. For this reason, it can be deduced that these entities are able to generate returns to investors. This research relied on the assumption that returns can be paid to investors, as it sought to disprove the relationship between risk and return and suggest alternative measures that better correlate with risk behaviour.

The top JSE listed companies as at 31 December 2020 were populated, because this was the most recent and relevant population available at the time of data collection. As these entities have remained highly ranked, despite the economic impact of the global pandemic, it can be posited that these top 100 businesses are the strongest and best performing shares within the South African market. Table 3.7 provides a summary of the populated companies, listed by descending market capitalisations. The applicable JSE sector is also indicated.

Table 3.7: Quantitative population of the study

Number	Company name	Market capitalisation in '000 000	JSE sector of operation
1	Prosus	2787 760	Communications
2	Anheuser-Busch InBev	1777 210	Consumer staples
3	Naspers	1484 480	Communications
4	British American Tobacco	1403 290	Consumer staples
5	BHP Billiton	920 930	Materials
6	Glencore Xstrata	830 830	Materials
7	Compagnie Richemont	760 550	Consumer discretionary
8	AngloGold	753 640	Materials
9	Anglo Platinum	404 510	Materials
10	FirstRand	276 320	Financials
11	Vodacom	226 160	Communications
12	Kumba Iron Ore	214 550	Materials
13	Standard Bank	207 920	Financials
14	Mondi PLC	183 610	Materials
15	Sibanye Gold Stillwater	181 580	Materials
16	Impala Platinum	167 630	Materials
17	Capitec SA	163 130	Financials

Number	Company name	Market capitalisation in '000 000	JSE sector of operation
18	Anglo Ashanti	144 780	Materials
19	South32	143 420	Materials
20	Sanlam	128 500	Financials
21	Gold Fields	124 620	Materials
22	MTN	120 240	Communications
23	Northam Platinum	106 520	Materials
24	Sasol	105 490	Materials
25	ABSA	99 390	Financials
26	Discovery	93 880	Financials
27	BidCorp	88 020	Consumer discretionary
28	Shoprite	79 450	Consumer staples
29	Clicks	67 500	Consumer staples
30	African Rainbow Minerals	66 819	Materials
31	Aspen	65 310	Health care
32	Nedbank	63 100	Financials
33	MultiChoice Group	58 220	Communications
34	Quilter	56 880	Financials
35	Old Mutual	56 740	Financials

Number	Company name	Market capitalisation in '000 000	JSE sector of operation
36	Exxaro	56 390	Materials
37	NEPI Rockcastle	55 630	Property
38	Reinet	54 820	Financials
39	Remgro	53 920	Consumer staples
40	Bidvest	53 050	Consumer staples
41	Pepkor	51 060	Consumer staples
42	Rand Merchant Investment Holdings	49 710	Financials
43	Comair Limited	46 930	Consumer discretionary
44	MediClinic	44 230	Health care
45	Mr Price Group	42 320	Consumer staples
46	Woolworths	41 230	Consumer staples
47	Harmony Gold Group	40 840	Materials
48	Tiger Brands	40 140	Consumer staples
49	Growthpoint	39 180	Financials
50	Spar	37 340	Consumer staples
51	The Foschini Group	34 950	Consumer discretionary
52	Santam	33 030	Financials
53	Ninety One PLC	30 080	Financials

Number	Company name	Market capitalisation in '000 000	JSE sector of operation
54	Investec PLC	28 540	Financials
55	Life Healthcare	27 590	Health care
56	Pick n Pay	26 000	Consumer staples
57	AVI Limited	25 310	Consumer staples
58	Momentum Metropolitan Holdings	25 190	Financials
59	Sappi	24 120	Materials
60	Capco PLC	23 840	Financials
61	Montauk Group	21 440	Utilities
62	Vivo Energy	21 220	Equity Issuer
63	Distell Group	20 900	Consumer staples
64	Cartrack	20 700	Technology
65	Dis-Chem	20 300	Consumer staples
66	Redefine Properties	19 750	Financials
67	Netcare	19 610	Health care
68	Barloworld	19 440	Industrials
69	Royal Bafokeng Platinum	19 140	Materials
70	Sirius Real Estate	18 950	Real Estate
71	Hammerson PLC	18 870	Real Estate

Number	Company name	Market capitalisation in '000 000	JSE sector of operation
72	Italtile	18 820	Consumer discretionary
73	Truworths	18 610	Consumer staples
74	NewGold	18 490	Materials
75	Liberty Holdings	17 940	Financials
76	Textainer Group Holdings	17 350	Industrials
77	Telkom	17 230	Communications
78	Bytes Technology Group	16 850	Technology
79	Coronation Fund Managers	16 559	Financials
80	Resilient	16 550	Financials
81	Fortress SA	16 320	Financials
82	Transaction Capital	15 800	Financials
83	Zambezi Platinum	15 270	Resources
84	PSG Group	14 230	Financials
85	Ninety One	14 150	Financials
86	Globe Trade Centre SA	14 020	Real Estate
87	DRDGold Limited	13 570	Materials
88	Investec Ltd	12 780	Financials
89	PSG Ltd	12 100	Financials

Number	Company name	Market capitalisation in '000 000	JSE sector of operation
90	Motus Holdings	11 490	Specialty Retailers
91	Equites	11 110	Financials
92	Pan African Resources	10 970	Materials
93	Impala Platinum	10 880	Materials
94	JSE	10 360	Financials
95	Sygnia Itrix	10 300	Investment Funds
96	AECI	9 980	Materials
97	KAP	9 620	Industrials
98	MAS Real Estate	9 550	Financials
99	Satrix40	9 500	Financials
100	Echo Polska Properties	9 350	Real Estate

Source: Retrieved from SA Shares (2020)

After the research population was identified, the researcher needed to sample participants from the identified population. Paragraphs 3.5.3 and 3.5.4 explain how this was executed.

3.5.3 Quantitative sampling strategy

Sampling is the process of selecting items or participants for a study from a population in accordance with predetermined parameters (Godwill, 2017:63). According to Kothari and Garg (2019:136), it is very rare for a researcher to include all possible items in the research. It is more cost and time effective to focus on a selected group of items within a population.

This is called 'sampling' (Leedy & Ormrod, 2012:147). Sampling is, therefore, the selection of participants or items from the population for inclusion in the research in order to ensure the research is cost and time effective.

Sampling can be done through mainly two approaches: probability sampling and non-probability sampling (Kumar, 2014:229). Probability sampling is a method that ensures that all items have the same probability of being selected from the population (Leedy & Ormrod, 2012:205). The types of probability sampling are summarised in Table 3.8.

Table 3.8: Probability sampling methods

Probability sampling method	Description
Random sampling	Random sampling refers to the method where the researcher selects sample participants randomly. This means that there is no predetermined strategy in which the participants are chosen. This method is sometimes referred to as the 'fishbowl draw' method, as all participants have an equal chance of being selected; in other words, the selection result is unaffected by any predetermined expectation.
Systematic sampling	Systematic sampling is a method in which the researcher selects research participants through a systematic approach. Here, the researcher can, for example, choose every 20th participant within the population to serve as part of the sample. This method is less random, as the researcher identifies a strategy by which participants are selected. A mathematical approach is followed, by applying the formula: $\frac{population\ size}{sample\ size}$. By applying this method, the research will know at which interval the sample participant is selected, e.g., every 30th or 22nd participant.

Probability sampling method	Description
Stratification sampling	Stratified sampling allows the researcher to divide the sample into different strata. Strata are different sub-groups within a population. Such groupings may be done based on gender, race, geographical background, income levels or any other characteristic which is key to the intended research. The researcher will then select a sample from each stratum proportional to the population size. By applying this sampling method, the researcher will be able to perform tests and compare the results among the different strata.
Cluster sampling	Cluster sampling is a method by which participants are divided into homogenous clusters, e.g., service companies or manufacturing entities. The researcher may then test specific characteristics within each cluster, e.g., which one employs the most employees or is more profitable. For cluster sampling to be applied successfully, each cluster should be a mirror image of its population. Cluster sampling is used to simplify large populations. Suppose the researcher wants to investigate the attitudes of students towards higher education in a country. This can result in large populations as there may be different types of higher education institutions in different states producing graduate and postgraduate students from different faculties. Clearly, clustering can assist the researcher in defining the probability sample more narrowly.

Source: Adapted from Creswell (2014:158-160), Creswell *et al*. (2019:214-219), De Vaus (2017:19-23), Fink (2013:56-62) and Kumar (2014:240-247)

Probability sampling did not apply to this study, as all participants within the population did not have an equal chance of selection. For this reason, the study had to use non-probability sampling, the method in which all research subjects within a population do not have an equal chance of being selected (Mills & Birks, 2014:76). Table 3.9, hereafter, sets out non-probability sampling in greater detail..

Table 3.9: Non-probability sampling methods

Non-probability sampling method	Description	Reasons why the sampling method applies/does not apply to this research
Convenience sampling	As its name indicates, convenience sampling is a sampling method by which the researcher chooses the sample based on convenience. Convenience may be with regard to geographical proximity, accessibility, approval for research undertaking. It is apparent that this method does not provide each participant of the population with an equal chance of inclusion, as those who cannot be reached at the researcher's convenience will be disregarded.	Convenience sampling did not apply to this research, as the sample was not based on ease of accessibility.
Expert sampling	Expert sampling requires that the chosen sample consist of participants who are experts in the field of the research problem or objective. This method is more often applied in qualitative research. If there are limited persons with expertise in the field under review, the researcher may experience problems in reaching a saturation response point for the study. Expert sampling may require the collection of information from experts individually or as part of different groups.	The sample selected for this study did not consist of participants that are experts in any particular domain, and therefore expert sampling did not apply to this research.

Non-probability sampling method	Description	Reasons why the sampling method applies/does not apply to this research
Snowball sampling	Snowball sampling is a method by which the researcher asks previous participants to direct them towards other potential participants, thus creating a snowball effect. This method is useful if the researcher knows little about the sample's whereabouts. The entire sample, however, depends on the participants identified within the early stages of the research. This method is difficult to apply when the population is rather large.	The research sample of this study was not selected based on referrals of any kind. Therefore, snowball sampling did not apply to this study.
Quota sampling	Quota sampling is a method by which the researcher selects a non-probability sample based on a predetermined characteristic that is essential to the research. This characteristic may be race, gender or any other viable characteristic. The researcher will most probably contact the sample from a convenient location and approach the respondents who visibly possess the essential characteristic (e.g., being female or African). The researcher will approach the applicable respondents randomly, until a saturation point is reached.	As this study entailed no saturation point, quota sampling did not apply.

Non-probability sampling method	Description	Reasons why the sampling method applies/does not apply to this research
Judgment sampling	Judgment sampling is a method in which the researcher applies their own judgment as to whom will most likely be able to provide the best information to achieve the research objective. This method is useful if the researcher wants to develop a new model. In judgment sampling, the researcher determines certain criteria with which the respondents need to comply. If all respondents need to comply with the exact same criteria, it is referred to as homogenous judgment sampling.	Homogenous judgment sampling applied to this study, as the researcher selected sampling criteria with which all sampled entities needed to comply. These criteria are discussed on page 101.

Source: Adapted from Fink (2013:63-65), Flick (2020:155-162), Kumar (2014:241-246) and Newsome (2015:248-250)

As indicated in Table 3.9, homogenous judgment sampling was applied, because the study required the selected sampled companies to have commonalities. The researcher applied her own judgment in selecting the non-probability sample. The following criteria were set for sample selection:

Criterion 1: All applicable data for the sampled entity should be readily available on IRESS for all years under review;

Criterion 2: The entity should be listed on the JSE for all years under review; and

Criterion 3: The entity should not operate within the financial sector, as such entities do not publish accountancy-related measures that are consistent and comparable to those of other sectors (Chabalala, 2015:52).

After establishing the type of non-probability sampling to the study, the sampling size is analysed. Paragraph 3.5.4 explains the applicable sampling size.

3.5.4 Quantitative sampling size

According to Mouton (2013:123), the sampling size of a study refers to the number of participants or research subjects which are included in the sample. Curtis and Curtis (2018:87) add that the size of the sample is determined by the number of elements which are chosen for inclusion by means of the sampling method. From these descriptions, it is submitted that the sample size of a study is represented by the number of respondents, subjects or research elements which are chosen for inclusion through the applicable sampling method.

As indicated in par. 3.5.3, homogenous judgment sampling was applied to this research. Table 4.8 shows which companies were included in the sample, and which not. In cases where the company was not sampled, a reason for exclusion is provided by referring to the criterion that was not met. (The criteria are listed in par 3.5.3.)

Table 3.10: Quantitative sample of the research

Number	Company name	Included/excluded	Reason for exclusion
1	Prosus	X	Breached criterion 1
2	Anheuser-Busch InBev	✓	
3	Naspers	✓	
4	British American Tobacco	✓	
5	BHP Billiton	✓	
6	Glencore Xstrata	X	Breached criterion 2
7	Compagnie Richemont	✓	
8	AngloGold	X	Breached criterion 1
9	Anglo Platinum	X	Breached criterion 1
10	FirstRand	X	Breached criterion 3
11	Vodacom	✓	
12	Kumba Iron Ore	X	Breached criterion 1
13	Standard Bank	X	Breached criterion 3
14	Mondi PLC	✓	
15	Sibanye Gold Stillwater	X	Breached criterion 2
16	Impala Platinum	X	Breached criterion 1
17	Capitec SA	X	Breached criterion 3
18	Anglo Ashanti	X	Breached criterion 1

Number	Company name	Included/excluded	Reason for exclusion
19	South32	✓	
20	Sanlam	X	Breached criterion 3
21	Gold Fields	✓	
22	MTN	✓	
23	Northam Platinum	X	Breached criterion 1
24	Sasol	✓	
25	ABSA	X	Breached criterion 3
26	Discovery	X	Breached criterion 3
27	BidCorp	X	Breached criterion 1
28	Shoprite	✓	
29	Clicks	✓	
30	African Rainbow Minerals	✓	
31	Aspen	X	Breached criterion 1
32	Nedbank	X	Breached criterion 3
33	MultiChoice Group	X	Breached criterion 1
34	Quilter	X	Breached criterion 3
35	Old Mutual	X	Breached criterion 3
36	Exxaro	✓	
37	NEPI Rockcastle	X	Breached criterion 2

Number	Company name	Included/excluded	Reason for exclusion
38	Reinet	X	Breached criterion 3
39	Remgro	✓	
40	Bidvest	✓	
41	Pepkor	X	Breached criterion 2
42	Rand Merchant Investment Holdings	X	Breached criterion 3
43	Comair Limited	X	Breached criterion 1
44	MediClinic	X	Breached criterion 1
45	Mr Price Group	✓	
46	Woolworths	✓	
47	Harmony Gold Group	X	Breached criterion 2
48	Tiger Brands	✓	
49	Growthpoint	X	Breached criterion 3
50	Spar	✓	
51	The Foschini Group	✓	
52	Santam	X	Breached criterion 3
53	Ninety One PLC	X	Breached criterion 3
54	Investec PLC	X	Breached criterion 3
55	Life Healthcare	✓	
56	Pick n Pay	✓	

Number	Company name	Included/excluded	Reason for exclusion
57	AVI Limited	✓	
58	Momentum Metropolitan Holdings	X	Breached criterion 3
59	Sappi	X	Breached criterion 1
60	Capco PLC	X	Breached criterion 3
61	Montauk Group	X	Breached criterion 2
62	Vivo Energy	X	Breached criterion 2
63	Distell Group	X	Breached criterion 1
64	Cartrack	X	Breached criterion 2
65	Dis-Chem	X	Breached criterion 1
66	Redefine Properties	X	Breached criterion 3
67	Netcare	✓	
68	Barloworld	✓	
69	Royal Bafokeng Platinum	X	Breached criterion 2
70	Sirius Real Estate	✓	
71	Hammerson PLC	X	Breached criterion 2
72	Italtile	✓	
73	Truworths	✓	
74	NewGold	X	Breached criterion 2
75	Liberty Holdings	X	Breached criterion 3

Number	Company name	Included/excluded	Reason for exclusion
76	Textainer Group Holdings	X	Breached criterion 1
77	Telkom	✓	
78	Bytes Technology Group	X	Breached criterion 1
79	Coronation Fund Managers	X	Breached criterion 3
80	Resilient	X	Breached criterion 3
81	Fortress SA	X	Breached criterion 3
82	Transaction Capital	X	Breached criterion 3
83	Zambezi Platinum	X	Breached criterion 2
84	PSG Group	X	Breached criterion 3
85	Ninety One	X	Breached criterion 3
86	Globe Trade Centre SA	X	Breached criterion 1
87	DRDGold Limited	X	Breached criterion 1
88	Investec Ltd	X	Breached criterion 3
89	PSG Ltd	X	Breached criterion 3
90	Motus Holdings	X	Breached criterion 1
91	Equites	X	Breached criterion 3
92	Pan African Resources	X	Breached criterion 1
93	Impala Platinum	X	Breached criterion 1
94	JSE	X	Breached criterion 3

Number	Company name	Included/excluded	Reason for exclusion
95	Sygnia Itrix	X	Breached criterion 1
96	AECI	✓	
97	KAP	✓	
98	MAS Real Estate	X	Breached criterion 3
99	Satrix 40	X	Breached criterion 3
100	Echo Polska Properties	X	Breached criterion 1
Total companies sampled		33	

Source: Author

As can be observed, a total of 33 companies were sampled for this research. In order to draw conclusions about these sampled companies, related data needed to be collected. Paragraph 3.5.5 explains how the data were collected.

3.5.5 Quantitative data collection

Data collection refers to the process by which the researcher gathers data relating to variables that effect the selected sample (Bairagi & Munot, 2019:17). The method of data collection depends largely on the type of data required – either primary or secondary data. To collect primary data, a research instrument, such as a questionnaire, may be constructed. In the instance of collecting secondary data, the researcher will have to ensure that the source is reliable (Flick, 2020:188).

As indicated by the research design (Figure 3.5), secondary data were collected for the purpose of this research. To fulfil the empirical research objectives, quantitative data needed to be collected, specifically related to the financial reports of the sampled companies. The data were collected by means of IRESS (formerly known as McGregor BFA). IRESS is a recognised research database that contains the financial data of listed companies in South Africa (Mouton, 2013:103).

Data collection was aimed at gathering different sets of data for each sampled company. Table 3.11 serves as a detailed summary of these sets.

Table 3.11: Data sets collected for quantitative analysis

Data variable	Proxies	Rationale for proxy selection
Systematic risk	Leveraged beta; Unleveraged beta	Proxies were derived from theoretical analysis. Chapter 2, Table 2.5 provided an in-depth explanation of the proxy selection.
Accountancy-related return measures	Operating profit margin (OPM); Net profit margin (NPM); Return on assets (ROA); Return on equity (ROE); Return on capital employed; Return on average assets (ROAA); Return on average equity (ROAE); Inflation adjusted ROA; Inflation adjusted ROE; Inflation adjusted ROAA; Inflation adjusted ROAE; Dividends per share (DPS); Dividend yield (DY); Earnings per share (EPS); Earnings yield (EY); Inflation adjusted profit per share; Price-earnings ratio (P/E); and Price per share	Proxies were derived from theoretical analysis. Proxies consisted of all ratios relating to earnings, profits and dividends, as well as the market price per share, published by IRESS. Refer to Tables 2.6 and 2.7 in Chapter 2 for detailed explanations.
Other possible financial measures which explain systematic risk behaviour	Cash flow per share; Current ratio; Debt to assets; Debt to equity; Market value added (MVA); Price-per-share to book value-per-share;	As it was unclear which financial measures may best reflect the behaviour of systematic risk proxies within the sample, ALL financial ratios and financial models contained on IRESS were collected as possible proxies. Thereafter,

Data variable	Proxies	Rationale for proxy selection
	Price-per-share to net asset value-per-share; Quick ratio; Return on external investments and Total assets to capital employed	SPSS was used to model these proxies as independent variables and automatically select the combination of viable independent variables which best predict the systematic risk proxies. (Refer to par. 3.5.6.4 for a full explanation on how SPSS was applied.)

Source: Author

The dataset reflected in Table 3.11 were collected for a period ranging between 2015 and 2019. Thus, data were collected for a period of five years. According to Field (2009:30), data should be collected for at least five years if the researcher wishes to draw conclusions from it. It can further be observed that data were collected for the most recent financial years available at the time the study was undertaken. Such data may be considered relevant, as the business environment is an ever-changing milieu (Vermeulen, 2020). It should be noted that data relating to the year 2020 were not included in the research because the business environment was affected by extraordinary circumstances (relating to the Covid-19 pandemic) during this time. It was not the researcher's intention to reflect these circumstances in the developed model.

After data collection, analysis follows to enable interpretation and answering of the research problem (Flick, 2020:203). Paragraph 3.5.6 serves as an explanation of the process of statistical analysis that was followed in this study.

3.5.6 Quantitative data analysis

According to Bell (2015:127), data analysis is the process by which techniques are applied to achieve research outcomes. Curtis and Curtis (2018:287) view data analysis as a research phase which applies statistical techniques as analytical induction. From these descriptions, it is put forward that data analysis assists in the achievement of research outcomes by applying statistical techniques. Data analysis for this study was performed through the application of BMI SPSS (version 26). Several tests were

performed to reach research outcomes. Figure 3.5 was constructed to provide an overview of the data analysis process.

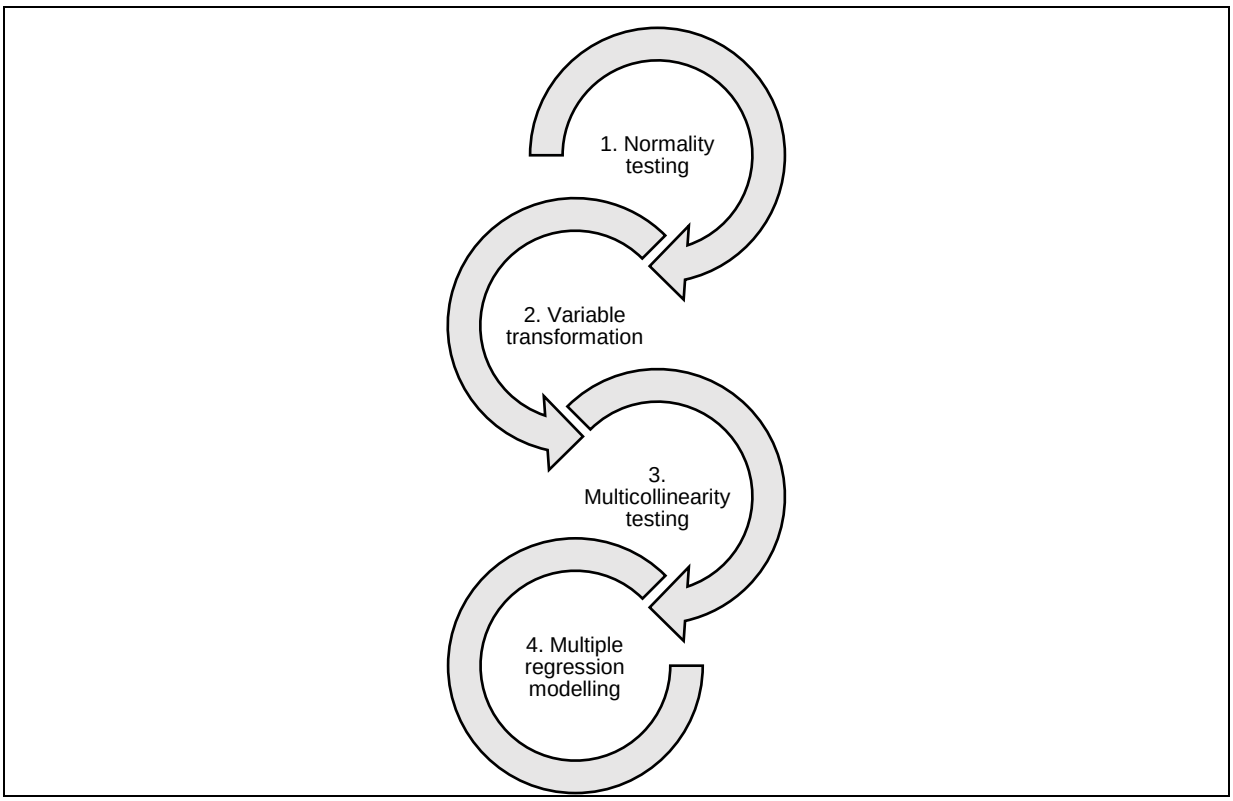


Figure 3.5: Data analysis process

Source: Author

Figure 3.5 illustrates that the data analysis process commenced with establishing an understanding of data distribution. This was done first, as subsequent testing would be affected by the outcome of the data metrics. Secondly, variable transformation was performed to ensure that all variables were similar in nature and could be subjected to identical statistical testing. Thirdly, multicollinearity was tested for before multiple regression could be embarked on. Variables that proved to be highly correlated had to be eliminated. Finally, multiple regression could be performed. This type of statistical modelling was selected to fulfil empirical research objectives 1, 2 and 3, as identified in Chapter 1, par. 1.5.2.2. These statistical tests are discussed in the paragraphs to follow.

3.5.6.1 Normality testing

Statisticians distinguish between two types of data: parametric and non-parametric data. These data types refer to the distribution of a data set (Fetters, 2020:117). Data could be distributed normally (meaning that data are distributed along a bell curve) or abnormally (where data are skewed to the left or skewed to the right) (Field, 2009:142). The distribution of data determines the type of statistical analysis that is most appropriate for application, as parametric data necessitate different testing than non-parametric data (Fetters, 2020:117). A Shapiro-Wilk test was applied to all variables to determine whether the distribution was parametric or non-parametric. The interpretation of a Shapiro-Wilk test is as follows (Aspelmeier & Pierce, 2017:129):

- Should the significance value (p) be greater than 0.05, the data are parametrically distributed; or
- If the p-value is smaller than 0.05, data are non-parametrically distributed.

The outcomes of the Shapiro-Wilk tests for this study can be viewed in Chapter 4, Table 4.3 and Chapter 5, Table 5.3. Where variable distributions were found to be non-parametric per the Shapiro-Wilk test outcome, data were appropriately transformed to reflect a parametric distribution.

3.5.6.2 Data transformation

Data transformation is a mathematical process by which statistical variables are transformed to reflect parametric distribution. This process is performed because many traditional statistical analyses require data distributions to be normal in order for tests to render viable results (Hamasha *et al.*, 2022:1). Data transformation entails the mathematical adjustment of data points in order to:

- Improve their interpretation;
- Declutter graphs and adapt for normality; and
- Obtain better insight into the relationships among different variables (McDonald, 2009).

The five types of data transformation are explained in Table 3.12 hereafter.

Table 3.12: Transformation of data

Type of transformation	Description
Natural log transformation	This method is applied generally for the correction of positive skewness. It is one of the most widely used transformations. When applying this function, each variable is replaced by the natural log of the variable. For example, if the variable is 3, the natural log function replaces the variable with $\log_e 3$. For natural log, the base is 'e', which stands for 'Euler's number'. The mathematical value of 'e' is 2.718 281 828 459.
Square root transformation	Calculating the square root of data points brings the data score closer to the data's centre. Square root transformation corrects for positive skewness because the square root of a negative number cannot be calculated (at least not in the absence of significant mathematical assumptions, which may distort statistical findings.) Square root adaptation also applies to data points larger than zero.
Exponential transformation	Exponential transformation is mostly applied when the data points are negatively skewed. A great advantage of this method is that it allows for negative values to be accommodated by its mathematical nature. This type of transformation is often applied successfully when data scores are collected in natural environments, such as the study of temperatures or blood pressure. Natural phenomena tend to be exponentially distributed. Such observations are expressed as $Y = a^{b(x+1)}$.
Reciprocal transformation	Reciprocal transformation entails that 1 is divided by each data point, e.g., $\frac{1}{data\ point}$. Thus, the scores are reversed, e.g., if the data point is represented by 10, the reverse score will be 0,10 or $\frac{1}{10}$. This corrects for positive skewness, as $\frac{1}{0}$ does not represent a viable mathematical outcome (at least not statistically). Thus, reciprocal transformation applies to positive data scores.
Reverse score transformation	Reverse score transformation can be applied when data are negatively skewed. To apply this method, subtract each data point from the highest score and add one (meaning '+1'). By applying this method, the large score becomes small and the small score becomes larger.

Source: Adapted from Field (2009:203)

For the purpose of this research, all variables were transformed to reflect normal distribution. This was done to ensure that all variables can be subjected to the same type of testing and that all outcomes of statistical tests would be comparable. The transformation performed to variables in this study can be observed in Chapter 4, Table 4.4 and Chapter 5, Table 5.3. Once all variables were distributed normally, testing could progress towards multicollinearity identification.

3.5.6.3 Multicollinearity testing

Before proxies are selected as independent variables for regression purposes, it must be ensured that independent variables are not highly correlated with one another. When independent variables share a high association with one another, multicollinearity exists, which implies that the correlated variables measure the same effect or change (Einspruch, 2015:97). Consequently, the prediction merit of the regression model is over-estimated, as it consists of independent variables that reflect one another. In essence, this means that the same measurement variable is added to itself repeatedly and a form of 'double counting' is brought about. As can be deduced, this situation results in fictitious statistical outcomes that should be avoided (Antonius, 2013:83).

Multicollinearity is achieved when independent variables share a correlation of 0,70 or higher (Pallant, 2013:152). Thus, correlation analysis is applied to independent variables to detect multicollinearity. Field (2009:167) states that correlation analysis is a statistical method that searches for relationships among variables and determines whether variables can impact one another (Aspelmeier & Pierce, 2017:152; Field, 2009:167). There are three different types of correlation analysis (Osborne, 2009:15):

- The Pearson correlation coefficient, which is a parametric measure for determining a linear relationship among variables. For this coefficient to be measured, data should be distributed normally;
- The Spearman correlation coefficient is a non-parametric measure of correlation among variables. Spearman's model first ranks data and then applies the Pearson formula. This is used when data are not distributed normally; and
- Kendall's tau, which is similar to the Spearman correlation coefficient, but is applied when the data set is very small ($n < 30$) and not normally distributed.

As indicated in par. 3.5.6.2, variables in this study were transformed to reflect parametric distributions, and for this reason, Pearson's correlation coefficients were measured during the process of multicollinearity testing. The results of these tests can be observed in Chapter 4, Table 4.5 and Chapter 5, Table 5.4.

3.5.6.4 Multiple regression modelling

According to Wagner (2017:104), regression modelling is a statistical process that allows one variable to be predicted or estimated through data relating to another variable. A multiple regression model is a more complex version of a regression model. It consists of multiple predictor variables that collectively estimate a dependable variable (Field *et al.*, 2012:263-264).

By means of SPSS, a stepwise multiple regression analysis was applied in model construction, as set out both in Chapter 4, par.4.3.4 and Chapter 5, par. 5.3.4. The stepwise multiple regression function in SPSS can be used for the following outcomes (Bruhl, 2018:92):

- To group selected independent variables in all possible combinations and seek the combination of independent variables that provide the best possible fit for prediction, as it relates to the dependent variable;
- To arrange independent variables in the correct regression order which ensures prediction accuracy; and
- To ensure that there exists no multicollinearity among independent variables.

With the stepwise function in SPSS, both forward and backward testing can be performed. Forward testing adds independent variables one by one, based on how well the semi-partial correlation correlates with the outcome (Bruhl, 2018:93). Backward testing places all selected independent variables in the model and eliminates them one by one until only prediction variables remain that contribute significantly to the model (Field, 2009:324). For the purpose of modelling done in this section, backward testing was applied. According to Field *et al.* (2012:265), backward testing is preferable over forward testing because it is less prone to the suppressor effect. The suppressor effect occurs when a predictor variable takes effect only when another variable is held constant.

According to Antonius (2013:211), there is practical merit in clearly differentiating between dependent variables and independent variables. Dependent variables are variables for which the researcher intends to estimate or predict a value, whereas independent variables are those the researcher intends to apply to predict the value of a dependent variable (Bairagi & Munot, 2019:100). For the purpose of this research, the proxies for systematic risk were applied as dependent variables. Proxies for returns and other financial measures that can predict systematic risk were selected as independent variables. The types of variables (dependent or independent) are distinguished in Chapter 4, Table 4.1 and Chapter 5, Table 5.1.

Multiple regression model outcomes were reported on in Chapter 4, Tables 4.6 and 4.7, as well as Chapter 5, Tables 5.5 and 5.6. In order to report accurately on multiple regression outcomes, several factors were included for statistical consideration. These factors are discussed in Table 3.13 hereafter.

Table 3.13: Factors included in regression modelling

Factor reported on	Rationale behind the factor
R^2	R^2 provides insight into how well a prediction model fits the data provided. An R^2 of lower than 0,25 indicates a poor data fitting model, while an R^2 of 0,50 or more indicates that the model fits data in a statistically significant manner.
Standard error	The standard error (SE) in regression indicates the average distance between the estimated regression line and the observed data points. There are no predetermined accepted values for standard errors, but the smaller the standard error, the better.
F ratio	The F ratio is the ratio between the regression mean square and the residual mean square. It is used to calculate the significance value (p).
Significance values	Also referred to as 'p-values', significance values demonstrate whether a variable or the model as a whole is statistically significant. As a benchmark, $p < 0.05$ is accepted as statistical significance.

Factor reported on	Rationale behind the factor
Degree of freedom	This represents the number of observations in a data set that has the potential to vary. The larger the data set, the larger the degree of freedom, because more observations mean more possible variety.
Unstandardised beta	Unstandardised betas are organised as coefficients that form part of the multiple regression expression because they indicate the variation in the dependent variable for one unit change in the independent variable.
t-value	The t-value represents standard deviations in coefficients. Ideally, t-values should be larger than 2 or lower than -2.

Source: Adapted from Field *et al.* (2012:366), Reid (2013:88-90), and Sarstedt and Mooi (2014)

In par. 3.5.6.5, and in accordance with Figure 3.4, the reliability and validity of data are discussed.

3.5.6.5 Reliability and validity requirements

Creswell (2014:201) differentiates between 'reliability' and 'validity': reliability means that the researcher's approach is consistent, while validity refers to the evaluation of accuracy measures. Leedy and Ormrod (2012:28-29) similarly describe 'reliability' as the consistency with which a measuring instrument is able to produce outputs, while 'validity' enquires as to whether the instrument is able to test to the extent to which it is intended to test. From these descriptions, it is put forward that reliability is the measure of an instrument's consistency, while validity is the measure of the same instrument's ability to produce research findings as was intended.

Cheng and Phillips (2014:371) state that there exists no particular statistical testing for reliability or validity when secondary data are used. Such testing is aimed at the evaluation of a research instrument when primary data are collected. For the purpose of this study, reliability of data was ensured by retrieving data from a recognised and credible database (i.e., IRESS). Validity was ensured by recruiting the assistance of objective and independent statisticians with appropriate qualifications. The purpose of this recruitment was to ensure that advice is obtained and that the correct consistent statistical testing is performed to fulfil the empirical objectives to the research.

3.6 QUALITATIVE RESEARCH METHODOLOGY (STAGE 3)

According to Adedoyin (2020:1), qualitative research aims at gathering and interpreting non-numerical data in order to understand the social milieu. Qualitative researchers are interested in beliefs, experiences and systems, and study such factors in a systematic, but somewhat subjective manner, to draw conclusions which can add perspective and meaning to social environments and behaviour (Mohajan, 2018:3-4). From the preceding arguments, it may be posited that qualitative research collects and interprets textual data with the purpose of understanding social milieus and behaviours. As with all research, qualitative research requires that some sort of logical methodology is applied in order to draw research conclusions. According to Cropley (2019:21-23), the rigor of qualitative research methodology is determined by four aspects:

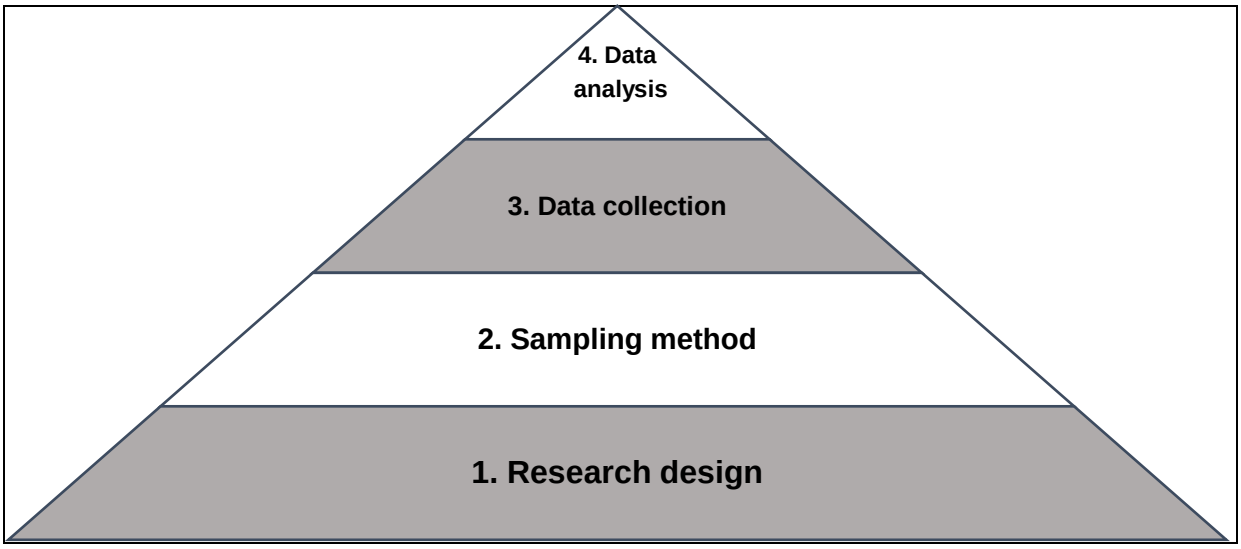


Figure 3.6: Four aspects of qualitative research methodology

Source: Adapted from Cropley (2019:22-23)

The qualitative research aspects displayed in Figure 3.6 are discussed in the paragraphs to follow, with the exception of research design, as this was already extensively described in Table 3.6 and Figure 3.2. Thus, only one aspect of research design is addressed in par. 3.6.1 below, namely the type of qualitative research applied to the study.

3.6.1 Qualitative research type

Earlier in this chapter, Table 3.5 provided an overview of the types of qualitative research. In this paragraph, focus is placed on the type of qualitative research as it applied to the current study.

As indicated in Chapter 1, par. 1.7.2.1, this research was oriented towards the application of a systematic review. A systematic review is a methodical process by which the researcher identifies and synthesises existing evidence to integrate recurring findings and, in this way, assist in the advancement of future practice (Boland *et al.,* 2017:2). According to Gough *et al.* (2018:2), synthesising knowledge is the most effective way to establish a complete understanding of a research phenomenon. Cropley (2019:48) is of the opinion that systematic reviews need to possess three characteristics in order to demonstrate substance:

- Credibility, which refers to the extent to which findings are trustworthy;
- Confirmability, which refers to the ability of the evidence to be verified; and
- Transferability, which indicates the relevance of findings when applied to similar circumstances or situations.

In the current research, credibility was supported by the fact that selection criteria were compiled (refer to par. 3.6.2). These criteria ensured that sources were sampled from trustworthy references on a timely basis. Confirmability was ensured by referencing all the necessary sources used. Thus, the evidence is verifiable, as the reader can access the research articles that were included in the sampling process. Transferability of findings was confirmed through the quantitative confirmation thereof, through statistical testing in Chapter 5, Tables 5.5 and 5.6.

Systematic reviews are executed by means of a fixed four-step process. This process is demonstrated in Figure 3.7.

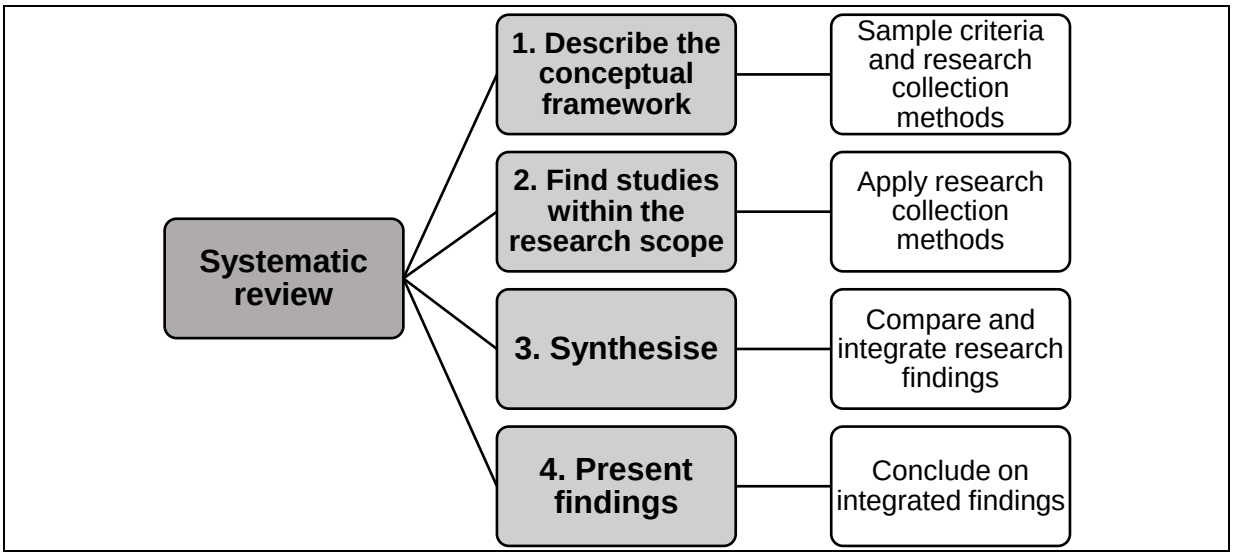


Figure 3.7: Steps to systematic reviews

Source: Figure 1.3 (Chapter 1)

According to Figure 3.7, systematic reviews are performed by means of four steps. These steps were explained in Chapter 1, par. 1.7.2.1. The execution of these steps is reported on in Chapter 6, par. 6.3. In accordance with Figure 3.6, par. 3.6.2 hereafter explains the sampling strategy of the current research.

3.6.2 Sampling strategy

One cannot study a phenomenon in its entirety. Owing to this predicament, sampling is of great importance to any researcher of substance (Marshall & Rossman, 2016:107). The term ‘sampling’ refers to the selection of specific elements for inclusion of analysis (Kothari & Garg, 2019:137). Fink (2020:84) describes a ‘sampling strategy’ as the method or process by which a subset of items is selected from a collective whole. Thus, ‘sampling’ refers to the selection process by which certain elements or items are included for testing from a collective total. Mohanja (2018:21) submits that a sampling strategy extends value and context to research findings. Thus, the sampling strategy can greatly affect the research outcome. An insufficient sampling strategy could lead to impractical findings which are neither relevant nor transferable to the situation or system under study (Mohanja, 2018:21-22). Owing to the importance of sampling, the researcher should apply caution when a sampling method is applied, because the sampling method may

determine whether the outcome can contribute towards the current body of knowledge on the research topic (Bernard & Ryan, 2017:5). There are several types of sampling methods that apply to qualitative research approaches. Table 3.14 was constructed as a complete discussion of the types of sampling methods.

Table 3.14: Sampling methods for qualitative analysis

Sampling method	Description	Application to the current research
Convenience sampling	Convenience sampling is geared towards sampling items or participants that are easily accessible to the researcher. This method is known for saving money and time and minimising the effort of fieldwork. In contrast to these advantages, the credibility of research outcomes may be brought into question. The researcher can, for example, only sample opinions from participants with whom they have established a relationship (friends, family or colleagues). Such interpersonal relations may distort findings.	This method did not apply to the current research, as qualitative items were not sampled for their accessibility.
Snowball sampling	In this strategy, one participant refers the researcher to another. This method must be applied with caution, as potential participants may perceive referrals as an invasion of privacy. Snowball sampling can be efficient in situations where the researcher intends to study a subject that is a rare phenomenon, for example, when rare genetic illnesses are studied in the medical field.	Snowball sampling was not employed in the current research, as journal articles were sampled, rather than natural persons who can provide referrals.

Sampling method	Description	Application to the current research
Extreme case sampling	Extreme case sampling requires the testing of highly unusual phenomena, for which only statistical outliers are sampled for testing. Extreme case sampling can apply to any participant or item that lies outside of the norm. This type of sampling has successfully been applied in psychological research, for example, where studies are done to analyse the behaviour of narcissists. Although any person may exhibit selfish and manipulative behaviour, this type of personality disorder only affects a small portion of the population to a detrimental extent.	This method was not applied in this research, as the researcher did not intend to study unusual phenomena.
Typical case sampling	Typical case sampling concerns itself with finding a norm or an average as it relates to a phenomenon of interest. Studies relating to typical working hours of a public accountant or the typical hourly wage of an IT consultant may employ this type of method.	As this research did not intend to collect information on averages or norms, typical case sampling could not be applied.
Critical case sampling	This sampling method is aimed at logical generalisation. If findings apply to one sample, it should apply to all others that have the same characteristics. Such generalisation may apply when studying muscle fatigue among aerobics participants. If warm-up exercises reduce muscle fatigue among one group, it is probable that it should have the same effect on another group of participants.	This research did not intend to generalise its findings. Therefore, critical case sampling did not apply.

Sampling method	Description	Application to the current research
Maximum variation sampling	This sampling method is applied when the researcher wishes to understand the diversity of a phenomenon within a population. Researchers identify a specific characteristic and study how much this characteristic varies among participants. An example of this type of sampling would be educators testing the reading speed of their students to understand the variation in the number of words read in a minute.	This research did not set out to study the diversity of a phenomenon. Therefore, maximum variation sampling did not apply.
Random sampling	Random sampling, as the name indicates, is a process of selecting any participant on a random basis. Random sampling is unbiased, but it may only apply to research studies where the research question is so universal that any possible participant could offer participation or express an opinion. When a research question is more focused, this method may not necessarily be applied effectively.	This research set out specific criteria for sample selection. Thus, random sampling was not applied.
Volunteer sampling	Volunteer sampling entails that participants volunteer to partake in a research experiment. There may be several reasons for participation, for example, support for the cause that the researcher is examining. In the 1960s, volunteer sampling was often associated with feminist research, where females would voluntarily offer to disclose their income to researchers to enable them to study the extent of payment gaps between men and women in a work place.	As journal articles were sampled through strategic criteria, volunteer sampling did not apply. This form of sampling is applied where natural persons serve as participants to research.

Sampling method	Description	Application to the current research
Theory based sampling	Theory based sampling is oriented towards identifying a theoretical construct to analyse it extensively. Theory based sampling is popular in research that relates to theoretical physics, as these theories, however plausible, may not be experimentally possible.	The objectives of this research were not merely theory based, but required execution. For this reason, theory based sampling did not apply to this research.
Intensity sampling	This form of sampling entails that the researcher only study information-rich cases, for instance studying a case only when it has been extensively covered by the media. One example may be presidential elections that are covered by both television and printed media.	This research was not geared towards collecting data on information-rich instances. Thus, this form of sampling did not apply here.
Criterion sampling	This method entails that the researcher identify some criteria in advance and measures the suitability for inclusion of an item against these predetermined criteria. This method relies on the knowledge and expertise of the researcher. To support these criteria, the researcher may often refer to existing research to study the sampling methods and research outcomes of other experts in the field.	Criterion sampling was applied in this research. The researcher established predetermined criteria, supported by the methods applied in existing research.

Source: Creswell (2013:156-158), Creswell *et al*. (2019:214-219), De Vaus (2017:19-23), Elmusharaf (2012), Fink (2020:87-90)

The application of criteria sampling requires the identification of specific criteria. The following sampling criteria were developed for the systematic review of this study:

Criterion 1: The aim/goal/objective/hypothesis of the sampled studies should be to predict/estimate systematic risk by means of financial ratios/financial models/financial concepts;

Criterion 2: Sampled articles should be selected from peer-reviewed academic journals; and

Criterion 3: The publication date of sampled journal articles should not be older than three years as at the date that Chapter 6 was written (May 2022). According to Wolf (2019), literature sources older than 10 years are not useful any longer, but for faster-paced research fields, literature sources are ideal when not older than three years. This sampling criterion was applied in line with Vermeulen's (2020) claim that the business environment is a fast-changing environment.

The outcome of the sampling strategy can be viewed in Chapter 6, Table 6.2. The three selected criteria dictated which data were to be collected, as well as the allowable time frame for the data. In par. 3.6.3, hereafter, the data collection process is elaborated on.

3.6.3 Qualitative data collection

Data collection is a key methodological aspect in any research project; in other words, research is not feasible without the necessary data readily at hand (Fetters, 2020:13). Different data collection methods exist. Regarding qualitative research, Bernard and Ryan (2017:18) posit that only two main categories of collection methods can be identified: indirect observation and direct observation. Figure 3.8 outlines these two categories.

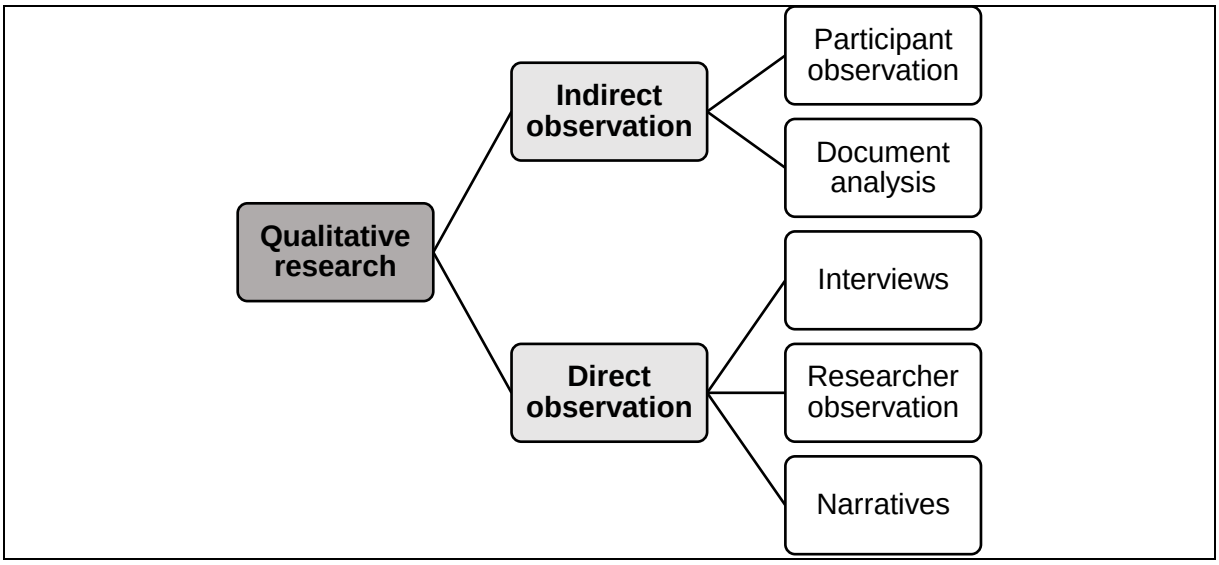


Figure 3.8: Qualitative data collection methods

Source: Adapted from Bernard and Ryan (2017:18), and Marshall and Rossman (2016:141-166)

Figure 3.8 demonstrates that qualitative data can be collected by means of indirect and direct observation. Indirect observation can be done through participant observation and document analysis. Participant observation is a data collection method where the participant is exposed to a situation or setting and required to express their observations, opinions or experiences with regard to the phenomenon that is investigated. The researcher places no limits on the dialogue and records conversations with the intention of analysing the information and seeking themes and patterns. For these methods to succeed, the researcher must remain unbiased and refrain from participating in debates (Marshall & Rossman, 2016:142).

Document analysis is another method of qualitative data analysis and, according to Cooper (2017:15), it serves one of two purposes: to critically analyse the information or to synthesise the information in the document. In critical analysis the researcher strives to critically evaluate the content of the document in order to identify underlying themes. Such critical analysis is also referred to as ‘content analysis’. Synthesising the information entails that patterns identified in the documents be sorted, compared and integrated (Boland *et al.,* 2017:2-3).

Direct observation consists of collecting data through interviews, researcher observation and narratives. Interviews are a fairly common method of collecting qualitative data. The researcher constructs a set of questions and selects participants to answer the questions. As interviews are conducted by means of predetermined questions, all participants are subjected to the same inquiry. The researcher collects interview responses and searches for themes and patterns within the responses (Creswell, 2013:148).

Researcher observation is the most biased method of collecting qualitative data. The researcher can either place themselves in a setting where the behaviour of participants can be observed and recorded, or create a setting and observe participants' responses to a situation. Irrespective of the method chosen, such observation is highly subjective as it relies on the interpretations of the researcher only (Fetters, 2020:56-57).

Narratives are the final type of data collection method displayed in Figure 4.8. Narratives refer to storytelling. Typically, the researcher would provide a discussion topic and require the participants to tell stories relating to their own lives, experiences and histories. An example of narrative data collection would be the collection of stories as told by Titanic survivors or Holocaust victims. This places the storyteller at the centre of the experience and provides the researcher with information-rich rhetoric to seek themes within the personal stories of participants (Bernard & Ryan, 2017:22).

For the purpose of this research, indirect observation in the form of document analysis was applied. The researcher analysed academic journal articles, searching for patterns in the research, and synthesised the findings reported in these articles. The academic articles were gathered through a data collection process consisting of four steps.

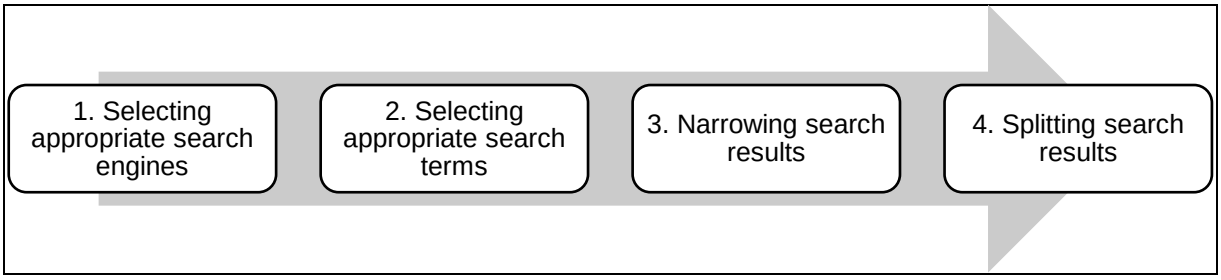


Figure 3.9: Qualitative data collection process

Source: Author

Figure 3.9 indicates that the data collection process was divided into four steps. The first step ensured that appropriate academic search engines were selected to consult for relevant articles. The following search engines were used:

- Google Scholar;
- EBSCOhost;
- Sabinet;
- Scopus;
- ProQuest;
- JSTOR; and
- Emerald Insight Journals.

In the second step, appropriate search terms had to be selected, keeping in mind criteria 1 and 3 (as indicated in par. 3.6.2). The following were applied as search terms: systematic risk; beta; risk; estimate risk; predict risk; predict systematic risk; estimate systematic risk; leveraged beta; unleveraged beta; cash flow per share; current ratio, quick ratio, debt to equity ratio; debt to assets ratio; return on external investments; market value added; price-per-share to book value-per-share; price-per-share to net asset value-per-share; total assets to capital employed ratio. Furthermore, search engines were set to limit search results from 2019 to 2022.

Per the third step, search results had to be narrowed down. This was done by:

- Eliminating research articles that were non-peer reviewed (as this breached criterion 2 per par. 3.6.2);
- Setting aside articles which did not test for the relationship between systematic risk and one of the identified independent variables simultaneously, but still contained either ‘systematic risk’ or an independent variable as one of its keywords. These articles were revisited in order to identify findings similar to those of the current study (refer to fourth step); and
- Eliminating articles which tested for the relationship between systematic risk and one of the identified independent variables but did not support the findings of the current study (as obtained in Chapter 5, Tables 5.5 and 5.6).

In the fourth and final step, the remaining research articles were split into two categories. The first category consisted of articles that contained findings identical to those of the current study. A summary of these articles can be viewed in Chapter 6, Table 6.3. The second category consisted of articles that contained findings similar (but not identical) to those of the current study. A summary of these articles can be observed in Chapter 6, Table 6.4.

In par. 3.6.4, the analysis and interpretation of the collected data are described, as per Figure 3.6. The focus is on aspects relating to qualitative data specifically.

3.6.4 Analysis and interpretation of qualitative data

After data have been collected, analysis needs to be performed in order to draw conclusions and state research findings (Gibson & Brown, 2019:2). Qualitative data analysis requires special attention to structure, elements and themes. Unlike quantitative analysis, qualitative analysis is concerned with the evaluation of components as they recur in legal processes, stories, communication, pictures, attitudes and experiences. There is often no 'good' or 'bad' result or theme, as qualitative undertakings are more exploratory than descriptive in nature (Gibson & Brown, 2019:3-4).

Friese (2019:4) highlights that it is useful for qualitative findings to be presented or demonstrated, for instance through flow charts, tables or other charts (pie charts, line charts, histograms, etc.) (Gibson & Brown, 2019:192). In this research, qualitative findings were tabled for interpretation convenience. Findings were summarised by means of frequency counting of independent variables, where these independent variables were shared with findings obtained in Chapter 5 of this research. Tabled findings can be referred to in Chapter 6, Tables 6.5 and 6.6.

This section of Chapter 3 is brought to close after the above exposition of the qualitative data analysis approach. In par. 3.7, hereafter, the ethical aspect of the research is discussed.

3.7 ETHICS IN RESEARCH

Creswell *et al.* (2019:47) view research ethics as a set of principles aimed to ensure that research is performed with integrity. According to Leeuw *et al.* (2012:79), the researcher

should act in good faith and collaborate with participants in such a way that research benefits are obtained without transferring unnecessary risk to the participant. Curtis and Curtis (2018:15-16) concur by stating that research experiments must be performed within ethical boundaries, where permission is obtained to perform the research and the researcher is unable to influence either the participants or the outcomes. From the preceding explanations, it is submitted that research ethics are a set of values that are adhered to by the researcher to ensure that data are collected without creating risk of harm for the participant. The researcher complies with ethics mainly through attaining permission to perform the research and refraining from having influence over participants and outcomes.

The current study aimed to collect secondary data from IRESS in order to fulfil the empirical research objectives. Owing to the nature of the data, a few ethical considerations applied, for the following reasons:

- Listed companies are obliged to publish their financial data annually. For this reason, information relating to the sampled companies is readily available, and the researcher need not consider ethical procedures to obtain such data;
- The financial statements of listed entities are audited annually. This minimises the possibility that data contain errors and misstatements;
- Data were retrieved from a recognised research engine: IRESS. Thus, financial data are made available accurately and consistently by the research engine;
- As data and ratios can easily be confirmed on IRESS, the researcher had little influence over published data and research outcomes; and
- An independent statistician was recruited to assist with statistical testing and test selections. Again, the researcher was unable to affect research outcomes that were generated by an independent party.

The Research and Ethics Committee of the North-West University evaluated the research and its intention to ensure that it complies with the necessary ethical requirements of the university. The ethical clearance number (NWU-00853-21-A4) provided by the Ethics Committee can be viewed in **Appendix C.**

3.8 CHAPTER SUMMARY

Chapter 3 provided an in-depth explanation of the research design and methodology that were applied to the study. This included an analysis of the underlying views of research philosophy, against the backdrop of the general research process set out in Figure 3.1.

Firstly, the supporting worldview of the study was placed in context, and it was indicated that a post-positivist philosophy was followed in the execution of the research (Tables 3.1 and 3.2). Thereafter, the research process was analysed in par. 3.3, and its applicability to the current study was illustrated in Table 3.3.

In par. 3.4, the research design to the study was explored. Here, focus was placed on the different dimensions of research design (Figure 3.2) and the types of applicable design (Table 3.6). Figure 3.3 provided a detailed summary of the research design and applicable research design dimensions. It was stated that the study employed a triangular mixed research design because a qualitative analysis (see Chapter 6) was conducted to support the quantitative findings (see Chapter 5). Thus, this study was both qualitative and quantitative in nature. With regard to the quantitative aspects of the descriptive research design, secondary numerical data were collected. For the qualitative aspects of the research design, secondary textual data were collected.

In par. 3.5, the research methodology for the quantitative analysis was explained. This entailed the description of the quantitative population (Table 3.7), the sampling strategy and sample size (Table 3.10). The top 100 JSE listed companies were populated for reasons elaborated on in par. 3.5.2. The strategy applied was non-probability sampling in the form of homogenous judgment sampling. The sampling criteria were provided in par. 3.5.4.

With regard to quantitative data collection and data analysis, the collected data sets and their rationale were stated in Table 3.11. The research aimed to collect data relating to the quantification of systematic risk and the financial performance measures of sampled companies. Data were collected from IRESS for a total of five years. The process of data analysis was demonstrated in Figure 3.5. Data were analysed through normality testing, variable transformation, multicollinearity testing and multiple regression analysis.

In par. 3.5.6.5, the reliability and validity of quantitative research findings were discussed. For the purpose of this study, reliability of data was ensured by retrieving data from a recognised and credible database (i.e., IRESS). Validity was ensured by recruiting the assistance of objective and independent statisticians with appropriate qualifications.

Paragraph 3.6 was directed towards explaining the qualitative research methodology. In Table 3.14, the qualitative sampling method was highlighted. Criterion sampling was applied, and the relevant criteria were provided in par. 3.6.2. Qualitative data collection and analysis were conducted through a systematic review of selected academic journal articles. These articles were sourced from Google Scholar, EBSCOhost, Sabinet, Scopus, ProQuest, JSTOR and Emerald Insight Journals. Qualitative data were collected by means of indirect observation, in the form of document analysis (Figure 3.8). The qualitative data will be presented by means of tabling.

Ethics in research were considered in par. 3.8, and it was emphasised that research should apply ethical principles to ensure that research integrity is maintained. Participants should not be exposed to unnecessary harm, and permission should be obtained to commence with data collection. This study was undertaken with the intention of complying with all these principles, while the research objectives were subjected to the scrutiny of the North-West University's Research and Ethics Committee to ensure that all relevant ethical requirements were complied with. It was highlighted that secondary data collection was executed, which necessitated few ethical considerations. Audited data were readily available on IRESS for enquiry and the recruited statistician assisted with modelling to minimise the involvement of the researcher when it came to data processing.

The next chapter focuses on the empirical analysis as it relates to stage 1 of the study. This chapter explores the viability of the risk-return trade-off for the sampled companies.

CHAPTER 4:
STAGE 1 – VIABILITY OF THE RISK-RETURN TRADE-OFF

Never assume the obvious is true. – William Safire

4.1 INTRODUCTION

As described in Chapter 1, par. 1.1, it is widely accepted that systematic risk and return measures are positively interrelated (Miller, 2019). This theory, referred to as the risk-return trade-off, has been in existence since 1952 (Rusoff, 2019). In this chapter the viability of this theory is tested based on data collected from the sampled companies.

In accordance with Figure 1.2 (Chapter 1), the research process is divided into three main stages. As indicated per the chapter title, Chapter 4 is directed towards the fulfilment of stage 1. In this stage quantitative methods were applied to test the viability of the risk-return trade-off, with the aim to fulfil empirical objective 1 (par. 1.5.2.2, Chapter 1). This undertaking is not purported to be seminal, as other researchers have brought this theory into question since the 1960s (refer to Tables 1.1, 1.2 and 1.3, Chapter 1). The findings presented in this chapter are limited to the sampled JSE companies and should not be generalised. It also seems rational to posit that the data collected specifically relate to the JSE, which is classified as a *developing* market, rather than a *developed* market. Therefore, findings may differ from those obtained by international researchers. This chapter is divided into three main sections in order to present the content in a logical and easy-to-interpret manner, as set out in Figure 4.1.

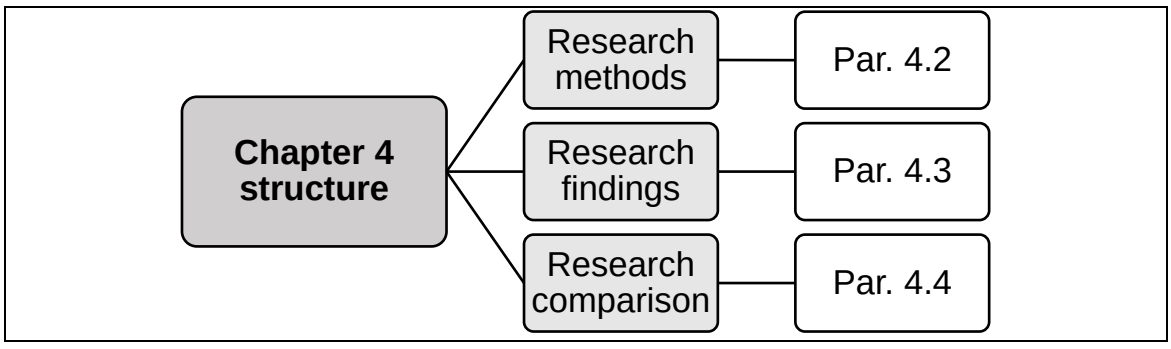


Figure 4.1: The structure of Chapter 4

Source: Author

Figure 4.1 shows the three main paragraphs of Chapter 4. In par. 4.2, an overview of research methods is provided. Although an in-depth analysis of the research methods

was provided in Chapter 3, the research methods pertaining to Chapter 4 are briefly revisited. In par. 4.3, quantitative research findings are presented by means of extensive statistical analysis, including a Shapiro-Wilk test and multiple regression modelling. Findings based on these tests are interpreted. Lastly, par. 4.4 provides a conclusion which ultimately indicates whether risk and return variables (as per this quantitative analysis) were interrelated or not.

4.2 BRIEF OVERVIEW OF THE RESEARCH METHOD

To ensure that findings are reliable and easy to comprehend, it is important to explore the methods applied in drawing conclusions. Although the research design and methodology were extensively described in Chapter 3, this study consists of several research steps (Figure 1.2, Chapter 1), and the reader may find it difficult to keep track of all methods and the sequence of application. Paragraphs 4.2.1 and 4.2.2 serve as a recap of the data collection method and statistical testing that were applied to determine whether systematic risk and accountancy-related return measures are related with regard to the sampled companies.

4.2.1 Data collection

The data presented in this chapter consist of two main sets of variables. The first set comprises systematic risk measures. The second set aims to quantify 'returns'. Table 4.1 was constructed to demonstrate how the sets of variables were quantified and coded.

Table 4.1: Data collection variables

Variable measured	Variable type	Proxy	Code
Systematic risk	Dependent variable	Leveraged beta	LB
Systematic risk	Dependent variable	Unleveraged beta	UB
Return	Independent variable	Net profit margin	NPM
Return	Independent variable	Operating profit margin	OPM
Return	Independent variable	Return on assets	ROA
Return	Independent variable	Return on equity	ROE

Variable measured	Variable type	Proxy	Code
Return	Independent variable	Return on capital employed	ROCE
Return	Independent variable	Return on average assets	ROAA
Return	Independent variable	Return on average equity	ROAE
Return	Independent variable	Inflation adjusted return on assets	Inf adj ROA
Return	Independent variable	Inflation adjusted return on equity	Inf adj ROE
Return	Independent variable	Inflation adjusted return on average assets	Inf adj ROAA
Return	Independent variable	Inflation adjusted return on average equity	Inf adj ROAE
Return	Independent variable	Dividends per share	DPS
Return	Independent variable	Dividend yield	DY
Return	Independent variable	Earnings per share	EPS
Return	Independent variable	Earnings yield	EY
Return	Independent variable	Inflation adjusted profit per share	Inf adj p/share
Return	Independent variable	Price/earnings ratio	PE
Return	Independent variable	Price per share	Price/share

Source: Author

The reasons for the selection of variables listed in Table 4.1 were discussed extensively in Chapter 2. With regard to systematic risk, leveraged and unleveraged beta were selected as proxies. Reasons for this selection were explored in Chapter 2, par. 2.2.2.3 (also refer to Table 2.5 in Chapter 2). Accountancy-related return measures were represented by financial ratios relating to profitability, earnings, dividends and share prices. The reasons for selecting these ratios as proxies for the

concept of return were discussed in Chapter 2, par. 2.3 (also refer to Tables 2.6 and 2.7 in Chapter 2).

Data were collected from IRESS for five consecutive financial years: 2015 to 2019. Thus, each variable consisted of 165 observations (n), that is, a total of 33 sampled companies with five observations each. Collected observations were subjected to statistical analysis through SPSS (version 26). Paragraph 4.2.2, hereafter, describes the statistical testing process.

4.2.2 Quantitative testing and interpretation

Figure 4.2 explains the statistical approach applied.

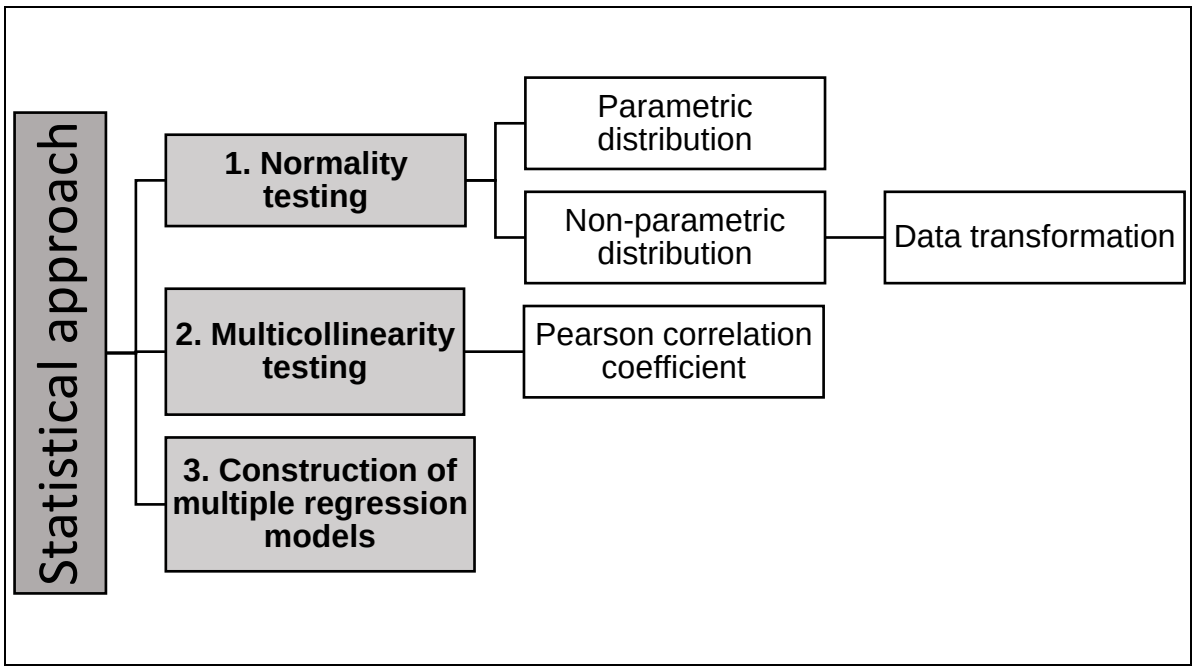


Figure 4.2: Statistical approach for research stage 1

Source: Author

Figure 4.2 demonstrates that the statistical approach is three-fold. Firstly, normality testing was applied, secondly multicollinearity testing was executed, and thirdly, multiple regression models were constructed.

With regard to normality testing, a Shapiro-Wilk test was applied to all variables in order to determine whether the distribution was parametric or non-parametric. The interpretation of a Shapiro-Wilk test is as follows (Aspelmeier & Pierce, 2017:129):

- Should the significance value (p) be greater than 0.05, the data are parametrically distributed; or

- If the p-value is smaller than 0.05, data are non-parametrically distributed.

In the case of non-parametric distribution, data can be transformed. Data transformation is a process by which all data points are mathematically adjusted to ensure the data are redistributed parametrically (Schendzielorz, 2020). (The five methods for data transformation were fully explained in Table 3.12 in Chapter 3.) For the purpose of fulfilling empirical objective 1, data variables that were not distributed normally were transformed in order to reflect parametric distribution. This was done to overcome circumstances where some variables are parametrically distributed, while others are non-parametrically distributed. By ensuring that all variables were normally distributed, all variables could be subjected to the same testing. To transform the variables, a natural log transformation was performed.

Figure 4.2 indicates that the quantitative approach necessitated testing for multicollinearity. Multicollinearity is a phenomenon where independent variables are highly correlated with one another which compromises the statistical substance of the regression model (Einspruch, 2015:97). The testing was done by identifying independent variables with shared Pearson correlation coefficients of higher than 0,70 (Pallant, 2013:152). These independent variables could not be selected as simultaneous independent variables in the multiple regression analysis. In the construction of the multiple regression models, the effects of multicollinearity were avoided by applying the stepwise multiple regression setting on SPSS.

Lastly, multiple regression analysis was performed to determine whether the independent variables that represent the concept of ‘return’ can predict the value of the dependent variables (i.e., leveraged and unleveraged beta). Paragraph 4.3, hereafter, discusses the findings for the Shapiro-Wilk tests, the data transformation, the multicollinearity testing, and the multiple regression models.

4.3 RESEARCH FINDINGS

The aim of this section is to set out and interpret the findings with regard to the sampled companies. Paragraph 4.3.1 elaborates on the results from the Shapiro-Wilk test. Paragraph 4.3.2 presents the necessary data transformations, par. 4.3.3 summarises the findings related to multicollinearity, and par. 4.3.4 indicates the multiple regression findings. It should be noted that descriptive analysis was not fundamental to the

statistical analysis required in the case of the selected empirical objective. However, the reader can view the descriptive statistics relating to the variables in **Appendix D**.

4.3.1 Results for the Shapiro-Wilk test

The Shapiro-Wilk test indicates whether data variables are parametric or non-parametric in nature (Aspelmeier & Pierce, 2017:128). The interpretation of this test was discussed in par. 4.2.2. Table 4.2 was constructed to display the findings from this test.

Table 4.2: Shapiro-Wilk test results for sampled companies

Variable	p-value
LB	0.052
UB	0.057
NPM	0.000
OPM	0.000
ROA	0.000
ROE	0.000
ROCE	0.000
ROAA	0.000
ROAE	0.000
Inf adj ROA	0.000
Inf adj ROE	0.000
Inf adj ROAA	0.000
Inf adj ROAE	0.000
DPS	0.000
DY	0.000
EPS	0.000
EY	0.000
Inf adj p/share	0.000
PE	0.000
Price/share	0.000

Source: Author

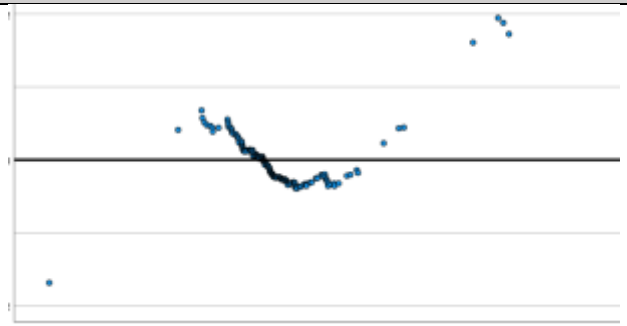
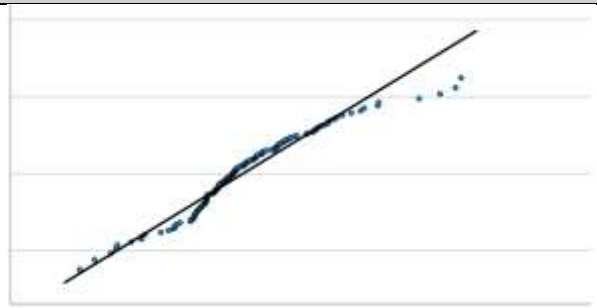
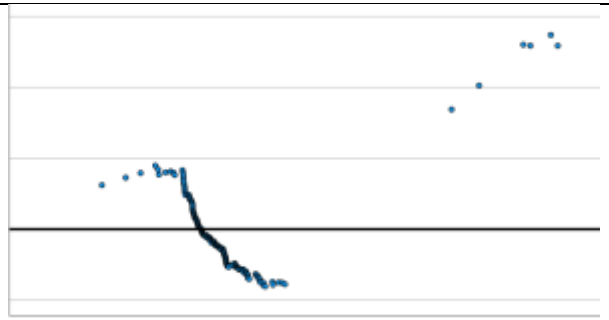
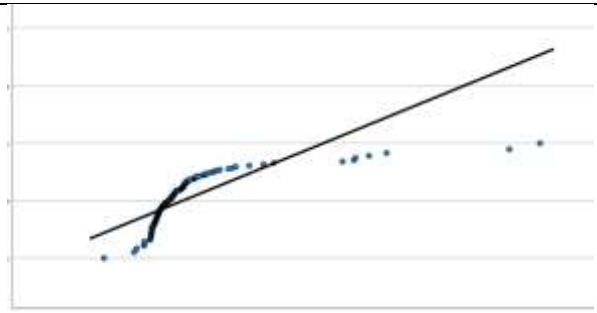
Table 4.2 represents the findings of the Shapiro-Wilk test. All significance values were rounded to three decimal places, as this is the automatic output generated by SPSS. Per Table 4.2, the reader finds that only LB ($p = 0.052$) and UB ($p = 0.057$) were normally distributed, where $p > 0.05$, which indicates parametric distribution. All other

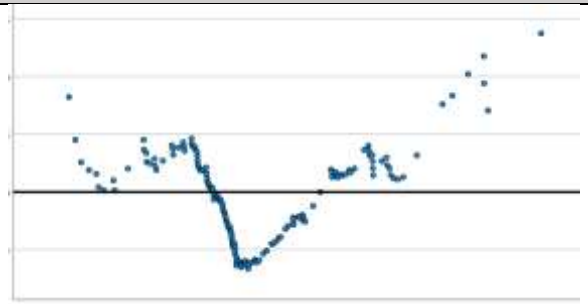
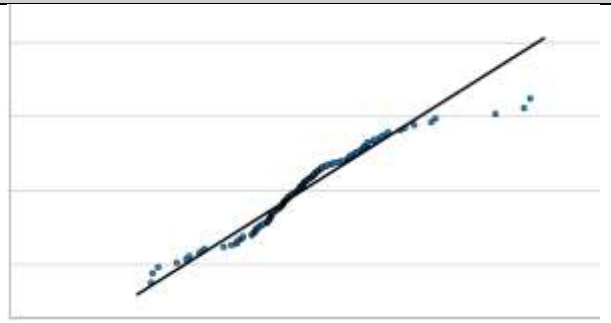
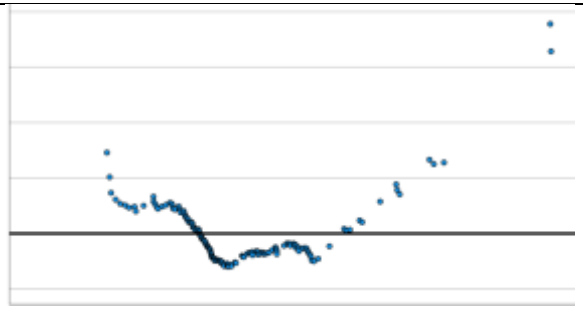
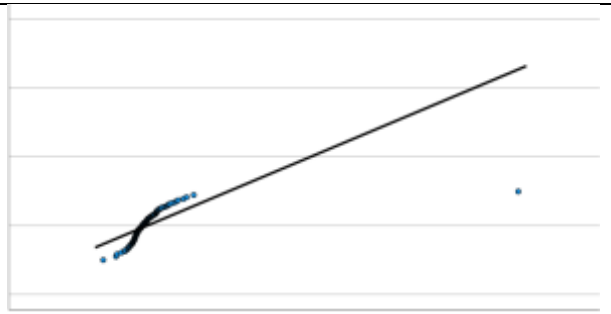
variables were non-parametrically distributed, with a probability value smaller than 0,000. As $p < 0.05$ for NPM, OPM, ROA, ROE, ROCE, ROAA, ROAE, infl adj ROA, infl adj ROE, infl adj ROAA, infl adj ROAE, DPS, DY, EPS, EY, Inf adj p/share, PE and Price/share, these variables required transformation in order for the abnormal distribution to be corrected.

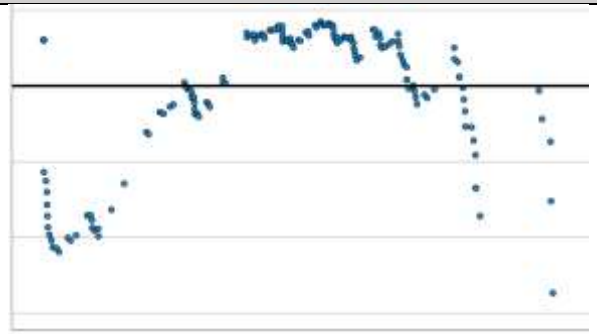
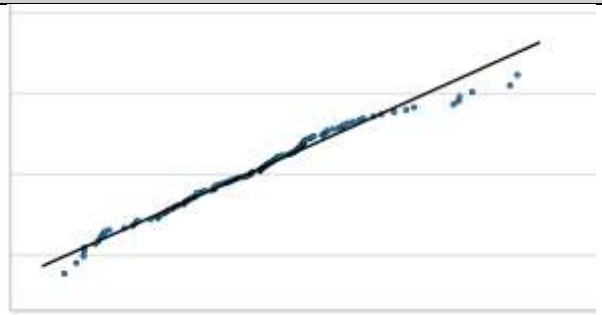
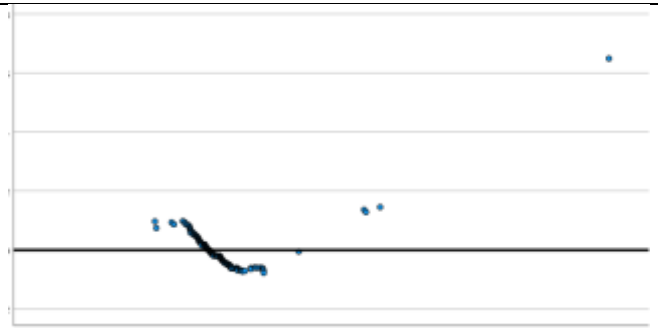
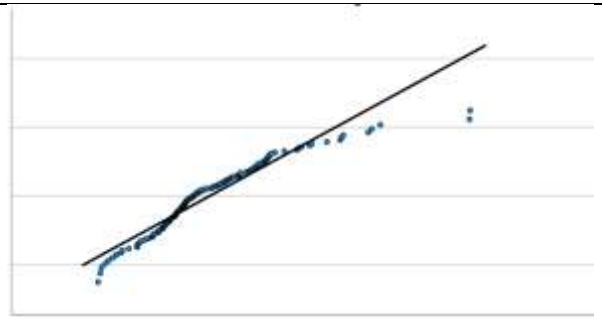
4.3.2 Data transformations

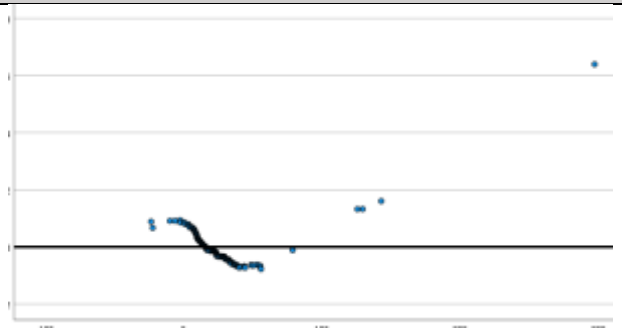
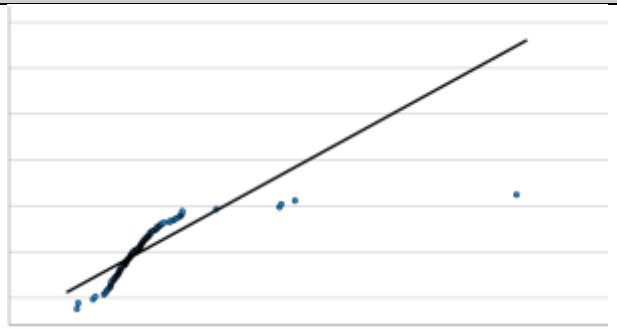
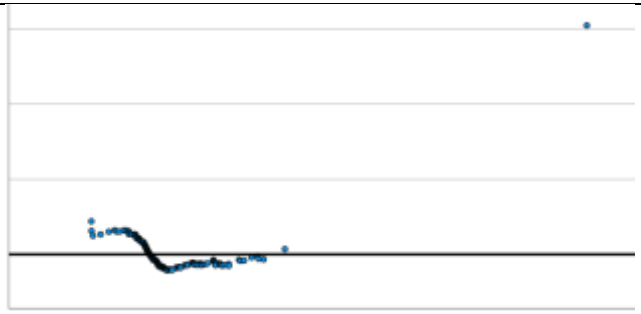
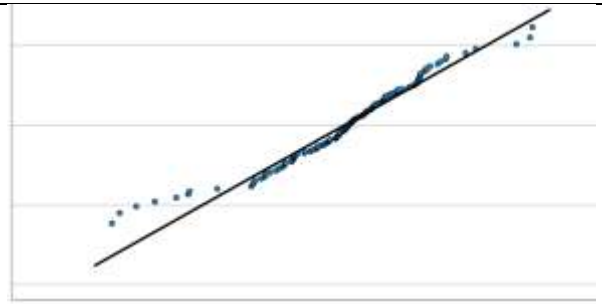
As indicated in par. 4.2.2, data can be adjusted for normal distribution when data are not parametrically distributed. As non-parametric distributions were implied by the results of the Shapiro-Wilk test in Table 4.2, natural log transformations were performed (as explained in Table 4.2). Table 4.3 illustrates the distributions of the applicable variables. The illustrations were done by means of Q-Q plots. Q-Q plots are statistical plotting tools which enable the observer to identify the type of distribution that relates to selected variables. Q-Q plots may indicate normal, exponential, Pareto or uniform distribution (Varshney, 2020). For the purpose of constructing Table 4.3, SPSS was applied for the plotting of ‘before’ and ‘after’ graphs.

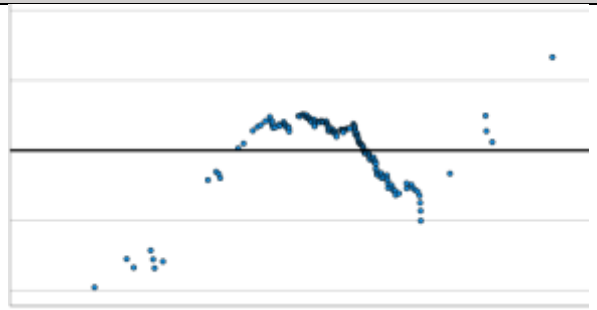
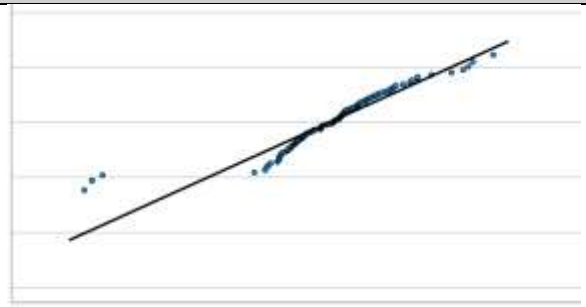
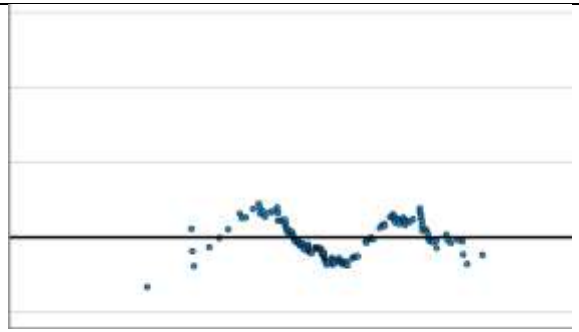
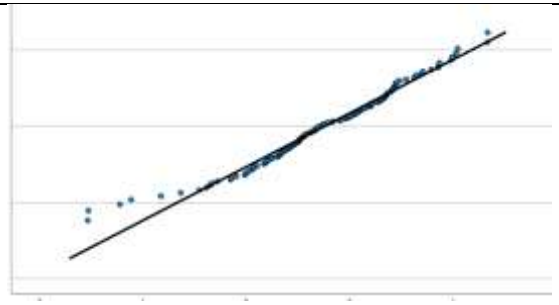
Table 4.3: Transformations of data sets

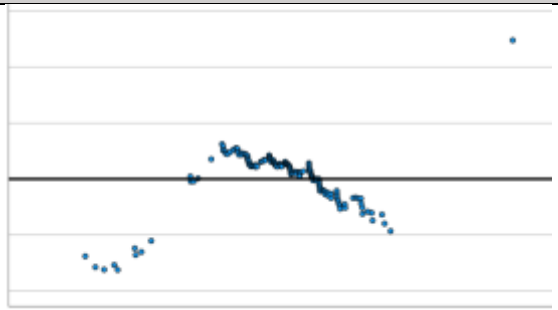
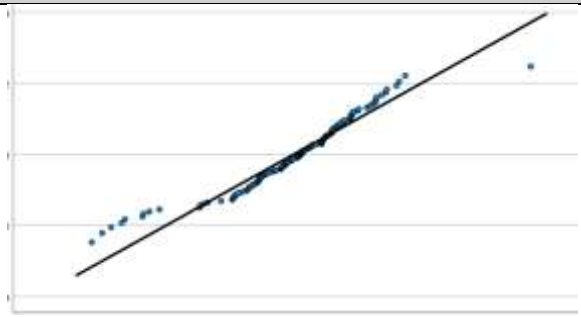
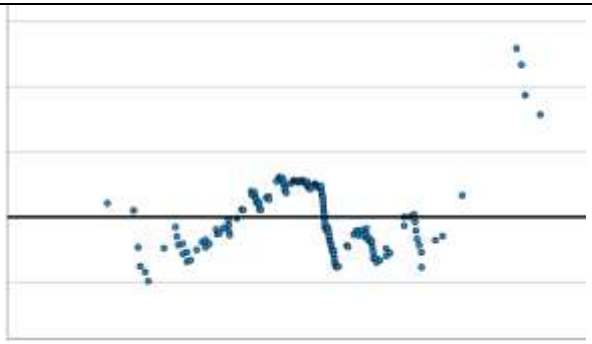
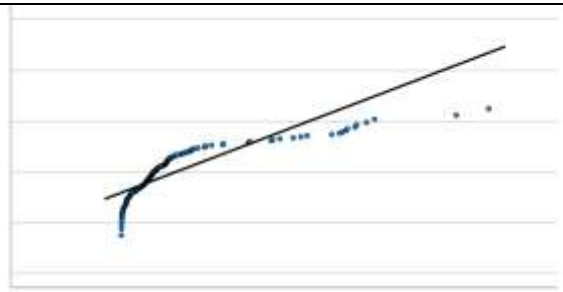
Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
NPM		ln_NPM	
OPM		ln_OPM	

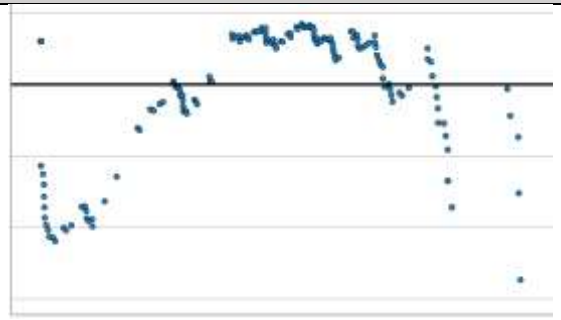
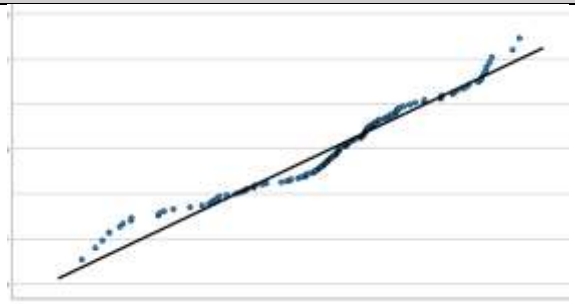
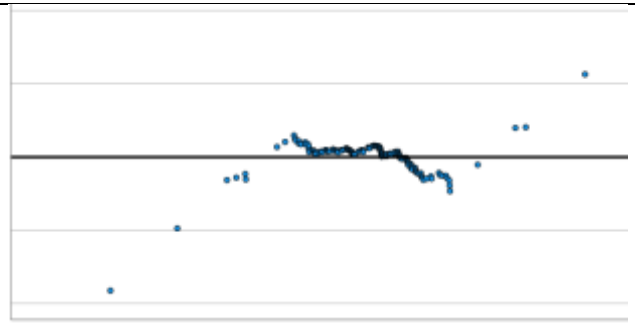
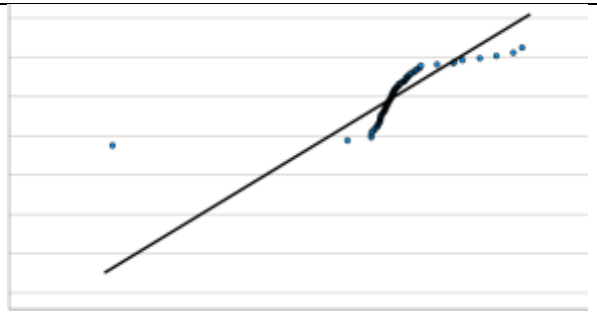
Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
ROA		ln_ROA	
ROE		ln_ROE	

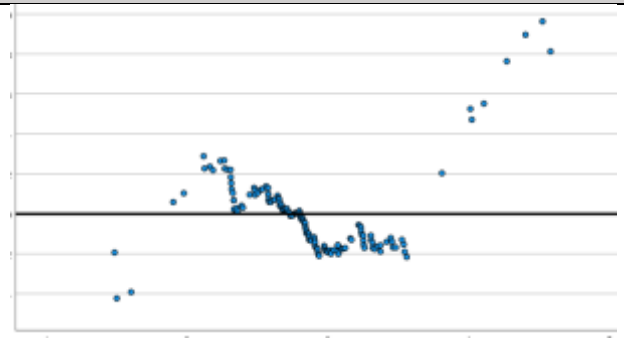
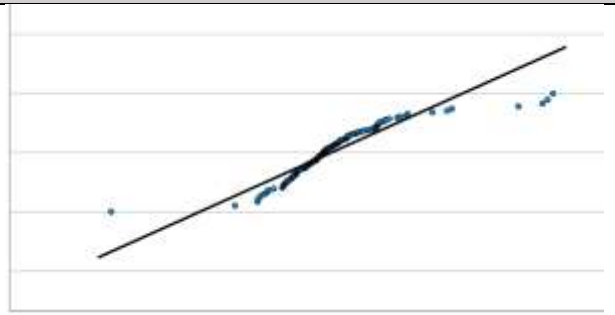
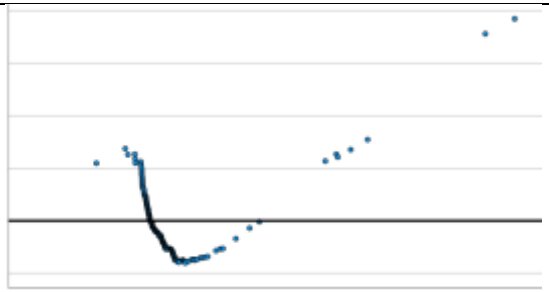
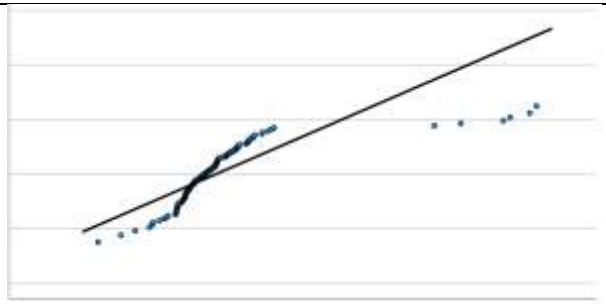
Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
ROCE		ln_ROCE	
ROAA		ln_ROAA	

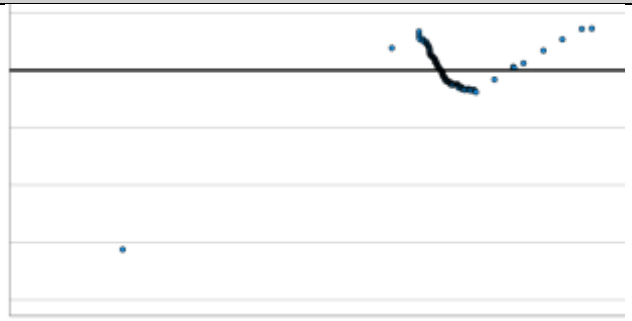
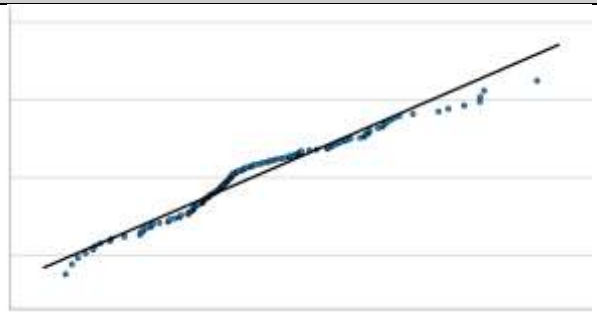
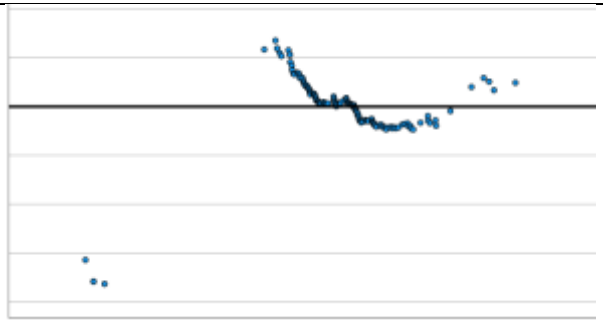
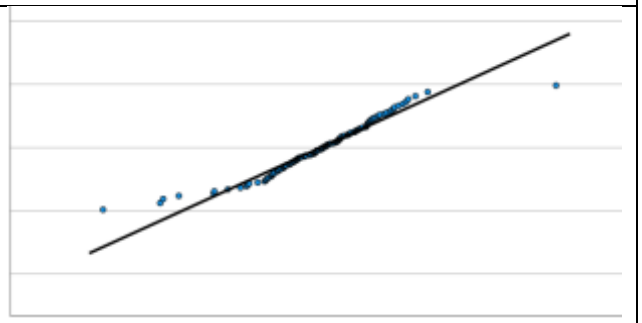
Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
ROAE		ln_ROAE	
Inf adj ROA		ln_ Inf adj ROA	

Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
Inf adj ROE		ln_ Inf adj ROE	
Inf adj ROAA		ln_ Inf adj ROAA	

Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
Inf adj ROAE		ln_ Inf adj ROAE	
DPS		ln_DPS	

Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
DY		ln_DY	
EPS		ln_EPS	

Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
EY		ln_EY	
Inf adj p/share		ln_Inf adj p/share	

Code of variable before transformation	Plot before transformation	Code of variable after transformation	Plot after transformation
PE		ln_PE	
Price/share		ln_ Price/share	

Source: Author

4.3.3 Multicollinearity testing

This paragraph provides the results of the multicollinearity testing. As indicated, multicollinearity testing needs to be executed before the multiple regression model is constructed. Table 4.4 displays the multicollinearity found among variables.

Table 4.4: Multicollinearity findings

Correlation between codes	Shared correlation coefficient (r)
ln_DPS and ln_EPS	0.829
ln_NPM and ln_OPM	0.743
ln_Price/share and ln_DPS	0.827
ln_Price/share and ln_EPS	0.910
ln_Price/share and ln_Inf adj p/share	0.866
ln_Inf adj ROA and ln_ROAE	0.715
ln_ROA and ln_ROAA	0.933
ln_ROA and ln_Inf adj ROA	0.807
ln_ROA and ln_Inf adj ROAA	0.933
ln_ROAA and ln_Inf adj ROA	0.772
ln_ROAE and ln_ROCE	0.871
ln_ROCE and ln_Inf adj ROE	0.889
ln_ROE and ln_ROCE	0.937
ln_ROE and ln_ROAE	0.949
ln_ROE and ln_Inf adj ROE	0.931
ln_ROE and ln_Inf adj ROAE	0.886

Source: Author

The shared correlations among independent variables indicated in Table 4.4 were considered when multiple regression was performed. Owing to the high shared correlations, the independent variables could not function as simultaneous predictors of the dependent variables. In order to overcome this mathematical predicament, stepwise testing was performed by means of SPSS. By applying this setting, SPSS automatically tests for and avoids multicollinearity in the process of generating multiple regression models that best fit the data at hand.

4.3.4 Construction of multiple regression models

For this purpose, two models were constructed: one which provides a prediction model for LB and another which indicates a prediction model for UB. The outcome of these models can be observed in Tables 4.5 and 4.6.

Table 4.5: Multiple regression output for leveraged beta

Model for leveraged beta (LB)			
R^2		0.202	
Standard error (SE)		0.532	
F ratio		8.587	
Significance value (Sig)		0.000	
Degrees of freedom (df)		5;145	
Independent variable	**Unstandardised beta**	**t-value**	**p-value**
Constant	-0.488	-1.036	0.000
ln_EPS	0.170	4.918	0.000
ln_NPM	0.011	0.244	0.000
ln_ROE	-0.217	3.956	0.000
ln_DY	0.148	1.948	0.000
ln_PE	0.171	1.739	0.000

Source: Author

Table 4.6: Multiple regression output for unleveraged beta

Model for unleveraged beta (UB)			
R^2		0.169	
Standard error (SE)		0.416	
F ratio		5.696	
Significance value (sig)		0.000	
Degrees of freedom (df)		5;145	
Independent variable	**Unstandardised beta**	**t-value**	**p-value**
Constant	0.125	0.478	0.000
ln_EPS	0.115	4.208	0.000
ln_ROE	-0.128	-2.826	0.000
ln_DY	0.110	1.818	0.000
ln_EY	-0.110	-1.381	0.000
ln_OPM	0.028	0.690	0.000

Source: Author

Table 4.5 illustrates the multiple regression outputs for both dependent variables. In the case of LB, the regression model indicated:

LB = -0.488 + 0.170(ln_EPS) + 0.011(ln_NPM) – 0.217(ln_ROE) + 0.148(ln_DY) + 0.171(ln_PE)

The preceding model can estimate 20.2% (R^2 = 0.202; SE = 0.532) of changes in LB. The model can predict LB reliably, as F(5,145) = 8.587 and the p-value is smaller than 0.05. All independent variables resulted in significance where $p < 0.05$. Although the prediction model for LB was statistically significant, it failed to explain 79.8% of the changes in LB.

For UB, the regression model in Table 4.6 indicated:

UB = 0.125 + 0.115(ln_EPS) – 0.128(ln_ROE) + 0.110(ln_DY) – 0.110(ln_EY) + 0.028(ln_OPM)

The second regression model can estimate 16.9% (R^2 = 0.169; SE = 0.416) of changes in UB. Prediction accuracy is indicated by F(5,145) = 5.696 and $p < 0.05$. With regard to the selected independent variables, $p < 0.05$, which confirms statistical significance. Despite the model's attaining statistical significance, it was unable to explain 83.1% of the changes observed in UB.

For the sampled companies, the multiple regression models did not result in convincing proof that identified return variables can be used to predict significant changes in LB or UB. According to Sarstedt and Mooi (2014), R^2 values smaller than 0.25 indicate weakness in explaining changes in dependent variables. In both instances (i.e., for LB and UB), the observed R^2 was smaller than 0.25 or 25%. For this reason, it is posited that the identified independent variables were unable to explain enough variability in the dependent variables. Return measures could predict only 20.2% of changes in LB and 16.9% of changes in UB. Consequently, the multiple regression models were unable to significantly predict systematic risk behaviour.

As per Figure 4.1, par. 4.4 hereafter draws comparisons between the findings in this chapter and similar previous research, as referenced in Table 2.8 of Chapter 2.

4.4 SIMILAR PREVIOUS FINDINGS

In par. 4.3, it was statistically demonstrated that accountancy-related return measures were not well associated with changes in systematic risk behaviour as they related to the sampled entities. To show that the findings in this chapter are not incidental, Table 4.7 was constructed. Table 4.7 draws parallels between previous research referenced in Chapter 2 and the findings of the current research. Five other studies have obtained

findings somewhat similar to those of the current research. These studies are summarised hereafter.

Table 4.7: Prior research with similar findings

Author(s)	Year	Location	Research finding	Similarity between studies
Mulli	2013	Kenya	There is no significant association between beta and NPM.	Although Mulli (2013) tested only for the association between beta and one profitability measure (i.e., NPM), its finding is similar to the finding displayed in Table 4.6. This table indicates that ln_NPM was selected as an independent variable in predicting LB, but it resulted in a poor fitting model, where R^2 = 0,202.
Li	2016	Netherlands	Beta is negatively associated with EBIT growth, but does not associate with ROE.	Like the study of Li (2016), ln_ROE was included in the current study as a predictive variable in modelling both LB and UB. However, none of the prediction models proved to be a good fit for estimating behaviour of systematic risk. This is similar to Li's (2016) finding that ROE does not associate well with systematic risk. EBIT growth as a ratio was not included in the study because it is not published by IRESS. Therefore, no findings were made regarding this ratio.

Author(s)	Year	Location	Research finding	Similarity between studies
Ramarow	2017	Malaysia	ROA and ROCE are significantly associated with beta. Other return measures are not significantly related to beta.	Findings by Ramarow (2017) indicated that ROE, EPS and ROI were not significantly associated with systematic risk. The study under review obtained similar results where ln_EPS and ln_ROE were selected as independent variables in the prediction of both LB and UB. However, the multiple regression models did not demonstrate a significant data fit.
Vongphachanh and Ibrahim	2020	Malaysia	Return measures (EBIT growth, ROA and OPM) are insignificantly related to beta.	Similar to the findings of Vongphachanh and Ibrahim (2020), Table 4.7 indicates that ln_OPM was selected as a variable predictor of UB, but the model failed to result in a good fit.
Tekin	2021	Turkey	ROA and ROE cannot significantly predict beta.	As per Tables 4.6 and 4.7, ln_ROE was included as an independent variable for LB and UB, but no significant fit for the multiple regression models was obtained. This is in line with the findings of Tekin (2021), who indicated that ROE was not a viable variable in the prediction of beta values.

Source: As listed in the table

From Table 4.7, it can be deduced that the findings presented in this chapter are not unique. Other international researchers have arrived at similar conclusions, even when their market, sample and location differed from those of the current study.

This chapter concludes with par. 4.5 hereafter. A summary of the findings in this chapter is provided and the next chapter is briefly introduced.

4.5 CHAPTER SUMMARY

Chapter 4 presented the quantitative analysis conducted to test for the viability of the risk-return trade-off within the selected sample. To present the analysis, the chapter was divided into three key sections, as illustrated in Figure 4.1. The first key section contained an overview of the research methods that were applied. This overview focused on providing insight into the quantitative variable collection (par. 4.2.1) and describing the statistical approach (par 4.2.2). The statistical approach comprised normality testing, variable transformation, multicollinearity testing, and multiple regression modelling, as set out in Figure 4.2. These elements were discussed in par. 4.2.2.

The second key section, par. 4.3, addressed the quantitative findings. Paragraph 4.3.1 dealt with findings regarding normality testing. In Table 4.2 the results of the Shapiro-Wilk test can be observed. This test indicated that LB and UB were normally distributed, but that all accountancy-related return measures were non-parametrically distributed. The correction of these non-parametric distributions was addressed in par. 4.3.2. Return variables were transformed to normal distributions via the application of natural log transformations. These transformations are shown in Table 4.3. With all variables normally distributed, multiple regression modelling could be embarked on. However, as indicated in par. 4.3.3, testing for multicollinearity had to be done first. Findings related to multicollinearity can be observed in Table 4.4. Based on these findings, grouping highly correlated independent variables together could be avoided.

Paragraph 4.3.4 stated the two multiple regression models that were constructed, one to predict LB and another to predict UB (see Tables 4.5 and 4.6). For LB it was indicated that:

$$LB = -0.488 + 0.170(ln_EPS) + 0.011(ln_NPM) – 0.217(ln_ROE) + 0.148(ln_DY) + 0.171(ln_PE)$$

The model for LB did not result in a significant data fit, as $R^2 = 0.202$. As this model can predict lesser than 25% of changes in LB, this model is not considered statistically meaningful.

For UB it was indicated that:

UB = 0.125 + 0.115(In_EPS) – 0.128(In_ROE) + 0.110(In_DY) – 0.110(In_EY) + 0.028(In_OPM)

The model for UB did not result in a significant data fit either, as $R^2 = 0.169$. This model estimates less than 25% of changes in UB, and therefore this model is not considered statistically significant.

Based on the multiple regression testing, it was found that accountancy-related return measures could not predict changes in systematic risk at levels that are statistically significant.

The third key section of the chapter (Figure 4.1) commenced with par. 4.4. Here, Table 2.8 provided a summary of previous research findings similar to those of the current study. The purpose of this summary was to demonstrate that the findings of the study presented in this chapter are not incidental, and that five international researchers have obtained at least somewhat similar findings in their studies.

In this chapter it was proven that systematic risk and accountancy-related return measures are not directly and positively related. This finding emphasises the need for a new perspective. Chapter 5 presents the test for new systematic risk models that could result in prediction models that are statistically meaningful.

CHAPTER 5:
STAGE 2 – DEVELOPING NEW RISK MODELS

We cannot solve our problems with the same thinking we used when we created them. – Albert Einstein

5.1 INTRODUCTION

The purpose of Chapter 5 is to present the empirical findings regarding the development of two new systematic risk models: a model to predict leveraged systematic risk, and a model to predict unleveraged systematic risk. This chapter is oriented towards the fulfilment of empirical research objectives 2, 3 and 4, stated in Chapter 1, par. 1.5.2.2. The chapter will provide an empirical demonstration of how the independent variables can be statistically modelled to predict the dependent variables. Table 5.1 serves as an overview of the variables that were applied for this purpose. Please refer to Chapter 3, Table 3.11, for an explanation on how these variables were selected for inclusion.

Table 5.1: Dependent and independent variables

Type of variable	Quantitative measurement	Abbreviation
Dependent variable	Leveraged beta, to measure leveraged systematic risk	LB
Dependent variable	Unleveraged beta, to measure unleveraged systematic risk	UB
Independent variable	Cash flow per share	CF/share
Independent variable	Current ratio	CR
Independent variable	Debt/Assets	DA
Independent variable	Debt/Equity	DE
Independent variable	Market value added	MVA
Independent variable	Price per share/book value per share	Price/Book
Independent variable	Price per share/net asset value per share	Price/Net assets
Independent variable	Quick ratio	QR
Independent variable	Return on external investments	ROEI
Independent variable	Total assets/Capital employed	Assets/Cap

Source: Author

Table 5.1 shows that the research applied two dependent variables: leveraged and unleveraged beta. These dependent variables were modelled autonomously, and the listed independent variables were applied as predictors in order to construct two different systematic risk models. The independent variables consisted of: cash flow per share (CF/share), current ratio (CR), debt/assets (DA), debt/equity (DE), market value added (MVA), price per share/book value per share (Price/Book), price per share/net asset value per share (Price/net assets), quick ratio (QR), return on external investments (ROEI), and total assets/capital employed (Assets/Cap).

This chapter unfolds by explaining how the empirical analysis was structured (par. 5.2) and executed (par. 5.3). Paragraph 5.3 provides an in-depth analysis of the statistical findings and indicates whether hypotheses can be rejected or accepted. A comparison is then drawn between the existing model (MPT) and the newly developed models before the conclusion in par. 5.4. But first, the chapter commences by explaining how the empirical analysis was structured.

5.2 THE SEQUENCE OF EMPIRICAL ANALYSIS

According to Pallant (2013:29), data analysis should follow an organised and methodical process. Figure 6.1 demonstrates the process applicable to the analysis and presentation of the empirical findings.

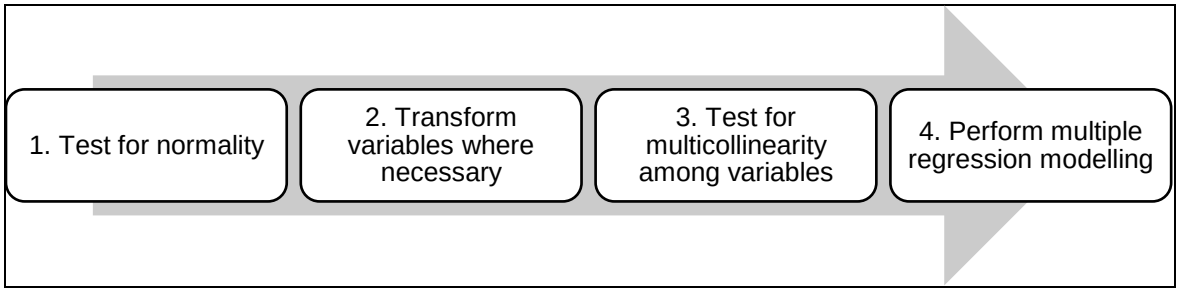


Figure 5.1: Sequence of empirical analysis

Source: Author

Testing for normality was the starting point in the empirical analysis. Both dependent and independent variables were tested for normality by means of the Shapiro-Wilk test. Subsequently, variables had to be statistically transformed in cases where distribution was found to be non-parametric in nature.

Once all variables were parametrically distributed, testing for multicollinearity was executed. This was done by means of measuring a Pearson correlation coefficient.

The Pearson coefficient tests for correlation among variables that are parametrically distributed. The purpose of this testing is to ensure that independent variables are not highly correlated with one another. After testing for multicollinearity, regression modelling was performed. For the purpose of this research, multiple regression modelling was executed. This entailed that multiple independent variables were applied in order to predict a dependent variable, which resulted in the construction of two prediction models: for leveraged systematic risk (LB) and for unleveraged systematic risk (UB). For a brief explanation of the research methods applied, the reader can revisit Chapter 4, par. 4.2. The research methods described in Chapter 4 also apply to this chapter. This ensures that all findings are comparable across chapters. In par. 5.3, hereafter, statistical findings are set out as described in Figure 5.1. Statistical findings are illustrated by means of tables and graphs.

5.3 STATISTICAL FINDINGS

This section provides an overview of normality testing (par. 5.3.1), statistical transformation (par. 5.3.2), testing for multicollinearity (par. 5.3.3), multiple regression analysis (par. 5.3.4), hypothesis testing (par. 5.3.5) and model comparison (par. 5.3.6). This was done in accordance with Figure 5.1. As descriptive analysis did not form a fundamental part of the statistical analysis for the selected empirical objectives, it was not prioritised for discussion in this chapter. However, the reader can observe the descriptive statistics to the sampled variables in **Appendix E**.

5.3.1 Testing for normality

To test for normality, a Shapiro-Wilk test was performed on the selected variables. The interpretation of this test states that its significance value (p) should be greater than 0.05 to demonstrate normal distribution. If the p-value is smaller than 0.05, the variable is not distributed normally and requires statistical transformation (Antonius, 2013:99). The results of normality testing are presented in Table 5.2.

Table 5.2: Normality testing

Variable tested	p-value measured
Dependent variables:	
LB	0.052
UB	0.057

Independent variables:	
CF/share	0.000
CR	0.000
DA	0.020
DE	0.000
MVA	0.000
Price/Book	0.000
Price/Net assets	0.000
QR	0.000
ROEI	0.012
Assets/Cap	0.000

Source: Author

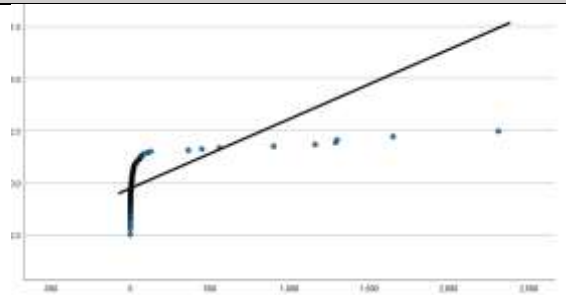
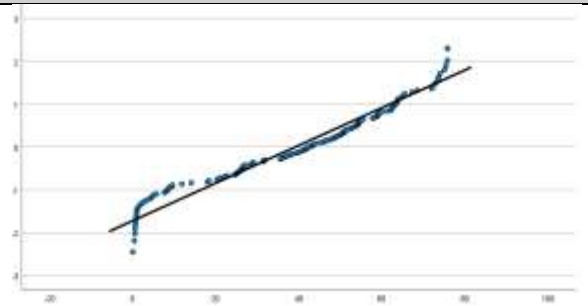
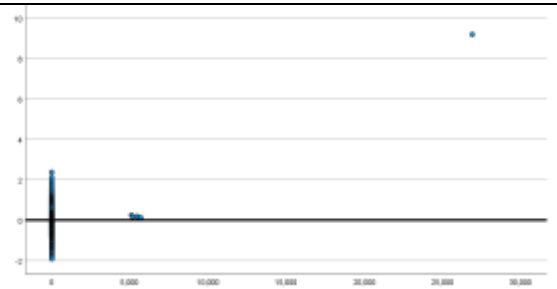
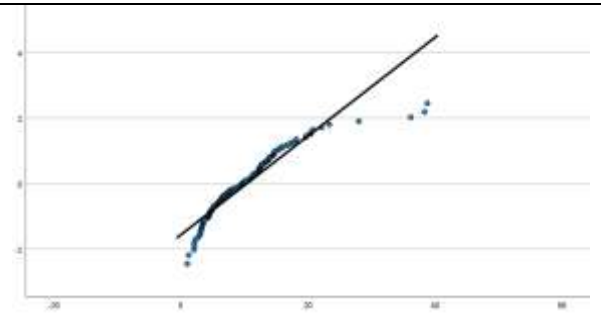
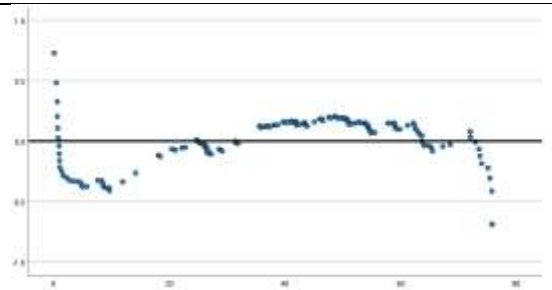
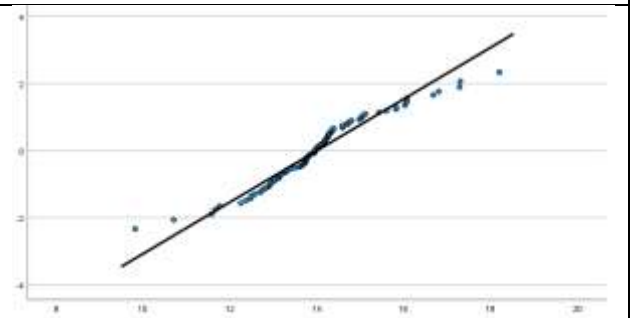
Table 5.1 indicates that all independent variables were non-parametrically distributed, for all observations, where $p < 0.05$. With regard to the dependent variables, both leveraged and unleveraged betas resulted in values where $p > 0.05$. In these instances, it is put forward that the dependent variables were normally distributed.

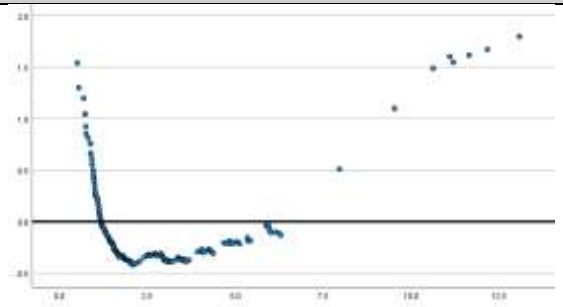
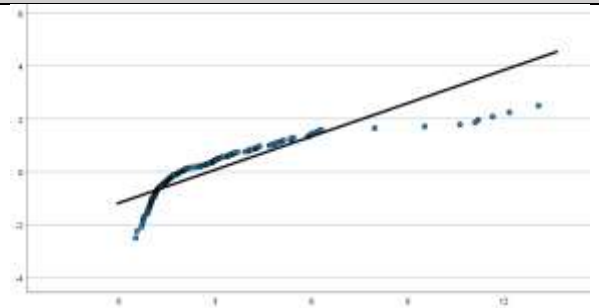
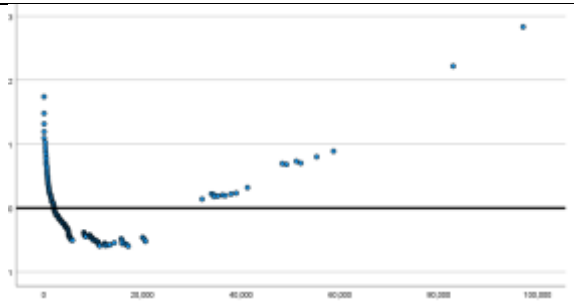
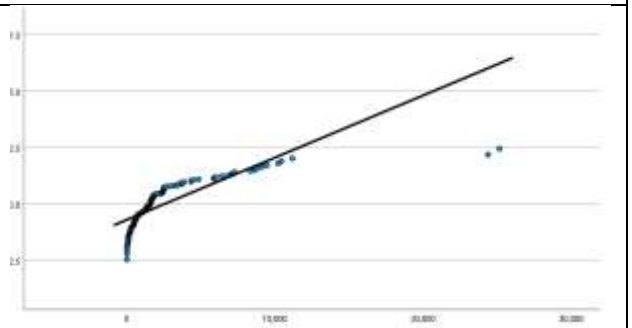
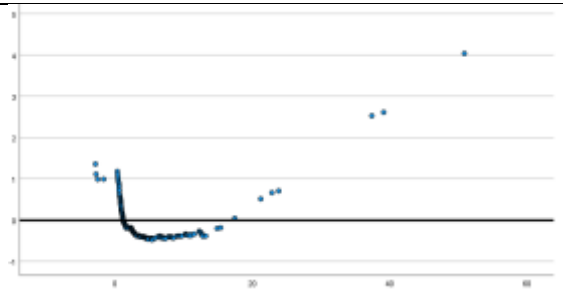
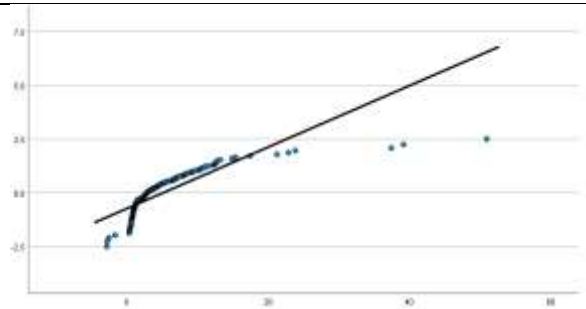
The non-parametric nature of the independent variables presented a challenge, as variables should not be included for regression testing if not parametrically distributed (Pallant, 2013:298). Thus, to ensure that the independent variables could be analysed as part of multiple regression modelling, transformation was required.

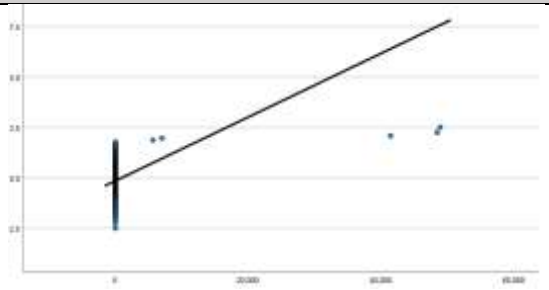
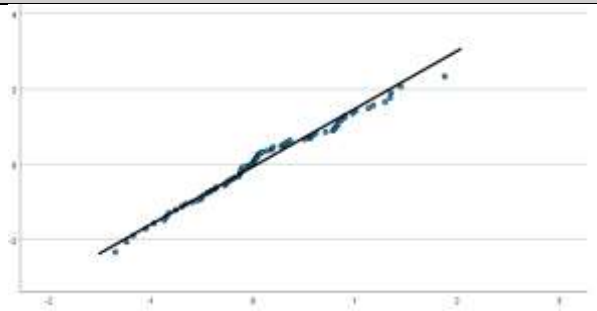
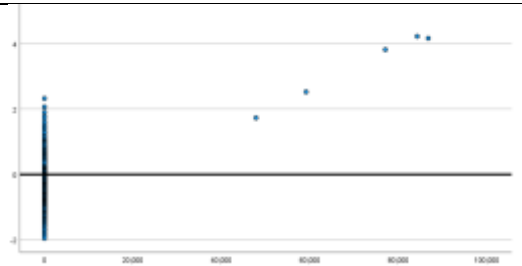
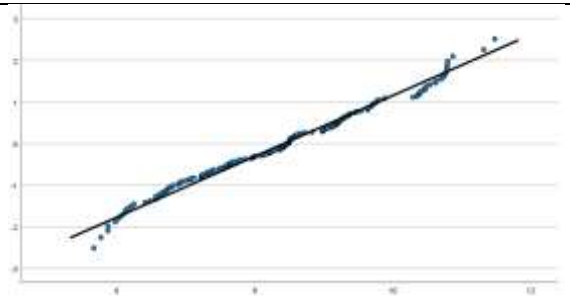
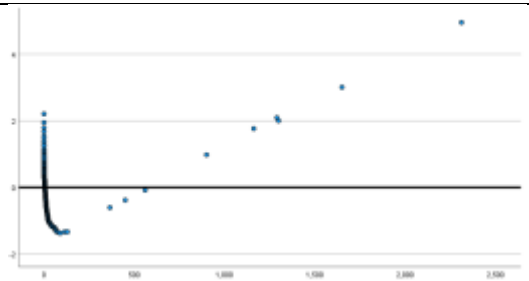
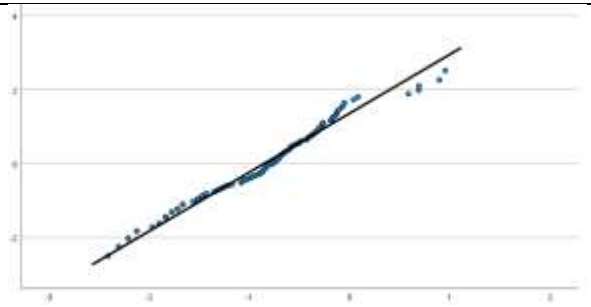
5.3.2 Transformation of independent variables

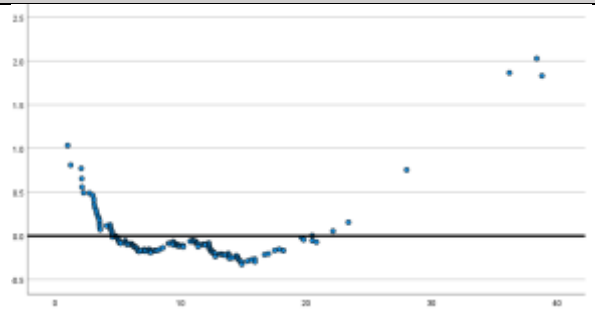
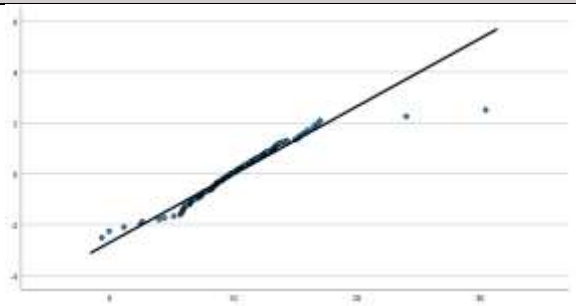
Transformation (or statistical transformation) is a process by which a mathematical expression is applied to each point of a data set (Schendzielorz, 2020). (Refer to Table 3.12 in Chapter 3 for a full explanation on the five methods of data transformation.) For the purpose of this research, data points were transformed by applying the natural log function (ln) to the data scores. Transformations were performed using SPSS. Table 5.3 was constructed for the reader to observe how the transformation affected the linearity of each independent variable. On the left-hand side of the table, the distribution before transformation is indicated. On the right-hand side, the distribution after transformation is displayed. Similar to Table 4.3 of Chapter 4, Q-Q plots were used for demonstrative purposes.

Table 5.3: Transformation of independent variables

Name of variable before transformation	Plot before transformation	Name of variable after transformation	Plot after transformation
CF/share		ln_CF/share	
CR		ln_CR	
DA		ln_DA	

Name of variable before transformation	Plot before transformation	Name of variable after transformation	Plot after transformation
DE		ln_DE	
MVA		ln_MVA	
Price/Book		ln_Price/Book	

Name of variable before transformation	Plot before transformation	Name of variable after transformation	Plot after transformation
Price/Net assets		ln_Price/Net assets	
QR		ln_QR	
ROEI		ln_ROEI	

Name of variable before transformation	Plot before transformation	Name of variable after transformation	Plot after transformation
Assets/Cap		ln_Assets/Cap	

Source: Author

After the distribution of data was corrected, the transformed variables were tested for multicollinearity. Correlation findings are displayed in Table 5.4, par. 5.3.3.

5.3.3 Testing for multicollinearity

Multicollinearity is the statistical phenomenon where independent variables are highly correlated ($r > 0.7$) with one another (Pallant, 2013:152). Multicollinearity should be avoided when regression analysis is performed. To ensure that the independent variables did not correlate highly, Pearson correlation testing was done (as described in Figure 5.1). Table 5.5 provides a summary of all the transformed independent variables together with the correlation coefficient (r) shared by these variables.

Table 5.4: Multicollinearity results

	ln_CF/ share	ln_CR	ln_DA	ln_DE	ln_MVA	ln_Price/ Book	ln_Price/ Net assets	ln_QR	ln_ROEI	ln_Assets/ Cap
ln_CF/share	1									
ln_CR	-0.554	1								
ln_DA	-0.079	-0.026	1							
ln_DE	-0.108	-0.108	**0.912**	1						
ln_MVA	0.106	-0.040	0.214	0.250	1					
ln_Price/ Book	-0.565	0.089	0.361	0.595	0.392	1				
ln_Price/ Net assets	-0.263	0.091	0.369	0.509	0.079	0.566	1			
ln_QR	-0.556	**0.987**	0.005	-0.032	-0.086	0.080	0.069	1		
ln_ROEI	-0.001	-0.234	0.210	0.189	0.264	-0.117	0.226	-0.246	1	
ln_Assets/ Cap	0.116	-0.471	-0.162	0.078	0.418	-0.321	0.280	-0.499	0.179	1

Source: Author

Table 5.4 indicates that the independent variables were not too highly correlated in general. The coefficients ranged between $-0.026 < r < 0.987$, where $p < 0.05$. Only two instances of multicollinearity were present: between ln_DA and In_DE ($r = 0.912$, $p < 0.05$) and ln_QR and ln_CR ($r = 0.987$, $p < 0.05$). These instances were **bolded** in Table 5.5, for the reader's convenience. The identified multicollinearity requires consideration when regression analysis is performed. In par. 5.3.4, Tables 5.7 and 5.10, it will be observed that multiple regression findings only included one of the multicollinear variables per model.

For the purpose of modelling LB, CR and DE were included, but QR and DA were excluded. Similarly, QR and DA were included for the purpose of modelling UB, while CR and DE were excluded. Paragraph 5.3.4, hereafter, sheds more light on the process of multiple regression analysis.

5.3.4 Construction of multiple regression models

Field *et al.* (2012:263-264) describe 'multiple regression' as the construction of a complex model using multiple predictor variables. Ideally, one variable should be able to predict another perfectly. But under realistic circumstances, this rarely happens. In most situations, a dependent variable is best estimated by combining different types of independent variables into a single model (Wagner, 2017:104). For the purpose of the modelling presented in this section, backward stepwise testing was applied. The concept of stepwise multiple regression testing was explained in Chapter 3, par. 3.5.6.4. The results of the multiple regression modelling can be observed in Tables 5.5 and 5.6.

Table 5.5: Multiple regression output for leveraged beta

Model for leveraged beta (LB)			
R^2		0.536	
Standard error (SE)		0.393	
F ratio		9.680	
Significance value (sig)		0.000	
Degrees of freedom (df)		8;67	
Independent variable	**Unstandardised beta**	**t-value**	**p-value**
Constant	-0.723	-2.096	0.040
ln_assets/cap	1.186	4.187	0.000
ln_CR	-0.356	-2.299	0.025
ln_DE	-0.895	-6.519	0.000
ln_Price/Book	1.480	5.295	0.000
ln_Price/net assets	0.395	2.694	0.009
ln_ROEI	0.046	2.694	0.009
ln_CF/share	0.146	3.342	0.001
ln_MVA	-2.391	-7.260	0.000

Source: Author

Table 5.5 demonstrates that the proposed model can predict 53.6% (R^2 = 0.536; SE = 0.393) of changes in the dependent variable (LB). In Table 5.5, the F ratio, together with its significance value (Sig.), indicates whether the regression model is an overall good fit for the data, with F(8;67) = 9.680, p < 0.005. This demonstrates that the model can reliably predict LB, as p = 0,000, which is smaller than 0.05. Furthermore, it can be observed that the t-values fall within the negative range of $-7.260 \leq t \leq -2.096$ and within the positive range of $2.694 \leq t \leq 5.295$. This is in line with the accepted norm, where t-values should be larger than 2 or smaller than -2 (refer to Chapter 3, Table 3.13). Thus, LB can be predicted by means of eight independent variables that are all statistically significant, as p-values were smaller than 0.05. Thus, the significant variables can be modelled as:

LB = -0.723 + 1.186(ln_assets/cap) – 0.356(ln_CR) – 0.895(ln_DE) + 1.480(ln_Price/Book)
+ 0.395(ln_Price/net assets) + 0.046(ln_ROEI) + 0.146(ln_CF/share) – 2.391(ln_MVA)

According to Utts (2014:107), the average R^2 value deemed acceptable in social science research is 49.9%. Similarly, Reid (2013:88) states that an R^2 value of around 0.50 indicates that a statistical model can contribute significantly to the estimation of a dependable variable. The model proposed in Table 5.5 can predict more than half of changes occurring in LB, as R^2 = 0.536. It is therefore put forward that the model displayed in Table 5.5 is quantitatively meaningful in estimating LB.

In Chapter 4, Table 4.6, it was indicated that accountancy-related return measures were able to predict only 20.2% of changes in LB. In comparison, the model indicated in Table 5.5 can predict more than 2.5 times the change predicted by accountancy-related return measures. This confirms that accountancy-related return measures are inferior in its prediction of LB for the sampled companies. A similar regression analysis was performed to estimate UB. Table 5.6 illustrates the findings.

Table 5.6: Multiple regression output for unleveraged beta

Model for leveraged beta (LB)	
R^2	0.547
Standard error (SE)	0.309
F ratio	13.878
Significance value (sig)	0.000
Degrees of freedom (df)	6;69

Independent variable	Unstandardised beta	t-value	p-value
Constant	-1.383	-4.488	0.000
ln_DA	-0.933	-7.474	0.000
ln_Price/Book	1.148	6.075	0.000
ln_ROEI	0.061	2.865	0.006
ln_CF/share	0.150	4.320	0.000
ln_MVA	-1.442	-6.579	0.000
ln_QR	-0.347	-4.036	0.000

Source: Author

In Table 5.6, it is demonstrated that the model for UB can estimate 54.7% ($R^2 = 0.547$; SE = 0.309) of changes in unleveraged systematic risk. In Table 5.6, the F ratio, together with its significance value (Sig.), indicates that the model can predict UB reliably, as F(6;69) = 13.878, p < 0.005, and the p-value is smaller than 0.05. T-values fall within the negative range of $-7.474 \leq t \leq -4.036$ and the positive range of $2.865 \leq t \leq 6.075$. Again, this is in line with the set norm for t-values.

Table 5.6 indicates that UB can be predicted by means of six statistically significant independent variables. Therefore, the significant variables can be modelled as:

UB = -1.383 – 0.933(ln_DA) + 1.148(ln_Price/Book) + 0.061(ln_ROEI) + 0.150(ln_CF) – 1.442(ln_MVA) – 0.347(ln_QR)

The model proposed in Table 5.6 can estimate more than half of changes occurring in UB, as $R^2 = 0.547$. It is therefore posited that the model displayed in Table 5.6 is quantitatively significant in predicting UB. In Chapter 4, Table 4.7, it was indicated that accountancy-related return measures were able to predict only 16.9% of changes in UB. In comparison, the model proposed in Table 5.6 can estimate more than 2.7 times the changes predicted by accountancy-related return measures. This confirms that accountancy-related return measures are also inferior in its prediction of UB for the sampled companies.

As an additional caveat, the researcher would like to turn the reader's attention to the fact that market price per share was identified as an item that could be associated with the behaviour of systematic risk (refer to Chapter 2, Table 2.7 and Chapter 4, Table 4.1). In Chapter 4, it was indicated that the market price per share would not be

included for modelling purposes due to its high correlation with ln_EPS (Table 4.4). Per Tables 4.5 and 4.6, it can be observed that ln_EPS was selected as a better independent variable in the process of estimating systematic risk, and since multicollinearity existed among the market price per share and EPS, the market price per share was omitted as independent variable.

In the current chapter, it was found that market price per share can be associated with systematic risk within the selected sample only when it is integrated into other ratios. As can be observed in Table 5.5, the ratios ln_Price/Book, ln_Price/net assets and ln_MVA were identified as independent variables to leveraged beta. All these ratios contain the element of market price per share (Chapter 2, Table 2.7). Similarly, in Table 5.6, ln_Price/Book and ln_MVA were identified as independent variables to unleveraged beta. Again, these ratios contain the market price. Based on the findings for the selected sample, it is not possible to say that the market price per share as a singular concept is well associated with the behaviour of systematic risk. However, when combined with book value per share or net asset value per share, or incorporated into MVA, market price per share can assist in understanding the behaviour of leveraged and unleveraged beta.

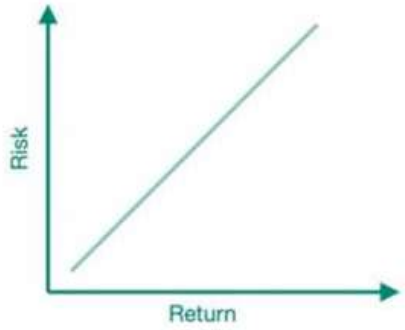
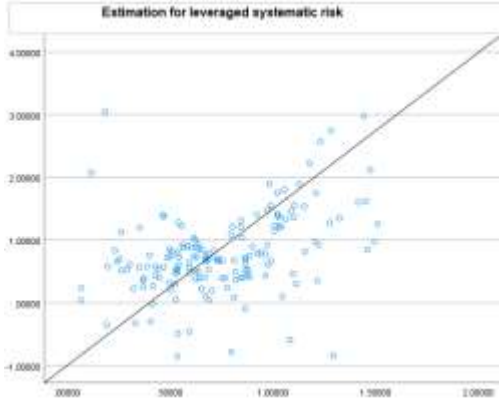
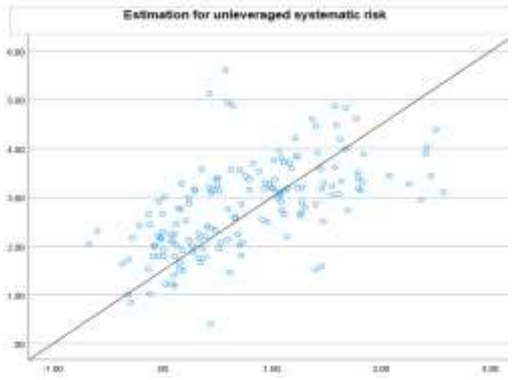
After regression analysis was performed, a comparison between the MPT and new models could be drawn. In par. 5.3.5, this comparison is discussed extensively.

5.3.5 Comparison between the existing MPT and newly developed models

This penultimate section of Chapter 5 fulfils the last empirical objective listed in Chapter 1, par. 1.5.2.2. Empirical objective 4 requires a comparison between the existing MPT and the newly developed risk models.

Table 5.7 is a summary of the main differences between the existing model (MPT) and the newly developed models. The newly developed models consist of one model to predict LB and another model to predict UB. Table 5.7 commences with a visual demonstration of each model. For the newly developed models, the scatter plots were constructed by means of the graph function on SPSS. The comparison focuses on the variables, the clarity of definition, the generalisation of the model, the market orientation of the model and the practicality of each model.

Table 5.7: Comparison between existing model and newly developed models

Characteristics	Existing model: MPT	New model: leveraged systematic risk	New model: unleveraged systematic risk
Visual presentation	 **Source**: WallStreetMojo (2021)	 **Source:** Author	 **Source:** Author
Variables	**Dependent variable:** Systematic risk **Independent variable:** Returns	**Dependent variable:** LB **Independent variables**: ln_Assets/cap ln_CR ln_DE ln_Price/Book ln_Price/net assets ln_ROEI ln_CF/share ln_MVA	**Dependent variable:** UB **Independent variables**: ln_DA ln_Price/Book ln_ROEI ln_CF/share ln_MVA ln_QR

Characteristics	Existing model: MPT	New model: leveraged systematic risk	New model: unleveraged systematic risk
Clarity of definition	Variables are not clearly defined and are vaguely referred to as 'systematic risk' and 'returns'. It is unclear how the variables are quantified.	Variables are clearly defined and quantifiable.	Variables are clearly defined and quantifiable.
Generalisation potential	Generalised to all markets and all companies, but diverse research findings are in conflict with regard to generalisation potential.	Not generalised, applies only to sampled companies.	Not generalised, applies only to sampled companies.
Market orientation	Oriented towards developed markets.	Oriented towards the South African market.	Oriented towards the South African market.
Practicality of application	Difficult to apply, because it is unclear which variables reflect 'systematic risk' and which reflect 'returns'. This leaves gaps for interpretation.	Easier to apply, as the multiple regression expression indicates the exact variables which can be used to estimate LB. No interpretation is required.	Easier to apply, as the multiple regression expression indicates the exact variables which can be used to estimate UB. No interpretation is required.

Source: Author

Table 5.7 shows the comparison between the existing MPT and the newly developed models. The comparison was drawn based on visual presentation, variables applied, clarity of definition, generalisation potential, market orientation, and practicality of application. From this table, it can be deduced that the MPT does not clearly define how its variables (systematic risk and return) can be quantified. In contrast, the newly developed models quantify their variables and their measurement precisely.

With regard to generalisation, it is assumed that the MPT can be generalised to all market environments, but researchers have found evidence against this claim. The newly developed models should not be generalised to all markets, because their applicability is limited to the selected sample. Concerning market orientation, it is again assumed that the MPT applies to all markets, while the newly developed models place focus only on the South African market environment.

Lastly, the table highlights that the practicality of the MPT leaves gaps for interpretation. Because its variables are not defined and quantified exactly, the MPT's practicality is compromised, and interpretation is required by the user. For example, 'return' can be interpreted in different ways, referring to dividends, earnings, profits, share price growth or a combination of them all. Depending on how 'return' is interpreted, the user may arrive at different conclusions, relating to the relationship between systematic risk and accountancy-related return measures.

This problem is solved by the newly developed models because they indicate that leveraged systematic risk is quantified by LB, while unleveraged systematic risk is quantified by UB. Furthermore, the exact independent variables are clearly defined and quantifiable. To estimate LB, the following apply: ln_Assets/cap, ln_CR, ln_DE, ln_Price/Book, ln_Price/net assets, ln_ROEI, ln_CF/share and ln_MVA. To estimate UB, the following apply: ln_DA, ln_Price/Book, ln_ROEI, ln_CF, ln_MVA and ln_QR.

Overall, it can be posited that the newly developed models maintain a more realistic stance on its generalisation potential and market orientation. Furthermore, they provide details regarding both their dependent and independent variables, leaving little room for misinterpretation. With this conclusion, the chapter closes with a summary in par. 5.4, hereafter.

5.4 CHAPTER SUMMARY

Chapter 5 provided and discussed the empirical findings to the research with the aim to fulfil empirical objectives 2, 3 and 4. The chapter commenced by giving a detailed layout of how the empirical findings were to be addressed. The sequence of analysis was: testing for normality, data transformation, testing for multicollinearity, and presenting the multiple regression analysis.

The findings of normality testing were set out in par. 5.3.1. Here, the results were given of the Shapiro-Wilk test, namely that the independent variables were not normally distributed. To address this statistical problem, the independent variables had to be transformed. In par. 5.3.2, it was indicated that data can be transformed by means of five techniques: natural log transformation, square root transformation, exponential transformation, reciprocal transformation and reverse score transformation. For the purpose of this research, the natural log transformation was applied. The successful application of this technique can be observed in Table 5.3, where the before and after distributions of independent variables are visually presented.

In par. 5.3.3, the findings from the multicollinearity testing were put forward. For the purpose of this test, the correlations among transformed independent variables were measured by Pearson's correlation coefficient. Multicollinearity is the phenomenon where independent variables share a correlation coefficient greater than 0,7. It was found that two instances of multicollinearity were present: between ln_DA and ln_DE ($r = 0.912$, $p < 0.05$) and ln_QR and ln_CR ($r = 0.987$, $p < 0.05$). To overcome this statistical challenge, LB was modelled by including CR and DE, but excluding QR and DA. Similarly, QR and DA were included for the purpose of modelling UB, while CR and DE were excluded. In par. 5.3.4, the outcomes of the multiple regression models were given. Table 5.5 shows that LB was modelled as:

LB = -0.723 + 1.186(ln_assets/cap) – 0.356(ln_CR) – 0.895(ln_DE) + 1.480(ln_Price/Book) + 0.395(ln_Price/net assets) + 0.046(ln_ROEI) + 0.146(ln_CF/share) – 2.391(ln_MVA)

This model for LB is statistically significant ($p = 0.000$) and can estimate 53.6% of changes in leveraged systematic risk. Similarly, Table 5.6 indicates that UB can be modelled as:

UB = -1.383 – 0.933(ln_DA) + 1.148(ln_Price/Book) + 0.061(ln_ROEI) + 0.150 (ln_CF/share) – 1.442(ln_MVA) – 0.347 (ln_QR)

The model relating to UB is also statistically significant ($p = 0.000$) and can estimate 54.7% of changes in unleveraged systematic risk.

In the final section of this chapter, a comparison was drawn between the newly developed models and the existing MPT model. Table 5.7 was constructed to summarise the

differences between the models, in order to fulfil empirical objective 4. Comparisons were drawn with regard to visual presentation of the models, variable type and clarity of definition, market orientation, generalisation of the model, and practicality of the model. It was posited that the newly developed models apply a more realistic approach to the estimation of systematic risk. In the case of the newly developed models, both dependent and independent variables are precisely defined and quantifiable, which, in turn, improves the practicality of the model. When the newly developed models are applied, the user knows which accountancy-related items should be included, to an exact quantification. It leaves no practical gaps for interpretation. The newly developed models are also exclusively aimed at estimating systematic risk as it relates to the sampled companies in the South African market. The models neither claim to apply universally, nor are they oriented towards any market in any specific time frame.

In stark contrast, the existing MPT does not precisely define its variables, which complicates the practicality of the model. Because the variables are ambiguously referred to as ‘risk’ and ‘return’, gaps for misinterpretation exist, and defining the variables is left to the user. Furthermore, the MPT claims to apply to all markets universally and is often presented as a generalised model for risk estimation. These claims have been challenged by researchers since the 1960s, and there is no consensus on the practical manifestation of these claims.

As a final thought, it is posited that systematic risk is a complicated phenomenon which should not be generalised in any way. It requires constant monitoring over time and within markets to provide updated estimation values. It is somewhat irrational to insist that a phenomenon of this kind be reduced to a single mathematical expression that rings true universally.

Chapter 6 will aim to provide the qualitative validation for the independent variables that were quantitatively identified in this chapter. Chapter 6 fulfils stage 3 of the research, as identified in Figure 1.2 in Chapter 1.

CHAPTER 6:
STAGE 3 – SEEKING QUALITATIVE VALIDATION

We have to twist the theories to suit the facts. Not the facts to suit the theories.
– Sherlock Holmes

6.1 INTRODUCTION

This penultimate chapter sets out the qualitative analysis that was applied to seek validation for the quantitative models proposed in Chapter 5. The purpose of Chapter 6 is to fulfil theoretical objective 4, as stated in Chapter 1, par. 1.5.2.1.

Chapter 6 commences with a description of the independent variables formulated as part of the newly developed systematic risk models. Thereafter, a brief overview is provided of the qualitative methodology, namely systematic review. Figure 6.1 is a layout of this chapter.

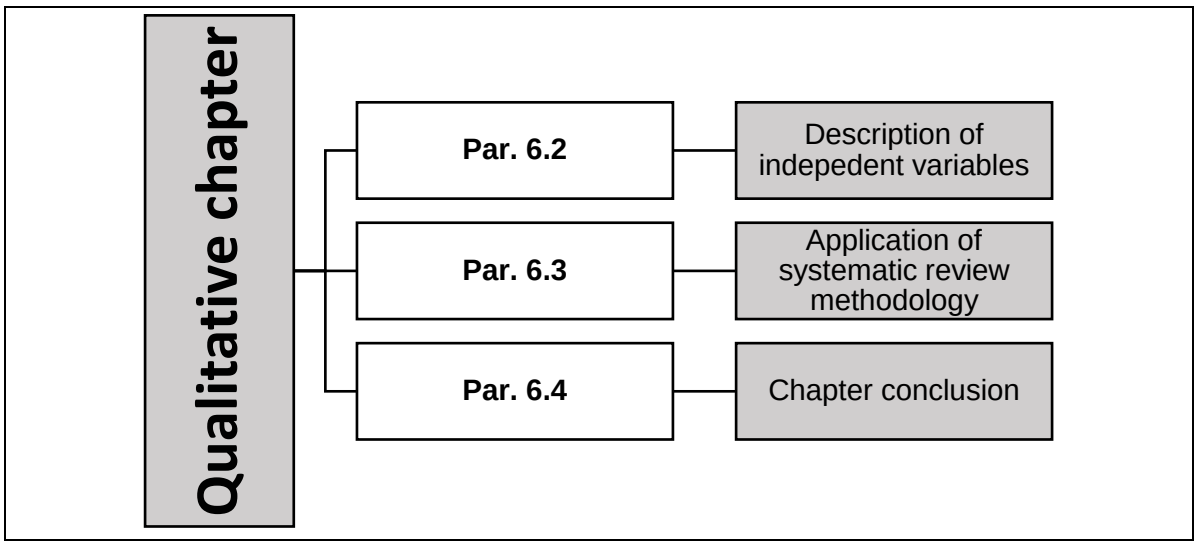


Figure 6.1: Structure of Chapter 6

Source: Author

Figure 6.1 indicates that Chapter 6 focuses on the qualitative aspects to the research, as indicated by the title of the chapter. Paragraph 6.2 provides a discussion of the variables that were found to have predictive value in the statistical modelling as presented in Chapter 5. As these variables were not addressed in previous chapters, a discussion is provided here to familiarise the reader with the concepts before progressing to the qualitative methods and analysis.

Paragraph 6.3 is divided into four sub-paragraphs (par. 6.3.1, 6.3.2, 6.3.3 and 6.3.4), each focusing on the qualitative research methods involved in the application of systematic reviewing. In the last paragraph (par. 6.4), the chapter is summarised and concluded on. As mentioned above, par. 6.2, hereafter, provides a description of independent variables.

6.2 DESCRIPTION OF INDEPENDENT VARIABLES

Chapter 5, par. 5.3.4, provided the structure of the two systematic risk models developed in this study: one relating to leveraged systematic risk and the other relating to unleveraged systematic risk. As indicated in Chapter 3, Table 3.11, the new systematic risk models were arrived at by collecting financial ratios and financial models available through IRESS. The data were applied statistically via SPSS (version 26) to generate multiple regression models that best predict the different types of systematic risk. Because of this methodological approach, the independent variables to the new models were not explained by the literature perspectives expressed in Chapter 2.

Before the qualitative analysis was conducted, an understanding of the independent variables had to be established to ensure that they can be interpreted within the appropriate context. Table 6.1 gives a detailed description of the independent variables contained in the two new models and categorises these variables into the ratio group they belong. According to Lovemore and Brummer (2013:88), ratio categories consist of profitability ratios, liquidity ratios, the leverage ratio, solvency ratios, and market ratios.

Table 6.1: Description of independent variables

Independent variables included in proposed model(s)	Ratio category	Description	Source
Cash flow per share	Liquidity ratio	The cash flow per share ratio measures the free cash that is available per ordinary share. It divides the free cash flow by the total ordinary shares in issue. When it comes to cash flow, two main arguments are put forward. The first claims that cash flow is of great interest to an entity to ensure that all short-term obligations can be met as soon as possible. The other argument states that higher free cash leads to smaller potential to generate returns, as cash is left idle and not invested appropriately. From a risk standpoint, free cash flow can assist in minimising risk. The immediate availability of free cash can assist an entity in its response to risk, as risky circumstances can be prevented or overcome when the entity can afford to introduce preventative or corrective measures.	Marx *et al*. (2017:112); Moles *et al.* (2011:55-58); Valahzaghard and Lemraski (2014:581)
Current ratio	Liquidity ratio	The current ratio expresses the relationship between current assets and current liabilities held by the entity. This ratio measures the ability of an entity to meet short-term obligations within the foreseeable short-term future (i.e., within the next 12 months). The current ratio depends on the effectiveness of working capital aspects. For example, the current ratio assumes that the entity owns inventory that is vendible and market worthy. In circumstances of owning inventory that is obsolete or nonsalable, the relationship expressed by the ratio will not be useful. Secondly, the ratio accepts that trade debtors are collectable.	Bose (2011:97); Fabozzi and Drake (2009:622-623); Vigario (2008:117)

Independent variables included in proposed model(s)	Ratio category	Description	Source
		In circumstances where trade debtors are unable to pay their debt, the current ratio expresses a misleading relationship between current assets and current liabilities. With regard to risk, the current ratio measures the ability of quick cash-turning assets to cover current liabilities. Where inventory and debtors can be converted into cash quickly, risk can be minimised for the entity.	
Debt/Assets	Solvency ratio	The debt to assets ratio indicates how much of the debt can be covered by the value of total assets. In order to maintain solvency, this ratio should be smaller than 1. The smaller the ratio, the better. In instances where the ratio is larger than 1, the entity is not solvent. This ratio can be considered a good indication of risk, as it can indicate bankruptcy or movement towards bankruptcy over a specific time frame. In instances where the entity fails to meet long-term commitments, continuity cannot be ensured without intervention such as business rescue.	Brigham (2021:237); Collis *et al.* (2012:118)
Debt/Equity	Leverage ratio	The gearing ratio expresses the relationship between debt and equity. It provides the user with insight into the funding approaches of the entity. Typically, debt is seen as 'cheaper' funding because interest is tax deductible. On the other hand,	Brigham (2021:238); Lasher (2021:57)

Independent variables included in proposed model(s)	Ratio category	Description	Source
		debt is also associated with risk because interest rates may fluctuate, to the disadvantage of the entity. The issuance of shares in order to obtain capital is viewed as a more expensive venture because failure to pay dividends to the shareholders' satisfaction can entail negative consequences for the firm. Equity is riskier than debt because future earnings and the ability to maintain dividend growth rates are uncertain.	
Market value added	Market ratio	The market value added measures the difference between the entity's market capitalisation and the cost of capital. From a financial standpoint, it is ideal for the market capital to exceed cost of obtaining capital. Both market capitalisation and cost of capital are strongly affected by systematic risk factors. Regarding market capital, share prices are affected by demand. In return, demand is often subject to fluctuation in macroeconomic factors. This concept was also explained in Figure 2.2 in Chapter 2. With regard to cost of capital, changes in costs to obtain capital are often a result of factors that are not within the control of the entity. For example, changes in interest rates and corporate tax rates will affect the cost of debts and funding. Such circumstances are unavoidable.	Berk *et al.* (2018:86); Knott (2005:41)

Independent variables included in proposed model(s)	Ratio category	Description	Source
Price per share/book value per share	Market ratio	The price-per-share to book value-per-share ratio indicates how many times the market price per share can cover the book value per share. Ideally, the market value should be marginally higher than the book value per share. This ratio can indicate riskiness, as incremental increases in book value, paired with incremental decreases in market value, demonstrate that increases in book value are not reflected by the shareholder's behaviour.	Berk *et al.* (2018:87); Lasher (2021:64)
Price per share/net asset value per share	Market ratio	The price-per-share to net asset value-per-share ratio indicates how many times the market price per share can cover the net asset value per share. The net asset value is represented by the total equity of the entity, divided by the number of shares in issue. This ratio is a potential indicator of risk to the investor, as the market price per share should ideally be higher than the net asset value per share. In instances where this is not the case, shareholder wealth is not created, and the investor will be unable to generate capital appreciation of the investment.	Berk *et al.* (2018:87); Pinder-Ayres (2008:32)
Quick ratio	Liquidity ratio	The quick ratio measures the ability of cash and receivables to cover current liabilities. Like the current ratio, this ratio is a potential indicator of risk, as the conversion of receivables into cash can ensure that short-term debts are paid or that risk is responded to by means of liquidity.	Bose (2011:98); Pinder-Ayres (2008:30)

Independent variables included in proposed model(s)	Ratio category	Description	Source
Return on external investments	Market ratio	Return on external investments refers to circumstances occurring within business combinations where the entity invests in another by obtaining a percentage ownership in the other entity. This return is calculated by dividing the returns (normally dividends paid to the entity by the other) by the market value of the total shares owned. Investing in other entities contribute to risk, as the market value of shares and returns paid by other companies can fluctuate. In instances where the entity that was invested in fails financially, the entity will also lose the resources originally invested.	Corelli (2014:42); Sharan (2012:77)
Total assets/Capital employed	Solvency ratio	The total assets to capital employed ratio indicates the relationship between total assets and capital employed. Capital employed is calculated by adding equity and non-current liabilities. This ratio assumes that capital is employed in order to obtain assets, which, in return, can generate revenue. The ratio can indicate risk, because investors expect that the capital they provide to the entity will be invested in obtaining assets which can ensure that a flow of revenue is maintained and grown.	Brigham (2021:237); Collis *et al*. (2012:117)

Source: As listed in the table

As can be observed in Table 6.1, the selected independent variables were clearly described and their association to systematic risk was highlighted. This was done to ensure that the reader has a complete understanding of how the selected independent variables are linked to systematic risk by means of the theory. Based on the theory summarised in Table 6.1, other researchers could potentially obtain similar outcomes to those in Chapter 5. In such a case, the items listed in Table 6.1 would also function as independent variables or important predictors of systematic risk.

Paragraph 6.3, hereafter, describes the approach followed to qualitatively analyse the quantitative findings of other researchers who have undertaken statistical modelling similar to this study (reported on in Chapter 5). The aim of the analysis was to verify that the quantitative findings, submitted in Chapter 5, are qualitatively valid. Paragraph 6.3.1 describes the qualitative sampling and data collection process, par. 6.3.2 indicates how the data collection method was applied, and par. 6.3.3 compares and integrates findings. Lastly, par. 6.3.4 concludes on the integrated findings.

6.3 THE QUALITATIVE RESEARCH APPROACH

As indicated in Chapter 1, par. 1.7.2.2, and Chapter 3, par. 3.6.1, qualitative analysis was performed by means of systematic reviewing of academic articles. A systematic review normally follows four steps (also refer to Figure 1.5 in Chapter 1), set out in Figure 6.2 as a reminder to the reader. Sub-paragraphs within this section provide a detailed explanation of how these steps were applied in qualitative analysis.

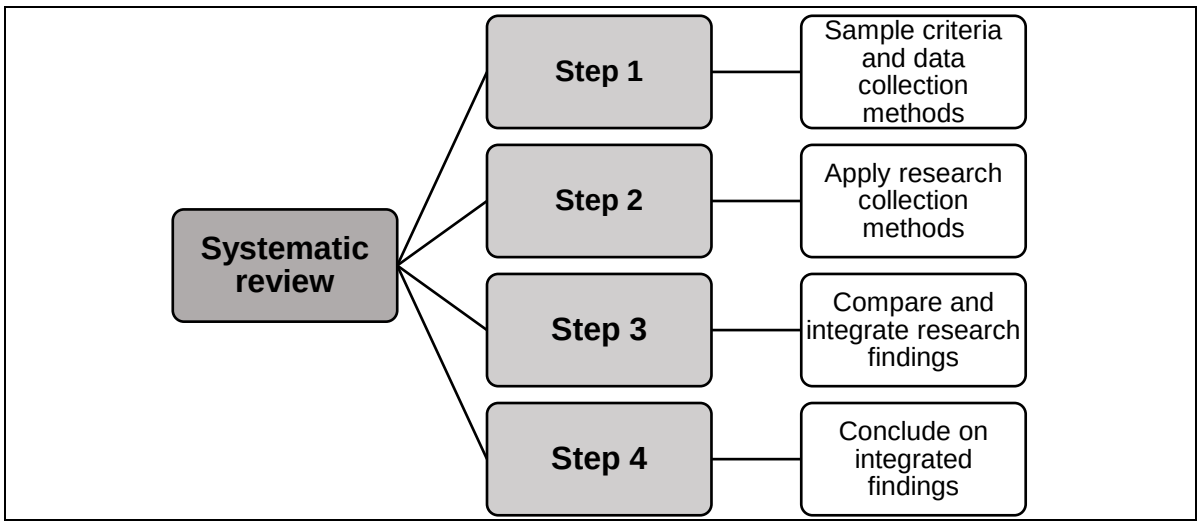


Figure 6.2: Application of systematic review process

Source: Adapted from Gough *et al.* (2018:16-18)

Figure 6.2 indicates that systematic reviewing first requires the identification of sampling criteria and the selection of a data collection method, followed by the practical application of the method. The third step entails that research findings are compared and integrated, while the last step requires for such findings to be concluded on. Paragraphs 6.3.1 to 6.3.4, hereafter, explain how these steps were followed in the study.

6.3.1 Sampling criteria and data collection method

In Chapter 3, the qualitative methodology was discussed in detail. This sub-paragraph provides an overview of the most important aspects of systematic reviewing: the sampling criteria and the data collection method.

Regarding sample selection, the following criteria were set out for the selection of academic journal articles for qualitative analysis:

- The aim/goal/objective/hypothesis of the sampled studies should be to predict/estimate systematic risk by means of financial ratios/financial models/financial concepts;
- Sampled articles should be selected from peer-reviewed academic journals; and
- The publication date of sampled articles should not be older than three years, as at the date of writing Chapter 6 (May 2022). According to Wolf (2019), literature sources older than 10 years are not useful any longer, and for faster-paced research fields, sources are ideal when not older than three years. Vermeulen (2020) argues that the business environment is a fast-changing environment, which is the reason why this sampling criterion was applied.

Regarding data collection, journal articles were collected by means of electronic searches via seven research databases:

- Google Scholar;
- EBSCOhost;
- Sabinet;
- Scopus;
- ProQuest;
- JSTOR; and
- Emerald Insight Journals.

These databases were used to search for the following keywords: systematic risk; beta; risk; estimate risk; predict risk; predict systematic risk; estimate systematic risk; leveraged beta; unleveraged beta; cash flow per share; current ratio; quick ratio, debt to equity ratio; debt to assets ratio; return on external investments; market value added; price-per-share to book value-per-share; price-per-share to net asset value-per-share; total assets to capital employed ratio. The databases were set to confine searches to the period 2019 to 2022. Results were further narrowed down by:

- Eliminating articles that were non-peer-reviewed (as this breached criterion 2);
- Setting aside articles which did not test for the relationship between systematic risk and one of the identified independent variables simultaneously, but still contained either 'systematic risk' or an independent variable as one of its keywords. These articles were revisited in order to identify findings similar to those of the current study, displayed in Table 6.4 later in this chapter; and
- Eliminating articles which tested for the relationship between systematic risk and one of the identified independent variables but did not support the findings of the current study (as obtained in Chapter 5).

In applying the listed criteria, the data collection methods were executed. Paragraph 6.3.2 discusses the outcomes of this process.

6.3.2 Applying data collection methods

Twenty research articles were collected through the methods described above. Table 6.2 provides an overview of all the articles which were sampled (as described in par. 6.3.1). Table 6.2 indicates the journal title, article title, the researcher(s) surnames, the year of publication, and location. Please note that articles were sequenced based on the date of publication, from oldest to most recent.

Table 6.2: Academic journal articles sampled

Journal title	Peer-reviewed journal?	Article title	Researcher(s)	Year of article publication	Location of sample
Review of Quantitative Finance and Accounting	✓	Systematic risk, the trade-off of leverage and IPO first-day returns	Aissia and Hellara	2019	France
European Online Journal of Natural and Social Sciences	✓	Islamic versus conventional mutual funds performance in Pakistan: Comparative analysis through performance measures and DEA approach	Arif *et al.*	2019	Pakistan
The Review of Financial Studies	✓	Ratings-based regulation and systematic risk incentives	Iannotta *et al.*	2019	USA
Financial Markets and Portfolio Management	✓	What drives stock returns in Japan?	Liang	2019	Japan
Organizations and Markets in Emerging Economies	✓	Systematic risk and accounting determinants: An empirical assessment in the Indian stock market	Parthasarathy	2019	India

Journal title	Peer-reviewed journal?	Article title	Researcher(s)	Year of article publication	Location of sample
International Journal of Academic Research in Business and Social Sciences	✓	Systematic risk determinants of the Japanese shipping industry	Riaz *et al.*	2019	Japan
Jurnal Manajemen	✓	Corporate fundamentals, BI rate and systematic risk: Evidence from Indonesia Stock Exchange	Santosa and Puspitasari	2019	Indonesia
The IUP Journal of Financial Risk Management	✓	Exponential weighted moving average of selected systematic investment plans of mutual funds and their risks	Anbarasu and Prakesh	2020	India
Finance & Accounting Research Journal	✓	The effects of firm size on risk and return in the Brazilian stock market: A sectoral analysis	Antunes *et al.*	2020	Brazil
The Journal of Financial Research	✓	Predicting systematic risk with macroeconomic and financial variables	Cenesizoglu and Ibrushi	2020	Canada

Journal title	Peer-reviewed journal?	Article title	Researcher(s)	Year of article publication	Location of sample
Journal of Economics, Finance and Administrative Science	✓	Relationship between cash holdings and expected equity returns: Evidence from Pacific alliance countries	Garavito and Chion	2020	Latin America and the Caribbean
The Review of Financial Studies	✓	A bound on expected stock returns	Kadan and Tang	2020	USA
Journal of Islamic Finance	✓	Examining the firm-specific factors influencing systematic risk of transportation firms in Malaysia and Singapore	Vongphachanh and Ibrahim	2020	Malaysia
Australasian Accounting, Business and Finance Journal	✓	Antecedents of firm's risk-play – A structural equation modelling approach in an emerging market context	DasGupta and Singh	2021	India
Review of Accounting Studies	✓	Earnings beta	Ellahie	2021	USA
Review of International Geographical Education	✓	Determinants of systematic risk in manufacturing sector of Indonesia	Gesaputri *et al.*	2021	Indonesia

Journal title	Peer-reviewed journal?	Article title	Researcher(s)	Year of article publication	Location of sample
Jurnal Hukum dan Ekonomi Islam	✓	The relationship of liquidity, debt and Sharia stock investment's risk moderated by financial performance	Hidayat	2021	Indonesia
Financial Studies	✓	Financial ratios affecting systematic risk in joint-stock companies: BIST Technology (XUTEK) industry companies case in Turkey	Tekin	2021	Turkey
International Journal of Economics and Management Studies	✓	How does company performance, systematic risk and capital structure affect the corporate value: Empirical study on the Indonesian capital market	Wibowo	2021	Indonesia
Global Finance Journal	✓	Transition to Islamic equities: Systematic risk and Shari'ah compliance	Balli *et al.*	2022	USA

Source: Author

Table 6.2 lists the 20 research articles that were sampled. After the data collection, the study progressed towards step 3 of the qualitative analysis (refer to Figure 6.2), in which the findings of the sampled articles were compared and integrated with the current

study, as set out in par. 6.3.3, hereafter.

6.3.3 Comparing and integrating research findings

For the purpose of comparing and integrating findings, document analysis was applied. According to Cooper (2017:15), document analysis is a technique by which information is critically analysed and synthesised. In the current study, the researcher applied document analysis by analysing academic journal articles with the intention of finding patterns and comparing the research findings. In this section of Chapter 6, the sampled articles are summarised in table format. This is similar to qualitative analysis done by researchers such as Malan (2021), Ratnaningrum *et al.* (2020), and Wagner *et al.* (2019). Two tables were constructed for summarising and integrating the findings of the sampled studies and the current study. Table 6.3 contains the findings which were identical to the findings of the current study, while table 6.4 summarises and integrates findings which were similar to those of the current study.

'Identical findings' means that the research article and the current study identified the exact same variable as independent variable that affects systematic risk. 'Similar findings' points to sampled findings which did not identify the exact same ratio as independent variable that predicts or affects systematic risk, but identified key elements within a ratio that affect systematic risk.

Research articles were sorted by date of publication, from 2019 to 2022. It should also be noted that sampled research studies did not precisely indicate whether the systematic risk tested for was based on leveraged or unleveraged values. Owing to this ambiguity, the summaries in the tables to follow do not speculate about the nature of beta values or systematic risk proxies with regard to their leverage.

Table 6.3: Summary of articles sampled with identical findings

Researcher(s)	Year	Research summary	Statistical method(s)	Shared independent variable identified	Ratio category
Aissia and Hellara	2019	This research intended to determine how systematic risk is affected when initial public offers are made by 254 listed companies. The study included leverage, liquidity, profitability, firm size, tangible assets and Tobin's Q for testing. It was found that the leverage ratio is related to systematic risk within this sample.	Multiple regression modelling	Debt/Equity	Leverage
Parthasarathy	2019	A total of 66 companies were sampled from the Indian Stock Exchange to test the association between systematic risk and ROE, ROA, liquidity, gearing, earnings growth, firm size, and earnings variability. It was found that ROE, ROA, earnings growth and liquidity associated well with systematic risk.	Gradual regression modelling	Quick ratio	Liquidity
Riaz *et al.*	2019	The researchers sampled listed shipping firms and tested whether beta was associated with the current ratio, total assets, debt to assets, return on assets, and net assets turn over. It was found that total assets and debt to assets correlated with beta values.	Correlation analysis Multiple regression analysis	Debt/Assets	Solvency

Researcher(s)	Year	Research summary	Statistical method(s)	Shared independent variable identified	Ratio category
Santosa and Puspitasari	2019	The study was undertaken to determine whether beta is associated with sales growth, net profit margin, debt to equity ratio and the benchmark interest rate, for companies listed on the LQ-45 index. It was found that sales growth, net profit margin and the debt to equity ratio correlated with beta values.	Panel data regression modelling	Debt/Equity	Leverage
Cenesizoglu and Ibrushi	2020	This research set out to test several types of variables (macroeconomic variables, portfolio variables, bond market variables and aggregate valuation variables) to find which associates best with systematic risk for sampled Canadian companies. With regard to aggregate valuation variables, it was found that the dividend payout ratio, DY ratio, PE ratio and market-to-book ratio were well associated with movements in systematic risk.	Multiple regression analysis	Price to book ratio	Market ratio

Researcher(s)	Year	Research summary	Statistical method(s)	Shared independent variable identified	Ratio category
Kadan and Tang	2020	The researchers divided risk into several categories: very conservative risk, conservative risk, neutrality, liberal risk and very liberal risk. It was found that firm size, market-to-book value, liquidity, profitability, and investment levels were associated with risk levels.	Fama–MacBeth regression	Quick ratio	Liquidity
				Price to book ratio	Market ratio
Vongphachanh and Ibrahim	2020	The researcher theorised that systematic risk can be predicted by means of leverage, profitability, firm growth, firm age, and operational efficiency. The study sampled 63 transportation companies and collected data for a total of 20 years.	Panel data analysis	Current ratio	Liquidity
DasGupta and Singh	2021	The researchers undertook the study to determine which factors influenced systematic risk for 269 listed Indian companies over a period of 18 years. The study found that leverage, liquidity, firm size, firm age, firm returns, market returns, cash performance, dividend payout, and price-to-book value affected systematic risk for the period under review.	Correlation analysis	Cash flow per share	Liquidity
				Price to book ratio	Market ratio
				Current ratio	Liquidity
				Debt/Equity	Leverage

Researcher(s)	Year	Research summary	Statistical method(s)	Shared independent variable identified	Ratio category
Ellahie	2021	The researcher collected data from 50 investment portfolios and indicated that risk could be predicted through asset turnover, asset growth, price-to-book value, dividend yield, earnings yield, earnings growth, earnings volatility, financial leverage, net profit margin, operating leverage, return on equity, firm size, and sales volatility.	Correlation analysis	Price to book ratio	Market ratio
			Multiple regression modelling	Debt/Equity	Leverage
Gesaputri *et al.*	2021	A total of 142 companies were sampled and observations were collected for five consecutive years. The researchers indicated that leverage and firm size were associated with beta, while liquidity, asset growth and interest rates did not associate well with beta figures.	Panel data regression analysis	Debt/Equity	Leverage
Hidayat	2021	The researcher sampled 22 companies and collected data totalling 110 observations. Observations were based on the current ratio, debt to assets ratio and ROA. The paper concluded that the current ratio and debt to assets ratio were associated with systematic risk for high performing companies.	T-testing	Current ratio	Liquidity
				Debt/Assets	Solvency

Researcher(s)	Year	Research summary	Statistical method(s)	Shared independent variable identified	Ratio category
Tekin	2021	The researcher sampled 14 technology companies listed on the BIST index. It was tested whether liquidity, leverage, ROE, ROA, asset turnover and total assets can affect systematic risk. It was found that liquidity and leverage affect beta figures significantly.	Panel regression modelling	Current ratio	Liquidity
			Correlation analysis	Debt/Equity	Leverage
Wibowo	2021	The researcher sampled 165 observations and found that ROA, debt to equity and Tobin's Q were associated with risk for the sampled Indonesian companies.	Multiple regression modelling	Debt/Equity	Leverage
Balli *et al.*	2022	This study aimed to determine whether beta values could be predicted by means of firm age, leverage, the debt to assets ratio, cash flow to assets and interest to EBIT. It was found that beta was associated with debt to assets, cash flow to assets and interest to EBIT.	Multiple regression modelling	Debt/Assets	Solvency

Source: As listed in the table

In Table 6.4, research findings similar to those of the current study are displayed. The findings from six papers published between 2019 and 2022 are presented, from oldest to most recent.

Table 6.4: Summary of articles sampled with similar findings

Researcher(s)	Year	Research summary	Statistical method	Shared research finding	Where similar independent variable applies	Ratio category
Arif *et al.*	2019	The researchers sampled 30 Islamic mutual funds and non-Islamic mutual funds to test which type of fund carries less systematic risk. Beta values were calculated based on the net asset values of the different mutual funds.	Data envelopment analysis	According to the methods applied by the researchers, movements in net asset values are indicative of systematic risk.	Price per share/net asset value per share was identified as an independent variable in Chapter 5. Thus, the net asset value is a concept shared between the current study and the research of Arif *et al.* (2019).	Market ratio
Iannotta *et al.*	2019	The researchers sampled 33 firms and found, among other things, a positive relationship between capital and systematic risk. Furthermore, companies that owned more assets were found to maintain lower betas.	Simple regression analysis	Capital and total assets affect systematic risk.	Total assets/capital employed was identified as an independent variable in predicting systematic risk (refer to Chapter 5). Capital and total assets are key concepts contained in this ratio.	Solvency ratios

Researcher(s)	Year	Research summary	Statistical method	Shared research finding	Where similar independent variable applies	Ratio category
Liang	2019	This Japanese study aimed to identify a systematic risk factor which drives share returns. From the sampled Japanese listed companies, the cash flow yield ratio was found to be one of the most important systematic risk factors when stock returns were analysed.	Fama–MacBeth regression	The study found that the cash flow yield ratio is a systematic risk indicator. The cash flow yield was calculated as cash flow per share divided by market price per share.	Cash flow per share was identified as an independent variable to the models constructed in Chapter 5. Cash flow per share is a key factor contained within the cash flow yield ratio.	Liquidity
Anbarasu and Prakash	2020	The researchers sampled 46 systematic investment plans to determine how risky such investments are. The net asset values of the investment plans were used as proxy for systematic risk.	Exponential weighted moving average method	The researchers theorised that systematic risk is represented by movements in net asset values.	Price per share/net asset value per share was identified as an independent variable in Chapter 5. Thus, the net asset value is a concept shared between the current study and the research of Anbarasu and Prakash (2020).	Market ratio

Researcher(s)	Year	Research summary	Statistical method	Shared research finding	Where similar independent variable applies	Ratio category
Antunes *et al.*	2020	The study undertook to determine if firm size affects the risk-return trade-off in a sample of 60 Brazilian entities. Per this research, firm size was expressed by market capitalisation values. Findings indicated that firm size and returns are positively related, while risk and return are also related. Thus, market capitalisation impacts systematic risk indirectly.	Simple regression modelling	Market capitalisation affects systematic risk.	Market capitalisation forms part of the MVA ratio.	Market ratio
Garavito and Chion	2020	The researchers investigated whether cash holding (excess cash flow) affects the systematic risk and returns of listed firms of the Pacific Alliance countries. The statistical findings revealed a significant and positive relationship between cash holdings and beta values.	Multifactorial regression modelling	Cash flow affects systematic risk.	Cash flow forms part of the cash flow per share ratio.	Liquidity

Source: As listed in the table

Tables 6.3 and 6.4 provided an in-depth analysis of the sampled academic articles, consisting of a summary of the research, the statistical method applied, the findings identical and similar to those of the current study, an indication of ratio similarity (for Table 6.4 only), and the ratio category. From this analysis, qualitative conclusions could easily be deduced. In par. 6.3.4, these conclusions are summarised by means of tabling and frequency counting.

6.3.4 Conclusion on integrated findings

In the final step (as indicated by Figure 6.2), the researcher concluded on the integrated findings. The frequency of these qualitative findings is tabled and elaborated on in this paragraph. Tables 6.5, 6.6 and 6.7 were constructed for this purpose. Each table addresses the frequency measures of different aspects relating to the findings from the sampled articles discussed in Tables 6.3 and 6.4.

Table 6.5: Summary per type of independent variable

Independent variable	Frequency of research papers with identical findings		Frequency of research papers with similar findings	
	Number	%	Number	%
Cash flow per share	1	7%	2	33%
Current ratio	4	29%	0	0%
Debt/Assets	2	14%	0	0%
Debt/Equity	7	50%	0	0%
Market value added	0	0%	1	17%
Price per share/book value per share	4	29%	0	0%
Price per share/net asset value per share	0	0%	2	33%
Quick ratio	2	14%	0	0%

Independent variable	Frequency of research papers with identical findings		Frequency of research papers with similar findings	
	Number	%	Number	%
Return on external investments	0	0%	0	0%
Total assets/Capital employed	0	0%	1	17%

Source: Author

From Table 6.5, it can be deduced that the debt to equity ratio was most often identified as a variable that is well associated with systematic risk. Half (i.e., 50%) of the sampled articles with identical findings pointed out that the gearing ratio impacts systematic risk. The current ratio and price-per-share to net asset value-per-share were the second most identified variables associated with systematic risk (i.e., 29% of findings). Following this, the cash flow per share and price per share/net asset value per share were found to be significant predictors of systematic risk by two articles respectively.

Total assets/capital employed and market value added were proven to be significant variables in 17% of papers with similar findings. It can be observed that at least one article published between 2019 and 2022 presented either identical findings or similar findings for all variables, accept for the return on external investments ratio. It would seem that the authors of the sampled articles did not investigate the effects that business combinations (i.e., groups of companies and the investment in one another) have on systematic risk. It is submitted that this ratio be further investigated in future research, as most of the listed entities function within the business combination environment and the performance of multiple companies is consolidated. Such consolidation can affect the collective systematic risk of the holder company.

In Table 6.6, the qualitative findings are narrowed down to show only the type of research ratios which resulted in significant findings for the sampled articles. Following the table, is a discussion focused on the type of ratio and the frequency counted.

Table 6.6: Summary per ratio type

Ratio type	Frequency of research papers with identical findings		Frequency of research papers with similar findings	
	Number	%	Number	%
Leverage/gearing	7	50%	0	0%
Liquidity	7	50%	2	33%
Market ratio	4	29%	3	50%
Solvency	2	14%	1	17%

Source: Author

Per the ratio type, Table 6.6 indicates that other researchers have often identified the leverage ratio as being associated with movements in systematic risk. A total of 50% of the papers with identical findings pointed out that leverage affected systematic risk. As highlighted in Table 6.1, both debt and equity funding are associated with systematic risk. With regard to debt, interest rates can fluctuate beyond the control of the entity, while equity issuance imposes the risk of not maintaining the necessary cash flow to pay expected dividends to investors. The association between risk and cash flow is further reiterated by the fact that liquidity ratios seem to be very well associated with systematic risk according to 50% of the papers with identical findings and 33% of papers with similar findings. Liquidity (i.e., the ability to have access to cash within a short period of time) mitigates systematic risk, as most circumstances which arise from systematic risk can be alleviated when cash is easily accessible.

Market ratios (accept for the return on external investments) were also well associated with systematic risk in 29% of papers with identical findings and 50% with similar findings. From the researcher's perspective, it would seem that market ratios associated with systematic risk are not concerned with market price movement itself, but rather with the ability of the market price to maintain higher levels than other key value indicators such as book value per share and net asset value per share. It would make sense to argue that investors expect a market price to exceed book values or net asset values of an entity. The closer the market price moves towards the book value or net asset value, the

less the investor deems the investment worthy. When investors abandon the investment for this reason, supply of the share is stimulated, resulting in volatility of the share value. This sequence of occurrences leads to changes in beta values and, thus, systematic risk.

Solvency ratios were the least frequent variables to predict systematic risk (14% of identical findings and 17% of similar findings). Although these variables were mentioned less often, systematic risk was found to be influenced by two factors related to solvency: (1) the ability of capital to be utilised effectively in order to obtain assets, and (2) the ability of such assets to carry a collective value higher than the entity's debts. In the instance of total assets divided by capital employed, it can be said that these ratios link up with concepts of liquidity because they reflect an expectation that capital is utilised to obtain assets which, in turn, ensure a continuous flow of revenue and, ultimately, cash. In terms of the debt to assets ratio, the risk is obvious: financial failure. If debts outgrow the value of the assets, the entity loses its solvency position and becomes bankrupt.

For the sake of thoroughness, the type of statistical methods used in the sampled articles are tabled and counted in Table 6.7. The aim is to draw a comparison between the types of statistical methods applied by other researchers and the method applied in the current study.

Table 6.7: Statistical methods

Statistical method	Frequency	%
Correlation analysis	4	20%
Data envelopment analysis	1	5%
Exponential weighted moving average method	1	5%
Fama–MacBeth regression	2	10%
Multiple regression analysis	7	35%
Panel data regression analysis	4	20%
Simple regression analysis	2	10%
Gradual regression analysis	1	5%
T-testing	1	5%

Source: Author

From Table 6.7, it can be observed that different types of regression analysis were applied by the authors of the sampled articles. The most prevalent statistical method was multiple regression analysis, with 35% of the papers applying this method. Correlation analysis and panel data regression analysis were the second most frequent methods used (in 20% of the articles), followed by Fama–MacBeth regression analysis and simple regression analysis (10% of the articles). Data envelopment analysis, exponential weighted moving average method, gradual regression analysis and t-testing were each applied only once in four articles respectively (thus 5% each).

From the summary in Table 6.7, it is submitted that the prevalent use of multiple regression analysis is in line with the quantitative method described in Chapter 3 and set out in Chapter 5. In par. 6.4, hereafter, the findings of the chapter are summarised and the qualitative aspects of the research are concluded on.

6.4 CHAPTER SUMMARY

As the title indicates, this chapter provided the qualitative validation for the quantitative findings obtained in Chapter 5. These findings showed that cash flow per share, the current ratio, debt to assets ratio, debt to equity ratio, market value added, price-per-share to book value-per-share, price-per-share to net asset value-per-share, quick ratio, return on external investments ratio, and total assets to capital employed ratio are representative of independent variables which can predict leverage and/or unleveraged beta values for the sampled companies.

Chapter 6 commenced with descriptions of the independent variables identified in Chapter 5. These variables were not discussed in Chapter 2, as their selection only became relevant after the quantitative research process was set out in Chapter 5. The descriptions were summarised in Table 6.1. After clarifying the meanings of the independent variables, the qualitative research process was addressed. In par. 6.3, the steps for the systematic review process were revisited and consequently applied in paragraphs 6.3.1 to 6.3.4.

Paragraph 6.3.1 provided a brief overview of the processes of sample selection and data collection. Paragraph 6.3.2 indicated the result of the data collection process, and the sampled journal articles were listed in Table 6.2. In par. 6.3.3 the qualitative research

findings were compared and integrated. This was done by means of categorising the sampled articles into two categories: those with findings identical to (see Table 6.3) and those with findings similar to the current study's findings (refer to Table 6.4). Tables 6.3 and 6.4 provided summaries of the research conducted in the sampled articles and integrated the findings by indicating which were identical or similar to those of the current study and demonstrating the type of ratio category affected.

Paragraph 6.3.4 concluded on the integrated qualitative findings. This was done by showing, firstly, the frequency of findings identical or similar to those of the current study (Table 6.5), secondly, the type of ratio identified from the findings (Table 6.6), and lastly, the statistical methods applied to obtain the findings (Table 6.7). From Table 6.5, it was deduced that the debt to equity ratio was most prevalent among the identical findings, followed by the current ratio, price-per-share to book value-per-share, debt to assets ratio, and quick ratio. With regard to the similar findings, cash flow per share and price-per-share to net asset value-per-share occurred most frequently, followed by MVA and total assets to capital employed. No qualitative validation was found for the return on external investment ratio, and it was submitted that this ratio should be further investigated in future research.

Table 6.6 indicated that the studies with identical findings mostly found the gearing ratio to be a significant ratio that affects systematic risk, followed by liquidity ratios, market ratios and, lastly, solvency ratios. The similar findings prioritised market ratios, followed by liquidity and solvency ratios.

The last table of the chapter, Table 6.7, summarised the statistical methods applied in the articles and indicated that multiple regression analysis was applied most frequently. Other methods frequently applied were correlation analysis, panel data regression analysis, simple regression analysis and Fama–MacBeth regression. The findings shown in Table 6.7 were in line with the quantitative method applied in Chapter 5, as the current study also applied multiple regression analysis to achieve the newly proposed models.

Hereafter follows the last chapter of this thesis. Chapter 7 is dedicated to indicating how all the research questions were answer, how the research objectives were fulfilled and how the research study can be concluded.

CHAPTER 7:
RESEARCH CONCLUSION

There are no simple answers to complex problems.
– Valerio Massimo Manfredi

7.1 INTRODUCTION

As with many phenomena in social science, the risk associated with investment opportunities can be scaled. Some investments may be riskier, while others may pose lesser risk. In general, it has been put forward that volatility in share price is the most significant indicator of potential returns (Blume & Friend, 1978:98; Hinman, 2014:17; May, 1968:113). Based on this assumption, the MPT was developed, and the mantra 'the higher the risk, the higher the return' has been widely adopted.

As this thesis unfolded, it became apparent that understanding the concept of systematic risk and its estimation may not be as straightforward as previously accepted. In Chapter 4, it was empirically demonstrated that accountancy-related return measures related to the sampled companies did not serve as worthy predictors of systematic risk. Other researchers, such as Chawana (2011), Ghysels *et al.* (2016), Mulli (2013), Salvador *et al.* (2014), Vongphachanh and Ibrahim (2020), and Tekin (2021), have uncovered similar findings.

The purpose of this study was to search for accounting measures other than return measures which could be applied when predicting systematic risk. The study limited itself to a sample of JSE listed companies. In Chapter 5, it was empirically illustrated that liquidity ratios, market ratios, solvency ratios and the gearing ratio could be applied within a multiple regression formation to predict systematic risk for the sampled companies. This stands in contrast to the traditional approach which assumes that only return measures can predict systematic risk behaviour. In Chapter 6 qualitative value was added to the findings by identifying peer-reviewed articles in which liquidity ratios, market ratios, solvency ratios and the gearing ratio were also applied to predict systematic risk.

This final chapter of the study provides insight into the fulfilment of the research objectives (par. 7.2) and the answering of the research questions (par. 7.3).

Recommendations are formulated (par. 7.4) and the contribution of the research is elaborated on (par. 7.5). The chapter also discusses the limitations of the research (par. 7.6) and mentions suggestions for further research (par. 7.7). Finally, the study is concluded on, with some closing remarks (par. 7.8).

7.2 FULFILMENT OF RESEARCH OBJECTIVES

The research objectives to the study were set out in Chapter 1, par. 1.5. This section of the current chapter demonstrates how the theoretical objectives (par. 7.2.1) and empirical objectives (par. 7.2.2) were fulfilled. Thereafter, and based on the fulfilment of the aforementioned objectives, an overall indication is given of how the primary objective (par. 7.2.3) was fulfilled.

7.2.1 Theoretical objectives

Four theoretical objectives were identified for the study in Chapter 1, par. 1.5.2.1. Sub-paragraphs 7.2.1.1 to 7.2.1.4 provide in-depth explanations of how these objectives were fulfilled.

7.2.1.1 Analyse existing traditional literature to determine how risk is categorised and quantified

Secondary theoretical objective 1 was addressed in Chapter 2, par. 2.2. Paragraph 2.2 commenced with an explanation of risk in general, and progressed towards distinguishing between unsystematic risk and systematic risk. In par. 2.2.1, the concept of unsystematic risk was described as a category of risk that is avoidable to the company when proper planning and pro-active action is taken. In Table 2.1, the most prominent types of unsystematic risk were summarised, namely compliance risk, reputational risk, security risk, competition risk, governance risk, strategic risk, technological risk, project risk, and quality risk. It was further indicated that unsystematic risk is not universal and that each company is faced with a unique set of unsystematic risks. As the researcher did not intend to study risk that is unique to companies, unsystematic risk was not included as empirical variable in this research.

In Chapter 2, par. 2.2.2, it was indicated that systematic risk refers to risk caused by market fluctuations that are not within the control of the entity. Possible external factors that could constitute market fluctuations were summarised in Table 2.2, namely gross domestic product, inflation rates, interest rates, taxation, cost of capital goods, political uncertainty, exchange rates, and commodity prices. In par. 2.2.2.1, it was further

explained that market fluctuations lead to share price volatility, while systematic risk is measured by means of share price volatility. Figure 2.2 explained how the process of systematic risk creation unfolds: Changes in external factors lead to changes in investment sentiments, which, in turn, lead to changes in supply or demand of shares and affect share prices. When share prices are affected, share price volatility can be observed and systematic risk arises.

In Table 2.3, share price volatility was elaborated on and three types of share price volatility were explained: historical volatility, relative volatility and implied volatility. Historical volatility measures volatility based on past trends, while relative volatility measures volatility relative to the market, where market volatility is expressed as '1'. Implied volatility refers to anticipated future volatility, based on yield-to-maturity calculations.

In Table 2.4, the measurement of share price volatility was explored. It was indicated that four possible measurement methods exist: standard deviations, alpha, R-squared and beta. Standard deviations indicate how share price data deviate from the mean value, while alpha measures the volatility of share prices relative to an identified benchmark. R-squared is used to model benchmark returns against share price returns. Finally, beta is measured by comparing share price volatility of a specific share against the volatility of the market. It was indicated that beta would be the preferred proxy for systematic risk for the empirical analysis to the study. Table 2.5 provided an elaborate explanation for this choice.

After the preceding aspects of share price volatility were covered, the types of systematic risk were explored. In Chapter 2, par. 2.2.2.3, it was indicated that two types of systematic risk can be measured: leveraged beta and unleveraged beta. Leveraged beta measures systematic risk which takes into account the funding structure of the entity (i.e., the debt to equity relationship). On the other hand, unleveraged beta assumes that systematic risk is estimated by only considering risk associated with equity acquisition.

To summarise, Chapter 2, par. 2.2 put forward that there are two categories of risk: unsystematic risk and systematic risk. As systematic risk exists universally for all companies, this study undertook to explore systematic risk only. Systematic risk can further be divided into two categories: leveraged systematic risk and unleveraged

systematic risk. As it pertains to the measurement of systematic risk, it should be noted that systematic risk is measured by means of share price volatility. There are different types of share price volatility: historical volatility, relative volatility and implied volatility. Share price volatility is measured through standard deviations, alpha, R-squared and beta. For the purpose of this study, beta was selected as empirical proxy for systematic risk. Paragraph 7.2.1.2 explores the fulfilment of the next theoretical objective.

7.2.1.2 Analyse existing traditional literature in order to obtain an understanding of how returns are defined and quantified

Secondary theoretical objective 2 was addressed in Chapter 2, par. 2.3. Paragraph 2.3 commenced with exploring the definition of 'return' and it was indicated that the interpretation of the term is open ended and all inclusive, because it depends on the type of investment and the investor's portfolio. In general, a 'return' refers to the profit or loss generated by an investment. Figure 2.3 showed that returns are affected by risk and time value of money. The idea of risk affecting returns links back to the MPT, which the study attempted to bring into question. Regarding the effect of time value of money on returns, it was indicated that money loses purchasing power over time, necessitating investment as soon as possible. If investment is deferred, higher capital may later be required. In addition, there is an opportunity associated with deferring investment, as idle capital does not result in returns. Time value of money was accommodated through the application of inflation adjusted ratios in the empirical testing in Chapter 4.

Figure 2.4 demonstrated the types of return. In par. 2.3, the distinction between expected returns and actual returns was emphasised. Expected returns are estimated returns, mostly based on the CAPM and dividend theories. The CAPM is applied to calculate the cost of capital, which is also the minimum expected return that investors will accept. Dividend theories are also applied as arguments when estimated returns are calculated. Like the CAPM, the DDM can be used to calculate the cost of capital, which again will represent the minimum expected return that investors will accept. It should be noted that investors will not accept a return lower than the cost of capital because such a return represents a loss to the investor.

It was stated that actual returns are representative of the returns that are actually generated, unlike estimated returns that ought to be theoretically generated. Actual

returns consist of short-term returns (such as dividends or interest) and long-term returns (such as capital gains). Figure 2.5 illustrated the potential interrelationship between short-term returns, long-term returns and share price value. From the existing theory, it was postulated that earnings and dividends are related, as the increases in earnings often lead to declaration of dividends (Dimitropoulos & Asteriou, 2009; Farsio *et al*., 2004; Skinner & Soltes, 2011).

Furthermore, earnings and dividends affect share price growth, and since systematic risk is measured by means of share price volatility, it was put forward that earnings and dividends can potentially affect systematic risk. Short-term and long-term returns are also interrelated. Generating unsustainable short-term returns will lead to a downward trend in long-term value creation (McKinsey & Company, 2017; Smart & Graham, 2012:159), which again indicates the relation between dividends and share price value changes, and, consequently, systematic risk behaviour. Table 2.6 showed that previous research has often selected profitability and market ratios (based on earnings, dividends and price per share) as proxies for actual returns. Table 2.7 indicated the 19 ratios that were selected as proxies for actual returns for empirical testing in the study.

To summarise, ‘returns’ are profits or losses generated by investments held by the investor. Theoretically, returns are affected by risk and time value of money. Returns can be divided into two categories: expected returns and actual returns. Expected returns are equal to the cost of capital, as investors will not be willing to accept returns lower than the cost of obtaining capital. Returns lower than cost of capital represent losses to the investor. Actual returns represent returns that were generated in real terms.

For the purpose of this study, actual returns were included for empirical testing, as deviations between expected returns and actual returns can occur, while the investor is more concerned about the real return generated than the expected theoretical return. In addition, historical trends are often used to estimate return, which essentially means that actual returns form the corner stone of estimated future returns. In accordance with previous research, actual returns are measured by means of earnings, dividends and share price values. For the purpose of this research, financial ratios relating to these financial concepts were selected as proxies for actual returns.

7.2.1.3 Explore research findings contained in existing research to observe how the concepts of 'risk' and 'return' have been interpreted by other researchers

Secondary theoretical objective 3 was addressed in Chapter 2, par. 2.4. Table 2.8 gave a synopsis of the interpretation of the terms 'risk' and 'return' by other researchers. This section highlighted that all selected previous research had selected beta as a proxy for systematic risk for empirical analysis. Consequently, beta was also selected as proxy for systematic risk for the empirical analysis of this study.

The interpretation of 'return' offered more diverse perspectives. From Table 2.8, it was clear that the degree of financial leverage, the degree of operating leverage and the degree of operational leverage were selected as proxies for return. In addition, profitability ratios in the form of the EBIT growth, gross profit margin, net profit margin, operating profit margin, profit retention ratio, return on assets, return on capital employed, return on equity and return on investment, were also included as return proxies. With regard to market ratios, Table 2.8 indicated that the dividends per share, dividend payout ratio and earnings per share were selected as proxies for return. Based on the interpretations by previous researchers, return on assets, return on equity, net profit margin, operating profit margin and earnings per share were included for empirical testing in Chapter 4. The degree of financial leverage, the degree of operating leverage, the degree of operational leverage, EBIT growth and the dividend payout ratio were not included for empirical testing, as these ratios are not made available by IRESS.

In short, previous research selected beta as proxy for systematic risk, while the degree of financial leverage, the degree of operating leverage, the degree of operational leverage, dividends per share, dividend payout ratio, EBIT growth, earnings per share, gross profit margin, net profit margin, operating profit margin, profit retention ratio, return on assets, return on capital employed, return on equity, and return on investment served as proxies for return.

7.2.1.4 Compare research findings of existing studies and the current study qualitatively to validate quantitative research outcomes

Secondary theoretical objective 4 was addressed in Chapter 6, which set out to find qualitative support for the quantitative models constructed in Chapter 5.

In Chapter 6, a systematic review was applied to peer-reviewed academic articles to find similarities between systematic risk models constructed by other researchers and the new models constructed in this study (Chapter 5). Qualitative findings were divided into two categories: sampled research articles with findings identical to and with findings similar to those of the current study. In articles with identical findings, the exact same independent variable was identified as in Chapter 5. In contrast, in articles with similar findings, the exact same ratio was not identified as an independent variable that predicts systematic risk; instead, key elements within a ratio that affects systematic risk were identified. Twenty research articles formed part of the qualitative sample, of which 14 contained identical findings (refer to Table 6.3) and six contained similar findings (refer to Table 6.4). Findings related to the systematic review were summarised in Table 6.5. This table displayed the percentage of times an independent variable appeared in either the identical or similar findings. Figure 7.1 provides a synopsis of these outcomes.

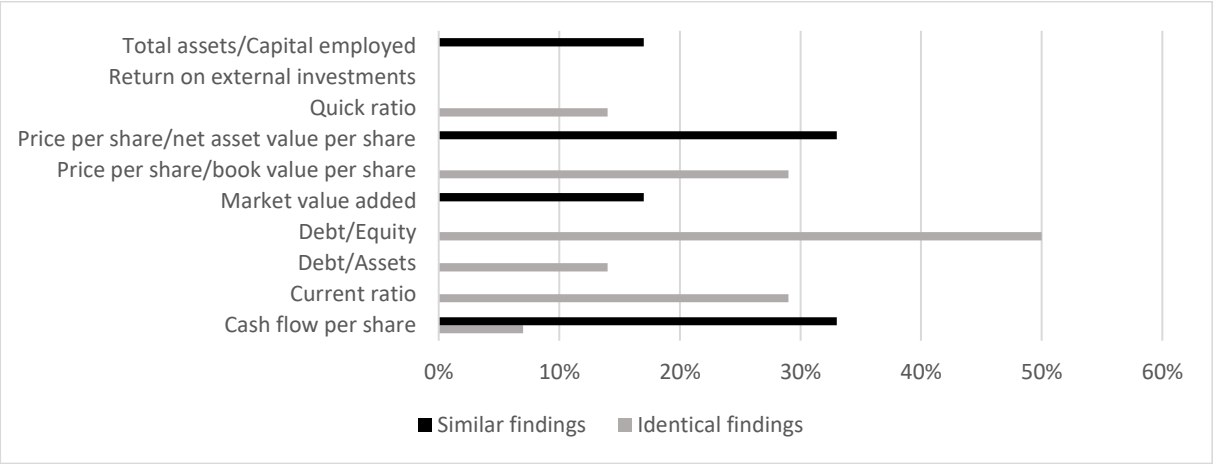


Figure 7.1: Comparison between identical and similar qualitative findings
Source: Author

Figure 7.1 demonstrates that, of the sampled research articles containing identical findings (indicated in grey), 50% identified the debt to equity ratio as a significant independent variable for predicting systematic risk, while 29% found that the current ratio and price-per-share to book value-per-share were important contributors in estimating systematic risk. A total of 14% of the articles identified the debt to assets ratio and the quick ratio as effective contributors in estimating systematic risk. Only 7% of the articles found cash flow per share as an important independent variable for predicting systematic risk.

Of the sampled articles with similar findings (indicated by Figure 7.1, per the black bars), 33% identified key elements contained by the cash flow per share or the price-per-share to net asset value-per-share measures to be effective predictors of systematic risk. A total of 17% of the articles pointed to key elements contained by the MVA or the total assets to capital employed ratios as important predictors of systematic risk. None of the articles delivered qualitative support for the notion that the return on external investments measure could predict systematic risk.

In Chapter 6, Table 6.6 listed the frequency of the categories of ratios which resulted in significant findings for the sampled articles. Figure 7.2 serves as a synopsis of Table 6.6.

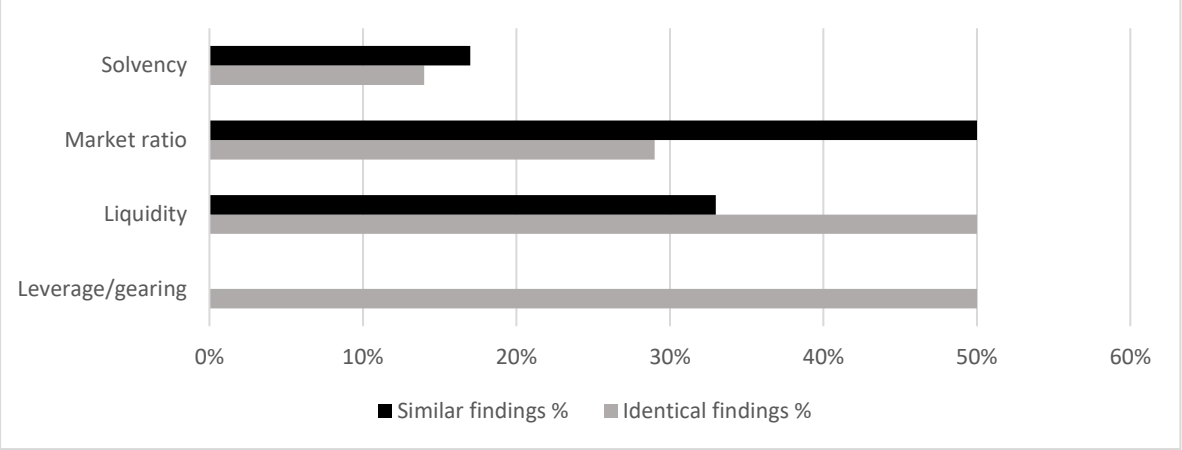


Figure 7.2: Similar and identical findings regarding ratio categories
Source: Author

From Figure 7.2, it can be deduced that 50% of the sampled articles with identical findings indicated that leverage and liquidity are significant contributors in predicting systematic risk. A total of 29% of the same articles found that market ratios can predict systematic risk, while 14% of the articles found that solvency ratios are important predictors of systematic risk.

Of the sampled articles with similar findings, 50% found that elements contained by market ratios contribute to the prediction of systematic risk. A total of 17% of these articles posited that elements contained by solvency ratios can significantly predict systematic risk.

The type of statistical method applied in the sampled articles was set out in Table 6.7. This was done for the sake of thoroughness and to explore whether appropriate

empirical methods were applied in Chapter 5 compared to those applied by other recent research. Figure 7.3 serves as an overview of the outcomes reached in Table 6.7.

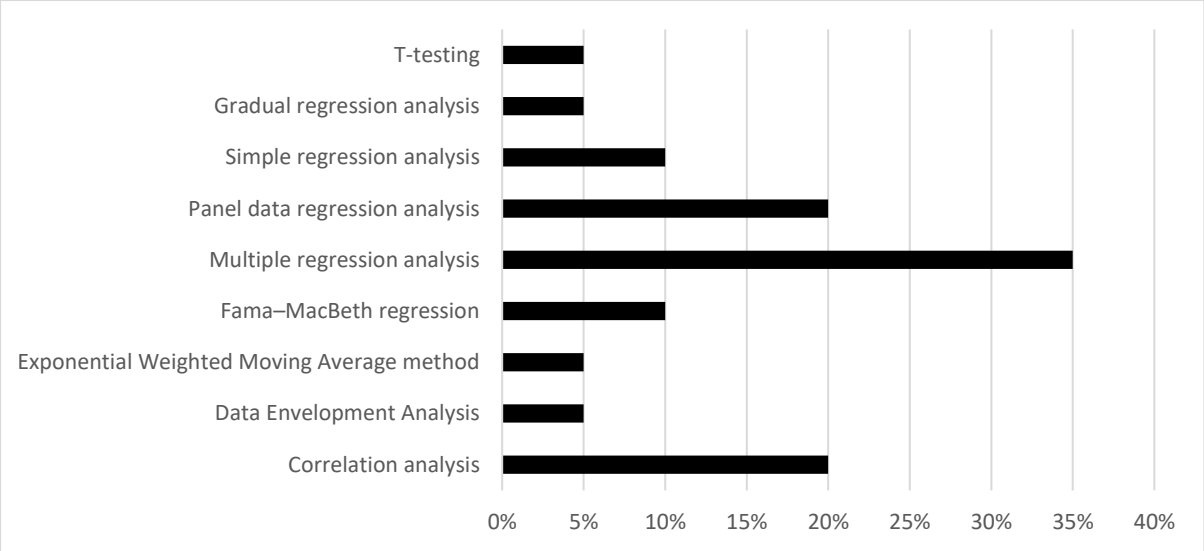


Figure 7.3: Statistical methods applied in sampled research articles
Source: Author

Figure 7.3 illustrates that the majority (35%) of the sampled articles applied multiple regression modelling in reaching their outcomes. This is in line with the method selected for empirical modelling in the current study.

A total of 20% of the sampled articles applied correlation analysis or panel data regression analysis as a method of statistical analysis. Figure 7.3 indicates that 10% of the sampled articles applied simple regression analysis and Fama-MacBeth regression analysis. In addition, 5% of the sampled articles utilised t-testing, gradual regression analysis, exponential weighted moving average method or data envelopment analysis.

In summary, it can be posited that qualitative validation was obtained for all independent variables formulated in Chapter 5, except the return on external investment measure. This measure is to be investigated by means of further research. The empirical method applied in obtaining research outcomes displayed in Chapter 5 was also verified, as the majority of the sampled articles followed the same statistical approach. In par. 7.2.2, this chapter progresses towards indicating how the empirical objectives of the study were fulfilled.

7.2.2 Empirical objectives

The empirical objectives to the study were stated in Chapter 1, par. 1.5.2.2. Paragraphs 7.2.2.1 to 7.2.2.4, hereafter, elaborate on the fulfilment of these empirical objectives.

7.2.2.1 Determine whether leveraged and unleveraged systematic risk are related to accountancy-related return measures

Secondary empirical objective 1 was addressed in Chapter 4 of this study. To fulfil this objective, stepwise multiple regression was performed. This was done to observe whether multiple accountancy-related return measures could be formulated into a regression model which can predict systematic risk.

Two dependent variables (LB and UB) and 18 possible independent variables were included for empirical testing: ln_NPM, ln_OPM, ln_ROA, ln_ROE, ln_ROCE, ln_R n OAA, ln_ROAE, ln_Infl adj ROA, ln_infl adj ROE, ln_inf adj ROAA, ln_infl adj ROAE, ln_DPS, ln_DY, ln_EPS, ln_EY, ln_infl adj p/share, ln_PE and ln_price/share. It should be noted that the independent variables were natural log transformed, as the distribution were non-parametric in nature (refer to Table 4.3 to observe the transformation). Testing for statistical distribution was done by means of a Shapiro-Wilk test and the results can be observed in Table 4.2.

Testing was also done to identify multicollinearity, with the results provided in Table 4.4. In constructing the multiple regression models, it was ensured that independent variables which shared high correlations were not formulated together. The results of the multiple regression models can be observed in Tables 4.5 and 4.6. These multiple regression models were generated by means of SPSS (version 26). SPSS was used to run prediction models in order to generate a prediction model that best fits the data available. In Table 4.5, the prediction model for leveraged beta can be observed. It was found that leveraged beta could be formulated as: LB = -0.488 + 0.170 (In_EPS) + 0.011 (In_NPM) – 0.217 (In_ROE) + 0.148 (In_DY) + 0.171 (ln_PE).

Table 4.5 also illustrated that the model was a good fit for the data, as $F(5;145) = 8.587$ and $p < 0.05$, while $R^2 = 0.202$ and SE = 0.532. It was observed that R^2 was smaller than 25%, and for this reason it was posited that the multiple regression model was unable to significantly predict leveraged systematic risk behaviour.

In Table 4.6, it was demonstrated that a similar model for unleveraged beta was constructed as: UB = 0.125 + 0.115 (ln_EPS) – 0.128 (ln_ROE) + 0.110 (ln_DY) – 0.110 (ln_EY) + 0.028 (ln_OPM). The model fit the data well, based on F(5;145) = 5.696 and $p < 0.05$. Furthermore, $R^2 = 0.169$ and SE = 0.416. Thus, the generated multiple regression model could only predict 16.9% of changes in unleveraged beta. As this does not comply with the benchmark of predicting at least 25% of changes in unleveraged beta, it is posited that accountancy-related return measures were not appropriate independent variables for predicting unleveraged systematic risk.

In summary, it was found that the selected accountancy-related return measures could not predict significant changes in leveraged or unleveraged systematic risk for the sampled companies.

7.2.2.2 Develop a new leveraged systematic risk model, consisting of accounting factors, for JSE sampled companies

Secondary empirical objective 2 was addressed in Chapter 5 of the study. New model development was oriented towards the construction of a multiple regression model. This objective focused on using liquidity measures, the debt to equity measure, market value added (MVA), return on external investments, price-per-share to book value-per-share, price-per-share to net asset value-per-share, and total assets-to-capital as possible independent variables for the multiple regression model. These accounting factors are discussed separately in the subsections hereafter.

a) Liquidity ratios as independent variables in predicting leveraged systematic risk

According to the findings of the study, the current ratio (ln_CR) and cash flow per share measure (ln_CF/share) can be seen as liquidity measures which contributed to the prediction of leveraged beta. It should be noted that both liquidity measures were natural log transformed (refer to Tables 5.2 and 5.3) to ensure that statistical distributions were parametric in nature. In addition, multicollinearity testing was done among independent variables to ensure that they were not highly correlated with one another (refer to Table 5.4).

In Table 5.5, the ln_CR was listed as a significant contributor ($p = 0{,}025$, thus $p < 0.05$) to the prediction of leveraged systematic risk. As the ln_CR and the quick ratio (ln_QR) were highly correlated with each other (per Table 5.4), it was found that the ln_CR was

better associated with leveraged systematic risk, and ln_QR was not included as independent variable. With regard to ln_CF/share, p = 0,001, where p < 0.05. This indicates that ln_CF/share was a significant independent variable in the estimation of unleveraged beta.

b) The debt to equity ratio as independent variable in predicting leveraged systematic risk

With regard to estimating leveraged beta, it was found that the debt to equity ratio (ln_DE) was a significant contributor in the prediction of systematic risk. In Table 5.5, it can be observed that p = 0,000, where p < 0.05.

In addition, it should be noted that the debt to equity ratio was natural log transformed to ensure that the statistical distribution was parametric. Transformations can be observed in Table 5.3.

c) MVA as independent variables in predicting leveraged systematic risk

Pertaining to ln_MVA, it was found that this independent variable was able to contribute to the prediction of leveraged beta. In Table 5.5, it was indicated that p = 0.000, where p < 0.05. MVA was natural log transformed (in Table 5.3) to ensure that its distribution was parametric in nature.

d) The price-per-share to book value-per-share as independent variable in predicting leveraged systematic risk

The price-per-share to book value-per-share (ln_Price/Book) was found to be a significant contributor in the prediction of leveraged systematic risk. In Table 5.5, it was indicated that p = 0.000 and p < 0.05. For this reason, ln_Price/Book was found to be an important independent variable in the prediction of leveraged systematic risk. Again, the variable was natural log transformed for the purpose of correcting a non-parametric distribution.

e) The price-per-share to net asset value-per-share as independent variable in predicting leveraged systematic risk

The price-per-share to net asset value-per-share (ln_Price/net assets) proved to contribute to the estimation of leveraged beta (in Table 5.5), where p = 0.009 and

$p < 0.05$. This independent variable was also natural log transformed to ensure that variables with parametric distributions were included for multiple regression testing.

f) Return on external investments as independent variable in predicting leveraged systematic risk

From Table 5.5, it can be derived that the return on external investments (ln_ROEI) contributed significantly to the estimation of leveraged beta, where $p = 0.009$ and $p < 0.05$. In Table 5.2, it was found that the distribution of this independent variable was non-parametric in nature. In Table 5.3, it can be observed that this variable was natural log transformed to correct the non-parametric distribution for inclusion in the multiple regression testing.

g) The total assets to capital employed ratio as independent variable in predicting leveraged systematic risk

For estimating leveraged beta, it was found that the total assets to capital employed ratio (ln_assets/cap) could significantly contribute to the prediction of systematic risk. In Table 5.5, it can be observed that $p = 0.000$, where $p < 0.05$.

Again, ln_assets/cap was natural log transformed to ensure that the statistical distribution was parametric. Transformations can be observed in Table 5.3.

In summary, it is posited that leveraged systematic risk could be predicted by means of: LB = -0.723 + 1.186(ln_assets/cap) – 0.356(ln_CR) – 0.895(ln_DE) + 1.480(ln_Price/Book) + 0.395(ln_Price/net assets) + 0.046(ln_ROEI) + 0.146(ln_CF/share) – 2.391(ln_MVA)

In Table 5.5, it was indicated that the multiple regression model fit the data well, as $F(8,67) = 9.680$, $p < 0.005$. T-values fell within a negative range $-7.260 \leq t \leq -2.096$ and a positive range of $2.694 \leq t \leq 5.295$. This is within the set benchmark for t-values (refer to Table 3.13). As $R^2 = 0{,}536$, the model can predict 53.6% of changes in leveraged beta. According to Reid (2013:88), a multiple regression model can significantly predict change in a dependent variable if $R^2 \geq 50\%$. In this case, it can be submitted that the new model pertaining to leveraged beta can significantly predict changes in leveraged systematic risk.

In par. 7.2.2.3, secondary empirical objective 3 is explored.

7.2.2.3 Develop a new unleveraged systematic risk model, consisting of accounting factors, for JSE sampled companies

Secondary empirical objective 3 was addressed in Chapter 5. This objective focused on accounting factors pertaining to liquidity measures, price-per-share to book value-per-share, return on external investments, MVA, and the debt to assets measure. Each of these accounting factors are discussed in separate subsections hereafter.

a) Liquidity measures as independent variable in predicting unleveraged systematic risk

In Table 5.6, the quick ratio (ln_QR) was identified as a significant independent variable ($p = 0.000$, thus $p < 0.05$) in predicting unleveraged systematic risk. In addition, cash flow per share (ln_CF/share) was pointed out as a significant contributor to unleveraged systematic risk, where $p = 0{,}000$ and $p < 0.05$. Both these liquidity measures underwent natural log transformation (see Table 5.3) to ensure that the non-parametric distributions were corrected to parametric distributions.

b) The price-per-share to book value-per-share as independent variable in predicting unleveraged systematic risk

In Table 5.6, the price-per-share to book value-per-share (ln_Price/Book) was listed as a significant contributor ($p = 0.000$, thus $p < 0.05$) to the prediction of unleveraged systematic risk. It should be noted that the ln_Price/Book was also natural log transformed to ensure that the statistical distribution was parametric. Transformations can be observed in Table 5.3.

c) Return on external investments as independent variable in predicting unleveraged systematic risk

With regard to return on external investments (ln_ROEI), it was found that this independent variable was able to contribute significantly to the prediction of unleveraged beta. In Table 5.6, it was indicated that $p = 0.006$, where $p < 0.05$. ln_ROEI was natural log transformed (in Table 5.3) to ensure that its distribution was parametric in nature.

d) MVA as independent variables in predicting unleveraged systematic risk

From Table 5.6, it can be derived that ln_MVA contributed significantly to the estimation of unleveraged beta, where $p = 0.000$ and $p < 0.05$. Table 5.2 showed that the distribution of variables was non-parametric in nature, while Table 5.3 indicated

that this variable was natural log transformed to correct the non-parametric distribution for inclusion in the multiple regression model.

e) The debt to assets ratio as independent variable in predicting unleveraged systematic risk

In the instance of estimating unleveraged beta, it was found that the debt to assets ratio (ln_DA) was a significant contributor in the prediction of systematic risk. In Table 5.6, it can be observed that p = 0.000, where p < 0.05. The debt to assets ratio was also natural log transformed to ensure that the statistical distribution was parametric. Transformations can be observed in Table 5.3.

Per synopsis, it is submitted that unleveraged beta can be predicted as:

UB = -1.383 – 0.933(ln_DA) + 1.148(ln_Price/Book) + 0.061(ln_ROEI) + 0.150(ln_CF) – 1.442(ln_MVA) – 0.347(ln_QR).

Table 5.6 indicated that the data were a good fit to this model, where F(6,69) = 13.878, p = 0.000. T-values fell within the negative range of $-7.474 \leq t \leq -4.036$ and the positive range of $2.865 \leq t \leq 6.075$. These intervals are well within the norms for t-value measurement. The R^2 of the model was equal to 0.547, indicating that the model can predict 54.7% of changes in unleveraged beta. As the new model can predict more than 50% of changes in unleveraged systematic risk, it can be posited that the newly developed model is indeed statistically significant.

In par. 7.2.2.4, hereafter, secondary empirical objective 4 is investigated.

7.2.2.4 Compare the newly developed systematic risk models to the existing MPT model

Secondary empirical objective 4 was addressed in Chapter 5, Table 5.7. The existing MPT model and the newly developed models were compared based on visual presentation, variables, variable details, generalisation potential, market orientation, and practicality of application.

Table 5.7 provided a virtual presentation of the different models. With regard to the variables of the models, it was indicated that the MPT consists of two variables: risk and return. For the newly developed model which predicts leveraged beta, the dependent variable is represented by leveraged beta, while the independent variables are represented by ln_Assets/cap, ln_CR, ln_DE, ln_Price/Book, ln_Price/net assets,

ln_ROEI, ln_CF/share, and ln_MVA. For the newly developed model which predicts unleveraged beta, the dependent variable is represented by unleveraged beta, while the independent variables consist of ln_DA, ln_Price/Book, ln_ROEI, ln_CF/share, ln_MVA, and ln_QR. Furthermore, it was highlighted that the variable descriptions provided by the MPT are vague and ambiguous, while the newly developed model provides precise descriptors of how the variables should be interpreted.

With regard to generalisation potential, it has been argued previously that the MPT can be generalised to all markets over all time frames, although this generalisation has not been supported by all possible empirical evidence. It was, however, indicated that the newly developed models should also not be generalised, as they apply only to the sampled companies.

Pertaining to market orientation, it was clear that the MPT is oriented towards developed markets, while the newly developed models are oriented towards the South African market. Lastly, the practicality of the MPT is not apparent, as it is unclear which variables reflect 'systematic risk' and which reflect 'returns'. This leaves gaps for interpretation. In contrast, the newly developed models offer easier interpretation, as the variables are explicitly indicated.

To summarise, it can be posited that the MPT and the newly developed models differed based on the selected variables, available variable details, generalisation potential, market orientation, and the practicality of application. In par. 7.2.3, the fulfilment of the primary objective is discussed.

7.2.3 Fulfilment of the primary objective

The primary objective of the study was identified in Chapter 1, par. 1.5.1, namely: *to develop a new systematic risk model, which consists of accountancy-related items other than returns, to predict leveraged and unleveraged systematic risk in selected JSE listed companies.* Overall, it can be posited that the primary objective of the study was carefully fulfilled through a three-stage approach (refer to Chapter 1, Figure 1.2):

- Stage 1 entailed an investigation into the viability of the risk-return trade-off as it related to the sampled entities. Here it was found that selected accountancy-related return measures could not significantly predict leverage or unleveraged systematic risk. This stage illustrated the need for further testing and new model development. Stage 1 of the research was supported by theoretical analysis, addressed in

Chapter 2, and the fulfilment of secondary theoretical objectives 1 to 3 (Chapter 1, par. 1.5.2.1). Support for the quantitative aims of this stage was provided in Chapter 4 and in the fulfilment of secondary empirical objective 1 (Chapter 1, par. 1.5.2.2);

- In Stage 2, two new systematic risk models were empirically constructed. The models consisted of accountancy-related items other than return measures. This stage provided empirical evidence that it is indeed possible to construct statistical models, which do not include return measures, to predict both leveraged and unleveraged systematic risk for the sampled companies. This stage was supported by the quantitative analysis in Chapter 5, as well as by the fulfilment of secondary empirical objectives 2 to 4 (Chapter 1, par. 1.5.2.2); and
- Stage 3 involved a qualitative analysis of recent research in the form of peer-reviewed academic articles to find qualitative support for the newly developed models proposed (Chapter 6). This stage supported the primary objective by showing that its fulfilment, through the development of new systematic risk models, could be supported by other international research. This confirms that the proposed models did not result from empirical happenstance, based exclusively on the data collected for the sampled companies. Other international studies have also reached identical or similar findings.

Ultimately, the primary objective of this study was fulfilled by demonstrating that leveraged systematic risk could be predicted by means of:

LB = -0.723 + 1.186(ln_assets/cap) – 0.356(ln_CR) – 0.895(ln_DE) + 1.480(ln_Price/Book) + 0.395(ln_Price/net assets) + 0.046(ln_ROEI) + 0.146(ln_CF/share) – 2.391(ln_MVA)

while unleveraged systematic risk could be predicted by means of:

UB = -1.383 – 0.933(ln_DA) + 1.148(ln_Price/Book) + 0.061(ln_ROEI) + 0.150(ln_CF) – 1.442(ln_MVA) – 0.347(ln_QR)

The fulfilment of the primary objective and the multiple regression formulation of these two newly developed models were unique for the following reasons:

- South African researchers have not questioned the empirical applicability of the risk-return trade-off as it relates to systematic risk for South African companies. Consequently, South African researchers have not attempted to formulate

systematic risk by means of accountancy-related items other than return measures;

- Two different models were developed, and the researcher did not operate under the assumption that both leveraged and unleveraged systematic risk could be predicted by means of identical independent variables. It is often the case that researchers simply apply beta as a dependent variable when attempting to estimate systematic risk, not paying attention to whether such systematic risk is leveraged or not. This phenomenon can, for example, be observed in Chapter 2, Table 2.8 where it was shown that other researchers simply indicated 'beta' as dependent variable without additional explanation with regard to its leverage; and
- Qualitative support for the newly developed models was sought to confirm that other researchers have also identified similar or identical independent variables for the prediction of systematic risk. Thus, the research did not rely on quantitative analysis only, but applied a mixed methodology to fulfil the primary objective.

In par. 7.3, the research questions of this study are answered.

7.3 RESEARCH QUESTIONS ANSWERED

In Chapter 1, par. 1.4, three research questions were set out. These questions are answered in par. 7.3.1, par. 7.3.2 and par. 7.3.3, respectively.

7.3.1 Are measures of risk and return related to each other when JSE listed companies are sampled?

The answer to this research question is that the risk-return trade-off did not apply to the sampled JSE listed companies.

In Chapter 4, Table 4.5, it was indicated that SPSS (version 26) pre-selected five independent variables to generate the most effective multiple regression model for predicting leveraged beta. These independent variables were ln_EPS, ln_NPM, ln_ROE, ln_DY, ln_PE and a constant value of -0.488. Although the model proved to be a good fit for the data ($p < 0.05$), the model was unable to explain enough variability in leveraged beta. The model delivered an R^2 of 20.2%. In technical terms, a model should predict at least 25% of changes in the dependent variable (Sarstedt & Mooi, 2014). Since the model was unable to deliver an R^2 of 25% or more, it can be posited the risk-return trade-off did not apply to the sampled companies with regard to leveraged beta.

In Chapter 4, Table 4.6, it was demonstrated that SPSS (version 26) also pre-selected five independent variables to generate a stepwise, automatic multiple regression model that best fit the data relating to unleveraged beta ($p < 0.05$). The independent variables were ln_EPS, ln_ROE, ln_DY, ln_EY, ln_OPM, and a constant value of 0.125. The multiple regression model which predicts unleveraged beta resulted in an R^2 of 16.6%. Again, the model delivered an R^2 smaller than 25%, and for this reason it can be posited the risk-return trade-off did not apply to the sampled companies with regard to unleveraged beta.

To summarise, it can be submitted that accountancy-related return measures for the sampled companies could not predict enough changes observed in leveraged or unleveraged beta.

7.3.2 Can the MPT be replaced by new models that explain the behaviour of systematic risk?

The answer to this research question is that the risk-return trade-off can be replaced by new models that better explain the behaviour of systematic risk. Table 7.1 provides a summary of the explanation.

Table 7.1: Comparison of predictive models

Model constructed	Cross-reference	R^2
Leveraged beta predicted by means of accountancy-related return measures	Table 4.5	20.20%
Unleveraged beta predicted by means of accountancy-related return measures	Table 4.6	16.90%
Leveraged beta predicted by means of liquidity ratios, market ratios, solvency ratios and the gearing ratio	Table 5.5	53.6%
Unleveraged beta predicted by means of liquidity ratios, market ratios and solvency ratios	Table 5.6	54.70%

Source: Author

From Table 7.1, it can be observed that accountancy-related return measures were able to predict 20.20% of change in leveraged beta, and 16.90% change in unleveraged beta. On the other hand, liquidity ratios, market ratios, solvency ratios and the gearing ratio could predict 53.60% of changes in leveraged beta, while liquidity

ratios, market ratios and solvency ratios could estimate 54.70% of changes in unleveraged beta. Based on the findings summarised in Table 7.1, it is posited that liquidity ratios, market ratios, solvency ratios and the gearing ratio were better predictors of systematic risk than the selected accountancy-related return measures. Thus, the risk-return trade-off can be replaced by accountancy-related measures other than returns with regard to the sampled companies.

7.3.3 Are the same accounting factors indicative of changes in both leveraged and unleveraged systematic risk?

Based on the findings put forward in Chapter 5, par. 5.3.4, and Tables 5.5 and 5.6, the accounting factors that are indicative of changes in leveraged and unleveraged beta are similar, but not identical. Table 7.2 explains the similarity and differences between the independent variables which predict leveraged and unleveraged beta.

Table 7.2: Independent variables that predict systematic risk

Dependent variable	Independent variable – ratio type	Independent variable – ratio
Leveraged beta	Liquidity ratios	ln_CF/share
		ln_CR
	Market ratios	ln_MVA
		ln_Price/Book
		ln_Price/net assets
		ln_ROEI
	Solvency ratio	ln_assets/cap
	Gearing ratio	ln_DE
Unleveraged beta	Liquidity	ln_CF/share
		ln_QR
	Market ratios	ln_MVA
		ln_Price/Book
		ln_ROEI
	Solvency ratio	ln_D/A

Source: Author

From Table 7.2, it can be deduced that leveraged beta can be estimated by means of liquidity ratios, market ratios, solvency ratios and the gearing ratio, while unleveraged beta can be better predicted by means of liquidity ratios, market ratios and solvency

ratios. The prediction of leveraged and of unleveraged systematic risk share the following independent variables: ln_CF/share, ln_MVA, ln_Price/Book and ln_ROEI.

The differences in predictive independent variables consist of leveraged beta being predicted by ln_CR, ln_Price/net assets and ln_DE, while unleveraged beta can be predicted by ln_QR and ln_DA.

In summary, leveraged and unleveraged beta can be predicted by four shared, identical independent variables in the case of the sampled companies, but leveraged and unleveraged systematic risk could not be predicted by an identical set of independent variables.

7.3.4 How would newly developed models compare to the existing MPT?

This research question was answered in Chapter 5, Table 5.7. In Table 5.7, it was indicated that the MPT and newly developed models can be compared in terms of:

- Visual presentation, where it became clear that the newly developed models and the MPT are visually very similar;
- Variables, where it was demonstrated that the MPT consisted of only two variables (one dependent and one independent variable). The newly developed models consisted of multiple independent variables and a single dependent variable;
- Clarity of definition, which emphasised the fact that variables are vaguely described by the MPT, while the newly developed models provide clearly defined, quantifiable interpretations of variables;
- Generalisation potential, which put forward that the MPT is generalised to all markets, despite conflicting research findings. On the other hand, the newly developed models are not generalisable, but only apply to the sampled entities;
- Market orientation, where is was posited that the MPT is oriented towards developed markets, while the newly developed models are oriented towards the South African market; and
- Practicality of application, where it was indicated that the MPT is difficult to apply, because its variables are not clearly defined. The new developed models are easier to apply, since it indicates the exact variables that are used to estimated both LB and UB

The preceding paragraphs (i.e. par. 7.2 and par. 7.3) focused on the fulfilment of the research objectives and answering of the research questions. In par. 7.4, hereafter, the research recommendations are discussed.

7.4 RESEARCH RECOMMENDATIONS

The recommendations submitted in this section are based on the research findings. Table 7.3 indicates the key findings from this study, supported by cross-references to the relevant tables in the thesis. Based on each findings, a recommendation is provided in the last column of the table.

Table 7.3: Recommendations based on findings

Key finding	Cross-reference	Recommendation
Systematic risk and accountancy-related return measures are neither directly nor positively related.	Tables 4.5 and 4.6	Investors who opt to invest in the sampled companies may want to avoid stepping into the risk-return trade-off trap. The general assumption that risk and return measures are related does not apply. Therefore, investors should not accept that investments that carry higher risk will result in higher returns. The empirical findings from this research provide no evidence that higher risk can lead to higher returns. It is therefore recommended that investors do not inadvertently accept higher risk, as it will probably not lead to more returns.
Selected measures of liquidity, solvency and market ratios can be applied to predict the behaviour of systematic risk.	Tables 5.5 and 5.6	Investors who are interested in investing in the sampled companies are encouraged to monitor systematic risk as follows: 1. Through monitoring beta values, as these values are a good indication of how risky an investment is in relation to the rest of the market; but 2. As beta values are not widely published and their interpretation may be difficult to comprehend, investors can also resort to the empirical systematic risk models proposed in par. 5.3.4 of Chapter 5. These models

Key finding	Cross-reference	Recommendation
		may provide guidance with regard to accountancy-related measures that may be beneficial when seeking patterns in historical systematic risk behaviour and aiming to predict possible future behaviour.

Source: Author

In par. 7.5, hereafter, the contribution made by this study is elaborated on.

7.5 CONTRIBUTION TO THE FIELD OF MANAGEMENT ACCOUNTING

As alluded to by Newcome (2015:1), the ultimate purpose of research is to contribute to knowledge. Babbie (2013:3) adds by stating that research should assist in a better understanding of the world. Thus, as all research should, this thesis contributed to knowledge within the academic sphere, specifically to the field of Management Accounting. Three distinct contributions can be identified, as set out in Figure 7.4.

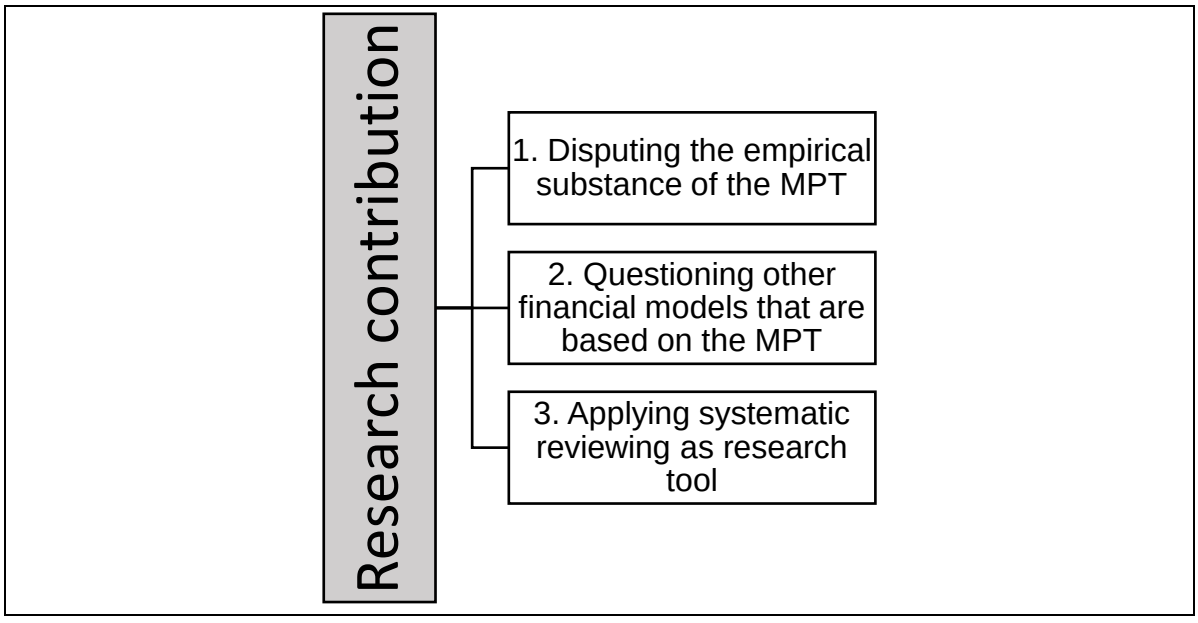


Figure 7.4: Research contribution

Source: Author

Figure 7.1 illustrates that three contributions were made through this research. Firstly, it brought to the fore the long-overdue dispute as to whether the MPT is indeed suitable for estimating systematic risk in the South African context. This dispute is not new (see Chapter 1, Tables 1.1 to 1.3 for an overview of previous research that has questioned

the appropriateness of applying accountancy-related return measures to estimate systematic risk). However, the applicability of the MPT has not been questioned by South African researchers in the context of JSE listed firms. The current study empirically demonstrated that the MPT cannot be accepted as absolute truth and that the theory does not apply to the sampled South African companies. As indicated by similar recent findings from international researchers such as Mulli (2013), Salvador *et al.* (2014), Ghysels *et al.* (2016), Vongphachanh and Ibrahim (2020), and Tekin (2021), it is probable that many more samples exist for which the MPT would fail to explain systematic risk behaviour. This research demonstrated that renewed thinking is required and that the estimation of systematic risk may not be as simple as once imagined. Empirical analysis will need to be performed continually to search for new patterns that may better explain systematic risk behaviour where the MPT falls short.

The study turned attention to the dispute at hand by also demonstrating that leverage can potentially affect the type of predictors required to estimate systematic risk. In Chapter 5 it was found that independent variables which predict leveraged systematic risk are not identical to independent variables which predict unleveraged systematic risk (refer to Table 7.2 for a clear distinction). This phenomenon has often been overlooked by other researchers. In Chapter 2, Table 2.8, it can be observed that previous research has not specifically consider the type of beta value selected as dependent variable when estimating systematic risk. This could lead to obscurity when systematic risk models are empirically tested for quantitative substance, as it may be unclear whether the models attempt to predict leveraged or unleveraged systematic risk. From a South African perspective, brokers or investors would probably turn to the model for leveraged systematic risk prediction, as listed South African companies are often funded by both debt and equity.

Disproving the viability of the risk-return trade-off, as it relates to the sampled JSE listed companies, can be helpful in the following ways:

- South African investors who invest in the sampled companies can now become aware that the prediction of systematic risk does not necessarily depend on returns and that absorbing higher risk may not result in higher returns;
- South African brokers and investors may want to turn to empirical testing when attempting to comprehend systematic risk and disregard the general assumptions put forward by theoretical financial models; and

- South African investors may turn their attention to other identified measures (such as liquidity, solvency and market ratios) in addition to return measures.

Lastly, in relation to the first contribution listed above (Figure 7.4), it should be noted that the MPT does not provide clear explanations as to how the terms ‘risk’ and ‘return’ should be interpreted (Chapter 1, par. 1.4). In this regard, the study’s contribution lies in the fact that it clarifies the ambiguity by performing an extensive theoretical analysis of both these terms (see Chapter 2). Consequently, this research may even be helpful to those who still opt to adopt the risk-return trade-off but require clear guidance on how these terms should be interpreted.

Returning to Figure 7.4, the second contribution of this research was that it brought other financial theories into question. Owing to the hasty adoption of the MPT, other financial theories have integrated the risk-return trade-off into their conceptualisation (see Chapter 1, par. 1.6). Two theories, in addition to the MPT, were brought into question, as far as investment decision making is concerned: the CAPM and APT.

The CAPM assumes that higher risk should lead to higher risk-bearing benefit for investors (refer to Chapter 2, par. 2.3.1). But in the case of accepting that higher risk and higher returns are related, while this phenomenon does not manifest itself in empirical reality, the cost of equity cannot be estimated accurately.

As indicated by Formula 2.3 in Chapter 2, the CAPM is calculated by multiplying the beta value by the market premium and then adding the risk-free rate. But in instances where risk and return are not related, it would be incorrect to put forward that the market premium should be multiplied by the beta value. This can be explained by means of an example. Suppose the beta value of a firm is equal to 1,5. By multiplying the beta value by the market premium, it is mathematically argued that investors expect a return equal to 1,5 times the market premium to compensate for investing in an investment that is 1,5 times as risky as the market. But if higher risk is not compensated for by higher returns, the market premium should not increase in proportion to the beta value. Consequently, cost of equity can either be over- or underestimated.

In case of underestimation, the entity will suffer losses, as it may compare a too low cost of equity to the return on investment generated by projects, and overestimate profit potential. Where an excessive cost of equity is estimated, it may lead to an

inflated weighted average cost of capital (WACC). This affects the market value of the company, as a higher WACC leads to a lower market value of the firm (ACCA, 2021). In addition, the answer resulting from the CAPM is often applied as a discount rate in the calculation of net present values, free cash flow analysis and the dividend growth model. If the CAPM erroneously assumes that risk and return are related in cases where they are not, it may be posited that the application of the CAPM, as discount rate, could result in further inaccurate outcomes.

In Chapter 1, par. 1.6, it was indicated that the accuracy of the APT also hangs in the balance when systematic risk and return measures are not related to each other. The APT is similar to the CAPM, but it estimates several different beta values for several risk premiums. The APT is a multifactorial model which calculates a beta value associated with every risk premium in the model (Szczygielski, 2018:9). But, evidently, if risk and return measures are not related, it would not seem logical to assume that higher risk leads to a higher risk-bearing reward.

Figure 7.4 indicates that the final contribution made by this research lies in its methodology. This study applied a mixed methodology, including both quantitative and qualitative methods, to reach conclusions. The study applied systematic reviewing as a qualitative method – a method which is often applied in educational and medical research, but not in accounting research (also refer to Chapter 1, par. 1.7.2.2). This study proved that the application of systematic reviewing can be extended to accounting research and that the empirical findings of previous financial research can be a useful qualitative tool when researchers are seeking additional support for the models that have been developed. Other accounting researchers may consult this study for future reference to obtain an understanding of how systematic reviewing could apply to their own research.

In par. 7.6, hereafter, the research limitations are explored.

7.6 LIMITATIONS OF THE RESEARCH

The expected limitations of this research were alluded to in par. 1.10 of Chapter 1. In this section of Chapter 7, the limitations are revisited, with the purpose of elaborating and providing reasons for the existence of the limitations, as well as reasons why they were not eliminated in the course of the study. Table 7.4 provides an overview of the limitations.

Table 7.4: Limitations of the study

Limitation	Reason for limitation	Reason why limitation was not eliminated
The quantitative sample of the study was small and consisted of only 33 sampled companies. Consequently, findings are not generalisable.	Data were collected from the recognised research database, IRESS. Unfortunately, IRESS does not make a full set of required data available for all companies populated.	Ratios could have been calculated manually, but this could have led to potential inconsistency and human error. For those reasons, ratios were not calculated manually.
Data included for statistical analysis were collected from a single stock exchange: the JSE.	Both the title and primary objective of this research limited the investigation to JSE listed firms.	The objectives of this study were oriented towards the exploration of findings related to listed South African companies. This study did not intend to perform international or comparative research.
The study focused on the statistical testing of beta as a systematic risk measure. Macroeconomic factors such as interest rates or inflation rates were not included for testing but could potentially serve as proxies for systematic risk.	As this study falls within the scope of Management Accountancy, rather than Macroeconomics, economic proxies for systematic risk were not included for statistical analysis.	This limitation was not eliminated for two reasons: *As demonstrated by Table 2.8, a plethora of researchers have applied beta as proxy for systematic risk. This means that beta has proven to contain research substance in the exploration of systematic risk behaviour; and *Figure 2.2 demonstrates that macro-economic factors bring about systematic risk. Based on information in Table 2.4, beta was found to be a measurement that encumbers the effects of macroeconomic factors. Therefore, beta indirectly measures the effects of macroeconomic factors, and the individual inclusion of such factors can potentially be considered obsolete.

Limitation	Reason for limitation	Reason why limitation was not eliminated
The systematic review in Chapter 6 limited the qualitative analysis to the collection of only three years of qualitative data.	The collection of only three years of qualitative data was determined by the qualitative sampling criteria in par. 6.3.1 in Chapter 6.	When sifting through enough qualitative data, qualitative support may eventually be found for almost all phenomena, despite the data being outdated. The goal was to ensure that the qualitative data included in Chapter 6 were relevant. This was done by selecting to include only recent research findings which corroborate the quantitative findings contained in the research.

Source: Author

After the discussion of the study limitations, suggestions for further research are listed in par. 7.7, hereafter.

7.7 SUGGESTIONS FOR FURTHER RESEARCH

Based on the findings of the study, the following suggestions are made for further research:

- The research methodology of this study can be mimicked and applied to a larger sample of South African companies, which may also include companies listed on AltX;
- The study can be duplicated with a sample of companies from other African countries to observe whether similar findings can be reached;
- The study can be duplicated to observe whether the return on external investments measure proves to be a significant predictor of systematic risk when other companies are sampled for testing; and
- Further research can be done to determine how the use of IRESS places restrictions on secondary data collection and how such restrictions can be overcome.

Paragraph 7.8, hereafter, concludes this study. Closing remarks with regard to the findings of the study and their usefulness and meaning are elaborated on, one last time.

7.8 CLOSING REMARKS

The philosopher Rene Descartes put forward that human nature seeks certainty (Skirry, 2022). To create a sense of certainty regarding the estimation of systematic risk, researchers and academics have uncritically adopted the MPT and, in the process, confused their humane pursuit of certainty for empirical fact. It is further said that 'certainty is the enemy of truth' (Boghossian, 2021). Based on the findings of this thesis, it is submitted that certainty needs to be dismissed, to uncover the empirical truth regarding systematic risk.

To conclude this study, it is posited that the estimation of systematic risk should be placed within a predetermined context. For a long time, it has been accepted that systematic risk is predicted by movements in returns. The MPT has generally been accepted without consideration of context, timing of development, location, or the market within which the theory was developed. The MPT was absorbed into academic literature and developed further, without questioning its substance. This research proved that academics and researchers need to move away from 'textbook' thinking. When a financial phenomenon requires understanding, model development should be placed within the context of the problem. To understand systematic risk, it needs to be modelled within the specifications of markets, market segments or, on a micro-level, within companies.

There is no universal solution for the comprehension of systematic risk. This research contributes to the field of finance by demonstrating that more open-minded approaches need to be followed when financial phenomena are analysed. Portfolio theories have been generalised to a great extent, and such generalisation should be questioned if researchers intend to understand systematic risk from different perspectives. This study proved that systematic risk can be estimated by means of liquidity, market ratios, solvency and gearing, for the sampled companies. It is submitted that prediction models were able to combine different financial aspects (not just returns) to predict systematic risk. This finding benefits investors by encouraging an open-minded approach to the analysis of systematic risk. Investors are encouraged to investigate a range of financial aspects when

systematic risk is explored and avoid the limitation of focusing on the analysis of returns, to the exclusion of other financial indicators.

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APPENDIX A: PROOF OF JOURNAL ACCEPTANCE

Natasha Robbetze (Vaal University of Technology, South Africa)

Dear author:

Based on a double-blind peer review and the recommendation of two independent reviewers and the editor regarding current editorial requirements, your manuscript entitled "Share Price As Dependent Of Basic EPS Or DPS – A South African Perspective" has been accepted for publication in the *Journal of Applied Business Research (JABR).* This acceptance is valid for one year.

The Article Processing Charge (APC) for your manuscript is $600. See the attached invoice for details. Hard copies of the journal in which your manuscript is published in, may be purchased for $50 per copy (plus international shipping). To make payment using PayPal, please visit https://www.cluteinstitute.com/article-processing-charges/. If you need an invoice for the APCs or want to pay by bank transfer or western union, please send an email to Payments@CluteInstitute.com. To make a payment using a Visa or MasterCard, please call our office.

As a condition of publication, the authors must grant the Clute Institute the right to disseminate their manuscript to the widest possible readership in print and electronic format. Authors must also agree to our open access policy, which is to provide immediate open access to our journals on the principle that making research freely available to the public supports a greater global exchange of knowledge. Users are allowed to read, download, copy, distribute, remix, tweak, build upon, print, search, or link the full text of the articles in this journal provided that appropriate credit is given.

An estimated publication date will be emailed to the contact author following payment and a formatted draft of the paper will also be emailed for approval prior to publication. At the time of publication, each author will receive a complimentary PDF copy of their manuscript. Please make sure that we are provided with an email address for each author. For journal rating purposes, we are including email addresses in the author biographies.

Attached is our current call for journal and conference papers. We hope that you can join us at one of our future conferences.

Congratulations on your successful acceptance and thank you for choosing the Clute Institute as your resource outlet. Please reference number JABR-9064 in the subject of all future correspondence.

Best regards,

Kind Regards,

Tracey
~~~~~~~~~~~~~~~~~~~~~~~~

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APPENDIX B: PROOF OF CONFERENCE ABSTRACT

Please press ‘control’ and then click on the pdf icon.

View page 96 of the pdf document.

APPENDIX C: ETHICAL CLEARANCE

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
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Economic and Management Sciences Research
Ethics Committee (EMS-REC)

28 May 2021

Prof MJ Swanepoel
Per e-mail
Dear Prof Swanepoel

EMS-REC FEEDBACK: 28052021
Student: Robbetze, N (22741569)(NWU-00853-21-A4)
Applicant: Prof MJ Swanepoel – PhD in Management Accounting

Your ethics application on, ***Developing a systematic risk model for JSE listed companies,*** which served 28 May 2021, refers.

Outcome:

Approved as a minimal risk study. A number **NWU-00853-21-A4** is given for one year of ethics clearance.

Please note that the ethics approval of this application is subject to the Covid-19 protocols.

Kind regards,

Mark Rathbone

Digitally signed by Mark Rathbone
DN: cn=Mark Rathbone, o=North-West University, ou=Business management, email=mark.rathbone@nwu.ac.za, c=ZA
Date: 2021.06.02 15:25:15 +02'00'

Prof Mark Rathbone
Chairperson: Economic and Management Sciences Research Ethics Committee (EMS-REC)

APPENDIX D: DESCRIPTIVE STATISTICS FOR CHAPTER 4

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
LB	165	-0,857	3,111	0,756	0,653
UB	165	-0,692	3,071	0,589	0,541
ln_NPM	165	0,113	5,220	2,281	0,999
ln_OPM	165	0,626	4,931	2,536	0,858
ln_ROA	165	0,247	3,847	2,520	0,703
ln_ROE	165	-0,892	6,090	2,792	0,822
ln_ROCE	165	-1,139	5,702	2,413	0,917
ln_ROAA	165	0,464	4,337	2,712	0,743
ln_ROAE	165	-0,916	5,695	2,982	0,820
ln_Inf adj ROA	165	-0,734	4,858	2,503	0,713
ln_Inf adj ROE	165	-1,022	6,079	2,592	0,967
ln_Inf adj ROAA	165	0,464	4,337	2,712	0,743
ln_Inf adj ROAE	165	-1,050	5,685	2,792	0,957
ln_DPS	165	2,546	8,434	5,831	1,289
ln_DY	165	-1,514	3,086	1,247	0,689
ln_EPS	165	2,539	9,477	6,474	1,293
ln_EY	165	0,020	3,125	1,758	0,524
ln_Inf adj p/share	165	3,129	10,424	6,463	1,380
ln_PE	165	1,482	4,582	2,847	0,524
ln_Price/share	165	6,349	12,710	9,332	1,276

APPENDIX E: DESCRIPTIVE STATISTICS FOR CHAPTER 5

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
LB	165	-0,857	3,111	0,756	0,653
UB	165	-0,692	3,071	0,589	0,541
ln_CR	165	-0,760	10,200	0,702	1,545
ln_QR	165	-1,350	11,370	0,419	1,993
ln_CF/share	165	4,800	10,010	6,887	1,579
ln_Asset/Capital	165	1,770	1,150	0,120	0,441
ln_DA	165	-0,241	0,960	0,846	0,626
ln_DE	165	-2,300	1,520	0,272	0,833
ln_Price/Net assets	165	-1,020	3,930	1,089	1,082
ln_ROEI	165	-0,970	7,700	2,060	1,906
ln_Price/Book	165	-0,800	10,800	1,183	1,777
ln_MVA	165	-0,670	2,570	0,764	0,704