
Intrinsic Valuation of REITs

by

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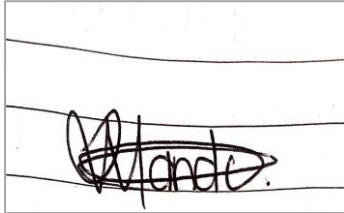
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Declaration

I declare that this Ph.D. Thesis is my own, unaided work. It is submitted in partial fulfilment of the degree of Doctor of Philosophy in the subject area of Finance at the University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted before for any degree or examination in any other university.

Date: 26 February 2024

Signature of Candidate:

A rectangular box containing a handwritten signature in black ink. The signature is written in a cursive style and appears to read 'T. Manda'.

Tamala Amelia Manda (Student No.: 722706)

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I would like to acknowledge, those who have come before me from the Manda, Banda and Chaka clan. My Lord and Saviour, King Jesus for the strength to keep pushing.

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To my unborn kids and their children- remember, If not you, then who? Therefore, go soar. With God on your side nothing will hurt you or break you. It is the finale and not a rehearsal.

Preface

Parts of this thesis have been accepted or submitted for publication as follows:

- P1: Chapter 3 has been accepted for publication under the title “Manda TA (2023). Modelling Different REIT Cash Flows. *Handbook of Investment Analysis, Portfolio Management & Financial Derivatives*, Chapter 92, Cheng-Few Lee and John C Lee eds, World Scientific, (in press)”, invitation.
- P2: Chapter 4 has been submitted for consideration for publication under the title “Manda TA (2022). “Bankruptcy Prediction in REITs”. *The International Real Estate Review*, **revise and re-submitted** (since January 2023).
- P3: Chapter 5 has been accepted for publication under the title “Manda TA (2023). “Beta Factor in the REIT Industry”. *The Journal of Beta Investment Strategies*, 14(2), 43-60.

Some parts of this work were presented at the following conferences:

- C1: The 30th Pacific Basin Finance, Economics, Accounting & Management Conference (National Taiwan University, Taipei, Taiwan), May 13th to 14th, 2022. Presented article entitled “Bankruptcy Prediction in REITs”.
- C2: The 18th African Finance Association Conference (University of Cape Town, Cape Town, South Africa), May 24th to 25th, 2022. Presented article entitled “Bankruptcy Prediction in REITs”.

Dedication

I would like to dedicate this thesis to all the young black women who feel like they are not enough. You are more than enough-you can do all things through Christ who gives you strength. Furthermore, I would like to dedicate this to my family, the Manda, Banda and Chaka Family-truly I am my ancestors' wildest dream! Who would have thought that a migrant worker grandchild would one day complete her Ph.D. thesis?

To my late Father, Mr Peter Manyeta Manda; thank you, Papa for always emphasising the importance of education and the fruits of hard work. My beautiful mother, Mrs Celia Lipontso Manda- You have always been my cheerleader and I am eternally thankful Mama for all the support you have given me through this journey. Tawonga!!

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Lastly, but most importantly- I dedicate this to the body of Christ- Arise and Shine for the Light has come and the glory of the Lord in upon thee. Thank you, Jesus.

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List of Abbreviations

CAPM	Capital Cash Flow
Cap	Capitalisation
CCF	Capital Cash Flow
CFd	Debt Cash Flow
DCF	Discounted Cash Flow
ECF	Equity Cash Flow
FCF	Free Cash Flow
FFOs	Funds from Operations
GDP	Gross Domestic Product
JSE	The Johannesburg Stock Exchange
REIT	Real Estate Investment Trust
REOC	Real Estate Operating Company
PLS	Property Loan Stock
PUT	Property Unit Trust
PV	Present Value
UK	United Kingdom
U.S.	United States of America
VAR	Vector Autoregressive

Abstract

This thesis investigates, models and presents the financial health and financial positions of the South African real estate investment trusts (from here, REITs). In order to address that investigation, this thesis is anchored on three essays-(i) dynamic cash flows, (ii) bankruptcy prediction and (iii) smart betas. The first study (i.e. chapter 3) uses different discounted cash flows (DFCs, hereafter) to determine values of REITs and those DCFs are anchored by the organisational capital structure. The second study (i.e. chapter 4) is shaped on Altman (1968) for predicting bankruptcy. Altman (1968) is one of the earliest studies that explored corporate bankruptcy. The third study (i.e. chapter 5) presents smart beta strategies, based on qualitative and quantitative betas.

The first study confirms that the value of REITs, as measured by DCFs, is sensitive to the capital structure. The second study illustrates that bankruptcy is well accounted for, when using probabilistic and multilinear models. Notably, the second study accurately predicted the default of the Rebois Property Fund in 2022 based on 2014-2018 time series, using different selected macroeconomic variables. A 5-year accurate prediction in any sector of capital markets is unheard of! The third study exemplifies that qualitative betas better measure the quality of management, while quantitative betas appropriately detect financial health and financial position of REITs.

The implications of this study are as follows. First, depending on the type-funding injected by investors, appropriate DCF valuation should be used to illustrate values, in particular, market values. Second, REITs, just like any other firms, are prone to bankruptcy, partly because the large portion of net profits are distributed to unitholders as dividends at the end of financial years. The funds from operations (FFOs), a widely acceptable REIT performance measure, equally, predict bankruptcy of these firms. Third, quantitative and qualitative betas should be used jointly in determining whether a REIT firm is investable or not.

Keywords: accounting cash flow, bankruptcy, beta, capital cash flow, debt cash flow, discounted cash flow, equity cash flow, free cash flow, REIT

JEL: C58, G12, G13, G33

Chapter 1 Introduction to the Research

1.1 Background

Property is a tangible asset that many individual and institutional investors invest in as a secure asset to earn a return on investment and store wealth in a tangible asset. The aforementioned explains why asset consultants, life insurance companies, pension funds, sovereign funds, other institutional investors, and individual investor's portfolios have property as an investment instrument (Ghent et al. 2019). The real estate sector, interchangeably property sector's, main segments include residential real estate, commercial real estate and industrial real estate. This multifaceted sector offers investors diversification benefits and a high potential for a return on investment (Letdin et al. 2019). This research will explore Real Estate Investment Trusts (REITs) as part of the real estate sector. REITs are legal entities that operate, own and manage real estate portfolios according to the Johannesburg Stock Exchange (JSE). Investors investing in REITs offer them exposure to real estate properties without complete ownership, maintenance of the properties and monthly financial obligations/commitments.

Before May 1st, 2013, the only publicly listed real estate vehicles trading on the Johannesburg Stock Exchange (JSE) were property unit trusts (PUTS) and property loan stocks (PLS). PUTs and PLS had uneven regulation, uneven tax and lacked flexibility. Although, PLS were governed by trust deeds and subject to the Financial Sector Conduct Authority (pre-2019, Financial Service Board) regulations (Collective Investment Scheme Control Act, 2002:1-49) PUTs were governed by the Companies Act (Companies Act 71 of 2008) and the JSE regulations. As such, regulations of the listed property sector were fragmented, and tax treatment structures differed for both PLS and PUTs (Kantilal, 2016), which affected investor confidence. The South African real estate market aligned with international standards, which made the listed real estate market in South Africa globally competitive (Naidoo, 2016).

REITs contributed a staggering 5.6% towards the South African GDP in 2016 (Carstens and Wesson, 2019). Lee and Chiang (2010), and Andrianto and Diputra (2017) opined that real estate investment yields higher returns contrary to the equity market, providing a steady income stream for investors. REITs have regulatory dividend policy obligations (Boudry, 2011 & Zhang and Hansz, 2019). Real estate investment vehicles are useful for diversification and hedging against inflation due to the unique property types, geographic focus and other macroeconomic factors.

Nonetheless, real estate remains a high-risk play in developing countries such as South Africa due to its unique capital structure, mandatory dividend pay-out and low-profit retention (Carstens and Wesson, 2019). Consequently, driving the need for REITs to depend on external financing. Carsten and Wesson (2019), consistent with Case et al. (2012), argue that the high dependence of REITs on external finances limits REIT's ability to invest in real estate assets, subsequently affecting the firm's value (Stein, 2003). The former exposes the firm to risk; Sharpe (1964) defines this as a systematic and non-systematic risk in the capital asset pricing model (CAPM). Guided by Sharpe (1964), unsystematic risk is specific to an individual company due to its management, geographic location and financial obligation, whilst systematic is unspecific. Noor and Abdalla (2014) provide examples of these risks; risks that firms are exposed to include credit risk, liquidity risk, foreign exchange risk, market risk and interest risk; conclusively, financial risk. According to Noor and Abdalla (2014), financial risk affects the operations, i.e. asset acquisition and maintenance of existing assets, furthermore affecting credit risk, which affects lending and borrowing by financial firms, forex risk and makes firms realise unpredictable losses, thus affecting performance.

The firm value explored in this study is extracted from the corporate finance concept of valuation. "The purpose of finance is to create value" (Fernández, 2004; 2007), Within the confines of financial theory; the definition of the procedure of valuation and investments in the financial industry implies the fundamental of calculation and operations, where they take a technical, often mathematical approach, to assign an output, which in this case is the value of an asset to inputs (mathematical variables that contribute towards value) (Ortiz, 2013).

The research will approach the concept of value guided by this insight, particularly adopting the definition given by Ortiz (2013). Ortiz (2013) suggests that value is central to contemporary professional financial practice. Value gives fluidity in terms of decision-making in a global context. For individuals involved in corporate finance, investment, and deal-making, understanding the mechanism involved in the valuation of an asset is an indispensable requisite. Fernández (2007) highlights the significance of valuation in mergers and acquisitions, adding that the valuation process helps firms and their business units associate economic value creation and deterioration sources.

Fernández (2004; 2007) further expresses that the valuation of publicly listed companies is used to (1) compare the value obtained with the share prices on the stock market, (2) decide whether to sell, buy or hold the shares, (3) make comparisons between companies when it comes to capital allocation and (4) to determine which securities the portfolio should concentrate on. The features of

REITs instruments, according to the JSE, are that REITs (i) are required to pay at least 75% of their taxable earnings available for distribution out to investors as dividends (ii) earn their income from property leases, which means that they usually have relatively stable income streams (iii) have a committee to monitor risk, and (iv) high degree of risk for investors because economic and social situations are unpredictable and may positively or negatively impact rental income, subsequently the price of REITs. It is important to note that REITs have become a desirable investment over the past few decades. However, the financial crisis commonly affects the real estate sector, particularly the global recession in 2008, which saw the amount of real estate investment transactions fall drastically the following year.

1.2 Substantiation of Problem

The South African National Treasury (2008) stated that the publicly listed property sector would have to undergo structural amendments to make it appealing and more convenient to investors. Subsequently, the introduction of legislation related to REITs was intended to result in critical changes; these include stringent regulatory requirements, which helped to uplift the South African real estate market to a level where it can compete globally with more unified tax treatments of listed property companies. Pertinent changes associated with introducing the REIT structure included taxation. Creating tax treatment from PUT and PLS structures gave investors more generous tax certainty and incentivised REIT investments (De Klerk, 2013). Naidoo (2016) concluded that a sample of industry participants and experts agreed that introducing an internationally recognised REIT structure in South Africa would increase liquidity, expansion in the South African publicly traded real estate sector, and the general performance of these entities. As a result, the REIT market in South Africa has grown exceptionally, with a 45% growth rate and achieved a staggering growth in its market capitalisation to R422 billion (Carstens and Wesson, 2019).

REIT's unique characteristics have an impact on its capital structure. Notably, South African REITs are mandated to keep their debt below 60% of the firm's gross asset value; as such, there is a high dependence on external finance (Allen and Letdin, 2020). The dependence of REITs on external financing, i.e. debt, suggests that REIT firms have financial obligations they must meet. As such, REITs are under immense pressure to ensure that they are in a position to refinance their loans while

also issuing healthy dividends to their shareholders. In line with their requirements to ensure 75% of their taxable income as dividends to their shareholders.

While the changes in the REIT structure are beneficial, one always needs to be reminded of the purpose of a company. A company's long-term goal is to maximise profit and increase shareholder gain through maximising the value assigned to the company (Jensen, 2002). A firm's increasing value benefits the company, including access to equity from the public capital markets and debt funding from institutional investors (Jensen, 2002). Furthermore, the value assigned to a company is a function of and chief to its performance, according to Hermuningsih (2016)

1.3 Problem Statement

REITs are amongst the most significant asset classes globally and are a means of storing wealth in a tangible way for many individuals and institutional investors (Womack 2012). Due to the underlying assets capital intensive nature and risk associated with rent, i.e. rental income and other economic factors (systematic and unsystematic risk), it is imperative to ensure that under/overvaluation in the REIT asset class is minimised due to its extensive capital requirements following the historical event of the Lehman Brothers. Subsequently, the Global Financial Crisis and, recently, the Covid-19 pandemic. The events of the global financial crisis proved that an asset's inaccurate valuation could affect a firm's profitability, leverage, and global financial system. As such, the incorrect valuation of an asset is detrimental to investors and the economic system. REITs are highly levered assets, which makes REITs susceptible to under/overvaluation.

Therefore, this paper puts forward the argument that it is not known what the best valuation method for South African publicly listed REITs is given the macroeconomic factors affecting REITs. The implications of not knowing those mentioned above are as follows:

- (i) Inaccurate financial valuation compromises the validity of an investor's decision to invest in a particular REIT;
- (ii) Financial reporting is driven by high transparency and investor confidence, which results in a higher frequency of liquidity and trading;
- (iii) Inaccurate valuation could result in overvaluation and undervaluation of REITs;
- (iv) Mispricing could be detrimental to investor confidence, affecting the flow of foreign direct investment.

1.4 Primary Research Question

The main research question is what are the intrinsic values of South African REIT firms considering the capital structure? That is, what are the applicable stratified DCF methods for valuing REIT firms? Considering REIT's sensitivity to the capital structure, particularly the composition of debt versus equity (See; Marcato et al. 2019).

1.5 Secondary Research Question

Based on the primary research question, the following secondary questions have been identified;

- (i) How to detect bankruptcy in REITs?
- (ii) What are meaningful measurements of risk, quantitative versus qualitative? Beta is one of the commonly used techniques to illustrate risk (Anderson et al. 2009)

1.6 Research Aim

This study aims to confidently suggest an intrinsic value for South African REITs with the consideration of capital structure compositions, whilst providing key metrics to assess potential bankruptcy in South African REITs, and finally, consider the effects of the quantitative and qualitative between risk on REITs values.

1.7 Scope

The research will determine the intrinsic values of South African REITs that were publicly listed in 2013. The study focuses only on publicly listed South African REIT firms. Therefore, the study is only limited to the South African context. Note that both in academia and in practice, standard valuations are based on a five-year horizon from the spot date (See; Crosby et al. 1998 and Marcato et al. 2019); therefore, this study will follow the same approach.

1.8 Delineation

PUTS and PLS that did not convert to REITs in 2013. This research will not explore REITs privately held in the 2013/2014 financial year; furthermore, the study will not explore REITs established in the 2013/2014 financial year.

1.9 Research Objective

Consistent with the aim, questions and all other conditions set for this research, the following research objectives are identified;

- (i) Ascertain the intrinsic values of REIT firms in South Africa.
- (ii) Establish the suitable risk metrics applicable to South African publicly listed REITs to assist with bankruptcy prediction.
- (iii) Determine and/or contrast the relationship between quantitative and qualitative risk (beta's) of REIT firms in South Africa.

1.11 Assumptions

The following assumptions are made for this research.

- (i) The DCF method is the preferred/accurate method used to value REITs,
- (ii) That value is defined similarly for individual and institutional investors,
- (iii) All investors deem the same input variables important for valuing REITs as an asset class.

Chapter 2 The Theories of Real Estate Valuation

2.1 Introduction

Valuation theory has its genesis in social sciences, where the central point is finding an objective value of any object (O'Donnell 1951). Furthermore, it can be inferred from O'Donnell (1951) that the theory of value minimises biases when judging how much an object is worth at the point in time. Sometimes, value is used interchangeably with the price of objects-price is instantaneous with spot "price" in the market. In contrast, the value considers all the fundamentals that affect the worth of the "price/value" of an object. Common value terms include (i) market value, (ii) fair value and (iii) intrinsic value. The value in this study is the latter one-intrinsic value. Those three types of values are different (See; Mooya 2011). This chapter disentangles valuation theories within the real estate framework. It can be inferred from Mooya (2011) that appropriate valuation should lead to realistic objective values, which have minimal inherent subjectivity.

2.2 Valuation Techniques

2.2.1 Appraisal Technique

Real estate returns that are reported are different from that of financial assets. The former is driven by the fact that real estate returns are dependent on returns used to measure periodic income return and capital growth. As such, an appraisal method was introduced, which is dependent on indices. It has been argued by Lizieri et al. (2012) that the latter is without its inefficiencies; as such, this practice results in "smoothing". According to Lizieri et al. (2012), consistent with Delfim and Hoesli (2021), the reliance on a smoothed measure of real estate performance could result in excess weights in property and distort performance metrics, which according to the authors, provides misleading information for risk management systems. High autocorrelation is found in appraisal-based series, produced by a lagging-effect and temporal aggregation.

In order to mitigate the effects of smoothing, which is used in the indices, namely Russell-NCREIF Index, the evaluation associates index, transaction-based indices, REIT-based indices and unsmoothing the Russel-NCREIF Property index; Geltner (1991), Fisher et al. (1994), Lizieri et al. (2012), and Delfim and Hoesli (2021) suggest unsmoothing works. The significant volatility that one

gets from unsmoothing makes it a successful method. Unsmoothed returns contrary to "smoothed" returns are not auto-correlated in reducing lagged effects. Whilst unsmoothing is not without its underlying inefficiencies, it reduces the robust errors prevalent in smoothing. Geltner (1993b) proposed a classical desmoothing model. Lizieri et al. (2012) extended this technique with the regime-switching extension. Delfim and Hoeseli (2021) argue that when changes in the underlying original series are marked, these techniques still generate unlikely extreme values, distorting real estate return distribution, further leading to an erroneous assessment of real estate investment risk in the overstating diversification benefits from real estate in a mixed-asset portfolio.

In their argument, Delfim and Hoeseli (2021) correct this using a time series filter to identify and correct the outlying values, so their influence on the return distribution characteristics is suppressed. The proposed time series still has its shortfalls; however, the method improves the following risk measures; expected shortfalls, correct for autocorrelation, generate series with higher volatility and enhance the skewness and kurtosis figures.

2.2.2 Sales and Transactional Comparison

Sales and transactional valuation methods are the same conceptually. However, the difference is that sales focus on revenues and transactions on costs. For the sake of this study, these concepts will be explored concurrently. Reinert (2020) assessed the accuracy of the German income approach compared to German DCF valuations. In this research, Reinert (2020) hypothesised that German valuations, according to GIA, and German valuations, according to DCF models, produce accurate predictors of market prices on average. With this, the researchers added further empirical evidence to the ongoing debate surrounding the GIA and its ability to mirror reality.

Doumpos et al. (2020) presented a comparative analysis about the performance of parametric and non-parametric regression techniques for developing reliable automated valuation models for residential properties. The study presented empirical evidence using machine learning and statistical approaches constructing using automated valuation models for residential properties. This study honed into the following characteristics for transactions in Greece and how incorporating spatial effects can affect the model's predictive performance. The study results showed that locally weighted linear models perform exceptionally well, seeing as they can capture spatial variations in prices more accurately than global and unweighted local approaches.

2.2.3 Cost Approach

The cost approach, according to van Vuuren (2016), determines the value of a property by depreciating the estimated new replacement cost of the buildings and adding the land value determined through the sales comparison method to arrive to a proposed value for the land and the buildings. Below the researcher will explore a case study that used the cost approach in determining the value of the condominium in Turkey.

Simsek and Uzun (2021) undertook a study whereby the authors evaluated the factors affecting the value of the condominium using the cost valuation approach. The study aimed to establish a mechanism by which the properties of the factors affecting the value can be determined mathematically and arrive at a value-based land share. According to the authors, this share reflects the ownership ratio of the landowners of the prominent real estate (land and structure). It affects the costs, expenses, construction, demolition, expropriation, management, and other decision-making processes.

According to Deniz (2013), problems associated with condominium ownership is the unavailability of criteria at the time of the determination of the land shares and the lack of field information regarding the condominium units in the land registry record. The author further emphasised that the most significant disadvantage is encountered in calculating land share when a land share distribution table is created at the sub-basement level during the easement of the condominium, before the building is constructed. The study was performed during Turkey condominium; the authors stressed that the identified problems, in addition to the ones aforementioned with land share, are that land share (1) ignores factors affecting the value (2) technical inadequacy of experts involved in land share correction proceedings and (3) difficulties in calculating the metric values of condominium units of a building that is not physically located on the ground during the establishment of condominium easement.

2.2.4 Marginal Error Approach

Property valuation includes systematic and random errors (Levy and Schuck, 2005). Valuation is understood as the estimation process in the marketplace; due to the nature of volatility in the marketplace, valuation has a degree of uncertainty as such when the market, according to Crosby et al. (2010). The authors argued whether the principle of 10%-15% of range in valuation,

approved in the English courts, is valid according to the available evidence collected from previous studies.

Awuah and Gyamfi-Yeboah (2017) investigated two main issues relating to variations in valuations in Ghana. A developing country such as South Africa experienced a surge in investor interest over the past two decades. Further, it is essential to state that two significant determinants of valuation errors are lack of reliable market data and market uncertainties. In addition, the study examined the extent of variation among valuations produced by professional valuers in Ghana in response to the growing concern about the standard practice within the country and the Sub-Saharan African region.

According to Awuah and Gyamfi-Yeboah (2017), although the existing book of knowledge on real estate valuations studied in developed and developing countries has reported that complex properties or valuation assignments are more prone to errors, none of them could conceptualise complex valuation assignments and further test the authenticity or otherwise on the assertion based on empirical data.

2.2.5 Multiple Approach

The real estate valuation literature on Sub-Saharan Africa shows growing concern about overvaluation errors extensive variation in valuations. Different valuation methodologies lead to different prices of stocks. Further research by Damodaran (2013) suggested that estimating the price of a stock could turn out to be complicated. Massari et al. (2014) stressed that valuation multiples obey a relative valuation. Further expressing multiple valuations as simple expressions of market value relative to a critical statistic assumed to be relative to that value.

Liu et al. (2002) examined the performance of value drivers. The researcher found that the most reliable multiples are based on forward earnings. These explain stock prices remarkably well contrary to historic earnings measures, cash flows measures, the book value of equity and sales. Although the research does not focus on a particular industry, overall different industries are not associated with different "best multiples". Real estate has been one of these, in as much as the multiple approach is a reliable approach that is used more commonly in the private capital market and has a 15% pricing error of stock prices (Liu et al., 2002). The use of large data sets could diminish the performance multiples. Furthermore, market participants may select comparable firms more

carefully. The multiple valuation approach shortfall presents itself in its restriction to firms with positive earnings and cash flows, as such not painting an accurate picture of the value of an asset.

2.3 Potential Solution

The traditional DCF model is generally used to estimate the present value of an enterprise or its equity based on expected future parameters such as growth rate, discount rate and cash flows (Takács et al, 2020). Existing literature supports DCF-based valuation as the most acceptable, correct valuation method (See; Damodaran 2013), and furthermore, supported by practitioners and academics alike. The DCF method is employed commonly to estimate the total enterprise value, additionally with the DCF approach, the basis of valuation is a well-designed model employing realistic assumptions related to future cash flows.

The income capitalisation approach is the potential method that has all the advantages, including disentangling and/or dismantling the corporate structure of any firm. The DCFs that are used are simply the income capitalisation approach.

Chapter 3 Dynamic Cash Flows

3.1 Introduction

Calculating DCFs is central to appropriate valuations, when one needs to make informed investment decisions. The concept of DCF is nothing new, DCFs have been in the public domain for centuries now. In most industries, other than real estate inclined industries such as REITs, valuation applications have been standardised in terms of the approaches. According to Godfrey and Koh (2001), DCFs are accounting cash flows plus depreciation and amortisation. It is important to note that accounting depreciation is not the same as property depreciation. According to Dixon et al. (1999), property depreciation decreases at a decreasing rate over time while accounting depreciation decreases at the same rate over time. Secondly, accounting depreciation does not account for capital structures of firms. Finally, the ACF does not take into account the profitability of firms. Now, are there any customised DCFs that account for vitality?

It can be inferred from Fernández (2004; 2007) that one can get more insight into investment values, when the valuation is customised to the funding-type and/or capital structure of firms. In order to perform the above, one should use free cash flows (FCF), equity cash flows (ECF), debt cash flows (CFd) and capital cash flows (CCF). One industry that is sensitive to funding-type and/or capital structure composition is the REIT industry (Marcato et al. 2019), particularly how REIT values react to different macroeconomic and qualitative “economic” variables.

According to Coskun et al. (2020), the issue of net asset value (NAV) versus share price diversion has been a long-standing point of discussion including within the Turkish REIT industry. In Coskun et al. (2020), parameters that led the divergence of financial and fundamental prices include; leverage, financial performance, liquidity, size, market sentiments and appraisal biasness of appraisers. The authors mentioned above, argued specifically that levered NAVs traded at lower levels than share price, while fair value accounting led to NAVs trading at premium. The issue of appraisal biasness is well documented in developed countries. Capozza and Israelsen (2007) stated that real assets’ values are uncertain due to acceptable margin error valuation, which led to subjective NAV values. Moreover, it can be inferred from Capozza and Israelsen (2007), that assessors make conservative assumptions when doing valuations, and that leads to diversion.

In light of the above paragraphs, the following questions were criticised: are there any benefits of differentiating valuations based on the funding-type and/or capital structure of REITs?

Do debt valuations differ from equity valuations? Do selected macroeconomic [i.e. debt, equity, funds from operations (herein, FFOs), interest as illustrated by consumer price index (CPI, hereafter), gross domestic product (GDP)] and qualitative “economics” [i.e. board composition-both race and gender, and executive composition-both gender and race] variables explain variations of different cash flows? The contribution of this study responds to those questions. The variables that were excluded for running regressions were GDP, Consumer Price Index and board composition based on gender parameters. For the first two variables, the value is always the same given that cash flows are calculated for the 2014 financial year. On the latter variable, the gender was always male dominated; hence, the regression outcome was “new singular metrics error”. Furthermore, “regressors are perfectly collinear”. Note that the variables were selected based on prior studies including Marcato et al. (2019). Fundamentally, the results illustrate that firstly, cash flows are different based on the funding-type and capital structure. Secondly, different cash flows react differently to different macroeconomic and qualitative “economic” variables.

The remainder of the article is structured as follows. Section 3.2 is on literature review. Section 3.3 is on data. Section 3.4 is on the analysis and section 3.5 concludes the study.

3.2 Literature Review

3.2.1 Equity Cash Flow

Graham and Knight (2000) explored the relationship between cash flows and earnings in the valuation of equity REITs. The authors used multilinear regressions (i.e. price model, return model and differenced-price model) where one of the main parameters was the funds from operations (FFOs). FFO is a key performance measure in the REIT industry, illustrating the operations of a REIT firm. Key parameters included in FFOs are parameters of debt nature. Insofar as FFOs are concerned, handling cash-items and non-cash items that are included in the actual calculation of cash flows, including debt cash flows (CFds). Firstly, they give the overview of equity REITs-holding and selling income-producing properties. The central theory that underpins Graham and Knight (2000) is that market-based accounting research, which according to authors focuses on financial statements effects on prices and returns. They opine that share prices contribute to FCF. On the other hand, they stated that cash flows studies dwell on two fundamental issues; (i) cash flows from operations and (ii) accruals. They put forward the argument that accruals can be manipulated. The

fact resonates with the handling of debt given accounting focusses on parameters when they incurred as opposed to when they are realised. Economics focuses on realisation. Hence, economics is more accurate than accounting. In the context of REITs, realisation versus accruals is important given that REITs use significant debt financing and that debt is structured different for one client versus the other client. By extension, *ceretis paribus*, that would imply CFds of those two would be handled differently. The subsequent question is; what is the appropriate way of handling debt financing in financial statements?

Graham and Knight (2000) state that different rules and regulations from different associations are intended to solve discrepancies. One such principle is the Generally Accepted Accounting Principles (GAAP) that was pioneered in the United States (U.S) and has many affiliated members throughout the world including South Africa. In the context of REITs, Graham and Knight (2000) stressed that GAAP has a discrepancy with the way the following items (i.e. depreciation, straight-line rents, tenant improvements and deferred leasing costs) are treated on the financial statements. It can be inferred from Dixon et al. (1999) that real estate depreciation compares the rental of recent property with similar older property rentals of given period of the older property. Contrarily, Graham and Knight (2000) argued that the depreciation of REITs should be treated based on their acquisition costs. Currently, REIT depreciation is taken off on a straight-line basis. On straight-line rents, the authors argued that the cause of discrepancies between earnings and cash flows may be even greater because costs are most likely taken into account in practice. Intuitively, when debt was accounted for, the discrepancy was wider. Tenant improvements are frequently allowed for property owners and that leads to capitilisation, even when not necessary in certain situations. On the deferred leases, they state that REITs defer leases, implying that cash is not realised, although accounting treats that as cash earned.

The data in Graham and Knight (2000) is on price returns from the Center for Research in Securities Prices (CRSP), and net income and FFOs is from the Compustat database. They match 37 REITs over at least two consecutive years. The period was from 1989-1995. The results revealed that net income and FFOs coefficients are positive and statistically significant. That implies that cash flows are good predictors of prices and returns. By extension, debt is a good predictor of cash flows as FFOs includes debt. In some instances, FFOs reverse the original sign. According to Graham and Knight (2000), the sign reversal is due to multicollinearity. On the other hand, that might imply FFO is a hedge variable. Marcato et al. (2019) stated that hedge variable assists in the formation model,

but that variable does not add any value to the model. The results of the differenced-price model were unusual according to Graham and Knight (2000) because of the unconstrained regressions.

Therefore, Graham and Knight (2000) stressed the importance of using accounting information to determine ECF, particularly seeing as the value of REITs is the present value of the future cash flow that an asset is expected to produce, which ultimately speaks to the potential earnings of a shareholder. The authors sought to provide an argument between cash flow and earnings, and provide an accurate representation of the firms' actual value. The above is primarily because accounting parameters such as depreciation are based on acquisition costs and thus could have an impact on the value of a REIT.

Francis et al. (2000) explored how comparing the accuracy of dividend, free cash flow, and abnormal earnings equity value estimates-using three equity valuation techniques. The valuation methods used will be discussed below to prove that the market value is the discounted value of the expected future payoffs generated by the share. Although the three models are different regarding the payoff attribute, the results show that the models yield the same intrinsic value.

Francis et al. (2000) presented three models: the dividend discounted model, the DCF model, and the discounted abnormal earnings model. The dividend discounted model suggests that the value of a company's equity is the sum of discounted expected dividend payments to be made out to shareholders. In addition to the above, the liquidating dividend is equal to the terminal value. Francis et al. (2000) followed the FCF model. Lastly, the discounted abnormal earnings model, the AE model, adopts the accounting identity.

Francis et al. (2000), introduced this method to reflect the equity value as a function of a company's book value and abnormal earnings. Modern valuation techniques (EBITDA multiple, revenue multiple, book value/liquidation value, capitalisation or earnings model, real option analysis and discounted cash flow analysis) provide an objective approach to calculating a firms intrinsic value. Prior literature presents a practical approach towards determining a company's discounted cash flow as a valuation method. Furthermore, the authors find it recommendable to adopt the dividend discounted model which is closely linked to ECF in determining the potential value for shareholders in a firm.

Godfrey and Espinosa (1996) studied the practical approach to calculating equity costs for investments in emerging markets. Central to this study is finding the net present value (NPV) of multinational corporations. NPV, which is the net present value subjected to the initial investment. PV is DCF over a given period, and therefore the DCF can also be ECF. Godfrey and Espinosa (1996) adopted the NPV model for valuation. Depending on the cash flow, the discount rate can be the weighted average cost of capital (WACC), the return of equity (ROE), or the capital asset pricing model (CAPM), and the cost of debt. In terms of the currency, everything is denominated in American dollars-for consistency purposes. Despite having an American presence, some companies were based overseas.

The results of Godfrey and Espinosa (1996) showed that the firms' sovereign debt is dominated by common currency-the American dollar. Furthermore, their coupon spread was relatively high, and most of the companies were rated B by rating agencies. The betas of these firms were relatively high $> 0,5$, and the equity premium was equally as high. Generally, REITs are rated as junk status due to their nature, furthermore in the context of REITs, a high beta and equity premium suggests that the firm has a risky nature. Thus a higher equity return is also expected for REIT shareholders.

A firm's stock prices are valued by multiplying earnings, which is the value driver. Liu et al. (2007) study adopted two stages to determine the price/value driver relation with and without an intercept. Before this, Liu et al. (2007) explored value drivers used to identify whether cash flow or accruals are related to stocks or cash flows. Value drivers are based on accruals that help distinguish accounting numbers from cash flow. They are used commonly in multiple valuation methods- book value and earnings, having been closely linked with the firm's value. Liu et al. (2007) merged data from three sources: accounting numbers from Compustat, price analyst forecast and actual earnings per share from IBES, and stock returns from CRSP. The firms that satisfied the conditions set out by the researcher formed part of the sample of 26,613 observations, with a small fraction of the sample being drawn from NYSE, AMAX and NASDAQ. The formula was adjusted, which allowed for an intercept which offers some improvement. Given the above, Liu et al. (2007) study revealed that accruals improve the valuation properties of cash flow. The value relevance is limited until it is matched with expenses.

Given that accruals improve cash flow valuation, seeing as accruals recognise revenue when earned, this feeds into the net income. The above was used to calculate ECF; however, Lui et al. (2007) used accrual accounting which has a limitation seeing as accrual accounting accounts for earnings that have been billed, but not paid. Consequently, this leads to an overvaluation of an asset. Furthermore, an overestimation of the potential returns a shareholder should expect to receive.

Berkman et al. (2000) analysed the accuracy of price-earnings and the DCF methods of initial public offering (IPO) equity valuation. The estimated values are compared to actual market prices used to obtain a valuation error. The data used in the study uses financial forecasts reported in New Zealand's IPOs used to estimate P/E and DCF valuation from 1989-1995; 45 newly listed firms were selected in the sample. With a median of 16.52 contrary to 13.02 in the market.

Therefore, price-earnings and share price are positively correlated. Subsequently, a price-earnings is positively correlated to growth. Berkman et al. (2000) used the price-earnings multiple and DCF to analyse pricing and equity valuation. The research outlined three-quarter of the cross-sectional variation in market prices. In the context of REITs, there is variation, seeing as REITs are highly volatile and sensitive, unlike prior findings where more significant errors occurred when industry data was used, contrary to comparable company data. The findings observed by Berkman et al. (2000) were attributed to the thin capital markets in New Zealand and the data used in the industries' comparability.

In addition to the above, evidence provided in this paper supported the adoption of traditional equity valuation techniques for the valuation of IPO equity in thin markets. These techniques produce a lower valuation error than industry-based models, this implying that these traditional models explain 70% of the cross-sectional valuation in market price. Berkman et al. (2000) did not necessarily use the ECF model in the valuation of the New Zealand based entities. However, they made use of price-earnings and DCF models. The DCF model, which determines the firm's value, is a function of the firms' ability to generate cash flow in the future for its shareholders. Berkman et al. (2000), recommended this method as it paints a more realistic picture for the shareholders, regarding their ability to generate profits from their investments and is therefore presented as a more reliable valuation model in the determination of equity returns.

Ohlson and Zhang (1998) studied accrual accounting and equity valuation. The authors analysed accrual accounting assessing differences between income and cash flows. Furthermore, the authors presented a model used to study accounting's central basis in the context of valuations. The model exploits ideas developed by Feltham and Ohlson (1996), similar to the study referred to above by Ohlson and Zhang (1998), which relates a firm's market value to accounting data. The model characterises efficient accounting with minimal restrictions and without analytical complications. A cash flow/ events accounting treatment must be consistent with the specific relative weight put on earnings versus book value in the firm's valuation. The model developed and analysed several limitations, chief of these is the requirement that the owner's equity statement must summarise all value-relevant transaction/events without any delay. This helped rule out the possibility that some value-relevant events are soft, such as successfully running advertising campaigns, and cannot be accounted for until they impact some subsequent "hard" events such as sales.

Ohlson and Zhang (1998) found that accruals were to some extent affected by non-cash events, in which case income and the changes in operating assets were equal. This concept expresses a firm's value as a weighted average of capitalised earnings and book value based on efficient accounting. The authors further examined the properties of efficient accounting rules from a traditional accounting theory-the analysis related to efficient accounting to asset valuation. In general terms, the authors used a self-referential concept to deal with asset valuation, which requires (current) earnings/asset recognition to align subsequent expected earnings. Ohlson and Zhang looked into the parameters used to determine ECF, primarily income and cash flow. Seeing as these two parameters are an important determinant of the value of ECF, one needed to ensure that they were accounted for in a defined manner. Therefore, once cash is received, one could determine a more accurate ECF value, unlike when one records income based on accrual, providing an inflated ECF value.

Ebrahim and Hussain (2010) looked at the particular case of real estate financial development and assets. The paper analysed the effects of financial development on the valuation of assets by explaining efficient financial intermediaries in evaluating the financial system and factors that shape its architecture. Moreover, the authors focused primarily on the real estate sector, seeing as it is a peculiar case of complete market contracting, where adverse selection and moral hazard are easily mitigated. Ebrahim and Hussain (2010) modelled the agency-theory perspective of risk-averse investors and financiers in a general equilibrium setting under the framework of rational expectation

(symmetric information), suggesting that all parties have received the same information and can therefore draw an equally mutual conclusion. The model assumed a two-period economy where there are two agents participating - investors and financiers. There are two types of assets. One is real estate, and the other is financial assets created by trading off financial claims against the payoffs of real assets. Consequently, the model analysed both agents in this 2-period economy, modelling the investor as an agent (of the financier) and modelling the financier as a principal.

Ebrahim and Hussain (2010), demonstrated that property financing is undertaken in a pecking order of increasing Pareto-efficiency (with a reduction in the agency cost of debt) and a 3-stage process. Financial architecture advances from a partially liberalised commercial bank to a developed stage of the capital market. The findings exposed a linkage between the properties' value and the Pareto-efficient financing package is the intertemporal marginal rates of substitutions of the borrowers and lender. Also, the valuation of properties under Pareto-neutral (default-free and defaulting) mortgages constitutes a dilemma for appraisers, as these are contingent on equilibrium. The paper further revealed a direct impact of financial development on real estate valuation in a general equilibrium framework. The increase of financial development, primarily in the real estate market, subsequently in the REIT industry, is of utmost importance as it helps to decrease asymmetric information. Ideally translating into a more accurate ECF, the direct link between financial development and real estate valuation was highlighted by Ebrahim and Hussain (2010).

In assessing how to predict how the accrual and cash flow components of earnings related to equity value., Barth et al. (1999) used a generalised version of a model developed by Ohlson (1999). This model comprises the abnormal earnings equation, earnings component and equity book value autoregressive equation, and the equity market value equation. The study's objective was to provide insight into the characteristics of cash flow and accrual components of earnings that affect the relationship to firm value. Furthermore, the study answered three questions. Firstly, the study assessed whether accrual and cash flow components of earnings aids in forecasting future abnormal earnings incremental to abnormal earnings. Secondly, the research analysed why accrual and cash flow components of earnings have incremental explanatory power in a valuation model that includes equity book value and abnormal earnings. Lastly, Barth et al(2000), assessed whether valuation multiples on cash flow and accrual differ, as highlighted by the Ohlson's model and its ability to predict future abnormal earnings.

Barth et al. (1999) utilised Ohlson's framework, which was developed in 1999. This framework is an expansion of the one created in 1995 by Ohlson. In this model, Ohlson models earnings components. The model revealed that the earnings component's value relevance depends on its ability to predict future abnormal earnings incremental to abnormal earnings; the persistence of the components in developing how the cash flow and accruals components of earnings relate to equity value. By using a generalised version of Ohlson's 1999 model, the model comprises of four equations. However, the researcher only outlined three. Firstly, the abnormal earnings equation. Secondly, earnings component and lastly the equity book value autoregressive equation and equity market value equation.

The study separated industry estimation, which was based on a sample of Compustat firms from 1987-1996 with annual data that was available - using data obtained from the Compustat primary, secondary and tertiary(P/S/T), full coverage, and research annual industrial files from 1987-1996. The sample was restricted to firms that produced full data, and firms with total assets of over \$10 million. The accruals and cash flows have significant explanatory power in the future abnormal earnings incremental to abnormal earnings forecasting that the coefficients on cash flow and accruals are positive and negative, respectively. The abnormal earnings are not as persistent when accruals include a large part of current earnings. Generally, in REITs, there are no significant abnormal returns.

The findings revealed a significant relationship between the accrual or cash flow earnings components - indicating that the components are incrementally informative in predicting future abnormal earnings. Barth et al. (1999) concluded that cash flows and accrual each have significant explanatory power in forecasting future abnormal earnings incremental to abnormal earnings for all industries. This statement is true for real estate as forecasting is equally dependent on cash flows and accruals. Furthermore, a significant relationship for the earnings component indicates that it is incrementally informative in explaining equity's market value. Stressing that cash flow and accrual each have significant incremental explanatory power in relation to the market value of equity and equity book value and abnormal earnings, suggesting that in determining the ECF, the adoption of either cash flow or accrual will provide a workable firm value.

Consequently, the valuation coefficients on cash flow and accruals differ as per the model developed by Ohlson in 1999. There is considerable agreement between the signs of the valuation

and abnormal earnings equation coefficients on cash flows and accruals. The findings suggested that the autoregressive equation and implied Ohlson model were not consistently positive from the abnormal earnings and components. To show that the cash flow valuation and accrual accounting method always yields equivalent results, Lundholm and O'Keefe (2001), conducted research that compared cash flow and accrual accounting models for use in equity valuation. Penman (2001) sought to disprove or approve the aforementioned statement; furthermore, a recent paper by Lundholm and O'Keefe suggested that there was no learning to be made from the model because of the equivalence in the empirical comparison of the models. The cash flow and accrual accounting models were adopted for valuation purposes. Lundholm and O'Keefe (2001) responded to papers by Penman and Sougiannis (1998); Francis, Olsson and Oswald (2000). The papers discussed valuation using different models. Lundholm and O'Keefe's paper exposed the misconceptions regarding these papers mentioned above about accounting and valuation. In contrast with the findings of Lundholm and O'Keefe, Penman (2001) put forward the argument that the claims of Lundholm and O'Keefe are valid by proving empirically that cash flow and accrual accounting methods for valuing equities will always yield equivalent valuations.

Gardner et al. (2012) valued Coca-Cola using the free cash flow to equity (ECF) valuation model. In this paper, the authors illustrated how Damodaran put forward the application of the free cash flow to the equity valuation model in 2006. The researchers combined the two models along with the super-normal growth model; in an attempt to determine the value of Coca-Cola. The authors outline three key areas of a business; investment decisions, financial decisions, and dividend decisions. These decisions contribute significantly towards the ongoing operations of the firm and the valuation thereof. The paper outlined the importance of a balance sheet, suggesting that a balance sheet is a cross-sectional representation of a firm at a specific point in time. Gardner et al. (2012) stated that decision-makers could use the probability distribution of expected future cash flows to determine total market capitalisation and a firm's value. It highlighted that firms' with high expected cash flow would have high value in the cost of funds. Which were constant and opposite for firms with low required rates of return - essentially outlining that the value of a firm increases with a greater cash flow and lower required rate of return, *ceteris paribus*.

Gardner et al. (2012) determined the share value of a firms' stock using the free cash flow model, stating that the value of a firms' share is derived from the future ECF, which is made available

to pay shareholders since ECF is in the future. ECF is discounted to the present time by the cost of equity. Therefore, the value of a share of stock is equal to the expected future ECF divided by the required rate of return of equity minus the expected future growth rate of the ECF for the firm. In addition to the above, Gardner et al. (2012) determined the super-normal growth model's importance. The valuation model used in valuing a firm's shares assumes that growth is constant. The super-normal growth period is above average. After which, the firm's earnings growth goes back to the long-term growth rate for the economy as a whole. Moreover, the present value of the shares in a firm is equivalent to the discounted present value of the ECF for the super-normal period and the present value of ECF for the normal growth period.

Gardner et al. (2012) stated that industry practice for the valuation of a company is computed over a five- year period. The above is consistent with REIT firms. Lastly, Gardner et al. (2012) defined ECF and further determined Coca-Cola's ECF. The authors defined the ECF model as net income minus net capital expenditure minus the change in working capital plus net changes in a firm's long-term debt positions. The computation of ECF for Coca-Cola was determined with data from 2001-2010. The data was derived from Coca-Colas 10-Ks, a comprehensive financial report filled yearly by publicly listed entities about their financial performance. Gardner et al. (2012) extracted the following key parameters; net income, depreciation, capital expenditure and change in working capital. When net income, capital expenditure, depreciation and change in working capital are combined, it gives ECF before debt changes. ECF after the debt is derived by subtracting new debt financing from old debt retirement.

The authors projected ECF for 2015 as \$ 9,658 million. Gardner et al. (2012) determined that the value of Coca-Cola in 2015, which at the time was an estimated \$161 billion using the ECF model, while the actual market value of Coca-Cola was \$150 billion at the time of performing the study. The shortfall between the determined ECF and the actual cash flow is \$11 billion; this was because the sustainable growth for the super-normal growth period was computed with the extended Du-Pont model at the time of the study. Furthermore, the long-term growth rate was assumed to be the same as the economy's growth rate, thus the shortfall indicated above. Gardner et al. (2012), adopted the ECF model, adopting this model assisted potential shareholders and the current shareholders of Coca-Cola in knowing how much cash is available to be issued as dividends to

shareholders. The authors support the use of the ECF model seeing as it provided a more realistic representation of what was due to the shareholders of Coca-Cola.

3.2.2 Free Cash Flow

In proving that free cash flows are a better measure to determine the past, present and future earning power of real property assets, Brown (1996) put forth the definition of cash flow as the primary means by which investments are valued. Gordon (1996) details that, traditionally, valuations are calculated using net operating income, contrary to cash flow. Brown revealed that at the time of his publication, researchers investigated techniques that would allow firms to discount anticipated future cash flows to arrive at present value. Brown initiated a conversation on cash flows, the definition and how they are used to determine a property's value. The cash flow statement has commonly been confused with the income statement. However, Brown (1996) defined a cash flow statement as a source that accounts for a firm's use of cash funds. In addition to the above, free cash flow generation is created by the current operation of a real estate venture and available to the shareholders without affecting the current growth levels.

Brown (1996) suggested that to determine the earning powers of a firm, one should use the cash flow statement, which was broken into three sections, namely cash flow for investing, free cash flow and operating cash flow. Brown (1996) explored free cash flow in detail, exposing that free cash flows are not similar to traditional cash flows. Seeing as free cash flows are generated by the current operations of a firm or a real estate venture and are thus available to be distributed to shareholders without affecting the firm's or project's potential to grow. At the time of publication, the author suggested that the argument for free cash flow was theoretical, seeing as all the traditional appraisal variables were quantified, emphasising that more parameters were to be used for the valuation of real estate firms and projects. In support of Brown (1996), Yaari et al. (2016) investigated the finance methodology of FCF, assessing the procedure of calculating the FCF when a significant portion of current liabilities offset against current assets. Brown (2016) recommends the use of the FCF method in the valuation of assets, taking into account the cash flow statement, primarily drawing focus on the free cash flow from operations sections of the cash flow statement.

Yaari et al. (2016) disclosed that based on the formal financial statements are consistent with the standard financial-economic methodology. Contrary to the above, the authors questioned the

procedure of calculating the FCF where a significant portion of current assets was offset against current liabilities, thereby creating the hybrid asset net working capital (NWC).

Yaari et al. (2016) outlined that the standard FCF offset's direct consequences include distortions of the firm's size, debt and asset compositions, risk profile, and financial leverage. Indirect consequences are inclusive of wider opportunities to manipulate the firm's FCF and estimated market value. Empirical evidence suggests that the offset makes the FCF systematically larger and more stable. In the study, an average sample size of 1220 U.S public firms, which were thoroughly analysed over 22 years from 1988-2009, revealed that the offset overstates the FCF mean by 33.7% and the median by 128.2%, this is due to a typically large share of current liabilities that represent on average 19.8% of firms' sizes with a median of 24%. Yaari et al. (2016) challenged the standard valuation method adopted in corporate finance. The flow of current liabilities or a portion were offset against the flow of current assets used to create a hybrid flow of net working capital. Theoretical and practical analysis indicate that management may prefer offset-based FCF, which can be controlled in terms of stability and size. The adoption of two data sources, namely the Compustat annual dataset for accounting information and the CRSP monthly stock files. The authors derived a solution to the problem indicated above. The offset flows equal the modification in the firm's current liabilities and current assets flows. Given the observations above, the authors proposed a solution that cancels the flexibility of the narrow definition of FCF. This solution is an offset-free corrected free cash flow (CFCF). This solution provides managers, stakeholders, and investors with more accurate and unbiased value estimates of the firms and planned projects.

Further to the above, Petty and Rose (2009) highlighted the relationship between the two crucial cash flow analysis tools, free cash flow within the cash flow identity and the accounting statement of cash flows. In support of the above, Petty and Rose (2009) stressed that free cash flow provides a global picture of a firm's cash flows by showing the total cash flow from the firm's assets. Petty and Rose reviewed the current textbook andragogy introducing the concept of a firm's cash flow. Using algebraic formulation, Petty and Rose derived the accounting statement of cash flows from the cash flow identity (whereby a firm's free cash flow equals its cash flow to investors). Given the importance of the cash flow concept, Petty and Rose affirmed that a firm's cash flow should be presented using 1) the free cash flow concept within the context of the cash flow identity and 2) the accounting statement of cash flows. This is of utmost importance when it comes to determining FCF.

Yeo (2016) assessed the role of free cash flows in making investment and dividend decisions in the shipping industry; Although not the key focus industry of this research, there are general attributes that apply to the real estate sector. The paper found that FCF contributes to investments and dividends. Substantial FCF leads to increasing investments and reduces dividends, which furthermore promotes the use of debt alleviation and overinvestment. The paper by Yeo (2016) stressed that insufficient investment can result in losses and diminish the firm's value, contrary to the above, overinvestment causes a negative free cash flow. Therefore, it is clear that uninformed business and investment decisions can give rise to market imbalance. The firms can decide to pay out free cash flow as dividends, use cash to reduce debt or equity financing, or spend the remaining cash generated on investments. According to Chay and Suh (2009), financially constrained firms depend on cash flow generated internally, affecting dividends.

Modigliani and Miller (1958) suggested that investment decisions are based on an investment's FCF; if the current cash flows are lacking, investments should be financed with equity or debt. Furthermore, Yeo (2016) suggested that a firm's value contains various components; these include but are not limited to real estate, equipment, brand and cash. Of these four components mentioned above, only cash can be used by management. However, not all cash can be used "freely". Cash that can be used freely; is described as FCF. The paper finds that FCF is a determinant of investment and dividends, and a greater FCF leads to an increase in investments and reduces dividends. The study performed by Yeo (2016) found that a decrease in free cash flow does not lead to a decline in investments but an even more pronounced shift towards debt. With empirical evidence exposing that in FCF, uncertainty tends to decrease dividends to maintain investment.

Yeo (2016) research showed the strength of FCF and its potential to pay off shareholders, debt of equity financing can be reinvested into the firm or another project. Furthermore, it showed the importance of a strong corporate governance and how corporate governance impacts on the firms FCF, as corporate governance can result in the rise or diminishing of a firm's value, ultimately its FCF. Furthermore, the relationship that exists between investments, dividend and FCF-FCF, has a directly proportional relationship with investment and an indirectly proportional relationship with dividends.

The combined effects of free cash flow and financial slack on bidder and target stock returns were studied by Smith and Kim (1994). Smith and Kim (1994) emphasised that combining slack-poor firms and firms with free cash flow enhance market value to the extent that the market has not

already anticipated a solution. "Slack" is defined as liquid assets and riskless borrowing capacity beyond what is needed to meet current operating and debt servicing needs. Smith and Kim (1994) suggested that a firm with slack can go after positive NPV investment opportunities without issuing risky securities. Mergers can transfer slack between firms without incurring adverse market response to a new issue (Myers and Majluf, 1984).

Smith and Kim (1994) stressed that a low slack firm ability to financing real asset investments should not be slack low so they can acquire financial claims on existing assets with established market values. The financial slack hypothesis states that managers and shareholders have information failure regarding the value of the firm. With this, managers can seek opportunities to transfer wealth from a new investor to existing shareholders by issuing equity when they are overvalued. Myers and Majluf (1984), contend that maintaining slack is beneficial for firms.

Smith and Kim (1994) went on to draw a linkage between Slack and Free cash flow. According to the authors, "free cash flow" is the excess cash flow required to fund positive net present value projects. The free-cash-flow hypothesis suggests that managers can benefit from retaining assets; even doing so required cash to be invested in negative net present value projects. In as much as slack and FCF have precise and distinct definitions, the concepts are difficult to distinguish empirically. Smith and Kim (1994) further added to the definition of the two concepts. Financial slack is a positive-net-present value valued investment in liquidity, whereas failure to distribute free cash flow is a negative-net-present-value use of funds. Since the investment opportunity schedule is not observable, this hypothesis can only be tested by examining the markets reactions to particular investment decisions.

Smith and Kim (1994) used accounting information to classify between target and bidders to encounter underinvestment problems linked to the lack of financial slack or investment problems due to free cash flow. Smith and Kim (1994) found that; returns of bidders with high FCF were more positive when the acquisitions result in increased use of debt.

Lang and Walking (1991) tested the free cash flow hypothesis on a sample of large investments made by firms. Testing the hypothesis required pre-knowledge of a firm's investment opportunities. Using Tobin's q , defined as the ratio of the market value of the firm's assets to their replacement cost. High q firms were expected to use funds generated internally. In contrast, low q firms were less likely to invest in positive net present value projects. Lang and Walking (1991) emphasised that the FCF hypothesis is economically significant. Lang and Walking (1991)

established that, an increase in FCF equals 1% of a bidder's total assets, which is associated with a decrease in the bidders gain from the takeover equal to approximately 1% of the value of the bidders' common stock. Furthermore, free cash flow explains more of the cross-sectional variation in bidder returns than the combined effect of the number of bidders and target management's attitude.

Having defined the free cash flow hypothesis above, Lang and Litzemberger (1988) studied cash flow signaling vs the FCF hypothesis. Lang and Litzemberger (1988) tested the cash flow signaling and FCF/overinvestments explanations of dividend announcements' impact on stock prices-using Tobin's Q ratios less than unity to designate over-investor. The dividend signaling models developed by Battacharya (1979), John and Williams (1985), and Miller and Rock (1985) predicted that the dividend announcements convey information pertaining to the future signaling cash flows. As knowledge of dividend announcements improves the accuracy of the average analysts' preannouncement forecasts of future earnings, it argued that a firm with substantial free cash flow will tend to overinvest by accepting marginal investment projects with negative net present value.

In distinguishing between the prediction of the cash flow signaling hypothesis and the FCF hypothesis, Lang and Litzemberger (1989) assumed that a firm's investment is scale-expanding and exhibit decreasing marginal efficiency an average Q less than unit implies overinvestment. If a firm was undertaking the value-maximising level of investment, its average Q would exceed unity. The evidence provided above is consistent with the hypothesis that overinvesting firms' dividends changes signal information about investment policies.

Gibbs (1993) studied corporate restructuring determinants: the relative importance of corporate governance, takeover threat, and free cash flow. The free cash flow hypothesis and agency theory prescriptions are used as the basis for developing a model of restructuring.

Within the context of the free cash flow hypothesis, there are three conditions for corporate restructuring. Firstly, the existence of free cash flow to create a potential agency problem. Secondly, ineffective corporate governance which allows management to become entrenched and agency cost to arise. Lastly, the threat of takeover to motivate management to initiate a restructuring. Gibbs (1993) stressed that FCF should not be observed directly. Instead, limited profitable investment opportunities; substantial, stable cash flow; low financial leverage, and high levels of diversification are identified as indicators of free cash flow. Although agency problems and the threat of takeover provide a partial explanation for restructuring, other factors also influenced restructuring, as evidence by the effect of current governance during the study periods. This is not entirely in conflict with the

free cash flow hypothesis. However, seeing as firms with strong governance restructured, it does indicate that other factors besides agency costs can drive restructuring.

Gibbs (1993), does not necessarily support the use of the FCF valuation, neither does the author disregard the valuation model. However, the author brings in another angle, stating that in the determination of the FCF comes along with the potential effects the value can have on the governance of a firm, suggesting that restructuring a firm is directly linked to the value of the FCF, particularly because the FCF exposes the profitability of a firm based on its operations.

Habib (2011) analysed the growth opportunities, earning performance and valuation of free cash flow. In this paper Habib practically examined the effects of a firms' growth opportunity/earning quality on the market valuation of free cash flow. The authors demonstrate empirically the impact that firm growth opportunities and earnings quality can have on the market valuation of the FCF. Furthermore, it analysed how the market valuation of the FCF can be conditional on a firm's growth prospectus and earning permanence. Habib (2011) used a basic accounting-based valuation framework of stock returns, which was used as a function of equity book values and earnings. The research population consisted of 15,773 institutions listed on the Australian Stock Exchange, excluding financial institutions, spanning from 1992-2005 (Data from the ASPECT-HUNTLEY database). The sample was reduced substantially to 7,229 firms. These 7,299 firms were used to study FCF market pricing. In both instances the FCF had negative mean and median values.

Habib (2011), provided theoretical support that FCF valuations are irrelevant because they represent dividends from the firm that reduce its value without affecting its cum-dividend value. The study revealed a positive significant valuation multiplier that was associated with the FCF variable in the presence of attractive growth opportunities. A positive coefficient implied that the stock market expected positive net present value projects to put a premium on such FCF. Stock returns positively correlated with earnings and equity book values were negatively correlated with dividends. Habib (2001:108) states that "all the correlation coefficients were statistically significant at better than the 1% level (two-tailed test)".

Only positive FCF observations were used to run the regression, seeing as firms with positive FCF and low growth opportunities were likely to suffer (acute) agency problems, and were therefore prone to valuation discount. The coefficient dropped from 1.02 to 0.80 when FCFCOMPR, which is the difference between the operating cash flows (hereafter OCF) and the cash expenditure plus acquisition and investment activities, was used as a measure of FCF. However, even when using this

the results were still statistically significant. Ultimately, the FCF is an important explanatory variable for stock returns when earnings are transitory.

The valuation of REITs is a robust area of discussion since the last financial crisis. Given the above methodologies and common variables that affect REIT valuation, many studies presented a myriad of estimation models that aim/aimed to define the most accurate REIT valuation method. CAPM was used to identify expected risk and expected return of hotel-REITs and C Corporations (herein C-corps) (Kim and Jang, 2012). The author revealed that there is little evidence to suggest that hotel REITs have significantly different risk-return characteristics from hotel-REITs and C – corps. Asteriou and Begiazi (2013) examined REIT returns and volatility using CAPM and Garch model. Asteriou and Begiazi (2013) findings exposed that the stock market had a substantial impact on REIT returns. This revealed that there exists no risk diversification potential; between REIT and common stock. The authors revealed that Funds from Operations (FFO) is a preferred indicator of returns contrary to net income (Graham and Knight, 2000). Furthermore, there exists a difference in the predictive relationship from dividend yields to REIT returns (Chiang, 2015). Lastly equity claims on publicly traded non-listed REITs are worth 23%-80% less than the equity claims of listed REITs (Seguin, 2016).

Letdin et al. (2019) explained REIT returns, in that they look at the increasing popularity of REITs as an investment vehicle, and the current record-breaking performance of the stock market in the United States triggered an increased interest in understanding how REITs perform relative to other investments. The paper examined the asset pricing structure of various factors that impact REIT return volatility, valuation models and REIT returns, REIT returns and asset growth, the impact of financial leverage on REIT returns and REIT returns and investor sentiments.

In addition to the above Letdin et al. (2019) analysed existing literature of the volatility of REIT returns. Ross and Zisler (1991) stated that equity rates were more volatile but had double return rate, contrary to other assets. The higher/lower future equity correlation between equity REITs and direct real estate results in higher/lower future equity returns (Fei et al, 2010). Lastly the volatility of REITs showed significant predictive power; both implied total volatility and realised total volatility were highly correlated to future realised volatility. Letdin et al. (2019), ability to determine the volatility of REIT directly illustrated that returns have a direct link with FCF. Seeing as the FCF is dependent on the operations of a firm, which were essentially the returns from an asset or operations.

With an indication of higher volatility, which results in an increased net income and thus the earnings used in the calculation of FCF.

Ghosh et al. (2013), studied the operating performance of REIT following seasonal equity offerings (SOE). In this study Ghosh et al. (2013) analysed operating performance of equity REITs following SOE. For each REIT, the authors (2013) measured the operating cash flow to prior years' total assets. Cash flows are scaled by total assets to allow comparison across different issuers, and through time. The authors used three alternative measures of cash flow, and used two related studies on operating performance (Mclaughlin et al, 1996 and Friday, hereafter FHH), and lastly operating income before depreciation in COMPUSTAT (However, this commonly used measure of operating performance can be misleading for REITs). To address this discrepancy COMPUSTATs reporting uses two alternative measures of operating cash flow.

The measure was used to correct potential bias caused by depreciation in operating performance and the final measure of cash flow from operation, which is frequently used as a measure for operating performance specific to REIT. For comparison with FHH, Ghosh et al. (2013) used the measure to examine REIT SEO over 1990-1996- which was used on the second measure.

To examine the operating performance of a sample of 604 equity REITs surrounding issuance of seasoned equity offerings over the 1990-2007 period, the data and method presented included direct comparison with FHH. All these firms were listed on the NYSE, NASDAQ and AMEC. The data includes 604 SOEs by 183 REITs over the 18-year period. The results were different from those that were reported by FHH, specifically operating cash flow reported by FHH was systematically lower than what was found over the same time period. The results exposed a median cash flow rate ranging from 8.8% 3 years prior to issue to a peak performance of 9.6% in the year of issue. For this sample of REITs, the results are similar to prior research conducted. These studies showed an increase in operating performance prior to issuance and a decline in operating performance subsequent to the equity offerings.

Drobetz et al. (2010) studied information asymmetry and the value of cash. In this study the authors aimed to evaluate the market value of corporate cash holdings in connection with firm-specific and time varying information asymmetry, commonly referred to as information failure. In the study the authors analysed two hypotheses. First, in cases where a higher degree of information asymmetry cash was valuable for a firm then in states where there was a lower degree of information asymmetry, the aforementioned is related to access to external finance. The second hypothesis states

that a higher degree of information asymmetry is valuable for a firm with a lower degree of information asymmetry. This hypothesis is more relevant for firms with weaker corporate governance structures. In the context of REITs, the transparent nature of REITs in theory implies low information asymmetry, in support of the former, information asymmetry is relatively low when REITs access the capital market.

In as much as Drobtez et al. (2010) was interested in the overall (net) effect, they disentangled the two effects by splitting the samples into two subgroups. The starting point of the analysis is the valuation model of Fama and French (1998), where they investigated the relationship between firm value to dividends and corporate debt. This framework was further extended to assess the impact of firm-specific and time varying information asymmetry on the market value of cash holdings. Drobtez et al. (2010) took the dispersion of analysis earnings forecast as the main measure of firm-specific and time-varying information asymmetry.

A robustness test was performed in order to provide evidence in support of hypothesis two, suggesting that liquid assets are valued at a discount with increasing information asymmetry. A sample size of 8500 firms was used from 45 countries over the period 1995-2005. Drobtez et al. (2010) used yearly data, seeing as quarterly data was not issued in other countries. The samples were split into two. This helped to reinforce findings that agency costs due to moral hazards decreases the market value of an additional dollar of cash.

Drobtez et al. (2010) tested two conflicting hypotheses with the results indicating that the market value of cash is significantly reduced when a firm faces a higher level of information asymmetry. The agency cost of FCF outweighs the benefits of cash as an internal source of finance. The findings did not contradict the pecking order theory in general and furthermore given high information asymmetry, the market value of cash is higher if investor protection is better and the quality of corporate governance is higher.

3.2.3 Capital Cash Flow

Myers and Turnbull (1977) disentangled the good and bad of the capital asset pricing model (CAPM). The CAPM is widely used when calculating the returns of required rate of return of an asset, i.e. equity returns. By extension, the CAPM is the discounting factor when one calculates the ECF. The authors opine that the CAPM is suitable when calculating the returns of long-lived asset. Among assets regarded as long-lived assets, includes real estate. At the heart of using the CAPM,

one should bear in mind that, parameters of the discounting rate, depend on numerous factors of the project including (i) project life, (ii) growth and (iii) other macroeconomic variables. Unlike prior studies on the CAPM, the CAPM derived in Myers and Turnbull (1977) is neither industry-specific nor asset-specific. One of the major challenges about calculating the CAPM is that when one estimates current parameters, they should be able to embed some future information in those parameters. According to Myers and Turnbull (1977), that should solve the problems on investor expectations. However, Myers and Turnbull (1977) focused on the CAPM, exposing some salient points related to capital cash flows (CCF).

The relevance to CCF is induced by the authors' exploration of how one should treat multiple cash flow streams. Firstly, according to Myers and Turnbull (1977), the separation of cash flows is usually due to different cash flows at different points in time. Secondly, the authors touched on cash flows being from different portfolios. In the context of CCF, cash flows are from debt and equity components. Among parameters calculated as part of the CAPM is systematic risk, which is illustrated by a beta. Although many individuals think of beta as one measure, Myers and Turnbull (1977) present an important point-beta is an aggregate measure of cash flows and asset price. That would imply that in the case of CCF, there are four betas. The beta of debt, which is the aggregate beta of debt cash flows (CFDs) and the price of debt. Then, the beta of equity, which is the aggregate beta of ECFs and the price of equity. Another advantage of ACF as per portfolio is that one can accurately weigh each portfolio contribution to the cash flow. The same principle applies when modelling the betas of portfolios. It seems from Myers and Turnbull (1977), in capital budgeting, the appraiser should view each situation based on its merit and then value that situation appropriately. The latter statement is consistent with the proposition by Miller and Modigliani, where they opine that market value comprises of (i) PV of cash flows generated by an asset and (ii) growth opportunities from future investments.

Ruback (1986) studied market values when cash flows are riskless. This article is one of the few papers that explored the arbitrage theory in the context of riskless after-tax cash flows. The fundamental question that Ruback (1986) responded to; is how one handles a stream of riskless cash flows in terms of calculations. According to the author, the cash flows are riskless when (i) they are certain, (ii) independent from firms' actions and (iii) claimants have no influence of cash flows. Furthermore, he opines that discounted cash flows are normally calculated using (i) the present value technique, one possibility being CCF and (ii) the adjusted present value (APV) technique. Ruback

(1986) starts from the APV formula. In his theoretical presentation, Ruback (1986) starts with the market value of cash flows when taxes are constant. The main proposition here is that in determining the value of tax shields, one should discount the ‘after-corporate-tax riskless rate of interest’ (P326). He further stated that when a firm repays a loan, the interest tax shield pays the remaining amounts. That latter part one would usually regard as after tax riskless cash flows when discounted by an appropriate discount rate. Interestingly, Ruback (1986) argued that there is no default incentive when the value of default is equal to riskless after-tax cash flows. This is probably because the situation does not make either situation better off. He then extends the situation to (i) non-uniform certain interest and tax rates, and (ii) uncertain interest rates.

The formula for the first situation (i.e. non-uniform certain interest and tax rates) illustrates that nothing changes in the formula, except that one should account for the stochastic nature of cash flows. In the second scenario, Ruback (1986) argued that one would have to do multiple-period discounts on bonds. The arbitrage situation responds to the latter scenario. The empirical results illustrate that market values range between \$100 and \$75.13. According to Ruback (1986), APV correctly prices after-tax cash flow when debt levels are changing. On the latter point, numerous studies synthesised in this article opine that APV is appropriated for cash flows of a firm made of debt and equity when debt levels change periodically. However, he found that the present value approach gives one direct market value of riskless after-tax cash flows. That was evident when one valued multiple streams of cash flows.

Aziz et al. (1988) used cash flow based models in predicting bankruptcy. They argue that financial ratios, which illustrate financial position and health of a firm, are based on ad hoc pragmatism. Then, the question was how to predict bankruptcy on sound principles. Aziz et al. (1988) opine that the appropriate response to the latter statement was sound valuation based on cash flow methods. Before using an empirical illustration, Aziz et al. (1988) presented (i) Lawson’s identity and (ii) how one should compute cash flows based on variables. Fundamentally, Lawson’s identity is about the enterprise value; ‘entity cash flows equal to lender cash flows plus shareholder cash flows’ (P420). Note that the symbolic formula for the latter formula is shown in page 420 of Aziz et al. (1988). The formula in the former sentence is the same as stating that the enterprise value is equal to the PV of equity plus PV of debt, where PV of debt can also be shown to be similar to the PV of tax shields. The salient about the market value (MV) of a firm as shown by Aziz et al. (1988) is that MV can be calculated using the CCF model. On the debt component of a firm, debt levels change at

times and creditors cannot keep up with debt levels, bankruptcy possibilities emerge. Then, they move to the second point - 'computation of the cash based variables' (P421). The salient point is that the interchangeability in the formula of the enterprise allows one to illustrate (i) funds from operations and (ii) other items of financial statements.

The data in Aziz et al. (1988) is Standard and Poor's 1983 industrial annual Compustat research file during 1971-1982. The population should have filed for bankruptcy, and the following conditions should have been met in order to have been included as part of the sample. First, the listed firm should have traded on some stock exchange or over-the-counter. Second, the file should be listed in the database at least two years before filing for bankruptcy. Finally, the company should not be in the financial or utilities industries. The methods used to predict bankruptcy are (i) multiple discriminant analysis (MDA) and (ii) logistic regression. The bankruptcy tested from the first possibility occurrence to the fifth one. The results from MDA confirm the presence of bankruptcy from the first possibility to the fifth. In order to validate the results of MDA, Aziz et al. (1988) used the Chi-square (χ^2) test. The χ^2 confirms bankruptcy possibilities. To the central part of Aziz et al. (1988) concerning this study (i.e. using cash flows valuation), the results illustrate that firms with lower cash flows are unlikely to file for bankruptcy. This is surprising because one would have thought poor and/or limited liquidity as illustrated by available cash would imply higher bankruptcy possibilities. One possibility is that the authors never controlled for multicollinearity. Secondly, Aziz et al. (1988) never talked about the splits of zeros and ones in their logistic regression. Normally, in order for results to be acceptable, the split between zeros and ones in either direction should be 70%/30%. In order to strengthen their cash flows method results, they compared their cash flow findings with Gentry et al. (1985) and ZETA models. The Gentry et al. (1985) bankruptcy prediction tends to be right over one year. Based on Gentry et al., the average accuracy and bankruptcy-hit ratio are 83.33% and 78.79%, respectively. For the ZETA model, the average accuracy and bankruptcy-ratios are 91.8% and 98%, respectively. Aziz et al. (1988) found that ZETA outperforms the cash flow based model when one extends those tests over three to five years.

Inselbag and Kaufold (1997) compared the CCF and APV techniques. The crux of the study is that CCF and APV are the same as they both account for when a firm is financed through a combination of debt and equity, except that CCF accounts for when debt is periodically fixed or proportional, while APV accounts for periodically changing debt. For the author, the issue of analysis and/or valuation is about finding patterns and duration of the cash flows. On which method to use,

Inselbag and Kaufold (1997) opine that the finesse treatment of cash flows lies on how debt and equity are taxed by the relevant authorities. In order to illustrate their case, they used a newspaper division, Media Inc. First, they calculated the unlevered value, \$101.7 million. The latter value is when a firm is entirely financed through the equity-equity cash flow (ECF) valuation. Then the authors proceed and debate the issue of leverage. They argue that how the advantage is treated will determine which technique, between APV and CCF is relevant. They presented the WACC, which is the discounting factor that one uses to discount CCF. The mistake that Inselbag and Kaufold (1997) made is that they presented WACC as a method, while it is a discounting parameter. However, the crux of their illustration stays. One of the things that authors overlook is that the debt and equity parameter in the WACC are estimated, not actual book and/or market values of those variables. In the WACC illustration, Inselbag and Kaufold (1997) showed that the debt portion of the WACC, is actually the PV of debt service (DVTS). The treatment of DVTS is debatable and different authors treat DVTS differently (Fernández 2004). The DVTS in Inselbag and Kaufold (1997) is \$30.5 million.

The elegance of separating debt portion from equity portion in valuations is that both bondholders (debt) and stockholders (equity) are well accounted for. In the context of Inselbag and Kaufold (1997), debt is exogenous. Similarly, in a REIT environment, debt is exogenous. Then, the authors did a separate valuation based on WACC, in principle CCF calculation, and the value was \$132.2 million - identical to value derived from APV calculation. In order to validate the earlier calculations, Inselbag and Kaufold (1997) recalculated APV and CCF when the debt: equity ratio is constant. The results in the second scenario were identical to the first scenario. Inselbag and Kaufold (1997) suggested that there should be an iterative process for the second scenario, which simultaneously determines the debt and value requirements.

Ruback (2002) simplified how one should model risky cash flows. He put forward that the CCF method is equivalent to discounting FCF by the WACC. When one reads the first part of Ruback (2002), it reads as if FCF is the same as CCF because it is not stated that WACC in FCF is after tax. According to the author, the common method of valuing risky projects in practice is FCF. The author stated that when using FCF, the WACC needs to be re-estimated every period because WACC is dependent on the weighting of debt and equity. The point where one shares with the author is that FCF has the interest shield component. The latter is similar to the APV technique. Before illustrating the main point of the study, Ruback (2002) presented the mechanics of the calculations; how the net

operating income is handled in the method, including non-cash items and changes in the working capital requirements, all the way to finding different cash flows (i.e. ECF, FCF, CFd and CCF). Those are well articulated and handled in nth illustration. The other point on net operating income as per the author is that, net operating income is the same as earnings before interest and tax (EBIT). Therefore, net operating income and EBIT are the same thing. According to the author, net operating income is widely used in practice compared to EBIT because it is easier to forecast accurate net operating income, and it uses corporate taxes and marginal taxes, which are not necessarily the same as taxable income. The latter three points are not well accounted for in EBIT. For calculating asset returns, the authors explored the WACC, return on equity and return on debt.

Using his theoretical example, Ruback (2002) showed that the PV based on CCF and FCF methods are the same. The discount rate for FCF is WACC and CCF is cost of equity, where the cost of equity for CCF is WACC before tax. That explanation would make understanding the difference between FCF and CCF easier. The fundamental issues are handled correctly. For example, in the WACC, the debt tends to be fixed and/or of proportional. By extension, that applies to CCF method while in APV, debt changes.

Fernández (2004) tackled a highly debatable topical area in corporate finance. Some investment banks treat the value of tax shields as the same as the PV of tax shields. The question is, what makes those values different? The author noted that the riskiness of tax shields is challenging to model and risk differs at different points. Moreover, whether the firm is levered or unlevered affects the riskiness. Before comparing those two measures, Fernández (2004), theoretically explored the following. First, the perpetual value of tax shields in absence of leverage costs. Then, compared the return on assets and return on equity. Finally, the author illustrated the growing perpetual value of tax shields. The first concern, Fernández (2004) showed is that the enterprise value is made up of an equity portion and a debt component, and in terms of calculating PVs, the equity would be the unlevered PV based on the equity amount, while the debt component would be priced as the PV of tax shield (VTS). Furthermore, according to Fernández (2004) the formula for E+D can be written differently taking into account the leverage amount in the firm capital structure. Interestingly, the author showed that the perpetual profit after tax of levered firm is equal to the ECF. Although those values might be equal, Fernández (2004) forgoes the parameters that constitute those values. Therefore, unlike Fernández (2004), this study will build from different parameters that build

different components of valuations. One may think that the latter suggestion is most likely to reveal most insights other than just looking at the actual numeric values.

On return on assets and return on equity, Fernández (2004) illustrated that required on asset is the discount rate used to discount FCF when calculating the value of unlevered firms, while return on equity is the discounting rate for discounting ECF when one calculates enterprise value. For the third point, growing perpetual value of tax shields, Fernández (2004) showed that the value of tax shields increases when there is perpetual growth. Following that a move was undertaken and performed comparisons on variety of methods. The salient point is how one models return on equity in different scenarios. That is, return on equity should be customised to different situations. The authors worked on a practical example, which was taken from Modigliani and Miller (1963). As expected, the values calculated (ECF, FCF, CFd and CCF) methods were different if modelled appropriately. On the other hand, in practice, it is infrequent that different types of investors in one firm hardly contribute equally to the financial position and/or situation of a firm.

There are many studies, but a few of them have explored the sensitivity of the cash flows. One such study is Almeida et al. (2004). The empirical study is on manufacturing firms during the period of 1971 to 2000. Furthermore, the data is from Compustat's P/S/T. Variables used in this study include (i) full coverage, (ii) total assets, (iii) sales, (iv) market cap, (v) capital expenditures, (vi) cash holdings and (vii) marketable securities. At the heart of this study by Almeida et al. (2004), is to illustrate the link between financial constraints and liquidity demand from firms. The main variables important to the study were (i) payout policy, (ii) asset size, (iii) bond ratings, (iv) commercial paper ratings and (v) index measure based on Kaplan and Zingales (1997) (KZ index, from here). The liquidity demand model of Almeida et al. (2004) was focused on four components; (i) cash management, (ii) hedging, (iii) dividend payouts and (v) borrowing. The model had three dates; 0, 1 and 2. The authors based their pricing on the usually held NPV principle-invest in positive NPVs. Moreover, they assumed that some firms found it hard to raise external funds. The latter phenomenon is common among REITs. The model can account for uncollateralised debt and equity issues. Thus, a typical situation when one uses the CCF method.

In building their model, Almeida et al. (2004) stated that high and low probabilities are jointly zero. The cash flows are exogenous and they determine whether a firm is constrained or not. Unconstrained firms can source funding externally -Almeida et al. (2004). The authors went further and built a constrained environment. The salient point in this case is that firms cannot take on positive

NPV projects. The latter phenomenon is rare in the REIT industry. Other interesting illustrations from constraint environments are that firms can increase their earning capacity by increasing innovation, investment in future growth opportunities and the firms' borrowings should be proportional to their capacity to pay back the loan. The first set of empirical studies is on sensitivity of cash holdings based on a multilinear model. One finds that cash earnings increase with an increase in growth opportunities in the absence of financial constraints. Similarly, future investments increase earning opportunities. Interestingly, constrained firms held more cash. One would have expected that firms with more cash to invest in future opportunities, especially profitable ones. The sensitivity of cash was noticeable indeed. Almeida et al. (2004) strengthened their results by conducting a robustness test-augmented regression and alternative baseline model. The results were invariably the same as before in the multilinear regression. Furthermore, they explored dynamism in liquidity management caused by macroeconomic shocks. The findings were that cash holdings react to macroeconomic shocks illustrated by gross domestic product (GDP), interest rates and the KZ index.

Booth (2007) compared CCF and APV-similar to Ruback (2002). The fundamental focus of Booth (2007) is on three methods; (i) APV, (ii) CCF and (iii) WACC methods. Just like some authors, he presented WACC as a method while WACC is just a parameter used in a valuation. Booth (2007) compares valuation to an English "idiom"- 'you cannot get there from here'. According to Booth (2007), appraisers should think about that English "idiom" when doing appropriate valuations. In presenting a theoretical consistent valuation, Booth (2007) started off by showing that the value of the firm (sometimes known as enterprise value) is made up of the equity and debt PVs. The PV of equity is what is usually known as unlevered PV while the PV of debt is value of debt tax shields. Thereafter, he showed how one could go on and build the returns, cost of equity and WACC. Those rates are appropriate for different scenarios, based on whether the capital structure is made of debt or equity, or both. The major point of illustration from Booth on this point (i.e. consistent valuation) is that one can account for the distress cost function, which is subtracted from the debt amount. To Booth (2007), there is an interlinked relationship between APV, ECF, WACC and CCF to get the same value. This study still questions why one would get the same value using the different valuation methods. Thereafter, the author moves and looks at 'the static trade-off model and ECF model'. For the latter section, Booth (2007) stated the key question; how the levered cost of equity varies with debt levels in nth firm? This is a typical situation where one has the option of choosing between APV and CCF. Additionally, outlining how different returns are handled in different valuation models.

According to Booth (2007), the pure leverage situation is synonymous with the Miller-Modigliani proposition. In a typical multi-financed situation, the author argues that in most cases, the risk in the form is borne by equity holders as bondholders protect themselves against such default risks.

Then Booth (2007) disentangled the WACC technique. In simple terms, this section looked at how one can calculate the value of a firm when the firm is financed through a combination of debt and equity. The critical takeaway from Booth (2007) under this section is that the appraiser estimates that debt and equity portion is used in nth WACC. He further showed that as the debt levels changed in the capital structure of a firm, the WACC started showing its shortcomings. The CCF method works appropriately when debt levels are fixed and/or are proportional in a firm. Alternatively, when debt is changing, it will be to use the APV method. In order to verify the latter statement, Booth (2007) used a highly leveraged transaction example where WACC varies over time with changing debt levels. The fundamental findings from Booth (2007) are as follows. Firstly, one should know when the CCF (APV) method is appropriate for valuation. Secondly, there should be an iterative process when debt levels are changing in a given situation. Thirdly, interest tax shield should be modelled correctly in a calculation. Lastly, the WACC should be used appropriately in the correct situation.

Hovakimian and Hovakimian (2009) investigated the sensitivity of cash flows in relation to investments made. According to the authors, both underinvestment and overinvestment lead to sensitivity of cash flows. They argue that traditional financial indicators such as (i) size and (ii) dividend payout, successfully distinguish between potentially constrained firms, but fall short when they are used to identify tight and relaxed periods. Hovakimian and Hovakimian (2009) use the KZ index, among other techniques, to explore the sensitivity of cash flows. The data is from Compustat covering the 1985-2003 period. For a firm to have been included in the analysis, it should have been worth less than \$1 million (based on the measurement of book values of assets, net fixed capital or sales). In addition, those firms should be listed on the database for at most two years. The final data is made of 60,285 observations representing 7,176 firms. As part of the preliminary analysis, Hovakimian and Hovakimian (2009) separated sensitive cash flows from insensitive cash flows. For that, they used a multilinear model where investment was a dependent variable, and independent variables are market-to-book ratio of assets and cash flows (both sensitive and insensitive). The midpoint of cash flow sensitivity (CSFI) is 0.5-above sensitive and below insensitive. That threshold is ad hoc-Hovakimian and Hovakimian (2009). The results for that particular analysis illustrate the

following: higher rates of investments imply high cash flow sensitivity. In addition, lower cash flows are smaller and less likely to pay dividends. Furthermore, those firms have lower leverage ratios, but higher tangible, market-to-book and R&D expenses. Based on Hovakimian and Hovakimian (2009) findings those firms were likely to raise external funds for future investment opportunities. The latter point is synonymous with the REIT industry. They went further and analysed investment and behaviour patterns based on those two types of cash flows. Findings revealed that insensitive cash flow firms led to a difference of 2.5 between high cash flows and low cash flows.

Further analysis by Hovakimian and Hovakimian (2009) includes (i) cash flow cycle investment, (ii) cash flow cycle external financing and (iii) cash flow cycle internal liquidity. For the three tests issues, the results confirmed the earlier findings. On the other hand, the results showed that those sensitivities of cash flows might be due to agency costs-managers and shareholders disagreeing among themselves.

Penniken and Manchidi (2020) contrasted the values of REITs using the income method and real option analysis. Just like other studies on valuations, Penniken and Manchidi (2020) stated that the values of REITs depend on the method used in the valuation. Broadly, each method has its own advantages and disadvantages. The authors put forward the fact that within the income methods, the capitilisation method is a widely accepted method for valuation. The income method is underpinned by the discounted cash flow, which can be either CCF, CFd, ECF or FCF. At the heart of Penniken and Manchidi (2020) illustrated that the income method, specifically CCF, does not take into account flexibility, while real options do account for flexibility. In the context of this study, one focused on the different income method and less on real options. The data used was based on the top 10 REITs listed on the Johannesburg Stock Exchange (JSE) from February 2006 to December 2018. The REITs were chosen based on their market capitilisation (market cap) - from the biggest market cap to the smallest market cap. At that time (2013-2018), the top 10 JSE listed REITs market cap made 80% of the JSE REIT index. The real option model used was the Samuelson-McKean (1965) model.

The preliminary analysis of Penniken and Manchidi (2020) illustrated that most South African REITs are diversified-invest in different sectors of the real estate industry. Based on CCF, most South African REITs are classified as small-caps to mid-caps stock based on the definition of Mueller (1998). The major finding based on the CCF method is that all the parameters of a firms' financial statements (i.e. cash items and non-cash items) are well accounted for in the method. When

CCF values are compared with real options values, CCF underperforms real options. On average, real options values are higher CCF values by ZAR5.68 billion.

3.2.4 Debt Cash Flow

The point of departure for Bahnson et al. (1996) is that financial statements (i.e. balance sheet and cash flows) cannot appropriately articulate changes from current assets and liabilities. That former point would imply that cash flows are incorrect in including CFds, where some items of liabilities contribute to those cash flows. According to the authors the contradiction between the movements of current assets and liabilities result in changes on financial statements. In order to investigate the main point, Bahnson et al. (1996) focused on (i) operating cash flows (OCFs), (ii) conventional articulation of OCFs and (iii) policy given cash flows, in relation to regulations from the Financial Accounting Standards Board (FASB). They used data on 6,999 U.S. firms from Compustat. The financial statements were from 1987, 1988, 1989 or 1990, where statements had enough information for the analysis. The sample was divided into larger and smaller samples (25% of the larger sample). The more significant sample results illustrated the differences between reported cash flows and articulated cash flows, and the range of difference is between -3% and 3%. Moreover, the difference is symmetrically distributed both to the positive and negative sides.

The results of the smaller sample showed that the difference between articulated cash flows and reported cash flows was 125%. The significant contribution to that divergence is how one handles cash and non-cash items. On debt, several items contribute to CFd; hence, the divergence due to non-synchronisation in debt is significant. Although, some ways of handling non-cash and cash items are legal, those mechanisms still lead to divergence. In order to strengthen their findings, Bahnson et al. (1996) used Kleer-Vu (KV) industries in 1990. The results from KV confirmed that conventional accounting principles lead to deficiencies in cash flows. That is largely because of non-ability to handle non-operating changes in current accounts. Fundamentally, Bahnson et al. (1996) showed that legal accounting principles lead to deficiencies in net figures of non-cash and cash items, which lead to incorrect CFds.

Sweeney et al. (1997) conducted a study where they contrasted the market and book values in calculating the returns of assets. In most assets, market values were not necessarily book values in the property market. However, when valuing financial statements of REITs, book values are invariably market values as the issue of a lagging effect is taken care of on financial statements. The

central theme in Sweeney et al. (1997) is the usage of the book values of debt effectively. The key issue on debt is how to measure the quality of long-term debt. The period covered was 1978-1991 across 15 U.S. industries and data is from Lehman Brothers Fixed Income. The maturity value of debt is at least \$500,000. The preliminary results were divided into first, firms with at least 50% of long-term debt available and secondly, firms with at least 90% of long-term debt available. The results illustrate that the difference in book and market values ranges from 0% to 7%. The 7% was in 1981, when the book value capital structure was under 30%. By extension, it would imply that CFds from market values would be higher than CFds based on book values. Furthermore, the results illustrate that, on average, book and market measures are 30% and 27%, respectively. The 3% difference is enormous, given that real estate investments are capital intensive.

The authors went further and explored the implications for the capital structure. Sweeney et al. (1997) found that book values introduce errors in the presence of market values. That would imply that book CFds are not a true reflection of market CFds. For the capital structure, the difference shows a bias towards the larger firms. Therefore, CFds of larger firms tend to be larger than those of smaller firms. Interestingly, one might find that debt book values illustrate that a firm has filed for bankruptcy while market debt values do not support bankruptcy, and inversely related. A similar pattern of earlier results was evident when one calculated the rates of returns including risk illustrated by betas. The fundamental finding from Sweeney et al. (1997) is that the amount of debt influences CFds.

Bradley et al. (1998) investigated the dividend effects on cash flows. Dividends are a cost to a company. Therefore, one can view dividends as debt incurred by a company, as dividends should be paid as long as shareholders declare them. The authors stated that dividend policy talks directly to the value of a company and its valuation. This is because the more dividends paid out, the lower the amount left, including money to use for a firm's growth. At the heart of Bradley et al. (1998), there is no optimal dividend policy, which translates into value creation. Furthermore, the authors state that firms with highly volatile cash flows normally have agency cost problems. They used multilinear models (i.e. return based and dividends), which have a simple one- period and two-dated model where risk was neutral. The main model was the return based model and it has the following independent variables; (i) risk-free interest rate, (ii) stock market returns and (iii) dividends. The dividend model has two independent variables; cash flow from shareholders (jointly with signaling parameters, positive when dividend declared) and volatility from cash flows (jointly with a parameter

illustrating the relationship between cash flow-volatility and dividends). Depending on the types of shareholders, the cash flows can be ECF, FCF, CFd or CCF. For this section, the focus was on CFd. Broadly, Bradley et al. (1998) model builds on from Eades (1982). In addition, the model includes a penalty when dividend payouts were not met. In the context of volatility, an increase in volatility should lead to lower dividends being declared.

The data in Bradley et al. (1998) is on REITs listed on the National Association of Real Estate Investment Forms (NAREIT), which were public during the 1985-1992 period. The final sample after cleaning the data was 416. The REITs invested in office, warehouse, retail and apartment properties. The geographic diversification was New England, Middle Atlantic, Southeast, Midwest, Plains, Southwest, South Pacific and North Pacific - 1 for geographic concentrated REITs and 0.125 for REITs invested over eight regions. The book values ranged between \$2.1 million and \$486 million. Note by law at the time, that the U.S. was required to pay at least 95% of their net income to unitholders (commonly known as shareholders). The preliminary results showed that highly levered REITs had little accounting income. This was consistent with the dividend payout policy. In addition, that would lead to lower CFd. Moreover, the depreciation expense was 2.5%. Overall, the cash flows were less than interest plus general and administration (G&A) expenses.

Further in depth analysis from Bradley et al. (1998) includes (i) evidence from annual data and (ii) announcement-period returns. On the first in-depth test, they found dividends decreased the penalty of not declaring dividends, and the magnitude of the penalty was at least 10%. On the last test, Bradley et al. (1998), returns decreased with an increase in dividends. Similarly, cash flows decreased with an increase with in dividends. Fundamentally, Bradley et al. (1998) illustrated that there is an inverse relationship between dividend payout with cash flow. However, there is a positive relationship between cash flows and dividend payout.

Barclay et al. (2006) studied the amount of debt capacity that a firm can handle in a given scenario. At the heart of their study is that, the asset base of a firm grows as the debt capacity of the firm grows. Interestingly, as that happens the growth options of the firm decrease -Barclay et al. (2006). The mitigating factor, according to the authors for the latter scenario, is that 'growth options tend to have low market leverage' (P37). On the other hand, as the amount of debt financing increases, so does the possibility of eroding the growth option, because of the emerging puttable scenario. And as the latter statement occurs, the possibility of underinvestment increases. However, with the options framework, Marcato et al. (2019) illustrated that leverage, as an underlying asset,

increases the value of an option (i.e. leverage) in the REIT industry. The contradicting environment of those studies might be the setting of how leverage is handled in the laboratory. Back to Barclay et al. (2006), they used the DCF method that has a growth option component and later, a linear regression. In building a case for their study, they focused on (i) the setting, (ii) overinvestment and firm value, (iii) leverage and underinvestment, (iv) optimal leverage and (v) optimal leverage and book values.

The setting was based on 2-period with 3-dated models of capital structure and real investment. External funding was from shareholders and from bondholders. The first cash flow is at period 1. It includes conflicts between managers and shareholders by stating that managers receive private information. However, the model takes the premise that managers are there in the best interest of the shareholders. In order to handle overinvestment and firm value, the focus is on how debt policy contributes to the value of the firm. That leads to the creation of the expected agency cost for FCF. The FCF is taken as CCF because the underpinning fact is debt financing, which is central to CCF. On the leverage, the emphasis is on control overinvestment from the managers' perspective. In addition, the optimal leverage is based on the ability of a firm to pay its debt borrowings. Based on different economic heuristics and mathematical illustration, Barclay et al. (2006) proposed three propositions. The first is that "debt levels determine the maximum level of a firm". Second, "decreasing debt levels increase investment opportunities" and finally, "decreases in market-to-book ratio is due to a decrease in book leverage".

The data in Barclay et al. (2006) is from the 1950-1999 period. The data was made up of 109,000 firms, with yearly observations constituting of 9,037 industrial firms. The variables tested in the model were (i) book leverage, in their sample the average was 25%, (ii) growth options, based on changes in market-to-book ratio, (iii) regulation, effects of rules, (iv) firm size, mean sales are \$163.12 million, (v) profitability, average was 11%, and (vi) fixed-asset ratio, the average was 34% and taxes-used marginal tax. The results showed that the market-to-book ratio was negative and statistically significant - both in cross-sectional and fixed-effects regressions. Moreover, as expected, as the debt levels increased, the possibility for defaulting increased; leading to underinvestment. The three parameters (i.e. truncation, tax proxies and periods) of robustness tests confirmed the earlier findings. Finally, the null hypotheses were rejected in the analysis.

Quagli and Avallone (2010) compared European real estate companies fair and cost values in Finland, France, Germany, Greece, Italy, Spain and Sweden - first time adopters of International

Financial Reporting Standards (IFRS). They argued that IAS40 is relevant for (i) reducing agency costs, (ii) managing information asymmetry and (iii) managerial opportunities. The IAS40 focuses on the values of investment properties. For their study, the authors used a probabilistic (i.e. logistic) model to explore debt (i.e. market-to-book value and leverage) on the values of firms. By extension, one uses cash flows such as CFds to find the values of firms. To understand the importance of value, Quagli and Avallone (2010) stated that the fair values provide information on future cash flows. At the same time, the cost model provided conservatism, smoothness and accruals of values. The question in a given scenario, which method provides the appropriate value? In order to respond to the latter question, Quagli and Avallone (2010) focused on (i) expectations from accounting choice theory, (ii) information asymmetries as measured by market-to-book ratio and (iii) managerial opportunism-fair values vs. cost values.

The data was on the cost method for investment properties from Germany (Deloitte & Touché 2001), Finland (KPMG 2003), Italy (PWC 2005), France (KPMG 2003), Greece (Tsalavoutas and Evans 2009), Italy (PWC 2005), Spain (Amat et al. 2007) and Sweden (KPMG 2005). Broadly, the following was noted on each country. In Spain and Italy, asset revaluations are permitted under special circumstances. In France, revaluations are only allowed if revaluations include fixed assets and long-term financial assets. In Greece, revaluations take place every four years. No revaluations allowed in Germany. In Finland and Sweden, revaluations are allowed when fair value exceeds the permanent costs of assets. Thereafter, they built five hypotheses. The first hypothesis, the chances of choosing fair value decreases with an increase in leverage before the adoption of IFRS. Second, the size of the firm is inversely related to choosing the fair value. Third, the more the difference between market and book values, the more one is inclined to choose fair value. Fourth, the difference between market and book values increases, the more one uses IFRS1 to choose historical cost values. Finally, when managers use accruals, then the choice of fair value decreases.

The preliminary results of Quagli and Avallone (2010) showed that there is a positive relationship between the increment levels of disclosure and the size of firms. Separately, market-to-book value and leverage contribute to outlying values of firms. Moreover, the increment in market-to-book value leads to choosing between fair value and cost value methods. By extension, the disparities between CFds based on fair value and cost value methods were evident. They stated that growth options are essential for high-tech firms but not for real estate firms. However, growth options are essential for REITs because REITs payout most net profits as dividends, leading to less money

left for investing opportunities. Fundamentally, most firms preferred the fair value method for appraisal. Quagli and Avallone (2010) went further and did a multivariate analysis. On the market-to-book value, results confirmed a decrease in market values. This was expected because the market should at least mimic most market movements. The robustness results confirmed earlier findings.

Minnis (2011) investigated on how debt financing contributes to the veracity of financial statements. Minis (2011) relates to CFds because every variable tested in the study was of debt nature. Moreover, he tested how those variables affected cash flows. By extension cash flows, emanating from debt financing should be CFd, although not explicitly stated in Minnis (2011). Note that cash flow is from operations, by extension operations of any business includes debt. According to Minnis (2011), authenticity of financial statements is central to financial reporting. In order to understand how debt financing contributes to the accuracy of accurate financing statements, he focused on three themes. First, 'auditing and the interest on debt', then, 'increasing informativeness', and finally, 'the predictive ability of financial statements' (Pages, 461-464). On the first theme, Minnis (2011) opines that prior studies stated that independent audits reduce moral hazard and information asymmetry of financial statements. He further stated that in order for audits to be acceptable, the audit firm should be credible. Based on synthesising theme one, the author hypothesised that appropriately audited financial statements should predict cash flows than net income for one year ahead of time. On the second theme, the author stated that auditing is intricately linked to hard and soft information. However, cautioned that soft information is generally subjective, while hard information is objective. Based on the second theme, the author inferred that the cost of debt is better associated with audited financial statements than unaudited financial statements. The third theme focused on the quality of financial statements. He based this theme on the fact that when auditing, financial statements should assure certain minimum acceptable level of quality. The latter statement translated into the third hypothesis.

The data for Minnis (2011) is on private firms. The author argued that private firms contribute significantly to the U.S. economy 'represents 99% of all firms and generate at least 50% of private sector gross domestic product (GDP)' (P 465). And, for those firms, it is about '\$650 billion of the \$2 trillion in 2007' (P 465). He acknowledged that these firms have problems but they contribute positively to the U.S. economy. The data was provided by Sageworks Inc. The initial sample was made up of 122,275 firms and from that initial sample, 57,490 firms were removed because they had abbreviated reports, 2,610 were eliminated because they faced mandatory reports – these were

utilities, finance and insurance industries, 6,959 were deleted because they had extreme values and 10 were removed as they had total assets of at least \$259 million. Finally, he stated that the final sample of firms that were required to use accrual basis accounting. The variables for testing are (i) attestation level (i.e. when firms report they are required to state compilation, review or audit in terms of veracity of the audit), (ii) interest rate (i.e. the actual interest is not provided in the data; therefore, he estimated by averaging beginning and ending levels), (iii) financial statement ratios [i.e. he used interest coverage ratio; current ratio; and property, plant and equipment (PPE), where PPE is amount of PPE that can be liquidated to pay outstanding debt), (iv) firm characteristic controls [i.e. leverage, where leverage is total liabilities divided by total assets, negative (neg) equity is total liabilities less total assets and sales growth- year on year sales over revenues), (v) exogenous instrument (i.e. potential biasness of quality reporting) and (vi) cash flow predictive ability variables [i.e. net income over total assets and cash flow (CFO) portion]. All tests were based on multilinear models.

The results of the six variables are as follows. For the first parameter, most audits were either review or compilation. For the interest rate, the median and mean of the sample were 7% and 7.3%, respectively. For the PPE, assets of firms made 32%. For the fourth parameter, sales growth was 8% per year and the mean (median) was \$6.5 (\$2.6) million in total assets. For the fifth parameter, the results support the fact that the correlation between state audit and the underlying economic conditions were positive. On the final parameter, it showed that firms that had lower interest rates had observable and unobservable characteristics. The author further tested correlation; positive audits are associated with leverage, but negative with interest coverage and interest rates. Further analysis in Minnis (2011) focused on self-selection bias. For that multilinear model, there were two vectors, X of exogenous variables affecting interest rates and β parameters illustrating the impact of those factors on interest rates. For modelling choice, the author focused on (i) variables predicting audit choice (profitability and liquidity, fixed assets, leverage, size, growth and incorporation status) and (ii) audit choice. The results for variables in the latter statement illustrated leverage and negative equity. Interest rates decreased with interest coverage, current ratio, PPE, LN (Assets) and C-corp. As expected, strong audits decreased information asymmetry. Finally, for both the three hypotheses, the results rejected the null hypotheses. The interesting hypothesis for this study is that debt financing is a good predictor of cash flows. The robustness result confirmed the earlier findings of Minnis (2011). Fundamentally, that debt is a better predictor of cash flows. In principle, appropriate CFds are underpinned by the ability to appropriately value the debt of a firm.

Faulkender et al. (2012) disentangled the relationship between cash flows and leverage adjustments. In the context of the cash flows, leverage affects CFds among other types of cash flows. Their point of departure is that leverage is affected by transaction costs and the ability of the firm to raise capital externally. They used a debt partial adjustment model where the outstanding debt at a particular time was a proportion of the outstanding debts book value. Thereafter, the model was adjusted such that in other scenarios, where passive and active mechanical components were subjects of the formula, another technique that was used was the Generalized Method of Moments. The data is from Compustat and CRSP from the 1965-2006 period. Financial and utilities firms were excluded from the study. The preliminary results of Faulkender et al. (2012) showed that the adjustment speeds for market and book values were different. For active management, the speed was 31.6%. With the absence of debt, the firms become more under-levered. According to the authors, the reason for the latter finding is that under-levered firms forego tax benefits. They went on further and explored if 'cash flow on capital adjustment costs' (P637)-that talks to the cash flows. The first thing that they picked up is that cash flows should accommodate leverage adjustments. The cash flow defined and/or illustrated in Faulkender et al. (2012) was similar to CFd.

The results from the latter test showed that leverage adjustment costs translate into the adjustment costs of firms. Second, when debt was fixed, its costs were easily absorbed into the costs of the firms. Thereafter, they did a robustness test based on selected macroeconomic variables (i.e. excess development, overlap and excess cash flows). The robustness tests confirmed earlier findings. Finally, they looked at financial constraints and market timing. For the latter test, they used size and rating as independent variables. Fundamentally, results reveal that market timing is affected by leverage effect. On a broader level, empirical presentations showed that CFds is positively related to leverage gap.

Dempsey (2013) disentangled the incorrect relationship between the WACC and APV. He picked up that one scholar earlier that showed that WACC (in principle CCF when debt fixed or FCF when debt levels change periodically) could not have the same value as APV. It can be inferred from Dempsey (2013) that sometimes appraisers and academics argued/argue that certain methods lead to incorrect values, while the problem is purely an algebraic manipulation error. In the context of Dempsey (2013), the problem is the mistreatment of WACC and discount rate when accounting for the value tax savings due to debt. According to the author, Massari et al. (2008) presented a WACC in which one of its parameters was the cost of equity of an unlevered firm, while WACC values for

a levered firm. That is, the formula for the levered value of firm according to Massari et al. (2008) is the tax savings value discounted at the cost of debt plus the discounted earlier value of dividend. The growth accounts for each portion of the different values. In correcting Massari et al. (2008), Dempsey (2013) showed that for the WACC, there are two components; (i) debt portion and (ii) equity portion. In fact, Fernandez (2007) opines that WACC is the proportional average of cost of equity and cost of debt. Put it differently, Fernández (2007) and Dempsey (2013) stated that wrongfully naming and/or interpretation of valuation parameters leads to the wrong values of assets. The final formula of a firm, when part of the firm is financed through debt according to Dempsey (2013), is the FCF discounted by the WACC and growth subtracted from the WACC. Dempsey (2013) did not state whether the WACC was based on the parameters before and/or after tax, but one can assume that it is after tax as the value of firms when using FCF should be discounted by the WACC after tax.

3.3 Modelling

The study explored valuations based on four different types of cash flows (i.e. CCF, CFd, ECF and FCF). The income valuation approaches are illustrated in table 3.1;

Table 3. 1: Income Valuation Approaches

Items	Adjustment
Profit After Tax	0
Depreciation and amortization	Add
Purchase of fixed assets	Subtract
Book value of disposals and sold fixed assets	Add
Interest of working capital requirements	Subtract
Interest (1-tax rate)	Add
Free Cash Flow (FCF)	
Interest (1-tax rate)	Add
Interest of short-term financial debt	Add
Principal payments of long-term financial debt	Subtract
Equity Cash Flow (ECF)	
Interest	Add
Principal payments of long-term financial debt	Add
Increase of short-term financial debt	Subtract
Debt Cash Flow (CFd)	
Capital Cash Flow (ECF+CFd)	

Note: Information in table 3.1 is adopted from Fernández (2004).

Before one moves to the discount rates, one should understand the different types of cash flows. ECF is money that goes from the company to the pockets of shareholders. FCF is the cash flow that a firm has after taking into consideration all cash flows that support the operations of firms. CCF calculates the value of the company (market value of its equity plus market value of its debt) and that is equal to the present value of CCFs discounted over weighted average cost of capital before tax ($WACC_{BT}$). CFd is cash flow from the debt portion of a firm. When one values a company based on each cash flow, in order to come to certain (market) values, one must discount the cash flows by using appropriate discount rates. The appropriate discount rates for different cash flows are shown in table 3.2;

Table 3. 2: Discount Rates for Different Cash Flows

Cash Flow Type	Discount Rate Name	Discount Rate Formula
ECF	Return on equity, usually illustrated by capital pricing asset model (CAPM)	$K_e = r_f + \beta_m(R_m - r_f)$
FCF	Weight average cost of capital (WACC)	$WACC = \frac{V_E + V_D(1 - T_c)}{V_E + V_D}$
CFd	Return on debt, usually represented by government debt and/or coupon with shortest maturity	K_d
CCF	Weight average cost of capital before tax ($WACC_{BT}$)	$WACC_{BT} = \frac{V_E + V_D}{V_E + V_D}$

Note: Information in table 3.2 is adopted from Fernández (2004) and Ruback (1986; 2002). ECF is for equity cash flows, FCF is for free cash flows, CFd is for debt cash flows and CCF is for capital cash flows, K_e is the return on equity, K_d return of debt, r_f is the risk free-interest rate, β_m is the beta of the market, R_m is the return of the market, V_E is the value of the equity, V_D value of debt and T_c is the corporate tax rate. Note that the main difference between FCF and CCF is that the WACC of FCF is based on after tax cash flows while the one for CCF is before cash flows. In addition, V_E and V_D in CCF are estimated market values not ones from the financial statements.

3.4 Data

3.4.1 Preface

The researcher used data on the South African listed REITs, starting from 2014 because 2007-2009 was a subprime crisis period. Crises lead to distortion in the calculation of values. Generally, in academia and practice, the values of firms are calculated over a 5-year period. This study will model values from the 2014 financial year because South Africa officially adopted the global REIT legislation in May 2013. Secondary data was adopted, from Bloomberg and SAREITs Association, which is a body representing all South African listed REITs. The association is modelled on NAREIT (National Association of Real Estate Investment trusts) in the U.S and EPRA (European Public Real

Estate Association) in Europe. Based on the data collected from SAREIT Association, there were 28 REIT firms members listed on the JSE in March 2021, of those 28 member firms, only 21 were listed on the JSE in 2014, these firms were; Fortress REIT Limited, Resilient Property Fund, Hospitality Property Fund, Dipula Income Fund , Delta Property Fund, Oasis Crescent Property Fund, South African Corporate Real Estate, Tower Property Fund, Texton Property Fund, Redefine Properties, Rebosis Property Fund, Hyprop Investment, Emira Properties, Arrowhead Properties Ltd, Vukile Property Fund, Growthpoint Properties, Attacq, Accelerate Property Fund, Fairvest Property Fund, Investec Property Fund Limited and Equities Property Fund. Transcend Residential Property Fund was only converted to a public company on the 22nd of August 2016, and has been listed on the JSE since the 12th of February 2020, Stor-age Property REIT Limited, Indluplace Properties, Spear REIT Limited, Octodec Investment Limited and Heriot REIT Limited were only listed on the JSE in 2017, therefore no integrated reports were available for the 2014-2017 period. Liberty Two Degrees listed on the JSE on the 6th of December 2016. Therefore, REITs which were not listed on the JSE after 2014 were left out in the study. REITs used in this study are shown in table 3.3.

Table 3. 3: Background on REITs

REIT	Geographic Focus	Sectorial Focus	REIT Type
GRT	South Africa and Australia	Retail, Office, Industrial, Residential and Motor Related	Equity
VKE	South Africa and Namibia	Retail, Office, Industrial, Residential, Hospital, Motor related and Sovereign	Equity
SA Corp	South Africa Namibia, UK, US and Swaziland	Retail, Office, Industrial and Residential	Equity
EMI	South Africa and Australia	Retail, Office, Industrial and Residential	Equity
RES	South Africa, Nigeria and Romania	Retail, Office, Industrial and Residential	Equity
TEX	South Africa	Retail and Industrial	Equity
RDF	South Africa, Europe, Australia	Retail, Office, Industrial and Residential	Equity
DIA	South Africa	Retail, Office, Industrial and Residential	Equity
FFA/FFB	South Africa	Retail, Office, Industrial and Residential	Hybrid
TWR	South Africa	Retail, Office, Industrial and Residential	Equity
REB	South Africa	Retail, Office, Industrial and Residential	Equity
ATT	South Africa, Namibia, Ghana, Zambia, Mauritius, England and Germany	Retail, Office, Industrial and Residential	Equity
OAS	South Africa	Retail, Office, Industrial and Residential	Equity
HYP	South Africa, Zambia and Ghana	Retail and Office	Equity
DLT	South Africa	Retail, Office, Industrial and Residential	Equity
HPB/HPA	South Africa	Retail, Office, Industrial and Residential	Equity
FVT	South Africa	Retail and Office	Equity
IPF	South Africa	Retail, Office, Industrial and Residential	Equity
APF	South Africa	Retail, Office, Industrial	Equity
AHD	South Africa	Retail, Office, Industrial and Residential	Equity
EQU	South Africa	Retail and Industrial	Equity

Note: GRT is a ticker for Growthpoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Rebois Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB/HPA for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund, AHD for Arrowhead Properties Ltd and EQU is Equities Property Fund. Mean stands for average, Min is for minimum, Max is for maximum, Med is median, StdDev is standard deviation, Skew is skewness and Kurt is kurtosis. Finally, StdDev, Skew and Kurt are not ZAR amount values but decimal values.

Table 3.3 indicates that REITs listed on the JSE in 2014 were all diversified regarding sectoral and geographical investments. Ro and Ziobrowski (2011), proved that diversified REITs outperform specialised REITs; however, in the context of the U.S., specialised REITs outperform diversified (Benfield et al. 2009) because in the U.S., the cost of diversifying outweighs the benefits of diversifying. It might be different for South Africa; however, the issue of diversifying REITs versus specialised REITs is beyond the scope of this study. REITs listed on the JSE in 2014 sectorial diversifications were mainly in the retail, industrial and office sector. The majority of the REITs that were listed in 2014 were primarily geographically focused in South Africa. However, this is not the pattern for all REITs listed on the JSE in 2014, with other REITs' geographical diversification

expanding to other continents and African regions. Namibia was the preferred African country to diversify into because of the already existing relationships South Africa has with Namibia, as part of the Southern African Development Communities Regional Economic Cluster. Vukile and Attacq were exposed to the Namibian property market. This might have to do with the fact that those REITs have Afrikaner management and Namibia is also an Afrikaans speaking country. On the geographical diversification, based on Florida and Roulac (2007), emphasised that it (i.e. geographic diversification) is a vital portfolio strategy applied by various real estate investors. Further to this, diversifying into other continents provides currency hedging (Kuhle, 1987). JSE listed REITs are primarily equity REITs, with the implication that the majority of REITs in 2014, which were managed and owned by the companies, and produced their income from investment properties. Evidence shows that this structure was not the same for Fortress, which adopted a hybrid structure in 2014, suggesting that Fortress, unlike all the other REITs, invests directly into property and indirectly through investments in listed property securities.

3.4.2 Analysis

Table 3.4 presents values of REITs based on the different cash flows.

Table 3. 4: Market Valuations

Ticker	FCF Values (in millions of ZAR)	ECF Values (in millions of ZAR)	CFd Values (in millions of ZAR)	CCF (in millions of ZAR)	Market Cap
GRT	21 386.92	39 030.55	35 155.69	69 930.45	55 704.00
VKE	-255.43	-4 168.19	9 210.10	5 918.65	8 500.00
SA Corp	1 821.77	150.99	4 142.32	4 183.20	9 547.00
EMI	4 957.93	-4 918.75	6 421.23	3 365.02	7 100.00
RES	19 272.42	31 604.01	20 692.49	50 149.84	18 769.00
TEX	388.31	931.35	338.13	1 632.22	1 632.00
RDF	14 869.49	-15 981.20	17 837.78	5 485.38	36 400.00
DIA	-1 623.21	-1 185.06	-214.68	-1 204.13	2 800.00
FFA/FFB	8 608.85	14 347.19	15 439.31	29 198.77	11 000.00
TWR	-1 331.33	-1 706.66	-834.18	-2 452.14	3 190.00
REB	3 173.06	6 238.58	4 915.93	15 875.37	4 230.00
ATT	-7 218.72	-16 409.90	-6 089.11	-21 224.94	11 889.00
OAS	183.11	175.73	156.39	351.45	666.00
HYP	13 987.51	-2 834.45	13 988.63	19 450.58	19 428.00
DLT	2 435.17	13 187.25	1 626.88	12 605.73	3 400.00
HPB/HPA	-589.72	-26 613.51	320.91	-10 645.13	4 780.00
FVT	120.51	167.58	155.99	1 733.71	733.00
IPF	791.88	5 652.00	4 288.34	12 046.43	5 191.00
APF	-5 577.93	-4 495.18	-4 619.16	-8 842.27	3 130.00
AHD	-2 038.17	258.36	329.52	-4 949.46	5 900.00
EQU	258.36	-4 938.09	-8 526.03	-1 503.25	5 408.00
Mean	5 909.39	9 706.56	7 666.64	14 179.87	8 619.54
Min	-7 218.72	-26 613.51	-8 526.03	-21 224.94	666.00
Max	21 386.92	39 030.55	35 155.69	69 930.45	55 704.00
Median	388.31	150.99	1 626.88	3 365.02	5 408.00
StdDev	7 554.83	14 253.88	10 024.04	20 007.51	12 940.13
Skew	1.16	0.91	1.36	1.71	2.53
Kurt	0.57	1.99	2.21	3.53	6.76

Note: Market cap is market capitalisation. GRT is a ticker for Growthpoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Rebohis Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB/HPA for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund, AHD for Arrowhead Properties Ltd and EQU is Equites Property Fund. Mean stands for average, Min is for minimum, Max is for maximum, Med is median, StdDev is standard deviation, Skew is skewness and Kurt is kurtosis. Finally, StdDev, Skew and Kurt are not ZAR amount values but decimal values.

The skewness on average of FCF was 1.54 and positive. That implies that the values based on FCF yield excess returns for the firms-Peiro (1999). Notable REITs had negative values based on FCF valuations. One possible explanation is that one can pick it up from the financial statements that those firms with negative FCF values acquired significant property; moreover, most of those firms traded as REITs in 2014. On the other hand, firms had increasing working capital requirements for that particular period. Finally, firms with negative FCF values were focused mainly on retail and

commercial sectors. In terms of geography, they mainly invested in South Africa. When one observed the values based on other DCFs (i.e. ECF, CFd and CCF) including market cap, the patterns were similar to the ones observed when valuing firms using FCF.

When one list in descending orders of absolute values, the highest values are market cap, followed by CCFs, then ECF, CFds and finally FCF. Based on Fernandez (2004) and Ruback (1986; 2002), FCFs and CCFs should be closely the same; however, in this study, they are not. This is one distinct finding on the REIT industry. Over the five-year period, the debt amount of the balance sheets of REITs increased up to 2018. Fernandez (2007) stated that when periodical debt levels change, the PV(FCF) and PV(CCF) are not equal. In principle, market cap for REITs are very close to CCFs, while in other industries, especially in soft-drinks, market cap is close to ECFs (Gardner et al ,2012). Fortress REIT Ltd had high positive values based on cash flow measure. One of the reasons for that is that was the only hybrid REIT listed on the JSE in 2014. Ling and Ryngaert (1997) found that there is overpricing in mortgage and hybrid REIT IPOs. That might tell that Fortress has benefited from overpricing to date - Fortress listed in 2009 as a property loan stock¹ and converted into a REIT in 2013.

When one explored debt levels, REITs, on average have slightly higher debt than equities. The latter point has been illustrated by Marcato et al. (2019). The only firm that did not follow the latter phenomenon is GrowthPoint Properties. Among the unique things about GrowthPoint Properties is that it operated before May 2013 and it is the largest REIT listed on the JSE. Broadly, GrowthPoint is a commercial REIT. Resilient Properties is one of the biggest REITs on the JSE and it used most of its cash to finance its growth. Hence, the values of Resilient Properties based on different cash follows are all positive for the 2014 financial year. Similarly, Oasis Crescent Property Fund never had debt during the 2014-2018 period. He and Niu (2018) illustrated that positive equity leads to positive valuations. For Texton Property Fund, the market cap and the CCF (value) were equal (Table92.4), possibly because the market cap should represent the market value of a firm when the capital structure comprises of both debt and equity - this is a unique finding in this study. For Hyprop, market cap and CCF(value) were very close (Table 92.4). A possible explanation for the two firms seems to be when firms are focused on similar sectors, the different cash flows tend to be close to one another. Fundamentally, market cap overstated the values of JSE-listed REIT firms when

¹ A property loan stock is basically a real estate operating company (REOC), in western countries context.

one took into account the capital structure. That would imply that investors in REITs were overly confident. Roll (1986) calls the latter phenomenon the hubris hypothesis.

In terms of the economic environment, South African REITs, like any other stock, are driven by macro and micro-economic factors (Billmeier and Massa, 2009). Furthermore, Billmeier and Massa (2009) investigated the drivers of stock market in emerging markets, stressing that both micro and macroeconomic factors contribute towards the supply and demand of stocks. Their study honed into four key areas that drive the South African equity market, with particular attention being drawn towards the South African REIT market. These include; the South African Top 40 Equity Market Index, South African bonds, interest rates and publicly listed real estate firm's performance. The South African Top 40 Index is made up of entities that are representative of various sectors, this index represents the 40 largest companies on the JSE All share Index ranked by their market cap.

The JSE Index within the 2014-2018 period of the cash flow analysis has seen fluctuations in the market, where in 2014 year-on-year performance was 9.2%. This performance was expected as the South African 10-year government bond yield was chasing behind the Top 40 index at 8.2% with interest rates at 6.1% as provided by Statistics South Africa in 2014. In this period investors confidently invested their monies in the equities market as they enjoyed positive returns. According to Ntuli and Akinsomi (2016), in 2014 South African listed properties outperformed all asset classes at a global level including the UK, Asian and European markets. In 2014 investor confidence was significantly high following the enactment of REITs in South Africa, and thus drove foreign direct investments into the South African property market.

3.4.3 Robustness Test

Marcato et al. (2019) used a multilinear model in determining the relationship between selected macroeconomic variables and exchange options. Thereafter, rolled over the model by adding independent variables until all independent variables were in the full multilinear model. The latter process also incorporated the step-wise regression process. In that way, one could pick up whether each independent variable is a contributor or hedging parameter of the multilinear model. Secondly, multicollinearity and/or heteroscedasticity issues were picked up during the building process of the

full model. This study followed a grounded economic theory of heuristics and presents a multilinear model. The multilinear model is given by eq. (3.1):

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon_i \quad (3.1)$$

where Y_i represents values based on different cash flows, X_1 is debt value, X_2 equity value, X_3 is FFOs, X_4 is board composition based on race (white is equal to dummy 1 and otherwise zero), X_5 is executive composition based on gender (male dummy is 1, otherwise zero), X_6 executive composition based on race (white dummy is 1, otherwise zero) and ε_i is the error term. Note that values based on different cash flows are high, running in billions of ZAR; therefore, one took the natural logarithms to minimise them. Furthermore, values that were negative, one took absolute values; otherwise, one would not be able to get natural logarithms. On the other hand, the issue was not so much about the sign of the values but how those values reacted to selected independent variables.

Based on prior studies (i.e. Marcato et al. 2019, Graham and Knight 2000, Letdin et al. 2019, and Dempsey 2013), one can expect that the following parameters influence the PVs (CCF, ECF, CFd and FCF) in a positive manner. That the increase in one unit of selected macroeconomic variable causes an increase in the listed PVs.

Due to the South African discriminatory history, the majority of board members on the JSE listed companies pre-1994 were middle aged, white males (Rao and Tilt, 2016). With the implementation of race equity policies there has been a shift in this. Although they are strides in correcting the indifferences of the past, Mans-Kemp and Viviers (2015) concluded that there is still a great representation of white males on majority of JSE listed companies. Therefore, it is expected that the majority of JSE listed entities will have a majority white male representation. In principle, by having white males as board members and/or executives on REITs should send a positive signal to the markets, leading to growth in values of REIT firms.

Table 3. 5: Robustness Test

Panel A: ECF											
Variable	ECF1	ECF2	ECF3	ECF4	ECF5	ECF6	ECF7	ECF8	ECF9	ECF10	ECF11
constant	4.369(0.002)***	4.356(0.010)***	5.042(0.006)***	7.098(0.000)***	8.068(0.000)***	6.995(0.000)***	2.981(0.060)**	2.934(0.099)**	2.824(0.117)	2.597(0.143)	2.488(0.121)
debt	0.493(0.004)***						0.383(0.031)***	0.377(0.075)**	0.334(0.132)	0.274(0.212)	0.233(0.239)
equity		0.466(0.019)***					0.275(0.151)	0.273(0.172)	0.278(0.172)	0.2863(0.152)	0.348(0.064)**
FFO			0.510(0.064)**					0.020(0.947)	0.013(0.966)	0.030(0.920)	0.167(0.542)
board_composition_race_white				1.363(0.1356)					0.569(0.493)	1.101(0.234)	3.563(0.023)***
executive_composition_gender_male					1.418(0.4476)					2.202(0.201)	4.715(0.025)***
executive_composition_race_white						1.332(0.236)					-3.387(0.0493)
Adjusted R ²	0.324	0.217	0.125	0.067	-0.02	0.024	0.367	0.330	0.309	0.341	0.470
F-statistic	10.626(0.004)***	6.559(0.019)***	3.862(0.064)**	2.429(0.136)	0.601(0.448)	1.497(0.236)	6.788(0.006)***	4.277(0.020)***	3.235(0.034)***	3.073(0.042)***	3.953(0.016)***
Akaike IC	3.674	3.821	3.933	3.998	4.087	4.042	3.651	3.746	3.811	3.794	3.603
Schwarz IC	3.773	3.921	4.032	4.097	4.186	4.142	3.800	3.945	4.060	4.092	3.951
Hannan-Quinn	2.505	3.843	3.954	4.019	4.108	4.063	3.684	3.789	3.865	3.858	3.679
Panel B: CCF											
Variable	CCF1	CCF2	CCF3	CCF4	CCF5	CCF6	CCF7	CCF8	CCF9	CCF10	CCF11
constant	5.091(0.000)***	5.477(0.000)***	5.027(0.000)***	8.082(0.000)***	8.736(0.000)***	7.543(0.000)***	4.046(0.000)***	3.492(0.0012)***	3.486(0.002)***	3.403(0.003)***	3.387(0.004)***
debt	0.481(0.000)***						0.399(0.000)***	0.316(0.009)***	0.314(0.015)***	0.292(0.0261)***	0.286(0.034)***
equity		0.406(0.005)***					0.207(0.063)**	0.181(0.107)*	0.185(0.106)*	0.185(0.104)*	0.193(0.104)*
FFO			0.617(0.001)***					0.230(0.159)	0.230(0.1728)	0.236(0.167)	0.257(0.157)
board_composition_race_white				0.903(0.193)					0.030(0.9471)	0.225(0.659)	0.592(0.520)
executive_composition_gender_male					0.706(0.618)					0.809(0.397)	1.184(0.346)
executive_composition_race_white						1.431(0.085)**					-0.505(0.626)
Adjusted R ²	0.581	0.343	0.405	0.040	-0.039	0.104	0.637	0.659	0.638	0.632	0.613
F-statistic	28.715(0.000)***	9.908(0.005)***	14.621(0.001)***	1.823(0.193)	0.258(0.618)	3.315(0.085)**	18.522(0.000)***	13.876(0.000)***	9.798(0.000)***	7.873(0.000)***	6.273(0.002)***
Akaike IC	2.632	3.133	2.982	3.461	3.539	2.530	2.505	2.646	2.646	2.724	2.724
Schwarz IC	2.731	3.232	3.081	3.560	3.639	3.491	2.679	2.704	2.849	2.944	3.072
Hannan-Quinn	2.653	3.154	3.003	3.483	3.413	2.563	2.548	2.548	2.654	2.711	2.799
Panel C: FCF											
Variable	FCF1	FCF2	FCF3	FCF4	FCF5	FCF6	FCF7	FCF8	FCF9	FCF10	FCF11
constant	3.751(0.001)***	2.280(0.033)***	3.330(0.0161)***	7.194(0.000)***	7.598(0.000)***	6.888(0.000)***	1.194(0.203)	0.572(0.557)	0.649(0.511)	0.671(0.513)	0.624(0.5301)
debt	0.505(0.001)***						0.303(0.007)***	0.210(0.0802)**	0.240(0.060)**	0.246(0.068)**	0.228(0.082)**
equity		0.657(0.000)***					0.506(0.000)***	0.473(0.001)***	0.472(0.001)***	0.472(0.001)***	0.498(0.001)***
FFO			0.705(0.003)***					0.259(0.136)	0.263(0.134)	0.262(0.149)	0.320(0.083)**
board_composition_race_white				0.543(0.524)					-0.399(0.397)	-0.449(0.409)	0.594(0.518)
executive_composition_gender_male					0.120(0.907)					-0.210(0.833)	0.855(0.492)
executive_composition_race_white						0.839(0.417)					-1.435(0.1778)
Adjusted R ²	0.425	0.595	0.357	-0.03	-0.051	-0.016	0.717	0.738	0.735	0.718	0.736
F-statistic	15.778(0.001)***	30.387(0.000)***	12.122(0.002)***	0.421(0.524)	0.014(0.907)	0.689(0.417)	26.38(0.000)***	19.810(0.000)***	14.835(0.000)***	11.169(0.000)***	10.273(0.000)***
Akaike IC	3.326	2.975	3.437	3.908	3.929	3.895	2.657	2.666	2.759	2.719	2.719
Schwarz IC	3.425	3.074	3.536	4.008	4.029	3.994	2.806	2.816	2.915	3.057	3.068
Hannan-Quinn	3.347	2.997	3.458	3.930	3.951	3.916	2.689	2.661	2.720	2.823	2.795
Panel D: CFd											
Variable	CFd1	CFd2	CFd3	CFd4	CFd5	CFd6	CFd7	CFd8	CFd9	CFd10	CFd11
constant	4.420(0.002)***	2.488(0.056)**	4.776(0.0083)***	6.929(0.000)***	7.913(0.000)***	6.307(0.000)***	1.647(0.212)	1.625(0.275)	1.514(0.315)	1.530(0.328)	1.549(0.338)
debt	0.454(0.001)***						0.2346(0.112)	0.231(0.1911)	0.188(0.309)	0.192(0.326)	0.200(0.326)
equity		0.666(0.000)***					0.549(0.003)***	0.548(0.004)***	0.553(0.004)***	0.553(0.006)***	0.542(0.0089)***
FFO			0.513(0.063)**					0.009(0.972)	0.002(0.993)	0.001(0.997)	-0.023(0.935)
board_composition_race_white				1.259(0.172)					0.573(0.419)	0.537(0.512)	0.106(0.943)
executive_composition_gender_male					-0.519(0.783)					-0.154(0.919)	-0.593(0.765)
executive_composition_race_white						1.845(0.096)**					0.592(0.721)
Adjusted R ²	0.265	0.495	0.126	0.048	-0.048	0.094	0.538	0.511	0.502	0.469	0.437
F-statistic	8.216(0.010)***	20.588(0.000)***	3.885(0.063)**	2.019(0.172)	0.078(0.783)	3.071(0.096)**	12.660(0.000)***	7.972(0.002)***	6.041(0.004)***	4.536(0.010)***	3.583(0.023)***
Akaike IC	3.766	3.391	3.939	4.024	4.121	3.975	3.342	3.437	3.491	3.585	3.671
Schwarz IC	3.865	3.491	4.039	4.92	4.221	4.075	3.492	3.636	3.739	3.883	4.019
Hannan-Quinn	3.788	3.413	3.961	4.046	4.143	3.997	3.375	3.480	3.545	3.650	3.747

Note: the multilinear model is given by $Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon_i$, where Y_i represents values based on different cash flows, X_1 is debt value, X_2 equity value, X_3 is FFOs, X_4 is board composition based on race (white is equal to dummy 1 and otherwise zero), X_5 is executive composition based on gender (male dummy is 1, otherwise zero), X_6 executive composition based on race (white dummy is 1, otherwise zero) and ε_i is the error term. Note that values based on different cash flows are high, running in billions of ZAR; therefore, one took natural logarithms to minimise them. Furthermore, values that were negative one took absolute values; otherwise, one would not be able to get natural logarithms. On the other hand, the issue is not so much about the sign of the values but how those values react to selected independent variables.

In Panel A of table 3.5, the independent variable is ECF. Single-linear models (ECF1 to ECF6) confirm prior expectations from prior studies. Thereafter rolled over dependent variables individually, until one had a full model, which has all the dependent variables. All independent variables in the full model maintained their earlier signs and their significant level, except executive composition race. This suggested that executive composition race was a hedge variable. That implies that having a white male executive in JSE listed REITs does not add any value - this is a salient finding and it goes against the notion that white males add value on executive of REIT firms. In Panel B, the independent variable is CCF. The results of panel B, confirm the results of Panel A. Similarly, one can say the same thing about white male executives in South African REITs firms. Panel C and Panel D confirm the findings of Panel A and B. However, Panel D exposes that there is a benefit to having a white male executive. In contrast to prior studies (Mans-Kemp and Viviers, 2015), the presence of white male executives adds value when firms are financed by debt. This is because South African financial institutions are predominantly run by white males. Therefore, it pays to have a white male executive when a REIT is largely financed by debt.

The validation parameters illustrated the following; firstly, the adjusted R^2 , showed that as one rolled over the models the reliability of the models improved for all the panels. The F-statistic showed that there was an issue of goodness fit in all models - this has to do with the fact that one used panel data. The Akaike info criterion, Schwarz criterion and Hannan-Quinn criterion were mostly outside normal range (1.72 to 2.6) - this is because one used panel data.

3.5 Conclusion

This study illustrated the following; firstly different cash flows based on capital structures of REITs and/or funding-type are different from one another. Therefore, the type of investor depends on the funding type that they injected in a REIT firm. Secondly, the values of a REIT firm are influenced by the property sectors that they invest in. Thirdly, geographical diversification, which was beyond South African borders, added value. Fourth, different selected macroeconomic qualitative management variables affect different discount cash flows, fairly similar except in exceptional situations. Lastly, market cap values are very close to PV(CCF) in amounts.

The implications of this study are as follows. Firstly, investors need to understand in detail capital structures of REITs. Secondly, in order for any investor to get value for money,

they should not focus on market prices but they should base their investment decisions on the funding-type. Thirdly, geographical diversification adds value in the context of the South African REIT industry. Fourth, one should take into account the effects of economic and management variables when determining the values of REITs. Lastly, CCF tends to reflect reality for the REIT industry.

Chapter 4 Bankruptcy Prediction

4.1 Introduction

Manda (2021) modelled different cash flows in the South African REIT industry. The cash flows are specifically, equity cash flows (ECFs), capital cash flows (CCFs), free cash flows (FCF) and debt cash flows (CFd). These cash flows have been modelled before, but in different industries, with no focus on the real estate sector (see; Altman 1968; Mensah 1983, 1984; Fernández 2007). Based on prior studies such as Fernández (2007), those cash flows have a common pattern, i.e. CCF is another form of FCF, and vice versa. Among common features of the cash flows is their sensitivity in relation to numerous macroeconomic variables.

Manda (2021) illustrated that those cash flows can be negative in the REIT industry- novel finding. Furthermore, those cash flows are sensitive to the capital structure of REIT firms. The latter statement is consistent with Fernández (2007). Interestingly, the CCF actually mirrors the market capitalisation (market cap) of REITs- novel finding. Cash flows react differently to selected quantitative and qualitative “macroeconomic” variables (see; Manda 2021). Fundamentally, the negative cash flows, which were partly due to the presence of debt funds, can be highly negative, and this could lead to financial distress and/or bankruptcy. Additionally, REITs are highly levered nature, also considering the fact that South Africa is an emerging country with other macroeconomic conditions that could result in financial distress (most recently in South Africa, Rebois filed for voluntary business rescue in 2021, which would then suggest the possibility of bankruptcy, depending on the steps of the business rescue plan). This is the first of its nature since the enactment of REITs in South Africa in 2013. The question therefore lies - is there something that other African countries and emerging markets can learn or are there mitigative steps to take to avoid bankruptcy in a highly-debt intensive market, or perhaps identify key financial metrics that could potentially signal that a standalone REIT company in an emerging market could be vulnerable to bankruptcy in the near future.

Now, the question is how managers can mitigate the risk of bankruptcy, which is ideally undesirable in any industry. There is no straight answer, but this study builds on prior studies. For example, Mensah (1983, 1984) showed that bankruptcy can be detected using (non)stationarity methods, while Altman (1968) created specific ratios which he deems central to determining bankruptcy of firms. Some REIT studies such as Giacomini et al. (2017) and Giambona et al. (2018) caution against high debt levels, in particular when the debt level is significantly high. Note that they never put up a specific measure and/or number, which constitutes a high debt level. The latter statement, among other factors, raises the question on how bankruptcy can be detected in the REIT industry.

What is unique about this study; first, it seems that no study has ever investigated financial bankruptcy in the emerging markets REIT industry, Mensah (1984), Shumway (2001) and Charalambakis and Garrett (2019); secondly, pretty much, earlier studies (Altman 1968, Mensah 1983, Waqas and Md-Rus 2018), when picking up data, they picked up companies that filed for bankruptcy and/or financial distress and in this study, no REIT has officially filed for bankruptcy, however it is important to note that Reboasis Property Fund entered into voluntary business rescue in August 2022. Moreover, their sample was made up of pairs, while in this study each REIT is analysed as a standalone firm. Finally, earlier studies demonstrated bankruptcy period during actual bankruptcy occurrence periods, while in this study the bankruptcy period is unknown, making the financial distress and/or bankruptcy computation in this study computationally challenging and interesting.

This study contributes to the body of knowledge by illustrating how bankruptcy can be detected in the emerging markets REIT industry. In order to detect bankruptcy, first, this study uses Altman (1968) variables and those variables are modelled in the VAR model to illustrate the interrelationship between Altman (1968) variables. Then, funds from operations (FFOs) are added to the Altman (1968) variables in the logistic model because FFOs are widely accepted measures of performance in the REIT industry. The usage of the logistic model assists in testing bankruptcy both in non-stationarity and stationarity environments - similar to Mensah (1983, 1984). Finally, a multilinear regression, similar to Marcato et al. (2019) is used for the robustness test. Moreover, the rolling over process is undertaken in a similar manner to Marcato et al. (2019).

The results of this study illustrate the following. The VAR results confirm that the Altman (1968) variables are interconnected, this is partly due to the fact that the Altman (1968) variables relate (in)directly to financial health and financial positions of the REIT firms. Overall, all the Altman (1968) variables have causal effect irrespective of their statistical significance. The main causal bankruptcy variables are (i) $\frac{\text{retained earnings}}{\text{total assets}}$ (has negative effect) and (ii) FFOs (has positive effect). Interestingly, profitability, solvency and liquidity ratios illustrate declining financial health and financial positions during tough market conditions.

The balance of the study is as follows. Section 4.2 is on literature review. Section 4.3 is on modelling. Section 4.4 is on data and section 4.5 is on empirical analysis. Section 4.6 concludes the study.

4.2 Literature Review

The REITs covered in this study are equity REITs, and prior studies have illustrated that equity REITs have the same and/or similar traits as equities (Van Nieuwerburgh 2019). Furthermore, more and more studies have illustrated that listed real estate is increasingly becoming incorporated in capital markets across many asset classes, in particular bonds and equities (Van Loon and Aalbers, 2017).

Therefore, in synthesising bankruptcy, this study explores prior studies on bankruptcy in equities and REITs.

4.2.1 Bankruptcy in Equities

Altman (1968) is probably the premier study that laid a foundation on predicting corporate bankruptcy using specific selected ratios, which have been retested by numerous studies to date. Moreover, Altman is the first person to use multiple discriminant analysis in business administration, in particular accountancy. Before him, multiple discriminant analysis was used mainly in biological and behavioral sciences. The contribution of Altman (1968) is as follows. Firstly Altman (1968) used a robust statistical technique (i.e. multiple discriminant analysis) to predict corporate bankruptcy. Secondly, before Altman (1968), financial ratios were not linked to prediction of corporate bankruptcy. Even the way the ratios are classified, “traditional ratio analysis”, gives an impression that during Altman’s tenure, when he wrote his seminal work, those ratios were no longer relevant. Interestingly, despite the elegance of the multiple discriminant analysis, Altman (1968) acknowledges that the multiple discriminant analysis had short comings. Some of the short comings have been listed in later studies (Ohlson 1980, Mensah 1984, Shumway 2001, Metrik 2019). However, there is a notable advantage, which later studies never picked up and/or elaborated on - the ability to model independent parameters in a vectorial setting. Models that confine with that setting includes (i) Markov-Regime switching and (ii) VAR models.

The parameters tested in Altman (1968) fall in the following categories; (i) liquidity, (ii) profitability, (iii) leverage, (iv) solvency and (v) activity ratios. The independent variables in the final discriminant function are (i) retained capital to total assets, (ii) retained earnings to total assets, (iii) earnings before interest and taxes to total assets, (iv) market value equity to book value of total debt and (v) sales to total assets. The dependent variable is the overall index. The first test in Altman (1968) is on discriminant ability of all variables based on F-statistic. The results show that most bankruptcy is predicted by profitability, followed by sales to total assets, then market value equity to book value of total debt; thereafter, retained earnings to total

assets and finally working capital to total assets. Furthermore, the discriminant test is based on the Chi-squared test. The Chi-squared results confirmed independence of selected parameters. Thereafter, Altman moved to the main analysis.

The second bankruptcy analysis compared bankrupt and non-bankrupt manufacturers, where there are 25 bankrupt firms. The results predict 94% bankruptcy versus 96% earlier bankruptcy in the full sample. The general phenomenon is that the smaller the sample size, the lower the bankruptcy prediction ability. According to Altman (1968), that might have to do with less optimality of some parameters. In most cases, the Z score is between 1.81 and 2.67. When prediction of bankruptcy is extended to 5 years, the results illustrate that the larger the sample size, the higher the reduction score. According to Altman (1968), the former has to do with the Central Limit Theorem. Overall, the Z scores were found to have “accurate” discriminant ability; hence, Altman recommends using Z score to predict bankruptcy.

Ohlson (1980) is one of the first studies that predicted bankruptcy by combining probability concepts and financial ratios. Interestingly Ohlson (1980) is one of the few scholars that recognises that bankruptcy occurrence is an event of a calendar. Broadly, event studies fall within the asset pricing subject area. Therefore, that acknowledgement from Ohlson (1980) opens opportunities of studying bankruptcy using broader asset pricing principles. Before presenting the data set and methodology, Ohlson (1980) puts the following comments forward. First, that multivariate discriminant analysis has short comings including poor predictability of bankruptcy. According to Ohlson (1980), the latter challenge is due to the vectorial setting. For appropriate application of discriminant analysis, the sample (both failed and non-failed) should match based on certain criterion including size and industry (Ohlson 1980). Moreover, Ohlson (1980) states that the criterion tends to be arbitrary. Second, the possible technique to be used in case of the discriminant analysis is the Bayesian process but the latter process leads to poor results due to its normality assumption. This is because the data is not always normally distributed. The latter is evident in the listed real estate industry (See; Hui and Chan 2018). Most studies synthesised by Ohlson (1980) including Altman (1968) found that bankrupt firms performed poorly. The latter point would be interesting for the industry as the industry has not filed bankruptcy, even during subprime crises periods such as 2007/2009 global economic meltdown.

For data collection, he used the legal definition for bankruptcy in order to identify bankrupt firms. For modelling, Ohlson (1980) used (i) logarithmic likelihood and (ii) logistic function. The variables used in Ohlson (1980) have been used before in such studies including Altman (1968). The results were presented using three models-model 1 predicts bankruptcy within 1 year, model 2 predicts bankruptcy within 2 years and model 3 predicts bankruptcy within 3 years.

The preliminary ratios results were hardly surprising according to Ohlson (1980). Fundamentally, the ratios illustrate that as the bankruptcy data approaches, the ratios deteriorate by decreasing further. As such, the ratios worsen. Key results illustrate that firms with strong earnings are tempted to raise external funding leading to possible bankruptcy in those firms. The main predictor of bankruptcy is the size of firms. Data sources such as Compustat also listed size as the main predictor of bankruptcy according to Ohlson (1980). In order to strengthen earlier findings, Ohlson (1980) evaluated the performance of the prediction. According to Ohlson (1980), the best model is “one which minimises the sums of percentage errors” (P124). He found that model 1 minimised the sums of percentage errors, by extension, model 1 is the best model in predicting bankruptcy. This is might be due to the fact that short-term predictions are more accurate than long-term predictions (See; Pan and Liu 2018). In stock markets, most acceptable predictions are up 12 months from the date of the first prediction of the event. Among key points noted from the main analysis is that some firms declared dividends a year before the bankruptcy period. The latter point would be interesting to test in the REIT industry, given that REITs are required by law to declare most of their net profits as dividends to unitholders or shareholders.

Mensah (1983) explored how different bankruptcy abilities are based on selected price stated financial statements. The central argument that Mensah (1983) put forward at that time is that no study illustrated bankruptcy based on replacement costs or specific price-level restated data. In the context of accountancy and investment management, replacement costs are similar to investment funds injected in a project (See; Fan et al. 2020). In order to illustrate the bankruptcy, Mensah (1983) hypothesised that (i) discriminatory effect of the specific price-level adjusted data is indifferent to that of historical cost data and (ii) the predictive of specific price-level adjustments and historical cost data are indifferent. The mitigating factors that induced the model(s) that were used by this study to embed flexibility is that Mensah (1983) opine that based on financial statements within an accountancy setting, people cannot tell beforehand when bankruptcy will occur.

In testing bankruptcy, Mensah (1983) used commonly used bank parameters, some of which are used in Altman (1968) are (i) short-time liquidity ratios, (ii) cash flows ratios, (iii) long-term solvency ratios, (iv) short-term capital productivity ratios, (v) profit margin ratios, (vi) long-term capital productivity ratios, (vii) return on investment ratios, (viii) debt coverage and (ix) price-level ratios. For modelling, Mensah (1983) stated with the Lachenbruch’s U-method-to evaluate discriminatory ex-post and ex-ante accuracy, then went to discrimination models-to evaluate likelihood of bankruptcy. For that, Mensah (1983) used full discriminant models and models of reduced collinearity variables. The results from discriminant analysis illustrated that historical cost data had an accuracy of 96.7% chance of predicting bankruptcy

while specific price-level adjusted data had a 93.3% chance of bankruptcy prediction. When historical cost and specific price-level adjusted data are combined, the prediction ability increases to a 100% success rate. For reduced models, the prediction ability is still there but at a reduced success rate-ranging from 69.6% to 78.3%. When “relative costs of misclassification” is used, lowest costs are in specific price-level adjusted data. Further analysis includes using the logit models. The logit results confirmed earlier findings. Interestingly, there were inconsistencies between specific price-level adjusted and historical costs data when inputted in the logit model. However, the salient point is that bankruptcy findings from earlier results still remain intact.

Mensah (1984) is different from Mensah (1983) in the sense that Mensah (1984) forecasts futuristic parameters that drive bankruptcy. Mensah (1984) opines that despite the fact that earlier studies such as Altman (1968) have done meaningful work on corporate bankruptcy, the economic issues relating to bankruptcy have been inadequately investigated. One of the elegant settings of Mensah (1984) is that he differentiates between stationarity and non-stationarity during bankruptcy. Mensah (1984) compares situations where the unconditional probability distribution is constant over the entire time series versus where the same probability distribution is stochastic over the time series. In starting off in the non-stationarity setting, Mensah (1984) argues that (i) inflation, (ii) interest rate and credit availability, and (iii) business cycle (recession/expansion phases) change overtime. By extension, those three parameters are affected by different economic regimes. Mensah (1984) mentions that variables affecting inflation changes are inventory intensiveness, profit margins, asset productivity and capital intensiveness. Interest rates and credit availability can be detected through interest rate coverage, receivables intensiveness, liquidity and long-term leverage, while business cycles are linked with the following variables; capitalisation, cash-flow generating ability, liquidity, inventory intensiveness and receivables intensiveness. The third parameter, business cycle, Mensah (1984) links to the macroeconomic environment and for the business cycle evolution, Mensah (1984) ties it (i.e. business cycle) to (i) steady growth phase, (ii) recessionary conditions, (iii) steady growth phase and (iv) stagflation and recession (P384).

The data is from the Wall Street Journal Index on companies (i.e. mining, manufacturing, retail and construction sectors) filed under Chapters X and X1 of the Bankruptcy Act in the period of January 1972 to June 1980. The final sample is made up of 110 pairs of companies from the original sample. In Mensah (1984), the ratios were calculated two years before the firms filed for bankruptcy. For the analysis, the author used the logit model, which is supported by the D-statistic, which is similar to adjusted R^2 in the (multi)linear model. According to Mensah (1984), the D-statistic supports prediction accuracy. Most of the ratios used in Mensah (1984) have been used before by other studies such as Mensah (1983) and

Altman (1968). The logit results reveal the following. Irrespective of the industry type, (i) cash-flow generation, (ii) liquidity, (iii) financial leverage and (iv) turnover of equity predicted bankruptcy-negative coefficients and statistically significant at an alpha of 1%. Mensah (1984) stated that findings during recession and expansion phases were similar in patterns. In order to strengthen those findings, Mensah(1984) repeated the same analysis on a subsample (i.e. in-sampling). For in-sampling, (i) cash-flow generation and (ii) coverage of short-term liabilities were found to explain and/or predict bankruptcy. Overall, stationary results were found to be more robust than non-stationary results. Data aggregation also confirms much stronger bankruptcy prediction in a stationary environment. Further analysis included using the multiple discriminant analysis (MDA), which confirmed earlier findings of Mensah (1984).

Shumway (2001) explored the multiple-period bankruptcy model instead of the single-period model. Despite his research focus area, he acknowledges that the static model falls short when estimating and/or predicting probabilities for bankruptcy of events. According to Shumway (2001), the reason for the latter phenomenon is because the occurrence of bankruptcy is infrequent and unknown beforehand. The main contribution of Shumway (2001) is the development of the “multi-information simple hazard model” (P102). Shumway (2001) opines that hazard models are more advantageous than static models because hazard models (i) explicitly account for time, (ii) allow for a time-varying environment and (iii) appropriate forecasting for out-sample data. On the second point, Shumway (2001) stated that what is central is accounting for potential duration dependence. The latter point is important for REITs because debt financing, which is redeemed over time, causes time dependence in a similar environment where installment options exist. When installment options have been exercised, the subsequent point of success depends on the immediate preceding point. Then, the main question of the hazard model is, what is so special about the hazard model developed by Shumway (2001)? Fundamentally, the hard model is a logit model with incorporated surviving probability and a hazard function driven by the key parameters. Broadly, the hazard model is a multi-period logit model, which is discrete in nature.

Thereafter, Shumway (2001) compared hazard versus static models. First, according to the author, both models have cumulative density function which is similar to $f(t, x; \theta)$, hazard function. Second, in the hazard model, bankruptcy is independent of age; moreover, the hazard model has a likelihood parameter. Broadly, the estimation of bankruptcy probability is natural. Furthermore, a joint log likelihood function is “created” as a way of extending the hazard model to account for longer periods of bankruptcy. Fundamentally due to embedded flexibility, the hazard model can account for bankruptcy at any point of the time series. The data is from the Wall Street Journal Index, the Capital Changes Reporter and the Compustat Research File. The

final sample is made up of 300 bankruptcies between 1962 and 1992. The independent variables are drawn from prior studies, including Altman (1968). More on the variables, see page 114 in Shumway (2001). The results of Shumway (2001) illustrate the following. The discriminant analysis results illustrate that bankruptcy occurs at least 6 months before the actual event for the in-sample data. Both hazard and discriminant analyses show that firms with high earnings to assets are less likely to file for bankruptcy. Overall, Shumway (2001) found that Altman's variables are strong predictors of bankruptcy in firms. The out-sample findings are similar to in-sample. Thereafter, the author used Zmijewski variables and findings of those variables to illustrate similar findings as ones from the simple logit model coefficients. Then, with market-driven variables, Shumway (2001) found that firms with high net income and low probabilities are less likely to file for bankruptcy. On the latter variables (i.e. market-driven variables), Shumway (2001) found that forecasting with them improves forecasting bankruptcy.

Charitou et al. (2004) empirically illustrated corporate failures in the UK. At the heart of their study, Charitou et al. (2004) argue that information content relating to cash flows assists in detecting and/or predicting financial distress. The main question put forward by the authors is "how cash flows illustrate insolvency in firms". In synthesising prior literature, Charitou et al. (2004) found that parameters central to causing insolvency in firms include (i) high interest rates, (ii) recession-squeezed profits and (iii) heavy debt burdens. Most prior studies used the multiple discriminant analysis-Charitou et al. (2004). Despite of the popularity of the multiple discriminant analysis, numerous studies including Charitou et al. (2004) opine that the multiple discriminant analysis falls short when coming to failure prediction. Due to the latter short coming, among other short comings of the multiple discriminant analysis, Charitou et al. (2004) used (i) the logit analysis and (ii) neural networks. Some of the elegance of the logit model includes its ability to present parameters in the form of vectors, where parameters are in continuous form and its ability to account for the inverse relationship of inputted parameters. The logit model has an equivalent model; probit function. The probit function is pretty much similar to the logit function, except the probit function works more effectively when data is normally distributed. Given that data is not normally distributed most of the time; hence, most studies use the logit model than probit model. The neural networks are advantageous in their ability to connect different nodes in the analysis. This nodal connection (i.e. discrete pricing), inherent in neural networks, has been proven to be effective in a risk management environment (See; Carr and Wu 2014).

The dataset is made up of 51 pairs of the failed British industrial firms during the period of 1988 to 1997. Charitou et al. (2004) predicted that corporate failures of at least 1 year to at most 3 years leading to actual corporate failure event. The authors state that the UK Insolvency Act of 1986 is assets of a firm cannot cover debts or firms unable to redeem existing debts when

they are due. In explaining corporate failures, Charitou et al. (2004) embedded the normative theory (i.e. it gives deductive reasoning for expectation of corporate failures) and positive theory (i.e. it tells inductive reasoning why failures occur in practice). In electing parameters to input in the model, the authors picked variables used in prior studies such as Altman (1968). In terms of categories, Charitou et al. (2004) grouped parameters into (i) financial leverage, (ii) operating cash flows, (iii) liquidity, (iv) profitability, (v) activity and (vi) market (P477).

The descriptive results of Charitou et al. (2004) reveal that (i) cash flows from operations of total liabilities and (ii) earnings before interest and taxes to total liabilities illustrate decreasing bankruptcy possibilities, which decrease as the year of the corporate failures. The total liabilities to total assets remain stable over the 3-year period. From the main analysis, leverage was found to be one of the main contributors of corporate failures. Furthermore, profitability ratios are central to revealing the bankruptcy. The results provided by the neural networks show similar findings to ones revealed by logistic results. For validating their findings, the authors used the Lachenbruch Jackknife procedure and Altman's (1968) variables. The validation confirmed earlier findings on the corporate failures.

Waqas and Md-Rus (2018) investigated how financial distress can be predicated using selected firm-specific market variables for listed firms in Pakistan. The authors opine that variables that drive bankruptcy equally apply to the financial distress of firms. The main argument as to why Waqas and Md-Rus (2018) studied Pakistan listed firms is that in each geography is different and therefore, each geography should be modelled appropriately, where bankruptcy is customised to a specific region (P2). Put it differently, their contribution is illustrating financial distress by combining selected market factors and financial ratios. For this study, financial distress is customised to REIT firms. In choosing ratios that the authors used for their analysis, they premise the selection of variables based on popularity and significance of parameters. Those parameters have been used as far back as Altman (1968). More on the variables used in Waqas and Md-Rus (2018), see table 1 on page 6. For the methodology, Waqas and Md-Rus (2018) used a quantitative methodology, where methods include the logit model and likelihood probability. The 10-year data is from 2007 to 2016 on 290 non-financial firms listed on the Pakistan Stock Exchange. The data sources are the Securities Exchange Commission of Pakistan and the State Bank of Pakistan.

The results of logit model 1 are pretty much similar to what has been illustrated earlier on bankruptcy and financial distress. Before dwelling into the logit model 1 results, the logit results are based on the two logit models. Logit model 1 tests, all selected parameters and in the logit model 11, variables that are insignificant in logit model 1 get excluded in logit model 11. Back to the logit model 1 results, all tested parameters based on Mann-Whitney U test (i.e. two populations test) are on average statistically significant in relation to financial distress.

Interestingly, from the statistically significant variables (i) retained earnings to total assets, (ii) working capital to total assets, (iii) earnings before interest and tax to interest expenses, (iv) working capital to long-term debt and (v) cash flow from operations to sales have negative coefficients. The rest of the parameters that complete the selection; (i) net income to total assets, (ii) earnings before interest and tax to total assets, (iii) quick assets to current assets, (iv) current assets to current liabilities, (v) total liabilities to total assets, (vi) total equity to total liabilities, (vii) cash flow from operations to total liabilities, (viii) log of total assets and (ix) idiosyncratic standard deviation of past returns have positive coefficients. Note that the mean averages are the difference between distressed and non-distressed firms. Waqas and Md-Rus (2018) is one of the few studies that illustrated that inappropriate quantitative handling of balance sheets and/or financial statements items can lead to financial distress. For example, they illustrate that inappropriate handling of inventory affects liquidity of firms. Although, that illustration is computationally easy, its grounded economic theory reasoning is profound. Moreover, that reasoning is intuitively inclined with reality.

They went further and illustrated the relationship between leverage ratios and financial distress. Waqas and Md-Rus (2018) found that (i) total equity to total liabilities and (ii) working capital to long-term debt had positive coefficients and were statistically insignificant in illustrating financial distress. The interest coverage and coverage ratios had negative coefficients and were statistically significant. Other variables in relation to financial distress; the cash flow from operations to sales ratio had a positive coefficient and were statistically significant. Similarly, market variables are statistically significant but have negative coefficients. The final finding on logit model 1 is that the accuracy ratio of distressed firms is 57%. The results of logit model 11 illustrated that all parameters are statistically significant and the only difference is that now (i) earnings before interest and tax to total assets and (ii) size have negative coefficients versus positive coefficients before in logit model 1. Based on the step-wise and rolling over effects inferred from Marcato et al. (2019), (i) earnings before interest and tax to total assets and (ii) size might be hedge variables. According to Marcato et al. (2019), hedge variables assist in building full models but have no causal effects in models.

Charalambakis and Garrett (2019) studied corporate financial distress prediction in Greece. The authors depart from the point that financial distress forecasting is important, and it is usually carried out using either accounting or stock market information. At the heart of Charalambakis and Garrett (2019) is determining the probabilities of parameters that lead to financial distress of unlisted firms. Most prior studies were on listed firms, many from developed economies. From criticising prior studies, the authors found out that static models, which focus on any single period, have a bias inclination. Furthermore, they found that the usage of accounting information leads to inflexible findings. Just like other studies, such as

Charitou et al. (2004), Charalambakis and Garrett (2019) opine that the MDA has short comings when it comes to their predictive abilities. Lastly, the authors argue that neural networks fall short when coming to provide significance of the predictor variables. In order to overcome those listed short comings, Charalambakis and Garrett (2019) developed a multi-period logit (discrete hazard) model. That is, the proposed model is able to predict the financial distress of firms over different points in time. Moreover, the same model can capture the curvature of any time series. The key features of the multi-period logit model are (i) the discrete angle can determine the bankruptcy period and (ii) the probabilistic angle can include an array of variables in a vector setting of a financial distress environment.

They extended the Z-score developed by Altman (1986), specifically, Charalambakis and Garrett (2019) focused on the following variables; (i) profitability, (ii) leverage, (iii) retained earnings-to-total assets, (iv) size and (v) liquidity ratio on the probability of financial distress (P474). Charalambakis and Garrett (2019) is one of the first studies to test financial distress on a sample that included real estate firms; however, they did not elaborate whether those firms are REITs, real estate operating companies (REOCs) or both. To do away with extreme observations, they winsorize independent variables at the first and the 99th percentiles of the distribution. The descriptive statistics of the analysed firms show that only retained earnings of total assets and liquidity, as illustrated by the current ratio, have negative means (i.e. averages). The other five variables have positive means. Broadly, the authors argue that variables with negative means are most likely to give rise to the financial distress of firms. Among variables of interest that were added by the authors above, Altman (1968) variables include exports. Given that the gross domestic product of Greece, largely comes from the tourism industry, the exports were found to be a good predictor of the financial distress. Interestingly, Greek firms were found to be less likely to be exposed to financial distress during the financial crisis period. Generally, bankruptcies in Greece were due to the debt crisis. The reason why retained earnings-to-total assets exemplified financial distress is because Greek firms generally declare dividend yields.

In order to strengthen their findings, Charalambakis and Garrett (2019) broke the time series into in-and out-of-sample. Both samplings confirmed earlier findings. Thereafter, the authors extended the forecast horizon. The extended forecastings were found to confirm the financial distress, when it prevailed at a future date. Finally, they undertook robustness checks based on the same selected variables, when data is disaggregated into in-and out-of-samples using the multi-period logit model. All tested variables were found to be negative and statistically significant. Thus, those variables predict financial distress of the selected Greek firms.

Wiggins and Metrick (2019) is different to earlier studies on bankruptcy because it is (i) purely qualitative and (ii) focuses on Lehman Brothers. Lehman Brothers was central to the 2007/2009 global financial crisis. Since the failure of the Lehman Brothers, most stock market commentators have asked themselves why an institution so big failed. The latter narrative resonates with REITs in the sense that REITs are capital intensive investment vehicles. Just like REITs, Lehman Brothers had a significant amount of debt on its balance sheet. According to Wiggins and Metrick (2019), the demise of the Lehman Brothers started in 2007 when a highly rated Chief Risk Officer, Madelyn Antoncic, a Ph.D. Economics major from New York University, was moved to the Global Head of Financial Market Policy Relations on December 31st, 2008. Before joining Lehman Brothers, Madelyn worked for Barclays Capital and Goldman Sachs. What is relevant from Wiggins and Metrick (2019) is not much about Lehman Brothers story but risk management strategies and their effectiveness in predicting bankruptcy. Before the demise of Lehman Brothers, the authors state that Lehman Brothers had sound and some of the best risk management systems in place and those risk management systems, which were noted by different American institutions including the U.S. Federal Reserve.

Before the firm collapsed, it had an integrated risk management framework (See; Wiggins and Metrick 2019). The pillars of that integrated risk management framework included (i) coherent mission and vision on risk management, (ii) solid risk management professionals, many who had PhDs across different disciplines and (iii) solid risk management techniques. Of interest from the three risk management pillars is risk management techniques. According to Wiggins and Metrick (2019), techniques used by Lehman Brothers include (i) value-at-risk, (ii) maximum potential exposure, (iii) risk appetite and (iv) risk equity. Furthermore, the authors put that those methods were underpinned by “novel risk appetite limit” (P67). Despite the elegance of the value-at-risk, it does not capture extreme values of risk (See; Calman et al. 2021). The maximum potential exposure captures current risk but falls short in accounting for the futuristic risk (See; Gomber et al. 2018). The key issue about the two techniques (i.e. value-at-risk and maximum potential exposure) is that despite their short comings, the techniques had sound and robust performance when picking up credit risk, at least for Lehman Brothers. Those techniques, among other risk management techniques, were applied across different business units of Lehman Brothers across different geographies where Lehman Brothers found itself operating in.

What underpinned the demise of Lehman Brothers, at least according to the authors, was the growth strategy in 2006. Given Madelyn’s tactical approach to risk management, the management of Lehman Brothers replaced her with a less experienced risk management professional but a highly regarded Chief Financial Officer, Christopher O’Meara. Thereafter, Lehman Brothers joined with the Tishman Speyer in purchasing Archstone REIT. The \$22

billion purchase price of Archstone was largely made up of debt finance. The transaction leads to ignoring existing risk management strategies and norms that had “saved” Lehman Brothers for years. The fall of Lehman Brothers led to numerous American risk management agencies and institutions/organisations revising their risk management programme, particularly, the Federal Reserve. As part of effective risk controls and changes in the risk management strategies, institutions have put strict and targeted measures in place to curb against bankruptcy in the U.S.

4.2.2 Bankruptcy in Listed Real Estate

Chang et al. (2009) unveiled the determinants of capital structure. The authors reconstructed the 1988 work of Sheridan Titman and Roberto Wessels on capital structure which used the structural equation model. Chang et al. (2009) applied the multiple indicators and multiple causes model. This was to correct the weak results found by Titman and Wessels (1988).

The authors justified the adoption of the structural equation model, which according to the authors is the preferred model in relation to the ordinary least square method-used commonly in capital structure research; this model makes use of leveraged measures with a variety of proxies as the dependent variable. The adoption of the ordinary least square model was used in research prior to the late 1990's. Researchers made use of this model to determine an entity's capital structure caused errors-in-variable problems, as such the multicollinearity in the independent variables which, include but were not limited to; the total debt, the long-term debt divided by the firm value, the book value ratio, and leverage. The adoption of a structural equation model overcame the problems stated above, and hence Chang et al (2009) adoption of the multiple indicator and multiple causes model. The aforementioned model combated multicollinearity in the independent variables and the violation of assumptions in the disturbance term. Multicollinearity is a common problem in financial studies when using regression analysis. Hence the strength of the proposed model as this is corrected for in the above-mentioned problem.

Chang et al (2009), revealed that the indicators of a firm's capital structure included; growth, uniqueness, non-debt tax shields, the collateral value of assets, profitability, volatility and industry classification. In Chang et al. (2009) the authors examined the capital structure measured simultaneously by the ratios of long-term debt, short-term debt and convertible debt to the market value of equity. Given the above, Chang et al (2009) found it suitable to adopt a structural equation model in the form of the multiple indicators and multiple causes model altered by Stapleton (1978) who further developed more latent variables, in addition to the

multiple indicators and multiple causes model, which was first proposed by Joréskog and Goldberger (1975). Moreover, Chang et al. (2009) used the following goodness-of-fit for the model adopted namely; standardised root mean square residuals, non-normed fit index, comparative fit index, incremental fit index, and the root mean square of error approximation instead of the exact-fit χ^2 -test, which does not accommodate for a large sample size, which results in an inappropriate model evaluation.

Chang et al. (2009) examined the literature on the indicators of the multiple indicators and multiple causes and the causal effect on a firms' capital structure. The authors outlined the following salient findings; the firm's uniqueness was negatively related to the debt ratio. Therefore, concluding that the uniqueness of a firm does not affect the capital structure of a firm. The existence of a non-debt tax shield was said to lower a firm's capacity for debt tax benefit. Therefore, a non-debt tax shield negatively affects a firm's optimal debt levels. The authors further stated that the non-debt tax shield level is different from an industry-to-industry basis. In that, different industries have different financial leverage. They used depreciation as a proxy as prescribed by Fama and French (2000). The authors further outlined that the type of assets that a firm owns can affect a firm's choice of capital structure. Myers and Majluf (1984) stated that firms with a higher level of collateral value in their assets tend to issue a higher level of debt to take advantage of the low cost. Hence, firms with collateral value tend to issue more debt. The collateral value of assets, according to the authors, can be a proxy for agency and financial distress costs, in that a positive relation between debt ratios and the collateral value of asset exists. Chang et al. (2009), built upon existing literature by expanding on the proxy of capital structure that was determined by using inventory plus equipment of total assets as an indicator of a firms' assets collateral value.

Furthermore, Chang et al. (2009) analysed the existing literature on profitability, volatility, and industry classification indicators. Booth et al. (2001) stated that to measure profitability, one must determine a firm's return on assets. Further uncovering that high profitability was associated with low debt in the 10 selected developing countries. The study does not include South Africa; however, it includes countries such as Brazil, which have similar economic and socio-economic attributes as South Africa. Chang et al. (2009) used the following factors as volatility indicators; the standard deviation of the percentage changes in operating income, the coefficient of variation of return on assets, the coefficient of variations of operating income divided by total assets. Lastly, different industries develop different financial structures suitable for them in responding to the nature of risk in each industry (Bowen et al., 1982). In addition to this, financial structures of different industries are related to the entity's level of debt and equity. Lastly, TW (1988) noted that although capital assets add to a firm and its value,

growth opportunities can neither collateralise nor generate current taxable income. Thus, a negative relationship exists between the debt and growth opportunity of a firm.

Chang et al. (2009) expanded the model proposed by TW, which shows the poor correlation in four out of the eight constructs that determined a firm's capital structure were statistically significantly different from zero. The model selection was based on the overall model fit evaluation results. Upon examining the seven indicators, the results revealed an effect on a firm's capital structure. Notable findings showed that the effect of the capital structure of the indicators from importance ranked by the order are; growth opportunities, profitability, collateral value, volatility, non-debt tax shield and uniqueness. Furthermore, the authors found that long-term debt is one of the most critical proxies of the capital structure, followed by short-term debt and convertible debt.

In the early 2000s, the U.S. experienced mild growth in housing prices when the interest rates were low, resulting in the subprime mortgage crisis. This led to an academic interest from Wang et al. (2018) to analyse the gain to the U.S. based firms acquiring REIT shareholders in the domestic market and/or cross-border mergers before and after the subprime mortgage crisis. In order to analyse the gain, the researchers measured the firms' abnormal returns by using the Brown and Warner (1985) standard event study methodology. In that, the researchers followed the market model approach to determine abnormal returns. To determine cumulative abnormal returns from merger announcements, a cross-sectional regression was applied. In this study, the significant independent variable was a domestic merger. Chang et al. (2009), found that the acquirer would achieve positive abnormal returns when the transaction is stock-financed in the announcement period of public-private mergers. The results from Wang et al. (2018) revealed that the overall average return from all the announcements of the mergers was 0.8% surrounding a 3-day window. Moreover, the acquirer achieved statistically significant and positive abnormal returns during the crisis period. However, REITs that were acquired achieved lower announcement returns than when the target was cross-border. The findings were consistent with Conn et al. (2005), who concluded that cross-border private and domestic acquisitions yielded positive announcement returns.

Dodd and Hill (2018) examined the determinants of credit ratings for equity REITs. The majority of South African REITs are equity REITs; therefore, this paper is relevant when looking at the credit ratings of publicly listed South African REITs. The researchers' particular interest in the REIT market was influenced by the fact that REITs provide a peculiar environment for examining debt ratings. A problem vexing ratings research is the subjectivity embedded in rating assignments due to analysts' "judgement calls". Subjectivity is more severe in industries invested in intangible assets - REITs being one of these industries. The factor

mentioned above increases the adverse selections problem because of the increased uncertainty in future cash flow.

The factors selected to be part of the model impacted on perceived corporate default risk. These include expected financial resources, financial obligation and the variability in those resources. These variables control for heterogeneity which is unique in REIT industries. Dodd and Hill (2018) studied the inverse relationship between rating and REIT debt levels, and if a direct association between credit rating and dividends exists. The researchers stated that the ability to meet corporate obligations depends on financial resources; financial resources are controlled by a firm's operating performance and liquidity. Specific to REITs, internal liquidity-defined by Riddiough and Wu (2009) is unused credit lines and retained cash flow, which provides a precautionary buffer to economic shocks that may reduce cash flow, mitigating the concerns associated with the expiration of a lease, debt refinancing and property acquisitions. Dodd and Hill (2020), further assessed the relationship between credit ratings and cash holdings. In addition to the above, the authors accounted for the performance of a firm using the following measures; free cash flow (FCF), earnings and FFOs.

Dodd and Hill (2018), adopted a probit model for the first specification. In this model rating was a binary variable (for REIT-year observation has an investment grade credit rating equal to one, otherwise zero.) The probit model according to Dodd and Hill (2020) further adopted the ordered probit methodology, with seven ordinal rating classifications representing the dependent variables. Furthermore, the researcher used equity REITs rated by Fitch and equity REITs rated by standard and poor (herein S&P) long-term issued credit rating from 1999-2010 to find the determinants of REIT credit ratings examining ratings from S&P and Fitch.

Dodd and Hill (2018) found an inverse and marginally significant (10% level) relationship between credit rating and leverage. According to the findings, leverage is an insignificant determinant of the Fitch rating after controlling for other financial characteristics. Furthermore, there is a statistically significant relationship between ratings and dividend variability. It indicated that the effect of dividend uncertainty is robust to the measurements of operating performance. Dividend smoothing helps improve credit ratings and, in turn, helps reduce the cost of debt, thereby improving the future growth and shareholder wealth. Following this research's performance of a robustness test was the direct relationship between rating and dividend levels. Thereby, the researchers found a lack of evidence of a significant relationship between credit rating and access to credit lines.

Notable, findings from this research revealed that heterogeneity unique to the REIT asset class is an important driver of ratings assignments. Furthermore, the authors performed a robustness test using audit-probit model and robustness test Fitch ratings were directly related

to cash flow performance measures and S&P500 ratings were associated with earnings, not cash flow performance. The results exposed by the researcher were robust to a number of specifications and robustness tests. The results observed were indicative of the fact that S&P rating assignments did not fully account for the sample REITs financial well-being. As a result of the above; the findings reveals that firms that are “under-rated” by these rating agencies, based on cash-flow operating performance were more likely to pay an excess risk premium for their debt and their shares were likely to be under-valued.

Giambona et al. (2018) developed a model in which quality firms separate themselves by issuing unsecured debt and commit to maintaining a strong balance sheet. The development of the model analysed the theory of collateral and financing choice of a going concern. The researchers assessed real assets, collateral and limits of debt capacity. Before developing the model, Giambona et al. (2018) outlined and analysed existing literature that had previously honed into their area of interest. Outlining the fact that lenders have limited ability to pledge collateral is indispensable to enhance credit market friction and enforce repayments. Their research contributed to the debate that suggests that an unobserved firm's quality can lead to screening signaling in unsecured debt markets and that effects the capital structure determinants of REITs. The model developed by Giambona et al. (2018) was influenced by Bester (1985, 1987), Stulz and Johnson (1985) and Myers and Rajan (1998). While these authors developed the models with firms that were going concerns with collateral assets in place in a single project. The difference in the model developed by Giambona et al. (2018), is that the firms used are going concerns with collateral assets in place.

The researchers analysed firms that are financed with unsecured debt, called “G-firms”. The G-firms are higher value firms, while B-Firms are lower value firms because of the above-discussed debt overhang problem. In the case of G-firms, insiders can fully finance the investment cost with external debt to realise an investment surplus. As a result, unlike with the B-firm, in G-firms, there were no underinvestment concerns. Seeing as the maximisation of a firm’s equity value is the objective of many firms, the issuance of secured-non recourse debt has no benefit to the G-firm as no excess benefits are forthcoming from the new financing, and firm value does not benefit from the isolation of assets-in-place from the new investment.

Firstly, Giambona et al. (2018) created a standard structured and secured nonrecourse debt model in order to investigate the role of secured non-recourse debt. In this model, Giambona et al. (2018) followed Stulz and Johnson's model proposed in 1985. Giambona et al. (2018) assumed that debt-in-place was equal-priority to unsecured debt. In this model, a positive net present value (NPV) eliminated asset substitution, an important indicator when financing new investment. The researchers further identified a firm called "B-firm", financed with secured non- recourse debt to finance investment. Therefore, the firms will only invest in

projects or firms that can provide a net surplus that is positive for the benefit of the equity holders. Among other assumptions made, it was necessary to note that underinvestment problem exists within "B-firms". This is because insiders do not want to dilute their default put option on the assets-in-place. Therefore, leading to an alternative debt structure, which aims to solve the underinvestment problem by allowing equity holders to internalise the surplus from new investment fully. This type of debt structure exists and is referred to as a bankruptcy-remote secured non-recourse debt. With this type of debt, only specific assets are available as security when borrowers default on that debt. Furthermore, the asset ownership was isolated through a bankruptcy-remote, subsidiary or particular purpose vehicle. B-firms finance aeroplanes, particular commercial real estate infrastructure projects and sizeable standalone infrastructure projects.

By empirically testing the model, Giambona et al. (2018) examined firms that were going concerns for which pledges of real collateral played an essential role in financing the investment. Therefore, the researcher analysed the listed CRE market, paying particular attention to the 1998 Russian crisis, alongside the role that Fannie Mae and Freddie Mac, which are government sponsored enterprises preferred investing in apartment REITs. Giambona et al. (2018) used apartment sectors as it was less affected by the crisis. The crisis shocked the market as it occurred when the Russian government devalued the ruble and defaulted on its debt. Given the sample, Giambona et al. (2018) put forth the main result of the research using three propositions. The first proposition looked into B-firms issuing bankruptcy-remote secured non-recourse debt to finance new investments, which led to efficient investment outcomes and dominates secured recourse debt and corporate unsecured debt of the type analysed by Stulz and Johnson (1985). In this proposition, secured-non-recourse debt is a form of debt preferred to other forms of secured recourse debt, and this was used to address the underinvestment incentive to equity holders. Although secured-non-recourse effectively limits investment distortions, the researchers stated that it could be difficult for firms to access the latent liquidity contained in their real asset values. This led to the prepayment restriction on debt, limiting a firm's capacity from extracting equity and even invest strategically by freeing up latent asset value.

The second proposition suggested that the G-firm would prefer to finance with secured-non-recourse debt over pooled unsecured debt. However, the B-firms' preference is the unsecured debt market which is infeasible and only issues secured-non-recourse debt. This was propelled by the fact that G-firms preferred not to be financed in the pooled unsecured debt market, seeing as such markets collapse. However, B-firms have no such option as they finance with secured-non-recourse debt. With this, unsecured creditors considered introducing a screening process capable of identifying the type of borrower such that G-firm financing

investments with unsecured debt and B-firms choosing secured-non-recourse debt. The salient to this proposition is that liquidity premium is not a credit spread, as the risk of borrower default given successfully screening is zero. As such, deadweight costs are borne strictly by the borrower, as the unsecured creditor internalises the premium. Lastly, the researchers' third proposition considered the "normal" market conditions, in which funding liquidity premiums were zero in the unsecured debt market. In this proposition, the researchers considered three cases: (1) guarantee costs were higher relative to the liquidity benefits of excess issuance proceeds, (2) guarantee costs were lower relative to the liquidity benefits of issuance proceeds; in this case, the liquidity benefits were not as high. Exceeding the lost put option value from guaranteeing the debt and (3) liquidity benefits excess issuance proceeds were high, even exceeding the guarantee cost plus the lost put option value. G-firms selected unsecured debt because of the incremental screening costs, and the B-firms' selected secured-non-recourse debt. In cases such as (2) and (3), choice of finances reveals firm types to outsiders.

Giambona et al. (2018) used the difference-in-difference estimation as the robustness test and those results show firms with high valued assets substitute commitment collaterals with tangible collaterals when financing new investments. A difference-in-differences model is specified, where heteroskedastic-consistent errors in the regressions are adjusted for clustering at the firm and quarter levels (Petersen 2009). In particular, for this sample of apartment REITs, the authors regressed the change in market-to-book ratio on an interaction term that equals one for the treatment group.

Giambona et al. (2018) showed that firms with higher valued assets substituted commitment collateral with tangible collateral when financing new investments; lower-valued firms, B-firms, stretched their debt capacity to pledge tangible collateral, primarily because maintaining a strong balance sheet is expensive. This accepted collateral was said to be an act of "laziness" by Manove et al. (2001), as it substituted the screening process. However, this is not the case for all countries and firms; in the more complex capital structure of going concerns, lax screening occurs only for secured debt structured firms as bankruptcy-remote and non-recourse were used to eliminate underinvestment. South African REITs can adopt the character of B-Firms. Hence, unsecured creditors are advised to screen the entity. In this process, required commitment collateral in the form of tangible assets as a substitute for a pledge of real collateral. This results in an unsecured creditor that was more secured than a secured creditor. Giambona et al. (2018) developed the model that predicted firms' pool in the secured debt market. Pooling raises the average quality of firms' financing in the secured debt market due to the migration of higher-quality firms into the market from the unsecured debt market. Conclusively, the authors modelled reveals that good firms tap into secured debt only when faced with adverse financial market conditions; however, the better-quality firms migrate

to the secured debt market during the height of a crisis, as seen with the crisis experienced in Russia.

Wong and Reddy (2018) explored the sensitivity of the performance of Australian REITs (A-REITs) to shifts in long and short term interest rate by evaluating A-REITs' performance and the impact of leverage and interest rates. The authors proposed an asset pricing model that consists of macroeconomics, market returns and the short and long term interest rates of the effects of market capitalisation. According to the authors high debt funds show greater sensitivity to adverse movements in long term interest rates compared to low debt funds. REITs in the Australian share market emerged in the early 1970's, however prior to 2008 they were known as property trusts and as such were renamed in 2008. A-REITs; offer investors enhanced liquidity, low entry and diversification as an alternative to direct property investing. Therefore, the research contributes towards investors, particularly given the volatility of A-REIT performance and the sectors historical reliance on debt investigation on the nature of A-REIT return and their relationship between interest rates. With Wong and Reddy (2018) objective to ascertain the performance of the REITs then there is a movement in interest rates. Ratcliffe and Dimowski (2007) noted that A-REITs have a significantly negative relationship with long term interest rates, but there is the opposite for short term interest rates as there is an insignificant positive relationship. Furthermore, Yang and Singh (2015) found that a negative implication of interest rate risk only impacts A-REITs during expanding and stable market conditions.

The intertemporal capital asset pricing model (ICAPM) was employed in the study by Wong and Reddy (2018), whereby the authors proposed that investors receive a premium for bearing market risk and additional risk in the form of unfavourable shifts in the investment opportunity set. Wong and Reddy (2018) used the panel method and quantile regression method for panel data, which was consistent with Yong and Singh (2015) and Ratcliffe and Dimowski (2007). In order to examine the effects of leverage on A-REIT performance, funds were divided into 2 portfolios, namely; low debt and high debt. A fund was considered low debt if its debt-to-capital ratio was smaller than the cross-sectional average in the prevailing period and high debt otherwise. Furthermore, the funds were separated into three portfolios based on their market capitalisations. The exposure to market risk (beta) was documented (the relationship between asset returns and inflation is not immediately clear). The research used ex-post benchmark data of total monthly return asset and macro-economic data over a 21-year framework (1995-2016). The model used financial variables of which adjusted closing prices, number of shares outstanding, capitalisation, debt-to-capital ratio and market price indices were obtained from the relevant benchmark sources. The researchers calculated the returns as natural logarithm of price ratio in sequential periods. The macro-economic variables that were used

were Gross Domestic Product, inflation, 10-year Treasury bond rates and 90-day bank accepted bill rates.

Following the above, the following results were observed by the Wong and Reddy (2018). The cross-sectional asset pricing test results indicated a statistically strong relationship exists among all portfolios market returns. This was indicative of the strong exposure of all the portfolios to market risk, thus being consistent with the portfolio theory. In the same case, low debt funds were more sensitive to market risk than high debt funds. Short-term interest rates were significant in all models. The positive coefficient in both funds showed that a higher gearing led to increased exposure to movements in short term interest rates. Wong and Reddy (2018) further added that rising short-term interest rates were an indication of economic prosperity as central banks tend to raise interest rates during robust economic growth; thus translate to higher rental yields which benefit REITs. Long term interest rates were strongly significant in all models and in this case, both funds had negative coefficients, which suggests that the fund performance was adversely affected by the rising cost of debt. The increased sensitivity of the high debt fund implied that highly leveraged funds are more exposed to this source of risk - these findings were consistent with those of Chen and Tzang (1998). Inflation was significant in all, low debt and high debt models; ultimately the results of negative coefficients indicate that higher gearing levels led to greater default risk exposure, which in turn is a proxy for funding liquidity risk.

To estimate the impact of size, the funds in the portfolio were separated according to their market capitalisation. All the portfolios exhibited strong exposure to market risk, with medium-sized funds having the strongest exposure. Medium and large sized funds, do not have a statistically significant relationship to inflation, thus suggesting that the funds were less exposed to general macroeconomic conditions, while small-sized funds had more exposure. Furthermore, small and medium funds show a positive relationship with changes in short-term interest rates.

Wong and Reddy (2018) further analysed the effects of the pre, during and post global financial crisis (2007-2009). Salient to this was that leverage sorted portfolios showed that funds prior to the global financial crisis did not exhibit much sensitivity to changes in interest rates and default risk premiums. During the global financial crisis, market risk increased sharply in magnitude and significance. In the post-global financial crisis, the market risk diminished in magnitude, while the interest rate became a less significant driver of fund returns possibly due to the low levels of interest rates that created an environment of “cheap” credit. During the global financial crisis, market risk became a much stronger driver of funds returns but dropped in prominence in the year after the global financial crisis. In this period Wong and Reddy (2018) noted that interest rate risk diminished in significance for small and medium sized funds and

large-sized funds remained sensitive to changes to long-term rates. Further to this, the researchers investigated beta variation over time, and performed a robustness test using a rolling regression with an 18-month fixed window and step size 1. Upon completion the following key findings were exacted. Firstly, the results showed that there existed a statistically significant relationship amongst inflation, market risk, default risk and interest rates. Furthermore, that rising short term interest rates were indicative of a strengthening economy. These findings were consistent with findings that were made in previous studies pertaining to the Australian REIT market.

During the early parts of the modelling period, market beta for A-REITs fell sharply possibly in response to the Asian currency crisis; this result was observed in 1977 and in 2000. REIT portfolios experience lower (higher) market beta during periods of economic contractions (growth). Evidence posit by Wong and Reddy (2018) suggests that A-REITs represented defensive options for investors during the early period.

According to Wong and Reddy (2018) several funds in the sector which had overseas investment and operations, exposure to several key foreign markets was also explored. Only exposure to the U.S. market was statistically significant. During the pre-global financial crisis period, the coefficient for S&P500 was negative. This result showed that the U.S. operations serve as a defensive purpose and is an important source of diversification benefits. However, the events of the crisis reversed this trend and added to financial risk. Post-global financial crisis, exposure to S&P500 was no longer a significant driver of REITs in Australia. Further interesting findings by Wang and Reddy posit that the A-REIT sector outperformed the equity markets prior to the crisis. Although post-global financial crisis A-REITs did not perform as well, the sector still managed to outperform general equities in terms of risk adjusted returns. Recovery efforts were focused on capital raising which were aided by general recovery of the equities market, debt reduction and balance sheet restructuring.

Following the importance of credit and access to funding, Kanno (2020) analysed credit risk assessment in REITs from the perspective of block-holders and lending networks. The study assessed the credit risk of Japan REITs (herein J-REITs) in two related markets during the 2008-2017 fiscal year. J-REITs are close-ended funds listed on the stock exchange and thus have corporate credit risk. They are more secure than any other debt, such as subordinated debt due to an entity.

Prior to analysing the credit risk of J-REITs, Kanno (2020) set a concrete foundation in that they provided one with a theoretical understanding of J-REITs. Kanno (2020) stated that REITs are a popular alternative investment. J-REITs market were the second-largest REIT market globally, after the U.S. post the U.S. subprime mortgage crisis; the J-REIT market started to take strain, in that some firms started filing for bankruptcy in 2008. This was caused

by failure to manage an entity's cash flow - the effects of the subprime mortgage crisis left real estate firms in a position where many of them were unable to raise funds to acquire assets and fund the operation of the firms.

Kanno (2020) focused on calculating the credit risk parameters. Firstly, by looking into external funding, J-REITs rely on external financing, namely, issuing investment corporation bonds, issuing investment securities and borrowing from financing institutions. With a high dependence on external financing, credit risk management is essential to real estate firms, because the failure to refinance leads to default. As a result, many J-REITs depend on sponsors; therefore, a sponsor probability of default is a leading indicator for an investment corporation default. The joint probability of default also adds as a coincidence indicator of default. Therefore, Kanno (2020) analysed the credit risk of an investment corporation and the interconnectedness with the sponsors in the block-holding and lending network.

The approach was based on a discounted cash flow valuation. A lending asset was valued based on its discounted expected cash flows using a discount rate adjusted for credit risk (these can be obtained from credit rating curves provided by credit rating agencies such as Moody and S&P). Kanno (2020) study calculated the credit risk exposure of a lending contract, discounting its cash flows at a discount rate adjusted for credit risk. The researcher used outstanding lending contracts and financial data for the financial year 2008-2017. In order to correct for the rate difference issues among the credit rating agencies; as a result, the study adopted the lowest credit rating when two or more different ratings were assigned to a firm.

Furthermore, Kanno (2020) used network analysis; an approach used to model data in economics and finance. In this section Kanno, described the analysis of J-REITs and the lending market network structure. The section which was based on J-REITs block-holders and credit risk exposure in the lending markets, market value exposure. Using the matrix, the study calculated the network indicator and centrality measures per entity for the first half of the 2008 to 2017 financial period. Regarding network indicators, network size is indicative of the total number of links in the lending network and block-holding and exposure size indicates the total number of exposures in that particular network.

The centrality measures used were lending degree centrality for lending network, weighted degree, degree, and hyperlinked induced topic search for the lending networks and block holding. Financial institutions as lenders have only one degree, and no out-degree regarding its relationship with an investment corporation has only one out-degree and no in-degree in terms of its relationship as an institution. Lastly, Kanno (2020) analysed J-REITs' credit risk using data from all J-REITs to this end; Kanno (2020) conducted a panel regression analysis and used the following variables; the centrality variables, property variables, sponsors and financial variables. The results showed that most correlations in the financial variables were

relatively low. Furthermore, it outlined that increased default risk was caused by increased financial leverage, which leads to a lower capital adequacy ratio.

A REIT credit risk is driven by its financial health, with the downside risk in the asset's value. Kanno (2020) investigated REIT credit risk by using the altered regression model namely, the binary logistic regression model. The results from the model proved that the assessment of a REITs credit risk is influenced significantly by a sponsor. The study contributed to the credit risk in J-REITs lending networks and block-holding academic literature. Salient findings include the fact that corporate lending exposure increased after the global financial crisis. This was also a result of an increase in the number of commercial banks and financial institutions, post the global financial crisis. Finally, although the research by Kanno (2020) adopted J-REITs data, the methodology applied can be used in other financial markets.

The liquidity risk of REITs was analysed by DiBartolomeo et al. (2021), the authors examined the liquidity risk of REITs by measuring REITs' return sensitivity to market-wide liquidity shocks. The authors emphasised that REITs should be financially rewarding to investors, as REITs decrease the reliance on the stock market to satisfy liquidity needs. Liquidity is a broad concept made up of a plethora of aspects. However, in this study, the authors examined two popular measures of liquidity. The first measure used was the market liquidity measure (LIQ), proposed and developed by Pástor and Stambaugh (2003). The LIQ measure captures liquidity related to temporary price fluctuations induced by order flow. Furthermore, performed robustness test on the findings using an alternative measure of market-wide liquidity shocks based on the findings of Amihud (2002), which informed the second measure used by DiBartolomeo et al. (2021), the ILLIQ methods (used to measure the NYSE/AMEX non-REIT common stock), captures the synchronous price impact of trades. Given the two measures adopted by the researchers, DiBartolomeo et al. (2021) averaged the Amihud measure across all identified stocks, enhancing their measure by using the residual from the ARIMA (3,1,3) model used to measure innovations in marketplace illiquidity.

In the examination of a security's liquidity risk, the authors used a regression model, where the dependent variable in the model was return on security, for time the authors used market-wide liquidity innovations and additional time-varying factors that can be deemed relevant for asset prices were considered as explanatory variables. This model was added onto to minimise model misspecification and to ensure that the results are attributable directly to liquidity risk. DiBartolomeo (2021), expanded on the model discussed above from the five-factor model. In this model the dependent variables were; the return on firms for month T, net of the rate on one-month treasury bills for month T. Moreover, a measure of aggregate liquidity shocks, as explanatory variables were employed from Fama and French. These factors being market, size, and value factors as well as momentum factor that was proposed by Carhart

(1997). Moreover, the researchers conducted a robustness test. This test was used to examine and determine the robustness of the estimates mentioned above over time. Noticeable findings from the research stress that REITs' liquidity betas are significantly negative in the time periods the robustness test was performed within. Further to this, the researchers used Ziman database in CRSP where they extracted data of publicly traded equity REITs.

The researchers used data from publicly listed equity REITs over the 1980-2015 period. Extracting key data points such as price, share outstanding, returns, data on assets, liabilities, dividends and earnings. A fundamental underlying premise is that REITs are unique because investors possess *ex-ante* information that they are due to receive dividends from the firm. With the data by DiBartolomeo et al. (2021) unveiling that equity REITs as a group display a negative sensitivity toward market-wide liquidity shocks.

In addition, when market-wide liquidity declines, REIT values increase relative to those of other firms. These findings prove that REIT prices reflect a liquidity benefit to investors contrary to non-REIT firms, which displayed no such relationship-seeing as their prices do not increase when market-wide liquidity deteriorates. Furthermore, findings made by DiBartolomeo et al. (2021) suggest that diversified REITs commonly suffered from lower valuations and reduced liquidity - because these REITs exhibit higher market-wide liquidity risk than firms with more property type focused investment holdings. Lastly, the researchers examined the liquidity beta of firms that operated within REIT status at a specific time, whilst having operated as a non-REIT firm, which is fully taxable. The stock liquidity risk of these firms was lower when the firms operated as REITs than when they did not. Conclusively, the authors managed to prove REITs as a security class exhibit a reduced return sensitivity to market-wide liquidity shocks and thus provides investors with reduced exposure to liquidity risk.

4.3 Modelling

4.3.1 Preface

Before running different models to test for potential bankruptcy, this study first tests the relationship between different independent variables as taken from Altman (1968). Key findings suggest that there exists a multi-relationship that should be noted. Therefore, the study proposes using the VAR model in a panel setting;

$$y_t = c + A_1y_{t-1} + A_2y_{t-2} + \dots + A_p y_{t-p} + e_t \quad (4.1)$$

where the l -periods back observation y_{t-l} is called the l -th lag of y , c is a $k * 1$ vector of constants (intercepts), A_j is the time-invariant $k * k$ matrix and e_t is a $k * 1$ vector of error terms satisfying $E(e_t) = 0$, every error term has mean zero. $E(e_t e_t') = \Omega$, the contemporaneous covariance matrix of error terms is Ω (a $k * k$ positive-semidefinite matrix. $E(e_t e_{t-k}') = 0$, for any non-zero k , there is no correlation across time; in particular, no serial correlation in individual error terms.

4.3.2 Financial Modelling

Mensah (1984) is one of the few notable studies that investigated both the stationarity and non-stationarity when there is bankruptcy. However, Mensah (1984) never combined stationarity and non-stationarity in his analysis. Therefore, this methodology departs on the notion where stationarity and non-stationarity are combined in the analysis. The log-linear model is suitable for the latter scenario (See; Marcato et al. 2019). For the main analysis, this study proposes logistic and log-linear models. Second, it can be inferred from Mansur et al. (2020) that returns and volatilities of REITs tend not to have a normally distributed curve. Therefore, the study proposes using models that take into account non-normality of distribution of curves. The model suitable for the latter scenario from prior studies (Mensah 1984, Wiggins and Metrick 2019, and Fan et al. 2020) that probabilistic models are suitable for illustrating bankruptcy, in particular logistic model as it doesn't take into account linearity. Therefore, this study adopts logistic-panel model:

$$f(x) = \frac{L}{1+e^{-k(x-x_0)}} \quad (4.2)$$

Where x_0 is the x value of the sigmoid's midpoint, L is the curve's maximum value, k is the logistic growth rate or steepness of the curve. Like an empirical study, it is in the interest of the analysis that the results should be validated and/or supported by a robustness test for strengthening reasons. Therefore, this study uses another model to carry out the robustness test.

4.3.3 Robustness Test

Another model that has close similarity to the probabilistic model, but is multilinear in approach, is the log-linear model. According to Marcato et al (2019) the log-linear model allows each variable to take its appropriate distribution interns of (non-)linearity. Therefore, this study uses a log-linear panel as a second choice model for testing bankruptcy:

$$\ln(Z) = c + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \varepsilon_t \quad (4.3)$$

Where Z is the market cap of each REIT firm, x_1 is the working capital over total assets, x_2 is retained earnings over total assets, x_3 is earnings before interest and taxes over total assets, x_4 is the market value equity over book value of total debt, x_5 is sales over total assets, x_6 is the FFOs and ε_t is the error term. The first five independent variables are adopted from Altman (1968) including their sequence and FFOs are included, as they are the main yard stick of performance measurement of REITs.

4.4 Data

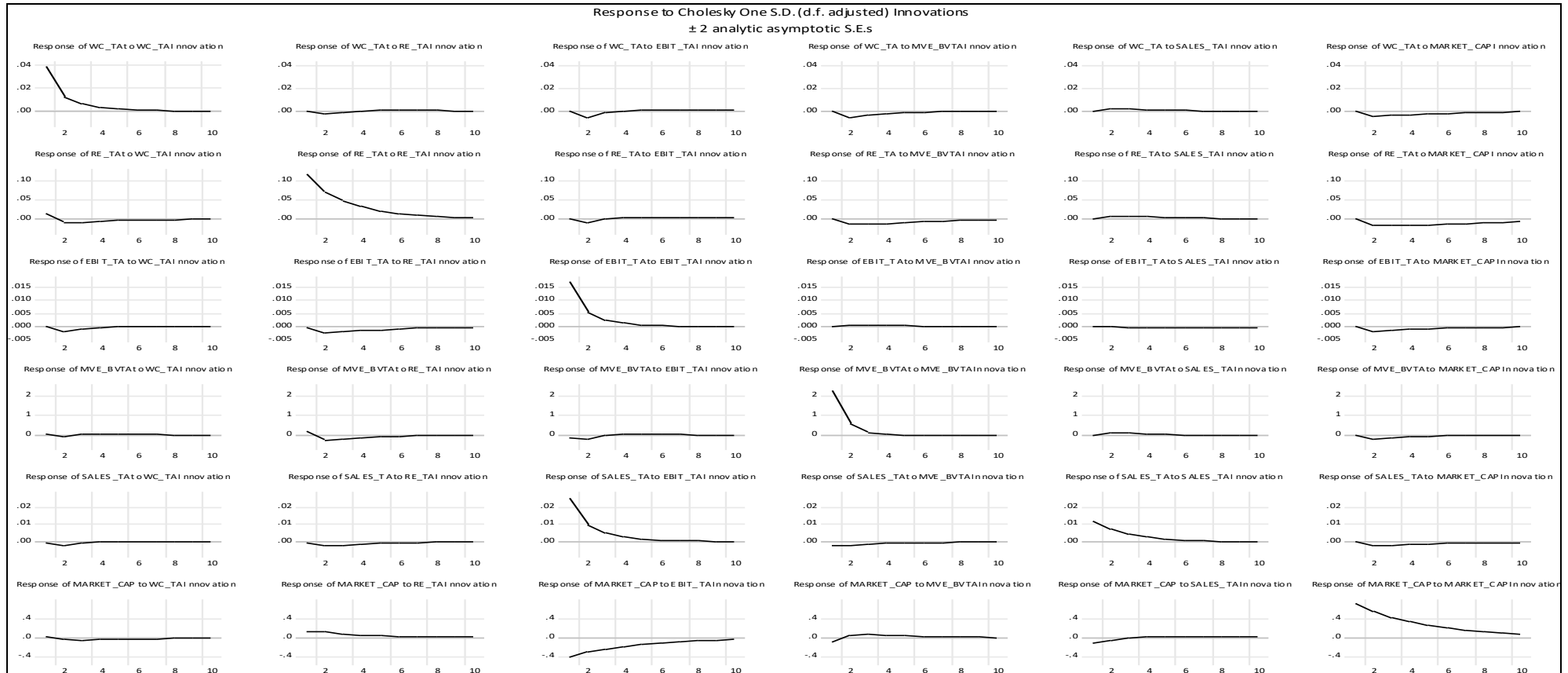
The study made use of 2014-2018 financial years annual financial statements (AFS) of FTSE/JSE listed REIT firms from Bloomberg. The REITs mentioned above were all listed on the JSE in 2014. These being GRT is a ticker for Growthpoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Rebasis Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB/HPA for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund, AHD for Arrowhead Properties Ltd and EQU is Equites Property Fund. The study made use of the AFS, namely the income statement, balance sheet and the cash flow statement to obtain key ratios analysed in the paper below from Altman (1968), pages 594-595. Further to this, the study extracted additional data such as the market capitalisation and FFOs of REITs for 2014-2018 financial years from the Thomson Reuters dataset.

4.5 Empirical Analysis

The panel data is on South African REITs, for the 2014 to 2018 period based on variables of Altman (1968). The variables (i) working capital/total assets, (ii) retained earnings/total assets, (iii) earnings before interest and taxes/total assets, (iv) market value equity/book value of total debt, sales/total assets and (v) market cap. Altman (1968) used overall index for the sixth variable, while this study uses market cap because this study focuses on firm specific bankruptcy as opposed to market bankruptcy. The data is from Bloomberg terminal.

4.5.1 VAR (1,1) Results

Figure 4. 1: Cholesky Decomposition



Note: Cholesky decomposition graph illustrations are interpreted in conjunction with the results in the VAR table 4.1. Kola and Sebehela (2021) followed the same procedure when interpreting the VAR findings.

In order to decide the appropriate lag, the following diagnostic tests were carried out. Given that the results of the VAR are sensitive to the order of variables, this study followed the exact order of variables as per the Altman (1968) study. This is because Altman (1968) is the one who pioneered bankruptcy of firms using ratio analysis among other factors. In order to decide the appropriate lag, the following diagnostic tests were carried out in the orderly manner. First the residuals tests, where the correlation LM 2 lag test was tested for both first and second order correlation, and the results for the former tests for both orders, correlation is significant, which implies any lag up to 2 lags, might be appropriate for the VAR. Thereafter, the lag structure test for 1 lag length criterion is tested and results support using 1 lag, when results are based on Aikaike IC and Schwarz SC. Finally, lag structure using AR roots test is carried and based on AR roots table, using the modulus values, all absolute values are less than one; therefore, all roots inside unit are stationary. Fundamentally, the results support using VAR(1,1).

Table 4. 1: VAR (1,1) results

Parameter	WC_TA	RE_TA	EBIT_TA	MVE_TA	SALES_TA	MARKET_CAP
WC_TA(-1)	0.3472 (0.0969) [3.5868]#	-0.4314 (0.2918) [-1.4782]	-0.0459 (0.0415) [-1.1043]	-0.9294 (5.7595) [-0.1614]	-0.0380 (0.0689) [-0.5517]	-1.2499 (2.04718) [-0.6106]
RE_TA(-1)	-0.0139 (0.0259) [-0.5359]	0.6378 (0.0780) [8.1766]#	-0.0148 (0.0111) [-1.3301]	-2.3068 (1.5394) [-1.4985]	-0.0153 (0.0184) [-0.8284]	0.03969 (0.5472) [0.0726]
EBIT_TA(-1)	-0.7032 (0.4484) [-1.5683]	-1.8077 (1.3505) [-1.3385]	0.3279 (0.1922) [1.7067]	-3.0086 (2.6653) [-1.1288]	-0.4058 (0.3188) [-1.2729]	-4.5835 (9.4739) [-0.4838]
MVE_TA(-1)	-0.0026 (0.0017) [-1.5057]	-0.0064 (0.0051) [-1.2427]	0.0001 (0.0007) [0.1887]	0.2586 (0.1011) [2.5575]#	-0.000 4(0.0012) [-0.3402]	0.0522 (0.0359) [1.45834]
SALES_TA(-1)	0.1208 (0.2636) [0.4585]	0.4574 (0.7938) [0.5762]	-0.0314 (0.1129) [-0.2779]	7.8961 (1.5667) [0.5040]	0.6103 (0.1874) [3.2569]#	3.4520 (5.5688) [0.6199]
MARKET_CAP(-1)	-0.0072 (0.0035) [-2.0476]#	-0.0227 (0.0106) [-2.1366]#	-0.0023 (0.0015) [-1.5329]	-0.2876 (0.2095) [-1.3724]	-0.0030 (0.0025) [-1.2083]	0.7888 (0.0745) [10.5907]#
<i>Adjusted R²</i>	0.1505	0.4459	0.1259	0.0595	0.2004	0.6049
F-Statistic	3.8649	14.0113	3.3291	2.0231	5.0523	25.7603
Akaike IC	-3.5998	-1.3947	-5.2943	4.5702	-4.2819	2.5014
Schwarz SC	-3.4152	-1.2100	-5.1097	4.7548	-4.0973	2.6861

Note: The wc_ta stands for $\frac{\text{working capital}}{\text{total assets}}$, re_ta stands for $\frac{\text{retained earnings}}{\text{total assets}}$, ebit_ta is $\frac{\text{earnings before interest and taxes}}{\text{total assets}}$, mve_bvtd is $\frac{\text{market value equity}}{\text{book value of total debt}}$ and sales_ta represents $\frac{\text{sales}}{\text{total assets}}$. In each cell, the first decimal number is the coefficient, the decimal number in rounded brackets is the standard error and the decimal number in squared brackets is the t-test. All squared bracket decimal numbers with # symbol next to them, are statistically significant for VAR values as they are at least 2 irrespective of being negative or positive. Table 4.1 should read jointly with figure 4.1.

In order to predict bankruptcy in the South Africa REIT market a multiple discriminant statistical technique was adopted using economic ratios. In this section one will provide the results from the VAR model and will read the results in conjunction with the Cholesky

decomposition. According to Kola (2021), the Cholesky decomposition provides more insight and interpretative power of the results.

The six key economic ratios that were outlined by Altman (1968) were used to assess the cause-and-effect relationship between the ratios that will be discussed below. However, before one reports on these findings it is imperative to define the respective ratios using the revolutionary study in corporate bankruptcy by Altman (1968) as a benchmark. The ratios are explained in a sequential order according to their level of importance and significance as this is important for the multivariate analysis model that was performed in this study. The definitions below are adopted from Altman (1968), as such this will be the definition of these ratios in the study. WC_TA, measures the net liquid assets of the firm relative to the total capitalisation. RE_TA, measures the cumulative profitability over time. EBIT_TA, measures the true productivity of the firms' assets abstracting from any tax or leverage factors. The MVE_BVTD, measure shows how much the assets of the firms can decline in value before the liabilities exceed the assets and the firm becomes insolvent. Sales_TA, measures the management capability in dealing with a competitive condition. Lastly the market cap measures a business value based on the number of outstanding shares and the share price.

The ratios proposed by Altman (1968) were analysed using a multivariate analysis, namely the VAR (1,1) model. In this model the following noticeable findings were exposed. Interestingly, the findings exposed that a one-unit lag in five out of the six ratios, with the exception of EBIT_TA, had a direct impact on their own ratios. EBIT_TA ratio, is a true measure of the productivity of REIT firms' assets. Productivity is defined as the potential earning power of an asset (Altman,1968). The results of the model show that EBIT_TA had no statistically significant results. This suggests that the productivity of assets in REIT firms will not be affected by a one-unit lag in the analysed economic ratios. This is particularly interesting as it is the only ratio that has no statistically significant result. These results could do with the fact that the productivity of the assets that enable earning power to the respective REITs are dependent on macroeconomic factors such as but not limited to; consumer spending, CPI, disposable income supply and demand of rental properties (Azmin and Shariff, 2016). These factors are factors that the company has limited control over.

As reported above, lag (-1) in WC_TA, RE_TA, MVE_BVTD, SALES_TA and Market_Cap all have significance to their own ratios. Suggesting that if there is a one-unit lag in the respective ratio they would have a direct impact on themselves. Therefore, a shock in any of the components that make up the respective lines of items would create a positive shift in itself, the shift ranges from a shift of 0,347530- 0,788772. Interestingly, a one-unit shock or lag

in market_cap which was the only variable that resulted in a shift in other variables. These variables being WC_TA and RE_TA. As such the results alongside the Cholesky decomposition reveal that a one unit lag in market cap would result in a negative shift in both WC_TA and RE_TA ratios. The lag in both these variables will result in a loss of -0.022684 in RE_TA -0,007218 in WC_TA and -0.022684 in RE_TA in South African listed REITs. The rate of shock in RE_TA caused by the lag referred to above is the smallest shift that occurred in the 2014-2018 period. Before one understands the effects of these ratios based on the market_cap (-1) shock, one needs to understand what could potentially affect a company's market cap. Pavone (2019) opines that the macroeconomic environment plays a significant role in an entity's market capitalisation. Furthermore, Pavone (2019) stressed that the price that a stock is trading at on the stock market reflects exogenous and endogenous factors that relate to the performance of the economy.

As such this reveals that the market cap is not solely dependent on the performance of a firm; this does not suggest that a firm's performance will not affect a company's market cap. However, this outlines that the market is affected by both the performance of a firm and macroeconomic environment. Retained earnings is what is left from your net income after dividends are issued to shareholders. Given that it is the nature of REITs, and by extension, their mandate to distribute at 75% of their net profits as dividends, this results in REITs having a high dividend payout, which limits REIT firms's retained earnings. Subsequently leading to a high dependence on equity and debt financing from REIT firms to keep operations and increasing earning powers through acquisitions. Therefore, the relationship between the retained earnings and market cap substantiates the negative shift in the RE_TA ratio given a one-unit lag in market cap. The shift -0.022684 shift in the RE_TA is not as significant as the shift of all other variables.

While WC_TA, which according to Altman (1968) is a measure of the net-liquid assets of firms relative to the total capitalisation. Working capital is the lifeline of any corporation and is the immediate liquidity available to the entity. As such a positive working capital will show that a company is operationally efficient in the short-term period of the company. Therefore, working capital is pivotal to the daily running of any entity. It is interesting to observe the shift and behavior of working capital in the REIT market, primarily because REITs are highly levered firms (Giacomini et al, 2017). The fact that REITs are highly levered means that there must be an efficient management of REITs working capital to avoid any form of bankruptcy. It can be observed from the studied laboratory that although some REIT firms during 2014-2018 period had healthy financial positions, bankruptcy is not out for reach for those REITs.

4.5.2 Logistic Results

Given that data used for running a logistic model is panel data, in order to increase the robustness of the logistic results, the model ran into scenarios. First, when the independent variables are rolled over, after step-wise regression, the rolling over procedure follows the order of importance based on the order of Altman (1968) variables. According to Altman (1968), the order of independent variables is as follows; first, it is $\frac{\text{working capital}}{\text{total assets}}$, second is $\frac{\text{retained earnings}}{\text{total assets}}$; thereafter, $\frac{\text{earnings before interest and taxes}}{\text{total assets}}$, fourth is $\frac{\text{market value equity}}{\text{book value of total debt}}$ and finally $\frac{\text{sales}}{\text{total assets}}$. Then, the second rolling in the logistic model hinges on the ascending causality effect based on the step-wise regression results. The reason why in the second logistic model one uses the latter logic is because an ascending order of causality minimises econometric challenges, including multicollinearity (Ghysels et al. 2020). In both logistic models, this study adds the FFOs because the FFO is the widely used and accepted measure for measuring performance in the REIT industry (Beracha et al. 2019 and Seok et al. 2020). For the first logistic model based on Altman (1968) variables, the FFO is the last variable that will be rolled over in the model. Note Resilient Property Fund (RES) in year 2018 and Fortress Property Fund for years 2016 and 2018 had negative FFOs. However, for modelling reasons, they are changed into positive numbers in order for the study to get neutral logarithms for those negative FFOs.

Table 4. 2: Logistic Results

Eq.	Panel A: Step-Wise Regression						Panel B: Altman (1968) Variables Importance Order					Panel C: Step-Wise Ascending Order				
	SWR1	SWR2	SWR3	SWR4	SWR5	SWR6	Altman (1968) 1	Altman (1968) 2	Altman (1968) 3	Altman (1968) 4	Altman (1968) 5	SWAO 1	SWAO 2	SWAO 3	SWAO 4	SWAO 5
Constant	0.0888 (0.000)***	0.0885 (0.0000)**	1.0649 (0.0000)**	0.0886 (0.0000)**	0.1068 (0.0000)***	0.0557 (0.000)***	0.08893 (0.0000)***	0.1083 (0.0000)**	0.1085 (0.0000)**	0.1089 (0.0000)***	0.0710 (0.0000)***	0.0711 (0.0000)***	0.0731 (0.0000)***	0.0730 (0.0000)***	0.0733 (0.0000)***	0.0710 (0.0000)***
wc_ta	0.0617 (0.0480)**						-0.0616 (0.0502)*	-0.0689 (0.0193)**	-0.0689 (0.0197)**	-0.0669 (0.0240)**	0.4226 (0.8019)			0.1619 (0.0328)	0.2075 (0.9031)	0.4236 (0.8019)
re_ta		-0.1778 (0.8369)					-0.00483 (0.9549)	-0.2563 (0.7474)	-0.2509 (0.7538)	0.0221 (0.9776)	-0.2233 (0.6117)				-0.1677 (0.7104)	0.2232 (0.6117)
ebit_ta			-2.7338 (0.0002)**					-0.2858 (0.0001)**	-0.2854 (0.0001)**	-0.7288 (0.9558)	-0.1896 (0.0135)***		-0.1581 (0.0333)**	-0.1579 (0.0345)**	-0.1620 (0.0327)**	-0.1898 (0.0135)**
mve_bvtd				-0.0141 (0.8012)					-0.0095 (0.8540)	-0.0325 (0.5258)	0.0548 (0.0667)*					0.0548 (0.0667)*
sales_ta					-0.1894 (0.0000)***					-0.1908 (0.0148)**	-0.0377 (0.4030)	-0.1383 (0.0000)***	-0.0584 (0.1827)	-0.0583 (0.1855)	-0.0561 (0.2086)	-0.0377 (0.4030)
FFO						0.8127 (0.0000)***					0.8046 (0.0000)***	0.7653 (0.0000)***	0.7816 (0.0000)***	0.7831 (0.0000)***	0.7836 (0.0000)***	0.8046 (0.0000)***
adjusted R ²	0.0281	-0.0093	0.1196	-0.00091	0.1699	0.6362	0.0186	0.1517	0.1435	0.1855	0.7381	0.7271	0.7365	0.7339	0.7316	0.7381
F-Stat	4.0005 (0.0000)***	0.0426 (0.8369)	15.129 (0.0001)**	0.0637 (0.8012)	22.2995 (0.0000)***	182.9051 (0.0000)***	1.9848 (0.1427)	7.1997 (0.0002)**	5.3566 (0.0006)**	5.7363 (0.0001)***	49.8442 (0.0000)***	139.5506 (0.0000)***	97.9199 (0.0000)***	72.7219 (0.0000)**	57.7041 (0.0000)***	49.8442 (0.0000)***
Durbin-Watson Stat	0.5475	0.4668	0.5042	0.4596	0.5204	0.9898	0.5491	0.6805	0.6798	0.6645	1.0741	0.9726	1.0112	1.0137	1.0119	1.0741
Akaike IC	3.4209	3.4587	3.3221	3.4585	3.2631	2.4382	3.4399	3.3034	3.3221	3.2809	2.1552	2.1601	2.1340	2.1529	2.1706	2.1552
Schwarz C	3.4572	3.5092	3.3727	3.5090	3.3138	2.4887	3.5158	3.4045	3.4485	3.4325	2.3321	2.2359	2.2351	2.2794	2.3223	2.3321
Hannan-Quinn C	3.4414	3.4792	3.3426	3.4789	3.2836	2.4587	3.4707	3.3444	3.3733	3.3423	2.2269	2.1908	2.1750	2.2042	2.2321	2.2269

Note: SWR stands for step-wise regression for stand-alone equation (i.e. eq.), where each numeric means a specific equation, i.e. SWR is step-wise regression 1. For Panel B, variables are rolled over till the full model [i.e. Altman (1968) model 6] based on order of importance as illustrated by Altman (1968) on page P594. For step-wise ascending order as illustrated in Panel C, rolling over starts from the coefficient that has the slowest causal effect provided it is statistically significant until the variable which has the highest causal effect, provided it is statistically significant. The non-statistically significant variables are rolled over in the same manner as statistically significant variables in terms of ascending order of causal effect; however, the non-statistically significant variables are rolled in last. The ascending rolling over to fuller model is inferred from (Ghysels et al. 2020). In terms of rolling over the independent variables, the model starts rolling over statistically significant variables, starting from the smallest absolute coefficient to the biggest absolute coefficient. The latter phenomenon minimises the occurrence of multicollinearity among potential econometric challenges according to Ghysels et al. (2020). The same rule applies to statistically insignificant independent variables. The FFOs are added last as they are not part of Altman (1968) but FFOs are widely used and accepted performance measures in the REIT industry. The wc_ta stands for $\frac{\text{working capital}}{\text{total assets}}$, re_ta stands for $\frac{\text{retained earnings}}{\text{total assets}}$, ebit_ta is $\frac{\text{earnings before interest and taxes}}{\text{total assets}}$, mve_bvtd is $\frac{\text{market value equity}}{\text{book value of total debt}}$ and sales_ta represents $\frac{\text{sales}}{\text{total assets}}$. In both Panels B and C, funds from operations are rolled over in last step because they are part of Altman (1968) variables but FFOs are one of the most important measures of performance of REITs. Note Resilient Property Fund (RES) in year 2018 and Fortress Property Fund for years 2016 and 2018 had negative FFOs. However, for modelling reasons, they are changed into positive numbers in order for the study to get neutral logarithms for those negative FFOs.

The results of Panel A show that of the 6 explanatory variables used in the step-wise regression model, only 4 were statistically significant. These variables are *wc_ta*, *ebit_ta*, *sales_ta* and FFO. With FFO being the only variable that reacted positively towards market cap in SWR6; As such, this result reveals that FFO is a predictor in the change that occurs in REITs market-cap, this result is supported by the fact that FFO is the most acceptable performance measure in the REIT industry. Further to this *wc_ta*, *sales_ta* and *ebit_ta* results were negative statistically significant to market cap. The negative statistical significance in Altman's 1968 variables in the context of their relationship to market cap in the REIT industry offers diversification benefits. Diversification benefits were first presented in Marcato et al (2019). The diversification benefits of Altman's variables in REITs is a novel finding according to one's knowledge. Panels B and C, all come to the same conclusion-*ebit_ta*, *mve_bvtd* and FFO are causal variables. The *mve_bvtd* variable causality is influenced by the relationship that exists between market cap and *mve_bvtd*. Where market cap represents the capital structure of a company. While *ebit_ta* provides additional relevant information about REITs as real estate companies in support of growing interest among generalist investors. The relationship between Altman's variables importance order and the step wise ascending order of the rolling order model confirms the robustness of the results, because it comes to the same conclusions

4.5.3 Robustness Test

For robustness test, this study uses the following ratios; (i) profitability-return on equity (ROE) and return on assets (ROA), (ii) liquidity-current and cash ratios and (iii) solvency-debt to equity and equity multiplier. The reason why this study uses the above-mentioned ratio pillars as part of robustness tests is because it can be inferred from Islamoglu et al. (2015) that those ratios are central in determining the financial health and financial position of REITs. Table 4.3 illustrates the selected ratios of the REIT firms.

Table 4. 3: Ratio Analysis

REIT	Date	Panel D: Profitability		Panel E: Solvency		Panel F: Liquidity	
		D1: ROA	D2: ROE	E1: Debt:Equity	E2: Equity Multiplier	F1: Current Ratio	F2: Cash Ratio
GRT	2014	0.0803	0.1367	0.4327	1.6684	0.8733	0.2329
	2015	0.0707	0.1247	0.4415	1.6791	1.3259	0.2501
	2016	0.0503	0.0874	0.5500	1.7355	1.4738	0.3909
	2017	0.0653	0.1172	0.6677	1.7608	1.4629	0.2343
	2018	0.0596	0.1050	0.7200	1.8248	2.5095	0.9760
VKE	2014	0.0317	0.0001	2.1509	3.7566	0.3269	0.1569
	2015	0.0657	0.0001	0.2879	1.4782	0.4626	0.3499
	2016	0.0778	0.1192	0.3448	1.5382	0.4749	0.3325
	2017	0.0885	0.1172	0.2134	1.3360	1.1627	0.9727
	2018	0.0928	0.1536	0.3478	1.4792	0.6469	0.5495
SAC	2014	0.0909	0.0938	0.0779	1.0997	0.8800	0.4776
	2015	0.1210	0.1416	0.3493	1.4164	0.9862	0.4634
	2016	0.1363	0.2055	0.2850	1.4076	0.6571	0.1294
	2017	0.0731	0.1173	0.3707	1.4906	0.7437	0.1765
	2018	0.0441	0.0645	0.4088	1.5858	0.4873	0.0907
EMI	2014	0.1009	0.1710	0.3738	1.6618	0.1168	0.0265
	2015	0.1311	0.2245	0.4675	1.6303	0.1726	0.0371
	2016	0.0447	0.0723	0.3911	1.6138	0.8236	0.0379
	2017	0.0474	0.0806	0.3988	1.6666	0.6655	0.0712
	2018	0.0579	0.0946	0.3594	1.6915	0.7768	0.0367
RES	2014	0.1330	0.2005	0.4207	1.4782	0.4258	0.0679
	2015	0.1527	0.2114	0.2734	1.3182	0.8849	0.0512
	2016	0.0920	0.1309	0.2728	1.4211	0.5401	0.0231
	2017	0.0598	0.1040	0.6366	1.7049	0.6553	0.4360
	2018	0.0841	0.1443	0.6443	1.7771	0.3129	0.1678
TEX	2014	0.0818	0.1222	0.2393	1.4655	0.2978	0.1691
	2015	0.0713	0.1221	0.5969	1.6315	3.6311	2.2150
	2016	0.0555	0.0901	0.5377	1.6201	0.3565	0.1362
	2017	0.0243	0.0413	0.4263	1.6703	0.2170	0.1080
	2018	0.0227	0.0508	0.1676	2.3175	0.1737	0.0355
RDF	2014	0.0601	0.1075	0.4583	1.7570	0.1469	0.2205
	2015	0.0826	0.1243	0.4862	1.5616	0.4211	0.0635
	2016	0.0578	0.0928	0.4322	1.6170	0.1890	0.1103
	2017	0.0363	0.0632	0.5402	1.7122	0.1707	0.0209
	2018	0.0743	0.1138	0.6107	1.7111	0.4574	0.0839
DIA	2014	0.0199	0.1046	3.3295	5.1579	0.1413	0.0441
	2015	0.0703	0.1085	0.4862	1.6019	0.3870	0.1513
	2016	0.0936	0.1581	0.6084	1.6917	0.5736	0.1630
	2017	0.0536	0.0920	0.5212	1.6741	0.5534	0.1925
	2018	0.0577	0.0910	0.4901	1.7468	0.2474	0.0738
FFA/FFB	2014	0.0848	0.1874	1.0318	2.2342	0.2034	0.0042
	2015	0.1730	0.2245	0.3289	1.4567	0.3151	0.0033
	2016	0.0972	0.1236	0.3095	1.3599	0.6391	0.0057
	2017	0.0699	0.0910	0.3065	1.3477	0.9539	0.0076
	2018	-0.0890	-0.1318	0.4037	1.5286	0.4390	0.1465
TWR	2014	0.0395	0.0680	0.4327	1.6684	0.5978	0.3040
	2015	0.0665	0.1293	0.4327	1.6684	0.1175	0.0215
	2016	0.0426	0.0756	0.4327	1.6684	0.3335	0.0843
	2017	0.0811	0.1341	0.4327	1.6684	0.5320	0.1662
	2018	0.0524	0.0863	0.4327	1.6684	0.3266	0.1302

Note: GRT is a ticker for Growthpoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Rebohis Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB/HPA for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund, AHD for Arrowhead Properties Ltd and EQU is Equites Property Fund.

Table 4.3: Analysis (Continue)

REIT	Date	Panel D: Profitability		Panel E: Solvency		Panel F: Liquidity	
		D1: ROA	D2: ROE	E1: Debt:Equity	E2: Equity Multiplier	F1: Current Ratio	F2: Cash Ratio
REB	2014	0.0384	0.1673	2.7915	4.2849	0.1525	0.1933
	2015	0.0278	0.0525	0.6908	1.9295	0.1611	0.0233
	2016	0.0869	0.1751	0.8635	2.0187	1.1487	0.1531
	2017	0.1169	0.2288	0.4468	1.9097	0.1869	0.0190
	2018	-0.0473	-0.0883	0.4709	2.0825	0.1193	0.0281
ATT	2014	0.0537	0.1021	0.7304	1.8628	1.2162	1.2162
	2015	0.0402	0.0823	0.8635	1.9475	2.6046	0.7431
	2016	0.0500	0.1326	1.1935	2.6452	3.3163	0.4629
	2017	0.0215	0.0432	0.7306	2.0914	9.3235	0.7141
	2018	0.1008	0.1589	0.6403	1.6016	26.5178	2.4661
OAS	2014	0.1121	0.1202	0.0000	1.0397	2.2295	0.4370
	2015	0.0709	0.0778	0.0000	1.0405	2.4420	0.5108
	2016	0.0771	0.0796	0.0000	1.0373	2.5553	0.0545
	2017	0.0657	0.0677	0.0000	1.0389	3.5360	0.1322
	2018	0.0828	0.0961	0.0000	1.0366	3.5754	0.0661
HYP	2014	0.0717	0.1523	0.8518	2.0858	0.0208	0.0070
	2015	0.1249	0.1748	0.2776	1.3323	0.0374	0.0139
	2016	0.0816	0.1203	0.3863	1.4724	0.2075	0.1092
	2017	0.0770	0.1093	0.2182	1.3924	0.3160	0.2604
	2018	0.0747	0.0964	0.3119	1.3368	1.8169	1.2807
DLT	2014	0.1002	0.2335	0.9139	2.3109	0.3098	0.1103
	2015	0.0780	0.2012	0.7949	2.3543	0.3605	0.0633
	2016	0.0632	0.1140	0.6383	1.9473	0.2970	0.1072
	2017	0.0542	0.0964	0.5883	1.7552	0.4982	0.1668
	2018	0.0621	0.1115	0.3800	1.7371	0.2125	0.0392
HPA/HPB	2014	0.0203	0.1322	5.0709	6.3779	2.3466	0.7604
	2015	0.0235	0.1383	4.1677	5.6100	1.4583	0.4525
	2016	0.0897	0.1343	0.3018	1.4947	0.5614	0.2699
	2017	0.0650	0.0825	0.2260	1.2816	0.3653	0.5730
	2018	0.0077	0.0102	0.1748	1.1819	1.4664	4.9573
FVT	2014	0.0000	0.0000	0.2009	0.2146	0.2858	0.0551
	2015	0.0832	0.1096	0.1837	1.2542	0.2905	0.0477
	2016	0.1133	0.1682	0.4304	1.4823	0.6905	0.2192
	2017	0.1280	0.1756	0.1795	1.3451	0.1926	0.0450
	2018	0.0915	0.1301	0.2079	1.4729	0.1683	0.0202
IPF	2014	0.7500	0.9910	0.3396	1.6730	0.8795	0.7227
	2015	0.0950	0.1337	0.1428	1.3354	0.2652	0.1264
	2016	0.0648	0.1003	0.4631	1.5541	0.2105	0.0530
	2017	0.7710	0.1199	0.4696	1.5684	0.2633	0.1325
	2018	0.5584	0.0987	0.4771	1.5781	0.5913	0.4002
APF	2014	0.0803	0.1422	0.4696	0.5319	0.3840	0.1253
	2015	0.0986	0.1527	0.4865	1.5492	0.7014	0.1798
	2016	0.0908	0.1400	0.4781	1.9343	0.3688	0.1331
	2017	0.0735	0.1239	0.4500	2.1455	0.4229	0.1168
	2018	0.0735	0.1238	0.5287	1.6834	0.3896	0.0461
AHA	2014	0.2815	2.1249	0.4684	0.9875	0.3758	0.2729
	2015	0.3831	1.6572	5.1361	0.0120	1.1074	0.6511
	2016	0.3979	1.7698	1.4992	1.6916	0.4644	0.2287
	2017	0.2281	0.8402	0.3537	1.9684	0.1806	0.0612
	2018	-0.0038	-0.0163	0.3946	2.0396	0.2573	0.0273
EQU	2014	0.0120	0.0132	0.0890	1.1066	0.6937	0.1225
	2015	0.1162	0.1291	0.0979	1.1117	0.7031	0.1992
	2016	0.0980	0.1143	0.1198	1.1672	0.6599	0.0231
	2017	0.0957	0.1261	0.2218	1.3176	0.3920	0.0290
	2018	1.0450	0.1062	0.3026	1.3470	1.2501	0.0135

Note: GRT is a ticker for Growthpoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Reboasis Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPA/HPA for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund, AHD for Arrowhead Properties Ltd and EQU is Equites Property Fund.

From 2014-2018 the profitability ratios show a negative trend; a decline in both ROA and ROE over the period abovementioned. The results show that some companies reported a negative ROA in 2018; these companies are AHA, REB and FFA. The negative result is attributed to a decline in total assets in all three entities. Further to this, the same entities that reported a negative ROA, also reported a negative ROE in 2018. The negative ROE can also be attributed to a decline in total equity. The decline in total equity can be associated with the dividend policy that REIT firms have put in place. Currently, in South Africa, REITs are required to declare at least 75% of their profits as dividends to their unitholders annually. The profitability in this period was fairly stable.

During the same period the D:E ratio was increasing steadily for the entities, with the exception of DIA, REB, HPA and OAS. Interestingly, OAS is the only REIT with zero D:E ratio, this is because the company is Islamic owned and they believe in the principle of Haram, which states that individuals who practice Islam should not have debt, and if they do have debt, it should be limited. This is the case with OAS, which has no non-current liabilities and limited current liabilities. In the case of DIA, REB and HPA; these entities had a low debt level. As such, these companies showed a higher dependence on equity financing. This is particularly engrossing for REIT firms, which are traditionally known to be highly levered firms (Giacomini et al 2017, Capozza and Korean 1995, and Ooi and Ong 2010). The equity multiplier (EM) showed an upward trend and that over the 2014-2018 period, majority of the companies' assets were financed by debt and not through stockholder's equity. As such, the companies could not depend much on debt because of a lack of collateral. Once the firms started acquiring more assets their dependence on debt financing increased.

The liquidity ratio shows the same pattern as the solvency ratio. In Panel F there is an increase overtime in both the current ratio and the cash ratio. As such, showing that there is a positive relationship between solvency and liquidity, and a negative relationship between profitability and liquidity. A study performed by Addae et al (2013) supports this finding for highly levered firms, the authors reported that there is a significantly negative relationship between profitability and total debt. Qui and La (2010) found that although levered firms are generally more than unlevered firms, there is a profitability decline in debt ratio of levered firms.

4.6 Conclusion

The findings of this study are as follows. First, the Altman (1968) variables and FFOs are interrelated in numerous ways - during certain points, the relationship is positive and other

times negative. The inter-relationship seems to be based on their [i.e. Altman (1968) variables and FFOs] connection to financial health and financial positions of REIT firms. Second, the probabilistic results show that the main contributors to bankruptcy in the REIT industry are $\frac{\text{retained earnings}}{\text{total assets}}$ and FFOs. Third, the ratios (i.e. profitability, solvency and liquidity) illustrate deterioration of financial health and financial positions of REIT firms. Finally, irrespective of a technique used to detect bankruptcy, the used techniques show a gloomy picture about the investment opportunities during bankruptcy periods.

The implications from this study are as follows. First, FFOs are widely used and accepted measures, and also they explain bankruptcy in the REIT industry. Thus, FFOs have more importance than just being a performance measure. Retained earnings are related to the financial health and financial position of any firm; therefore, the importance of retained earnings in explaining bankruptcy is not unsurprising at all. Second, probabilistic measures are valuable techniques in detecting bankruptcy because probabilistic measures can be customised to different situations. Third, traditional measures such as ratios are still valuable in illustrating bankruptcy. Finally, it is advisable that bankruptcy techniques should be used jointly in detecting bankruptcy as that leads to a deeper insight of the given financial health and/or financial position in any firm.

Chapter 5 Smart Betas

5.1 Introduction

Manda (2021) contrasted valuations and profitability of real estate investment trusts (from here, REITs) based on different cash flows-free cash flows (FCFS), equity cash flows (ECFs), debt cash flows (CFDs) and capital cash flows (CCFs). Fundamentally, Manda (2021) confirmed that the values of REIT firms are sensitive to the type of cash flows underpinning valuations. In terms of ascending absolute cash flows values; the smallest values are from FCFS, thereafter, CFDs, followed by ECFs and the biggest are from CCFs. Interestingly and unsurprisingly, CCF values are close to the market capitalisation values. Furthermore, Manda (2021) showed some valuations are negative and then, the question is, is there any risk inherent to those valuations, including bankruptcy?

Manda (2022) built on from the latter question and investigated bankruptcy on REITs. The latter study is anchored largely on Altman (1968) because the very first study that explored corporate bankruptcy is Altman (1968). Based on (i) step-wise regression, (ii) ascending absolute order of Altman (1968) variables and (iii) ascending absolute order step-wise regression, Manda (2022) confirmed that deteriorating financial health and position leads to potential bankruptcy in REIT firms. Similarly, the profitability, liquidity and solvency ratios confirmed the same findings as in the regressions. However, Manda (2022) did not specifically focus on risk. According to Goetzmann (2020), among commonly used risk measures is beta because it measures market risk.

The beta concept can be traced back to 1945-Goetzmann (2020). At that point according Goetzmann (2020), the laboratories of the research were mainly bonds and stocks (also known as equities). One of the elegant features of the beta theory is that it has led to new theories-(i) mean-variance optimisation, (ii) alphas such as Sharpe, Treynor, Jensen and the capital asset pricing model (CAPM, thereafter) and risk parity. Furthermore, Goetzmann (2020) opines that the beta theory has been tested on a number of strategies, where some are passive and others are active in nature. Some of the products that used the beta theory as laboratory are alternative investments, and in alternative investments, there are property assets.

This study takes the concept of a beta factor further, with a specific focus on REITs. Studying the beta factor on REITs is interesting for many reasons including (i) uniqueness and heterogeneity of the product (See; Marcato et al. 2019), (ii) there is a growing interest in REITs, both from academics and practitioners; therefore, the beta risk needs to be better understood and (iii) studies on smart betas and zoo factors (coined by John Cochrane in 2011) are thin indeed. The study closer to this study is Zhu and Lizieri (2022), conceptually and appropriate

applicability, except of the usage of some parameters and some beta techniques. Zhu and Lizieri (2022) focused on underlying property assets owned by the U.S. REIT firms, while this study focuses on the actual listed South African REIT firms. Zhu and Lizieri (2022) confirmed that risk/equity premium is inherent in local betas, where local beta is the sum of the systematic risk and allocation strategy of a REIT firm.

The results are important for institutional investment strategy and manager choice for REIT investors. According Ennis (2020), alternative investments were not regarded as ‘diversifiers as from 2000s’ (P104). One of the main reasons for the latter statement, according to Ennis (2020), is the blending of different products erodes their diversification abilities. However, this study illustrates the following. First, quantitative betas are insightful in illustrating financial health and financial position of REITs, while qualitative betas appropriately measure the quality of the management. Second, positive REIT betas are rare indeed and those betas illustrate the strength of closed diversification - a novel finding. Third, Monte Carlo simulated betas converge to lower values when compared to the starting simulated betas, on average. The latter phenomenon is consistent with the volatility theory. Similarly, the alphas move on the same trajectory as the volatility theory.

The remainder of the study proceeds as follows. Section 5.2 disentangles prior appropriate studies. Section 5.3 is on methodology. Section 5.4 presents empirical application and section 5.5 concludes the study.

5.2 Literature Review

5.2.1 Beta Models

He and Kryzanowski (2008) explored beta dynamism in Canadian sector portfolios. Central to the authors, is the ability to capture a trend and a cycle. Then, the subsequent question is which beta is appropriate for the latter mentioned situation. According to He and Kryzanowski (2008), time-varying betas are suitable for their setting. Their monthly dataset is on cyclical and non-cyclical sectors in Canada, during January 1988 to December 2004. They used two betas, one is made up of current beta plus cyclical component of the market and the second beta, which captures preceding beta risk and error term. In defining the terms of the beta model, they opined that the error term is a random process. Although, the latter statement is not covered in He and Kryzanowski (2008), the two betas are structured similarly to the CAPM. Why? The first beta formula indirectly, incorporates excess returns on sector and market portfolios. The latter parameters are included in the CAPM. The last beta model is included in

the CAPM. The last beta model comprises of a ‘permanent component modelled as a random walk’ (P113).

The last beta model, to some extent the first beta model, is similar to the asset pricing theory. Ross (1976) demonstrated that the beta is dynamic, thus, it changes over time, despite the fact that, the time series is the same over its life. In order to account for that, Ross (1976) came up with the asset pricing theory, where the original CAPM is allowed to have different betas over the life of the time series. And the expected return has the expected excess return on the market. Furthermore, Ross (1976) exemplified that based on the Central Limit theory, the dynamic asset pricing model converges to a standard CAPM. The key taking from Ross (1976) is that standard models such as the original CAPM should be flexible such that they can embed much more parameters, if the situation deems so.

Back to He and Kryzanowski (2008), the fundamental finding is that, there are strong time-varying betas of sectors. This is evident across all analysed betas. Utilities have negative betas and negative betas are commonly found in the REIT industry (See; Anderson et al. 2015). Both Anderson et al. (2015) and Kola (2021) confirmed that negative betas mean moving away from the market, and by extension, confirm the presence of diversification benefits. Financials, telecoms, energy, industrials and consumers had positive varying betas. The robustness test (both in-and-out-of-sampling) as illustrated by R^2 , confirmed similar findings as in the main analysis.

Carhart et al. (2014) revisited exotic betas. At the heart of their study is to find simple and intuitive risk premiums, which they term exotic betas. Carhart et al. (2014) opine that what distinguishes betas is their sources of returns. According to the authors, the CAPM and intertemporal CAPM (I-CAPM) limit insight on risk factor identification, especially within theoretical settings. Thus, the authenticity of exotic betas is questionable. The key thing that leads to exotic betas is time-varying risk factor-Carhart et al. (2014). This study departs on the same route on defining exotic betas. In terms of the risk premium, the authors argue that there are numerous factors, including geographical diversification. Interestingly, geographical diversification minimises risk in the REIT industry (See; Talukdar et al 2021).

In Carhart et al. (2014), exotic betas setting is in a vectorial form. In that setting, it allows the weighting in different assets/portfolios to be adjusted accordingly. Moreover, bid-ask spread can be picked up from the vectorial setting-Carhart et al. (2014). The vectorial setting distinguishes this beta formation from other betas such as exotics in CAPM and I-CAPM. Other elegances of vectorial betas are that they allow for (i) spillovers and (ii) Black-Litterman (1992) type optimisations. The results of Carhart et al. (2014) confirmed that vectorial betas are time-varying over time. Ideally, time-varying betas have zero correlation with equities. The exotic

betas use leverage scour of '2.8 times for both the long and the short sides' (P32). In the context of REITs, leverage allows REITs to take advantage of expansion opportunities (Manda 2021) and increase volatility (Kola 2021). In Carhart et al. (2014), irrespective in (i) simulations, (ii) risk premiums calculations, (iii) alternative investing (e.g. hedge funds and risk budgeting) and (iv) tactical investing, one thing that is evident is beta (exotic) time varies. Therefore, the more time varying the beta is, the more appropriately risk is captured in the analysis. The latter sentence talks to conditional betas.

A conditional beta is interesting because it gives a discrete beta numeric value while varying over the life of a time series (Engle 2016 and Hollstein et al. 2020b). In Engle (2016), the conditional beta is adaptable to its past, while in Hollstein et al. (2020b), the conditional beta has the ability to be historical and realised (i.e. implied). Then, how does this conditional beta differ from other betas? In Engle (2016), conditional beta estimates maximum-likelihood and it is comparable to other discrete volatilities such as the generalised autoregressive conditional heteroscedasticity (GARCH, here after). In Hollstein et al. (2020b), a conditional beta is able to account for lags. Kola (2021) illustrates that model lagging, specifically in GARCH, improves accuracy of measures. Although, both studies (Engle 2016 and Hollstein et al. 2020b) never contrasted GARCH and conditional beta values, it is probably true that the two models will come to the same conclusion.

Hollstein et al. (2020b) show that conditional betas vary, and the frequency (daily, weekly or monthly) does not have much effect on the actual findings. However, if the study wants to explore high frequency risk, it is better to use daily data as daily measures accurately reflect high frequency risk. However, for daily systematic risk, there is substantial uncertainty (See; Hollstein et al. 2020a). Beta and volatility settings in Hollstein et al. (2020a) are similar to Hollstein et al. (2020b). Engle (2016) confirmed that conditional betas vary over time. Moreover, dynamic conditional beta parameters can be plugged into the GARCH model-Engle (2016). It can be inferred from Sebehela (2021) that if parameters are transferable in between two models, then those models should be conceptually similar. Over time, error in time-varying betas is eroded. The latter phenomenon is rare in other beta models. Engle (2016) went further and used asset pricing and global systematic risk to validate his findings on betas. The conclusion on the latter models (asset pricing and systematic risk models) are similar to findings of conditional beta analysis.

5.2.2 Beta Strategies

Low volatility investing in the U.S. equity REITs were investigated by MacKinnon and Spinney (2017). In that study, the authors examine the U.S. equity REIT market, searching for evidence of the volatility effect. With the primary question of the research being centered on, “do higher risk assets yield higher returns on average”? With risk being in question, the risk-return relationship is a cornerstone of the asset pricing theory. The first objective of the research investigates the relationship between risk (measured by volatility or beta) and return. Findings by Blitz and van Vliet (2007), Blitz et al. (2013) and Ang et al. (2009) answer this question that lower-risk stocks tend to outperform higher-risk stocks. The second stream of the research investigates risk-based portfolio construction techniques designed to exploit the "volatility effect" of "low volatility anomaly" for institutional investors.

MacKinnon and Spinney (2017) consider the performance of four portfolio construction methodologies for REITs, which are minimum variance, equal-weighted, equal risk contribution and maximum diversification. The equal-weighted strategy is based on the fact that the analyst has zero to no information available about the potential returns, correlation or volatility. The minimum variance strategy is efficient when expected returns are equally weighted, and the analyst has good foresight on the variance-covariance of asset returns. The equal risk contribution and maximum diversification approaches can be considered solutions that bridge the gap between the equal-weighted and minimum variance techniques. MacKinnon and Spinney (2017), constructed four equally weighted quartile portfolios (quarter 1 contained the lowest volatility REITS while quarter 4 contained the highest volatility REITs) by ranking REITs on their trailing standard deviation of monthly returns. The lowest volatility quartile portfolio shows a higher Sharpe ratio for all quartiles that the authors focused on and the alphas from all the three-factor models are significantly positive for the low volatility quartile. The results show that for the 20-year period (December 1993-December 2013).

The authors made use of the market cap portfolio as a benchmark, seeing as investors can easily implement this strategy passively and at a low cost, the results reveal no compelling reason to depart from the strategy favouring risk-based investing within the U.S. equity REIT entities. In considering the results made by the researchers, it was made evident that low volatility investing is less attractive for REIT portfolios than it is for broader equity portfolios. Mackinnon and Spinney (2017) do not provide a definitive answer to the above, however they provide the following potential reasons, (i) that volatility effects based at least on macro effects (weighted to low volatility industries rather than specific equities) and (ii) invest clientele, thus indicating a behavioral contribution to the results. This study will explore potential reasons for this anomaly.

The beta anomaly has become an area of great debate in the space of academia and industry (Kim et al, 2019 and Ang et al, 2009). Adding to the debate are, Frazzini and Pedersen (2014), who concur with the beta anomaly theory in the U.S. public capital market. Shen et al. (2020), build further onto the findings by Frazzini and Pedersen (2014), seeing as this study excluded the REIT market, Shen et al. (2020) hone into the U.S. equity REIT market. While, Frazzini and Pederson (2014) pioneered their study by paying considerable attention to the low beta strategy, which has received attention because it challenged the classic CAPM. The CAPM model was prevalent in the U.S. equity market (Friend and Blume, 1970), bond markets and future market (Frazzini and Pedersen, 2014) and the international equity market (Walkshäusl, 2014). Following on Frazzini and Pedersen (2014); Shen et al. (2020) document if there exists a beta anomaly with, using a longer time horizon (1982-2017). Shen et al. (2020) intended to present a case where they exposed a beta anomaly in the case of long-short beta strategy with long low-beta and short high-beta REITs and a BAB strategy presented by Frazzini and Pedersen (2014).

Consistent with Frazzini and Pedersen (2014), Shen et al (2020) paid attention to REITs due to their bond and equities like characteristics, highlighting that post-1990 REITs were considered to be like bonds, because of their predictable and stable income (Karolyi and Sanders, 1998), and as such no effect of beta anomaly. However post 1990, REITs turned into more stock-like assets (Glascock et al, 2000), due to the structural changes to REITs. Subsequently REIT returns became positively-correlated with small-cap returns, after which the beta anomaly became detectable. Interestingly, due to the time horizon focus of this paper, the implication of this study indicates that there exists a beta anomaly in the laboratory of this study.

Equities research has attempted to unveil the reason behind a beta anomaly, attributing it to many factors. Novel study performed by Black (1972) argues that investors with leverage constrained, would overweight high-beta assets to achieve a high-return, which pushes up the price of high-beta assets and results in a lower risk-adjusted return in the assets. To build on this presence of the beta anomaly in equities. Novy-Marx (2016) argues that the beta anomaly is caused by the underperformance of the stocks, whilst Brown et al. (2017) assert that the beta anomaly can be explained by “lottery-demand” of some investors. Lottery-demand investors generate demand for stocks with high probabilities of large short-term up moves in the stock market.

Shen et al. (2020) unveiled a negative relationship between REIT returns and betas after accounting for firm characteristics. Contrary to the findings of Novy-Marx (2016) and Brown et al. (2017), Shen et al. (2020) substantiate that the REIT market is not driven by asset growth,

lottery-like returns, beta correlations, or stock returns' skewness. Thus, Shen et al. (2020) analysed a low-minus high beta strategy and a betting-against beta strategy in the REIT market to prove the above. The authors showed how the beta anomaly could exist in the REIT market based on unique features of the REIT market, because the beta anomaly exists in the REIT market, the beta anomaly only exists in the REIT market in the New REIT era (post 1990). This suggests that the beta anomaly will exist in the South African REIT market, for the following reasons; REITs in South Africa were enacted in 2013. Shen et al. (2020) further stated that there exists a negative correlation associated between beta and REIT stock return disappear after firm characteristics (lottery-like returns, profitability and co-skewness risk of stock return) are taken into account, and that leveraged constrained investors are more likely to invest in high-beta REITs if other characteristics are constant.

Studies highlight that the beta anomalies in the stock market, in general, are driven by the beta correlation along with some firm characteristics, including investment and profitability, lottery-like returns (Bali et al., 2017) and the skewness of stock returns (Schneider et al., 2020). With the above, Shen et al. (2020) stress that the beta anomaly would disappear after controlling the abovementioned factors. Shen et al. (2020) estimated the beta anomaly by using the risk-adjusted returns on a long-short portfolio. In the long portfolio were the REITs with 20% betas, and the short was the REITs with the highest 20% beta. The researchers made use of the CAPM model, Fama-French three-factor model, and the Van Nieuwerburgh five-factor model. Furthermore, a bet-against-beta strategy was adopted following that adopted by Frazzini and Pedersen (2014). The bet-against-beta factor, according to Shen et al. (2020), it is a zero-beta and zero-investment strategy.

The new era REITs, which in the paper is defined as REITs that existed post-1990, existed pre-1990. The results abovementioned indicate that the negative correlation between REIT stock returns and beta is not associated with a beta correlation with firm characteristics. Lottery-like stocks were negatively correlated with stock returns. These findings are consistent with the findings unveiled by Bali et al. (2011). Further stressing that lottery-like stocks probability to earn lower returns are high.

5.3 Methodology

5.3.1 Preface

In principle, this study maps return against its appropriate risk levels. Markowitz (1952) implied that one of the ways of mapping return against risk is to use betas for risk in relation to

alphas for returns, in particular, in cases where one wants to illustrate excess performance. The analysis in this study departs from the mentioned point.

5.3.2 Qualitative Betas

For qualitative beta, this study adopts the bet as illustrated in Fernández (2015);

$$\text{MASCOFLAPEC} \tag{5.1}$$

where M stands for management, A is for assets (business, industry, product, etc.), S is strategy, C is country, O is operating leverage, F is financial leverage, L liquidity of investment, A is access to sources of funds, P is partners, E is exposure to other risks (i.e. currencies) and C cash flow. Those are acronyms for eq. (5.1). In terms of weight allocation to each parameter and scaling, this study follows the same procedures as in Fernández (2015). And the procedures lead to the illustration in table 5.1;

Table 5. 1: MASCOLFAPEC Matrix

weight (%)	Acronym	Risk					weighted risk
		Low	average	substantial	high	very high	
		1	2	3	4	5	
10	M						
25	A						
3	S						
15	C						
10	O						
15	F						
5	L						
5	A						
2	P						
5	E						
5	C						

Note: that Table 5.1: MASCOLFAPEC Matrix is adopted from Fernández (2015). M stands for management, A is for assets (business, industry, product, etc.), S is strategy, C is country, O is operating leverage, F is financial leverage, L liquidity of investment, A is access to sources of funds, P is partners, E is exposure to other risks (i.e. currencies) and C cash flow.

There are other complementary methods such as (i) CAMEL (C is for capital, referring to leverage, A is for asset quality (referring to business risk; M for management, referring to the confidence in the management; E is for earnings, referring to the volatility of earnings and L is for liquidity, referring to the liquidity of the shares), (ii) MARTILLO (M management, A asset quality, R risk exposure, T trade analysis: product/market, I IRR of new investments, L leverage, L liquidity and O other revelations) and (iii) BAMIFLEX (B business: product/demand/market, A access to credit: capacity to obtain finance, M management: managers/shareholders, I indebtedness: solvency and long-term survival, F flows: resource

generation (capacity to pay debt) and return, L liquidity of shares and EX exposure to other risk: foreign exchange, country, interest rate, raw materials, etc.)-Fernández (2015). This study stays with the MASCOLFAPEC method because it encompasses elements covered in the other three qualitative methods. Fernández (2015) opines that Goldman Sachs uses CAMEL widely, probably because the method focuses primarily on the financial position and health of any firm. Note that the MASCOLFAPEC betas are average betas for the entire period of this study. The risk levels of the MASCOLFAPEC beta are determined in the following manner;

- Management risk

Management of a company is key to individuals with a mandate to ensure the success of a business as they are parties responsible for executing strategic plans and aligning the interests of shareholders, partners and financiers. As such, management needs to be well experienced in the property sector, understand the behaviour of the property market and have more than 15 years of experience in the property sector to help reduce management risk. Furthermore, looking at accounting for a diverse team is important as it has been proven that a diverse team improves a project or a company's performance and outcomes (Gomez and Bernet, 2019). This diversification includes age; to ensure succession and race; for different views and opinions, which should eliminate bias and, in the case of South Africa, previously disadvantaged persons.

- Assets risk

Asset risk has to do with physical assets. The underlying assets of REITs are mostly tangible assets-as such, REITs are highly susceptible to asset risk - this, however, is closely assessed by portfolio managers to diversify their assets to avoid any economic, social, or technological risk affecting the assets. Therefore, it is important to diversify the asset types (i.e., retail, residential, healthcare REITs, etc.). Furthermore, geographic diversification, preferably international (Lagoarde-Segot and Lucey 2008), affects the underlying assets and reduces asset risk.

- Strategic risk

The risk that failed business decisions may pose a threat to a company. In the case of a REIT, this could include the disposal of assets contributing towards the company's revenue or disposing of an asset at a low valuation. Therefore, it is imperative that companies put measures in place to avoid any of the 5 potential strategic risks outlined by de Araújo Lima

et al. (2020) are (i) reputational, (ii) financial, (iii) governance, (iv) operational and (v) competitive. While this risk parameter is not the easiest to measure, it is important as it borrows from other risk measures and is the average of all the other risk measures - given the limited information that the companies provide. However, if done internally, more data is available to determine the strategic risk.

- Country risk

Country risk as guided by John (1979), it is a weighted average of an index of a country's (1) economic stability and (2) as an index of its external debt servicing capacity. Generally speaking, emerging markets are risky to invest in due to their political instability, employment rate and other socio-economic factors. Therefore, the country risk was higher if a company only operated in an emerging market. According to the National Treasury (2013), Standard and Poor's ("S&P") decision to affirm South Africa's long-term foreign currency credit rating at "BBB" and the local currency credit rating at "A-2". S&P maintained a negative credit outlook on the rating. It is important to note that in the case of geographic diversification (i.e. developed countries and emerging markets), the country risk was less-guided by credit rating agency S&P.

- Operating leverage risk

Operating leverage, according to Lev (1974), is defined as a ratio of the fixed to variable operating costs; the higher the operating leverage (the lower the unit variable costs), the larger the overall systematic risk of the stocks is given by the following equation; $operating\ leverage = \frac{\% \Delta\ in\ Operating\ Income}{\% \Delta\ in\ Revenue}$. The higher the operating leverage, the greater the risk.

- Financial leverage risk

Financial leverage risk is defined as debt to capital or total assets; essentially, this is the company's capital structure (debt versus equity). In addition to assessing this, the allocation of risk was also decided with the guidance of the South African REIT regulatory obligations, stating that South African listed REITs should keep their debt below 60% of their gross asset value. It is, therefore, essential to note that the use of leverage causes the REIT to incur additional expenses and increases the fund's losses in case of underperformance of underlying investments.

- Liquidity risk

Liquidity is defined as the ability to settle obligations with immediacy. Liquidity risk can take indefinitely many values depending on the underlying funding positions of a company. As with any other risk, it is forward-looking and measured over a specific horizon. This study looks at a 1-year horizon, focusing partially on three ratios (i) debt-to-equity, (ii) current ratio and (iii) the quick ratio. Essentially, the higher the debt-to-equity (>60%) risk, the higher the liquidity risk. A higher current ratio would result in a lower risk, as this shows that the company is able to finance its current liabilities. This logic is consistent for quick ratio- where a higher quick ratio is more desirable as it comes with less risk.

- Access to the source of funding

In this parameter, this study looks the current assets and the ability of the company to repay the debt. Its geographic domicile and the advancement of its financial institutions. Furthermore, accessing funding in the public capital market is not as difficult, contrary to the private capital market. According to Brav (2009), private companies have a high dependence on debt financing, have a higher leverage ratio, and tend to avoid external capital markets. Moreover, Brav (2009) opine that for capital intensive firms, their main funding mode is debt, which is largely privately facilitated in most parts of the world. And given that REITs are mostly listed on stock markets, that, does not necessarily help in making it easy for REITs to access funding in capital markets.

- Partners

Partners in business are either operational or not operational. However, one thing all these individuals have in common is their financial interest in the business; as such, these individuals are usually board members, whether executive or non-executive. These key individuals have voting power and control over the company. Due to REIT's public state on the stock exchange, REITs have several shareholders - however, some shareholders own significant units in the company. This section analyses the risk that these individuals bring. The study looks at the shareholders involved in the company, their understanding of the market and the property market behaviour, and their voting power (as a result of their shareholding). It is crucial to ensure that one individual does not own more than 51% in a REIT to reduce partner risk and that the individual's decision-making ability is that of an individual who demonstrated an understanding of property investment and management.

- Exposure to other risks (i.e. currencies)

In the case of this parameter, the study accessed currency risk. Exposure to currency risk plays a significant immediate role in the return on investment, and as such, REITs hedge against this risk; by diversifying their currency exposure as there exists a positive relationship between this parameter and country risk as currency risk must be a function of currency risk (Colacito et al. 2018). Therefore, it is consistent with Feng et al. (2021), a more geographically diverse portfolio with exposure to currencies that are not correlated has a low risk and the opposite where a company is only exposed to one currency.

- Cash flow risk

According to Harris and Roark (2019), firms with higher cash flow volatility have a higher debt level. This positive like is only for firms with the weakest financial performance measured by operating cash flow. Given the highly levered nature of REITs, it is safe to say that REITs have a high cash flow volatility - according to Bates et al. (2009), this may lead to cash shortfall for firms.

5.3.3 Quantitative Betas

For the quantitative beats, first, this study uses the historical beta; thereafter, the Monte Carlo simulation beta. The formula for historical beta is;

$$\beta_H = \frac{\sigma_A}{\sigma_M} \quad (5.2)$$

Where β_H stands for historical beta, σ_A is the volatility of an asset or firm and σ_M is the volatility of the market. The Monte Carlo simulation beta builds on, from the Brownian motion, where the stock prices evolve as $dS = \mu S dt + \sigma S dW_t$, where dS is the evolving stock price, μ is the mean (return), S is the initial price, σ is volatility, dt is the deterministic interval parameter and dW_t is the White noise (also known as Weiner process). When the price follows a path from time 0 to T , the price is represented as;

$$s(k\delta t) = S(0) \exp \left(\sum_{i=1}^k \left[\left(\mu - \frac{\sigma^2}{2} \right) \delta t + \sigma \varepsilon_t \sqrt{\delta t} \right] \right) \quad (5.3a)$$

Where the price has the mean 0 and variance of δt . The error term is ε_t and the rest of parameters remain the same as before. Recall, in this study, the focus is on betas; therefore, eq. (5.3a) can be re-written such that the Monte Carlo beta (β_{MC}) is the revolving parameter and that leads to;

$$\beta_{MC:T}(k\delta t) = \beta_{MC:0} \exp\left(\sum_{i=1}^k \left[\left(\mu - \frac{\sigma^2}{2}\right) \delta t + \sigma \varepsilon_t \sqrt{\delta t}\right]\right) \quad (5.3b)$$

Where $\beta_{MC:T}$ and $\beta_{MC:0}$ are evolving and initial Monte Carlo betas, respectively. The rest of the variables remain the same as before. Intuitively, the randomness in $\beta_{MC:T}$ is inherent and/or underpinned by $\beta_{MC:0}$. Note that the $\beta_{MC:0}$ is simply the historical beta. In order to randomise $\beta_{MC:0}$, this study assumes that beta moves as per random “number”. Therefore, at any point in time, *historical* $\beta_{MC:0} = \beta_{MC:0} \times N_{JR}$, where N_{JR} is *rand()* in an excel cell and is the randomise initial number. Second, why this study follows the mentioned pattern of initialised random betas is because beta risk is non-linear (See; Chart et al. 2014, Hollstein et al. 2020a; 2020b). Thus, for calculating quantitative betas, this study uses equations (5.1) and (5.3b), respectively. Given that both β_H and β_{MC} are based on daily data, by extension, it implies that the effects of high frequency in betas are accounted for. One of the main advantages of modelling betas the way it is stated in this report is that the Monte Carlo simulation, in principle, is deterministic (i.e. discrete) and by incorporating the stochastic nature of the Weiner process, then the resulting betas are continuous. Prior studies such as Sebehela (2021) opined that risk modelling is better in a deterministic setting, but this study takes a different setting (i.e. continuous) in presenting beta risk.

For the Monte Carlo simulations, this study used 10,000 as that number is an acceptable number of simulations, which makes the simulated numbers to be normally distributed, by extension, and the simulated values conform to normality (See; Durham and Gallant 2002). For the actual simulations, they are done under three ways-(i) vanilla simulation, (ii) Antithetic variables and (iii) Quasi-Random sampling. The vanilla simulations are characterised by randomness, which continuously changes as one randomises the random values more. Antithetic variables use a pair of negatively correlated random numbers as a way of minimising “unwarranted” randomness. Finally, the quasi-random sampling uses $\frac{1}{n}$ as a proportion measure instead of $\frac{1}{\sqrt{n}}$, where n is the sample size. The reason why this study uses different Monte Carlo types, is to illustrate robust Monet Carlo betas.

5.3.4 Robustness Test

In carrying out the robustness tests, this study takes the same route as Hollstein et al. (2020a; 2020b), where they confirmed where the beta uncertainties are due to risk or mispricing. And in order to do that, they first calculated alphas from the same time series; thereafter, any

other appropriate robustness test. The commonly used alphas are (i) Sharpe ratio, (ii) Treynor Ratio and Jensen ratio;

$$\left\{ \begin{array}{l} r_S = \frac{R_p - R_f}{\sigma_p} \quad (a) \\ r_T = \frac{R_p - R_f}{\beta_p} \quad (b) \\ r_J = R_p - \left[\underbrace{R_f + \beta_p(R_M - R_f)}_{R_e, \text{ which is CAPM}} \right] \quad (c) \end{array} \right\} \quad (5.4)$$

Where r_S Sharpe ratio, r_T is Treynor ratio and r_J is Jensen ratio. The parameters for the alphas are return of the market shown by R_p , R_f is the risk-free interest rate, σ_p is the standard deviation, β_p is the beta of the portfolio, R_M is the return on the market and $R_f + \beta_p(R_M - R_f)$ is the return on equity, which is calculated based on the CAPM.

5.4 Data

The daily share prices data is from January the 4th, 2014 to October the 26th, 2022. Hollestein et al. (2020a; 2020b) illustrated that risk dynamism as shown by betas, is appropriately captured by daily share prices. Note that South Africa adopted the international REIT legislation as from May 2013. This study utilises only REITs that have share prices listed on the database, Thomson Reuters during the mentioned period. The market is represented by the JSE listed property index. Table 5.2 shows the returns of the selected REITs;

Table 5. 2: REIT Returns

Measure	EQU	APF	IPF	FVT	HPB	DIB	TWR	GRT	REB	HYP	OAS	DLT	RDF	VKE	SAC	EMI	RES	FFA	FFB	ATT	TEX	J253
Mean	-0.053	-0.027	0.000	-0.016	0.000	0.018	-0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.034	0.000	0.000	0.000	0.000	0.000	0.000
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Min	-1.000	-1.000	-0.171	-1.000	-0.271	-1.000	-1.000	-0.264	-0.180	-0.218	-0.146	-0.166	-0.144	-0.356	-0.195	-1.000	-0.165	0.000	0.000	0.000	0.000	0.000
Max	0.446	0.257	0.143	0.375	0.159	128.286	0.333	0.277	0.214	0.155	0.304	0.153	0.128	0.333	0.148	0.474	0.181	0.000	0.000	0.000	0.000	0.000
StdDev	0.227	0.163	0.018	0.130	0.024	2.733	0.077	0.027	0.022	0.022	0.020	0.016	0.031	0.022	0.185	0.014	0.000	0.000	0.000	0.000	0.000	0.000
Kurt	13.11	31.08	17.08	47.99	16.33	2,191.88	124.60	27.60	15.97	13.65	24.41	11.76	13.37	19.08	10.04	22.58	38.91	0.00	0.00	0.00	0.00	0.00
Skew	13.11	31.08	17.08	47.99	16.33	2,191.88	124.60	27.60	15.97	13.65	24.41	11.76	13.37	19.08	10.04	22.58	38.91	0.00	0.00	0.00	0.00	0.00
No.:	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215	2,215

Note: Mean stands for average, Min is minimum, Max is maximum, StdDev is standard deviation, Kurt is kurtosis, Skew is skewness and No.: is sample size. GRT is a ticker for GrowthPoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Reboasis Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund, EQU is Equites Property Fund and J253 is the JSE listed property index.

Table 5.2 shows that the returns of most mentioned REITs are positively skewed despite the fact that some might have incurred negative losses at some point during the life of the time series. A few REITs (i.e. Texton, Attacq, and Fortress both A and B shares) and the JSE listed property index have zero skewness. Moreover, those REITs with zero skewness, have their basic statistics as zeros. The latter reason is because their share process hovered around the same level(s) throughout time series. The latter trade pattern of hovering around the same levels is unsurprising-Ling et al. (2020) confirmed the same finding on share prices and Fisher et al. (1994) saw the same finding on real estate indices. At the heart of these movements is because real estate displays greater short-run volatility than long-run volatility (see; Ling et al. 2020 and Fisher et al. 1994). On the other hand, REITs with zero skewness are specialised within the sectors that they invest in.

5.5 Empirical Analysis

5.5.1 Betas

Table 5.3 presents calculated betas of REITs-(i) historical beats, (ii) MASCOLFAPEC betas and (iii) Monte Carlo simulated betas.

Table 5. 3: Betas

Date	EQU	APF	IPF	FVT	HPB	DIB	TWR	GRT	REB	HYP	OAS	DLT	RDF	VKE	SAC	EMI	RES	FFA	FFB	ATT	TEX
Panel A: Historical Betas																					
2013	0.000	0.009	0.369	0.081	-0.293	0.266	0.018	0.139	0.268	0.244	-0.062	0.010	0.305	0.262	0.416	0.191	0.295	0.257	0.037	0.037	0.039
2014	0.001	-0.118	0.004	0.125	-0.203	-0.123	0.033	0.074	0.110	0.009	0.065	-0.078	0.179	0.050	-0.074	0.202	-0.015	0.022	-0.131	-0.091	-0.227
2015	0.071	-0.058	0.260	0.131	-0.024	0.230	0.131	0.056	-0.219	-0.007	-0.010	-0.027	0.021	-0.151	-0.228	0.117	-0.175	0.013	0.153	0.019	0.087
2016	0.009	0.030	-0.019	-0.129	-0.114	-0.151	0.129	-0.042	0.125	-0.012	0.002	0.049	0.044	-0.002	0.021	0.061	0.030	0.022	0.042	-0.019	-0.034
2017	0.049	-0.016	-0.188	-0.173	0.173	0.133	-0.291	-0.050	-0.034	-0.080	-0.052	0.001	-0.019	0.145	0.226	0.147	0.000	0.007	-0.085	-0.102	0.033
2018	-0.034	-0.062	-0.077	-0.043	-0.003	0.023	0.086	0.080	-0.094	-0.004	0.043	-0.007	0.053	-0.019	-0.014	-0.013	0.312	0.072	0.358	-0.029	0.056
2019	0.009	-0.480	-0.119	0.254	-0.260	0.145	0.161	-0.065	0.652	-0.143	0.053	0.178	-0.024	-0.140	0.313	0.032	-0.248	-0.169	0.139	0.007	-0.230
2020	0.004	0.473	0.062	-0.022	0.040	-0.055	0.135	0.169	-0.091	0.097	-0.002	-0.080	0.220	0.245	0.145	-0.012	0.063	0.023	-0.288	0.121	-0.117
2021	0.075	0.094	-0.109	-0.104	-0.004	-0.427	0.053	0.068	-0.257	0.342	-0.001	0.216	-0.084	0.112	0.074	0.041	0.039	-0.085	0.021	-0.001	0.202
Average Beta	0.021	-0.014	0.020	0.013	-0.076	0.005	0.050	0.048	0.051	0.049	0.004	0.029	0.077	0.056	0.098	0.085	0.033	0.018	0.027	-0.006	-0.021
Panel B: MASCOLFAPEC Betas																					
2013	0.000	2.600	1.700	2.400	2.400	1.900	1.600	1.600	2.700	2.400	1.800	2.000	2.000	1.900	2.200	1.700	2.100	2.100	2.100	1.700	1.900
Panel C: Vanilla Monte Carlo Betas																					
2013	-0.008251	-0.001769	-0.219467	0.026896	-0.021121	-0.059890	-0.028659	-0.427394	-0.211957	-0.282499	-0.014686	-0.100425	-0.368695	-0.240902	-0.310509	-0.234612	-0.308512	-0.184191	0.012186	-0.000309	-0.039920
2014	-0.011073	-0.002765	-0.312814	0.008429	-0.017538	-0.000061	-0.002194	-0.589633	-0.074711	-0.413730	0.000000	-0.135790	-0.557556	-0.346038	-0.448735	-0.335848	-0.436032	-0.246961	0.019015	-0.000440	-0.000886
2015	-0.015593	-0.003734	-0.468944	0.000677	-0.007284	0.000000	-0.000018	-0.855229	-0.007287	-0.636689	0.000000	-0.135759	-0.882828	-0.522655	-0.681833	-0.505581	-0.648066	-0.347540	0.030826	-0.000661	-0.000001
2016	-0.022751	-0.004156	-0.727476	0.000013	-0.001402	0.000000	0.000000	-1.285765	-0.000178	-1.011086	0.000000	-0.094699	-1.433763	-0.816267	-1.070737	-0.787247	-0.997123	-0.506907	0.050708	-0.001026	0.000000
2017	-0.034119	-0.003698	-1.155771	0.000000	-0.000119	0.000000	0.000000	-1.985537	-0.000001	-1.637852	0.000000	-0.044411	-2.357071	-1.304128	-1.718853	-1.254628	-1.572330	-0.760160	0.083368	-0.001631	0.000000
Panel D: Antithetic Monte Carlo Betas																					
2013	-0.000026	0.000015	-0.000327	0.000016	0.000190	-0.001566	0.000011	-0.001329	-0.000260	-0.003918	-0.000075	0.001205	-0.001556	-0.000968	0.001276	0.002135	0.004113	0.000661	0.000056	0.000003	-0.000146
2014	-0.000035	0.000023	-0.000465	0.000005	0.000157	-0.000002	0.000001	-0.001833	-0.000092	-0.005738	0.000000	0.001630	-0.002353	-0.001390	0.001844	0.003056	0.005814	0.000886	0.000087	0.000004	-0.000003
2015	-0.000050	0.000031	-0.000698	0.000000	0.000065	0.000000	0.000000	-0.002659	-0.000009	-0.008830	0.000000	0.001630	-0.003725	-0.002100	0.002801	0.004600	0.008641	0.001246	0.000142	0.000005	0.000000
2016	-0.000073	0.000034	-0.001082	0.000000	0.000013	0.000000	0.000000	-0.003998	0.000000	-0.014022	0.000000	0.001137	-0.006050	-0.003279	0.004399	0.007162	0.013295	0.001818	0.000233	0.000008	0.000000
2017	-0.000109	0.000030	-0.001720	0.000000	0.000001	0.000000	0.000000	-0.006173	0.000000	-0.022714	0.000000	0.000053	-0.009946	-0.005239	0.007062	0.011415	0.020964	0.002726	0.000383	0.000013	0.000000
Panel E: Quasi-Random Monte Carlo Betas																					
2013	-0.000008	-0.000002	-0.000230	0.000024	-0.000019	-0.000056	-0.000025	-0.000359	-0.000226	-0.000271	-0.000014	-0.000097	-0.000349	-0.000259	-0.000327	-0.000229	-0.000300	-0.000170	0.000012	0.000000	-0.000036
2014	-0.000010	-0.000003	-0.000328	0.000007	-0.000016	0.000000	-0.000002	-0.000495	-0.000080	-0.000396	0.000000	-0.000132	-0.000528	-0.000372	-0.000472	-0.000328	-0.000424	-0.000228	0.000018	0.000000	-0.000001
2015	-0.000015	-0.000004	-0.000492	0.000001	-0.000007	0.000000	0.000000	-0.000718	-0.000008	-0.000610	0.000000	-0.000132	-0.000836	-0.000562	-0.000718	-0.000495	-0.000630	-0.000321	0.000030	-0.000001	0.000000
2016	-0.000021	-0.000004	-0.000763	0.000000	-0.000001	0.000000	0.000000	-0.001079	0.000000	-0.000969	0.000000	-0.000092	-0.001357	-0.000878	-0.001127	-0.000770	-0.000970	-0.000469	0.000049	-0.000001	0.000000
2017	-0.000032	-0.000004	-0.001212	0.000000	0.000000	0.000000	0.000000	-0.001666	0.000000	-0.001569	0.000000	-0.000043	-0.002231	-0.001403	-0.001809	-0.001227	-0.001529	-0.000703	0.000081	-0.000001	0.000000

Note: For Monte Carlo simulations, the number shown in the in each cell is the average eof 10,00Mean stands for average, Min is minimum, Max is maximum, StdDev is standard deviation, Kurt is kurtosis, Skew is skewness and No.: is sample size. GRT is a ticker for GrowthPoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Rebosis Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund and EQU is Equites Property Fund.

Panel A in table 5.3 illustrates that absolute historical betas range from 0 to 3, approximately. An absolute beta of 0.7 is very high and betas of analysed REITs leading up to year 2022 are high. This is in contrast with Marcato et al (2018), who found that American REITs have relatively lower absolute betas. One possible reason why South African REITs have high absolute betas might have to do with the fact that there are fewer REITs (approximately 33 as of 2022). Hence, REIT investors are fighting to have exposure to limited South African REITs. That competition, might have led to high absolute betas of REITs in terms of beta risk. In terms of having negative historical beats, this finding is consistent with Anderson et al (2015). According to Anderson et al (2015), negative betas confirm the presence of diversification benefits in REITs. Equities Property Fund and Texton Property Fund have non-negative betas in 2013 and 2014, respectively. Note that Equities was not listed in 2013, and for Texton Property Fund, it might be due to the fact that South Africa officially adopted international REIT legislation in May 2013. Regulatory changes on REITs take some time before the regulatory effects affect the performance of REITs (See; Hartzell et al. 2008). In terms of broadly negative betas, those results are unsurprising because according to Anderson et al. (2015), fundamentally, REITs are inherent of diversification benefits. Hence, why REITs have negative betas.

Panel B illustrates that qualitative betas, based on the MASCOLFAPEC principle, are high. This is consistent with the evolution of historical betas in Panel A; although, signs are different. Furthermore, one possible reason for high MASCOLFAPEC betas is that first, South African REITs are predominantly small to mid-caps stocks based on the definition of Mueller (1998). That is, the profitability of South African REITs is thin indeed. Despite, the fact that qualitative betas are informative of the quality of assets such as brands (See; Frieder and Subrahmanyam 2005), they (qualitative betas) fall short in illustrating diversification presence in REITs and/or real estate industry because they cannot be negative in principle. On the other hand, MASCOLFAPEC betas demonstrate what Fernández (2015) terms “common sense”. It is widely known that REITs embed numerous risks, partly because of their capital structure and real estate heterogeneity among other factors. Therefore, it is common sense that there should be high risk in the REIT industry.

Interestingly, analysed South African REITs had high debt levels on their balance sheets during the 2013 to 2021 financial year. Thus, probably a significant portion of their profits went to paying off debt. On average, historical betas are lower than MASCOLFAPEC betas and there are potentially two reasons for that-(i) historical betas only measure financial health and financial position of any firm, while qualitative betas measure the quality of any firm, in particular, its management, and (ii) quality of any firm is not necessarily captured by numbers. The main message on the historical versus qualitative betas is that, those two types of betas

should be calculated in conjunction with each other in order to have much more insight of beta factor analysis of any firm.

Panels C, D and E in table 5.3 illustrate Monte Carlo betas based on 10,000 simulations. Note the stated numbers are averages of 10,000 simulations. In terms of absolute Monte Carlo betas, following a descending pattern, from highest to the lowest; first, vanilla betas are the highest, then, followed by antithetic betas and finally, the quasi-random betas. The latter pattern is unsurprising, given the explanation of those different types of Monte Carlo simulations in the methodology section. Note that for the Monte Carlo simulation, this study simulated only 2013 historical betas in order to see how Monte Carlo betas evolve in relation to historical betas. In principle, the quasi-random betas would be a fair representation of betas under the Monte Carlo simulation. Irrespective of the Monte Carlo simulation type used, over time, Monte Carlo betas converge to lower absolute betas. Something which historical betas did not capture. The latter illustration is consistent with the volatility theory, which argues that over time, the volatility risk diminishes as different stakeholders have more information on any firm that they invested in (See; Kola 2021). To one's knowledge, this is the first study that illustrates that REIT Monte Carlo betas over time conform to the volatility theory. Overall, this study moves on the same path as Manda (2021; 2022) about significant risks inherent in REITs.

5.5.2 Risk or Mispricing

Table 5. 4: Alphas

Date	EQU	APF	IPF	FVT	HPB	DIB	TWR	GRT	REB	HYP	OAS	DLT	RDF	VKE	SAC	EMI	RES	FFA	FFB	ATT	TEX
Panel F: Sharpe Ratio																					
2013	0.0000	-0.3743	-0.0393	-0.0260	-0.0229	-0.0396	-0.0357	-0.0429	-0.0412	-0.0514	-0.0945	-0.0464	-0.0454	-0.0536	-0.0402	-0.0581	-0.0509	-0.0472	-0.0488	-0.1005	-0.0695
2014	-0.0525	-0.0509	-0.0560	-0.0304	-0.0214	-0.0389	-0.0477	-0.0718	-0.0473	-0.0776	-0.1146	-0.0484	-0.0702	-0.0745	-0.0680	-0.0706	-0.0708	-0.0640	-0.0347	-0.0747	-0.0531
2015	-0.0324	-0.0404	-0.0463	-0.0281	-0.0225	-0.0169	-0.0521	-0.0486	-0.0414	-0.0437	-0.2420	-0.0416	-0.0434	-0.0444	-0.0452	-0.0471	-0.0437	-0.0450	-0.0332	-0.0514	-0.0373
2016	-0.0586	-0.0302	-0.0497	-0.0377	-0.0053	-0.0228	-0.0627	-0.0598	-0.0491	-0.0470	-0.2194	-0.0460	-0.0526	-0.0547	-0.0629	-0.0490	-0.0544	-0.0622	-0.0544	-0.0610	-0.0519
2017	-0.0805	-0.0006	0.0003	0.0003	-0.0002	0.0000	-0.0004	0.0002	-0.0005	0.0000	0.0001	-0.0005	-0.0003	0.0005	-0.0006	-0.0001	0.0011	0.0004	0.0011	0.0006	-0.0004
2018	-5.1937	-0.0654	-0.0410	-0.0552	-0.0358	-0.0264	-0.0958	-0.0700	-0.0618	-0.0338	-0.0622	-0.0954	-0.0390	-0.0663	-0.0702	-0.0568	-0.0613	-0.0305	-0.0733	-0.0247	-0.0746
2019	-0.0682	-0.0163	-0.0609	-0.0303	-0.0298	-0.0354	-0.0412	-0.0783	-0.0165	-0.0497	-0.2363	-0.0173	-0.0617	-0.0749	-0.0494	-0.0683	-0.0614	-0.0796	-0.0410	-0.0582	-0.0218
2020	-0.0398	-0.0145	-0.0252	-0.0229	-0.0088	-0.0142	-0.0231	-0.0257	-0.0134	-0.0187	-0.4419	-0.0128	-0.0149	-0.0200	-0.0207	-0.0217	-0.0259	-0.0329	-0.0155	-0.0225	-0.0156
2021	-0.0610	-0.0243	-0.0375	-0.0359	-0.0149	-0.0165	-0.0422	-0.0584	-0.0143	-0.0360	-0.0552	-0.0240	-0.0332	-0.0392	-0.0468	-0.0422	-0.0565	-0.0772	-0.0331	-0.0353	-0.0181
Panel G: Treynor																					
2013	0.0000	-0.0844	-0.0020	-0.0089	0.0024	-0.0028	-0.0418	-0.0052	-0.0027	-0.0030	0.0117	-0.0745	-0.0024	-0.0028	-0.0017	-0.0038	-0.0025	-0.0028	-0.0196	-0.0198	-0.0185
2014	10.1667	-0.3112	0.0069	0.0020	-0.0035	0.0017	0.0105	-0.0279	0.0051	0.0044	0.0110	-0.0140	0.0141	0.0131	-0.0200	0.0105	0.0039	-0.0052	0.0048	0.0851	0.0084
2015	-0.1185	-0.0404	-0.0463	-0.0281	-0.0225	-0.0169	-0.0521	-0.0486	-0.0414	-0.0437	-0.2420	-0.0416	-0.0434	-0.0444	-0.0452	-0.0471	-0.0437	-0.0450	-0.0332	-0.0514	-0.0373
2016	-0.0037	0.0096	0.0141	0.0083	0.0032	0.0043	0.0095	0.0058	-0.0091	0.0057	-0.0361	0.0058	0.0177	0.0035	0.0069	0.0185	0.0054	0.0049	-0.0078	0.0070	-0.0137
2017	-0.0038	-0.0002	-0.0003	0.0000	0.0000	0.0000	0.0000	-0.0002	0.0001	0.0000	0.0002	0.0000	-0.0001	0.0000	0.0000	0.0000	-0.0001	0.0000	0.0004	0.0001	0.0000
2018	-0.1517	0.0076	0.0132	0.0092	0.0237	0.0344	0.0236	0.1097	0.0103	-0.2428	-0.2228	-0.0120	-0.9594	0.0160	0.0341	0.0133	-0.0666	0.0094	-0.0278	-0.0849	0.0070
2019	0.0086	0.0417	0.0392	-0.0024	0.0018	-0.0680	-0.0147	-0.0579	0.0263	-0.0078	0.0325	0.0042	-0.0520	-0.0332	-0.7313	0.0131	-0.0021	0.0242	-0.0022	-0.1931	-0.0070
2020	0.0710	-0.0442	0.0372	0.0317	0.0139	0.0188	0.0909	0.1037	-0.0094	0.1048	-0.0722	-0.0047	-0.0630	0.0579	0.0327	-0.3146	-0.0312	0.0199	0.0231	0.0396	-0.0116
2021	0.1073	-0.0019	-0.0058	0.0033	-0.0015	-0.0020	0.0057	0.0143	-0.0024	-0.0040	0.0525	0.0016	0.0041	0.0169	-0.0058	0.1230	-0.0112	-0.0120	-0.0026	-0.0632	-0.0105
Panel H: Jensen																					
2013	-0.0731	1.0602	0.3887	0.0106	0.0335	0.0401	-0.0081	0.0002	0.0067	0.0027	0.0038	0.0038	0.0057	0.0000	0.0076	0.0009	0.0046	0.0023	0.0167	0.0048	0.0021
2014	-0.0870	2.2035	0.0016	0.0106	0.0334	-0.0155	-0.0094	0.0004	0.0056	0.0028	0.0038	0.0037	0.0057	0.0000	0.0066	0.0002	0.0047	0.0023	0.0166	0.0043	0.0020
2015	-0.4591	3.0191	0.7354	0.0107	0.0323	-0.0155	-0.0094	-0.0002	0.0066	0.0027	0.0031	0.0037	0.0051	-0.0004	0.0063	0.0003	0.0045	0.0025	0.0167	0.0043	0.0003
2016	-0.1373	3.4780	-0.0735	0.0107	0.0291	-0.0156	-0.0096	-0.0012	0.0065	0.0028	0.0031	0.0022	0.0048	-0.0009	0.0065	-0.0005	0.0040	0.0019	0.0168	0.0063	0.0003
2017	-0.3825	2.7234	-0.5099	0.0108	0.0292	-0.0156	-0.0096	-0.0014	0.0067	0.0024	0.0031	0.0006	0.0048	-0.0005	0.0067	0.0000	0.0037	0.0019	0.0165	0.0056	0.0003
2018	0.1660	1.1196	-0.0849	0.0113	0.0313	-0.0166	-0.0112	-0.0020	0.0068	0.0025	0.0031	0.0006	0.0041	0.0001	0.0059	-0.0015	0.0029	0.0023	0.0160	0.0073	-0.0015
2019	-0.1643	-0.8692	0.0677	0.0113	0.0308	-0.0167	-0.0104	-0.0026	0.0051	0.0025	0.0019	0.0037	0.0041	-0.0025	0.0064	-0.0010	0.0032	0.0003	0.0159	0.0012	-0.0004
2020	-0.1543	-3.0449	-0.3571	0.0114	0.0302	-0.0161	-0.0097	-0.0034	0.0044	0.0000	0.0019	0.0025	0.0027	-0.0030	0.0063	-0.0007	0.0019	-0.0004	0.0174	0.0008	0.0003
2021	-0.5652	2.5128	-0.3100	0.0084	0.0304	-0.0193	-0.0097	-0.0036	0.0047	-0.0003	0.0020	0.0037	0.0020	-0.0037	0.0054	-0.0015	0.0015	-0.0007	0.0156	0.0002	0.0002

Note: GRT is a ticker for GrowthPoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Rebois Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund and EQU is Equites Property Fund.

Table 5.4 illustrates the alphas (Sharpe, Treynor and Jensen) of analysed South African REITs. For Sharpe and Treynor ratios, this study shows that those alphas are very small and mostly negative. Anderson et al. (2015) confirmed that positive alphas are rare indeed for American REITs. The same phenomenon is presenting itself for South African REITs. The Treynor ratios exemplify a similar pattern as Sharpe ratios. The latter finding on Treynor ratios is unsurprising given the fact that the numerators for both ratios (Sharpe and Treynor) are the same and only differ in denominators - Sharpe uses standard deviation while Treynor uses beta.

Panel H in table 5.4 shows that Jensen ratios are slightly positive as those ratios when compared with Sharpe and Treynor ratios. The mathematical inclination of the Jensen ratios allows the ratio to be interpreted as alpha-of-alpha. Generally, the Jensen ratios are negative, except for a few REITs (Accelerate, Fortress, Hyprop, Resilient, Attacq and Texton). The mentioned REITs are either specialised with sectors or in between sectors that they invest in. Of interest is the Accelerate Property Fund, which is mainly retail focused for upmarket residential areas in terms of its investment strategy. Accelerate is the only REIT with Jensen absolute ratio of at least one but less than four. This is partly due to solid performance of the South African retail properties. Marzuki (2018) showed that during the 1996-2016 period, South African commercial retail properties showed a strong performance, partly due to their diversified nature in terms of investment philosophy.

5.5.3 Error Pricing

For pricing error, this study follows Hollstein et al. (2020b) and uses the mean absolute error. According to Hollstein et al. (2020b), the mean absolute error is used as an alternative statistical loss of a function. This study measures the statistical loss of historical betas using a significance level of 5%. The reason why this study uses a significance level of 5% is because that significance level implies that one has a confidence level of 95% on historical betas.

Table 5. 5: Mean Absolute Errors

Year	EQU	APF	IPF	FVT	HPB	DIB	TWR	GRT	REB	HYP	OAS	DLT	RDF	VKE	SAC	EMI	RES	FFA	FFB	ATT	TEX
2013-2021	0.03	0.17	0.34	0.14	0.21	0.26	0.10	0.10	0.32	0.22	0.06	0.08	0.22	0.20	0.29	0.11	0.26	0.23	0.05	0.06	0.13

Note: GRT is a ticker for GrowthPoint Properties, VKE for Vukile Property Fund, SAC for SA Corporate Real Estate Limited, EMI for Emira Property Fund, RES for Resilient Properties Income Fund, TEX for Texton Property Fund, RDF for Redefine Properties, DIA for Dipula Properties, FFA/FFB for Fortress REIT Limited, TWR for Tower Property Fund, REB for Rebois Property Fund, ATT for Attacq, OAS for Oasis Crescent Property Fund, HYP for Hyprop Investments, DLT for Delta Property Fund, HPB for Hospitality Property Fund, FVT for Fairvest, IPF for Investec Property Fund, APF for Accelerate Property Fund and EQU is Equites Property Fund.

In Hollstein et al. (2020b), mean absolute errors are one while in this study, the mean absolute errors are significantly less than one, some mean absolute errors approach zeros. That is, the quantitative betas in this study are more accurate than ones in Hollstein et al. (2020b) as the quantitative betas of this study have less errors, as shown by the mean absolute errors. In principle, the beta findings in this study are robust indeed.

5.6 Conclusion

This study illustrates the following. First, the historical REIT betas represent a fair futuristic risk of firms. Despite the fact that Fernández (2015) questions the validity of historical betas, in the REIT industry, historical betas appropriately represent systematic risk. Second, Monte Carlo betas, in particular quasi-random, show evolution of beta risk appropriately, at least over a 5-year horizon. Third, MASCOLFAPEC betas measure the quality of management of a firm. As a rule of thumb, if the calculated MASCOLFAPEC betas are at least one, it is a cause of concern on the quality of management of a firm. Generally, betas of at least one are regarded as being risky. Finally, both betas and alphas confirm consistency with the volatility theory.

The implications of this study are as follows. First, historical betas should be used among other beta risk measures to illustrate risk as they (historical betas) appropriately depict non-diversifiable risk. Second, for quantitative betas, it is better to calculate different beta types, as when they are used jointly, they reveal more on beta risk - see the effect of historical and Monte Carlo betas. Third, an appropriate measure of any firm should disentangle both the qualitative and quantitative sides jointly. This latter point trails on the same path as Cannon and Beard (2017), who opine that a fair assessment of any business should evaluate both quantitative and qualitative characteristics of that business. Finally, risk as a concept should follow a downward trajectory as stakeholders become more aware of a firm over time.

Chapter 6 Conclusions, Recommendations and Further Work

6.1 Overall Conclusion

This study has demonstrated that there are a number of studies that explored asset pricing in REITs, mainly using the most common valuation methodologies. These methods have been used in academia for several decades and continue to inform the private sector. This thesis suggests that one needs to consider the discounted cash flow and funding type in determining a REIT firm's intrinsic value, that FFO and retained earnings/ total assets are the best financial metrics to predict bankruptcy in REITs and lastly analysis of betas, qualitatively and quantitatively, is important to stakeholders. While the geographic focus of this research was limited to South Africa, this research is appropriate for diversified REITs because South Africa has mainly diversified REITs. The enactment of REITs in South Africa occurred close to a decade ago, whilst compared to other countries, particularly developed countries, REITs have traded in the market for close to 60 years. As such, the time horizon of this study is limited to 9 years. Subsequently, the body of literature that had been produced in emerging markets is still buildings, contrary to the developed market.

This thesis only uses South African listed REITs that were listed on the Johannesburg Stock Exchange and operated in 2013 as a part of its laboratory - interestingly this was the year of IPOs for all these REITs in South Africa, thus suggesting that there was a lot of foreign direct investment and investor confidence from institutional investors and other stakeholders. Thus, it was important to access the behavior of the market considering all the macroeconomic variables, systematic and unsystematic risk considering the new regulation, being REITs. As such in accordance with Fernandez (2015), the study determined the intrinsic values of the firms based on the funding type underpinning the firm.

The first hypothesis presents the intrinsic values of REIT firms in South Africa based on their cash flow and funding type, as the thesis confirmed that the values of REIT firms are sensitive to the type of cash flows underpinning the valuation. Secondly, considering the highly-levered nature of REITs suggested potential of financial distress which ultimately leads to bankruptcy. This is not such a popular phenomenon in South Africa; however, one needs to manage their investment such that they do not fall prey to such, following Rebois Property Fund filing for business rescue in 2022; which is a prerequisite step before filing for bankruptcy - anchored on Altman (1968) premier study on corporate bankruptcy, however this thesis adds FFO and market cap within the context of REITs.

The second hypothesis confirms that deteriorating financial health and positions leads to potential bankruptcy in REIT firms. Lastly amongst commonly used risk measures, beta was used to determine the market risk of the laboratory; the results of qualitative and quantitative models suggested that REIT beta is significantly low and REITs can have negative betas. Furthermore, that there is similarity between the beta factor and volatility theory.

6.2 Applied Techniques

In the first hypothesis, the study explored valuations based on four different discounted cash flows, namely the CCF, ECF, FCF and CFd. These cash flows are particularly important as they allow one to determine the intrinsic value of an asset based on its capital structure and selected macro-economic factors. This is as a result of the unique characters of REITs (i.e. debt equity, funds from operations and management). In the valuation of a firm based on the cash flows listed above, in order to come to certain (market) value; it was important to discount the cash flows by using appropriate discount rates in determining the relationship between selected macroeconomic variables and exchange options. Thereafter, the model was rolled over by adding all the independent variables until all independent variables were in a full multilinear model. That is, for DCFs, models are used in the original standard form.

Furthermore, a step-wise regression process was followed - further identifying hedging parameters of the multilinear model. One uses basic statistics (mean, minimum, maximum, median, standard deviation, skewness and kurtosis). The basics confirmed the presence of skewness, kurtosis and uneven distribution of the present values. The main test for hypothesis one is based on a multilinear model. The results follow on the same path as exchange options in Marcato et al. (2019). Multicollinearity and/or heteroscedasticity issues were traced during the building process of the full model. The Akaike info criterion, Schwarz criterion and Hannan-Quin criterion were mostly outside normal range.

The second hypothesis uses premium bankruptcy study, Altman (1968). Altman (1968) uses the VAR model. In addition to this technique, this study uses logistic and multilinear models to detect bankruptcy in the REIT industry using macroeconomic variables first presented by Altman (1968) as part of illustrating bankruptcy. Seeing as Altman (1968) laboratory consisted of manufacturing companies; this research included funds from operations; due to its appropriateness as performance

measure of REITs. The results of the study confirm interconnectedness among the Altman (1968) variables and FFO, which was added in this research considering the importance of FFO in real estate, including their casual nature of bankruptcy. Prior to running the different models listed above, the study tests the relationship between different respective variables extracted from Altman (1968). For the main analysis, this study proposes logistic and log-linear models. As such, this thesis proposes using models that account for non-normality of distribution curves, which builds on Mensah (1984) studies where Mensah (1984) investigated jointly the stationarity and non-stationarity when there is bankruptcy. Notably, Mensah did not combine both stationarity and non-stationarity in his analysis. This thesis builds further by analysing both stationarity and non-stationarity. Therefore, based on prior studies (Mensah, 1984; Wiggins and Metrick, 2019; Fen et al, 2020) that probabilistic model is suitable for illustrating bankruptcy. To confirm bankruptcy, an additional model, which is the log-linear model, which allows each variable to take its appropriate distribution intern of (non)-linearity (Marcato et al, 2019). In addition to the variables that were used by Altman (1968), this study also added the market cap and FFO of each REIT firm.

The third hypothesis explored beta factors in the South African REITs. Using MASCOFLAPEC, historical and Monte Carlo (vanilla, antithetic and quasi-random) betas, it was confirmed that beta factor and volatility theory are juxtaposed with the same intuition explanation. Prior studies such as Sebehela (2021) opined that risk modelling is better in a deterministic setting, but this study takes a different setting (i.e. continuous) in presenting beta risk. Interesting, beta factor as shown by quantitative and qualitative betas, appropriately accounts for the financial position and financial health of REITs. The alphas (Sharpe, Treynor and Jensen) support findings on the betas. In carrying out the robustness tests, the study takes the same route as Hollstein et al (2020a; 2020b), where they confirmed their beta uncertainties are due to risk or mispricing.

6.3 Contributions of the Hypotheses

6.3.1 Findings of Hypothesis One

The essence of hypothesis one is to determine the value of REITs using the four cash flows; based on the unique capital structure of REITs. It is well known that real estate financing is predominantly financed using debt (Marcato et al, 2019), therefore it is imperative to establish the value of the firms using the funding structure. This research adopted the income approach to

determine the present value of REITs listed in South Africa in 2014. The results produced four different intrinsic values for REITs based on the cash flows being used, furthermore the market cap- interestingly the statistical description of the data revealed that FCF was skewed to the right - this implies that that firm values based on FCF yielded excess returns for JSE listed REITs in 2014. In REITs, the highest values are market cap; which is most commonly influenced by investor confidence and has potential to be invaded by noise theory, followed by CCF, ECF, CFD and finally FCF. Interestingly most transactions are valued using FCF; therefore, one needs to ensure that they use the best cash flow in determining the value of a firm to best suit their interests.

Notably, Texton Property Fund market cap and PV(CCF) were equal, while other companies (i.e. Hyprop) were fairly close. Upon through analysis of the REITs one had to understand the background of these REITs. This includes their geographic focus, sectorial focus, REIT type, executive and management compositions. These were the selected macroeconomic variables and exchange options used in a multilinear model to determine the relationship between these variables and the firm value. Based on prior studies (Marcato et al. 2019, Graham and Knight. 2000, Letdin et al. 2019 and Dempsey 2013), one can expect that the following parameters influence the PVs (CCF, ECF, CFd and FCF) in a positive manner. That the increase in one unit of selected macroeconomic variables causes an increase in the listed PVs. Therefore, the single-linear model confirms prior expectation from prior studies listed above. Moreover, in contrast to prior studies (Mans-Kemp and Vivier,2015), the presence of white male executives adds value when firms are financed by debt - therefore it is beneficial in South Africa to have a white male executive to get access to debt financing. Essentially, selected macroeconomic variables, management variables and geographical diversification affect different discount cash flows differently.

6.3.2 Findings of Hypothesis Two

Hypothesis two illustrates models to test potential bankruptcy. This study exposes that the variables illustrated by Altman (1968) and FFO are interrelated in numerous ways - during certain points, the relationship is positive and other times negative. The key findings suggest that there exists a multi-relationship that should be noted. Therefore, the study used the VAR model in a panel setting. To predict bankruptcy in the South African REITs market a multiple discriminant statistical technique was adopted using the economic ratio (Altman, 1968) including market capitalisation and

funds from operations. The ratios proposed were analysed using a multivariate analysis, namely the VAR(1;1) model; the findings from running this model demonstrated that a one-unit lag in five out of the six ratios, with the exception of EBIT_TA, had a direct impact on their own ratios - suggesting that the productivity of assets in REIT firms will not be affected by one-unit lag in the analysed economic ratios.

According to Mensah (1984), Wiggins and Metrick (2019) and Fan et al. (2020), the probabilistic model is suitable for illustrating bankruptcy, in particular model as it doesn't take into account linearity. The probabilistic results show that the main contributors to bankruptcy in the REIT industry are $\frac{\text{retained earnings}}{\text{total assets}}$ and FFOs. Third, the traditional ratios (i.e. profitability, solvency and liquidity) illustrate deterioration of financial health and financial positions of REIT firms. Finally, irrespective of the technique used to detect bankruptcy, the techniques that were used show a gloomy picture about the investment opportunities during bankruptcy periods. This study used three models to predict bankruptcy.

6.3.3 Findings of Hypothesis Three

Using beta factors in the South African REIT industry, in particular MASCOFLAPEC, historical and Monte Carlo (vanilla, arithmetic and quasi-random) betas - both qualitative and quantitative betas. Qualitative betas are insightful in illustrating financial health and financial positions of REITs, while quantitative betas appropriately measure the quality of other attributes that qualitative betas do not. The former includes the quality of the management, assets risk, operating leverage risk, country risk, strategic risk, financial leverage risk, liquidity risk, partners, cash flow risk, access to the source of funding and exposure to other risks (i.e. currencies).

Findings of this research suggests that positive REIT betas are rare indeed/those betas illustrate the strength of closed diversification - a novel finding! Historical betas, measure financial health and financial position of any firm, while qualitative betas measure the quality of any firm, in particular its management. The quality of any firm, which is not necessarily captured by numbers, is essential to the beta risk of the same firm. The results of this research further suggest that it is beneficial to calculate together (qualitative and quantitative betas) in order to have much more insight of the beta factor analysis of any firm. Historical betas represent a fair futuristic risk of a firm, despite the fact that the Fernandez (2015) study further questions the validity of historical betas, in the REIT industry.

To respond to Fernandez (2015), this thesis confirmed through the adoption of Monte Carlo betas, in particular quasi-random, the evolution of beta risk appropriately at least 5-year horizon and finally, moreover both betas and alphas confirm consistency with the volatility theory.

6.4 Future Implications

For the first hypothesis, the future implications are as such. As an investor or stakeholder, one should not only look at the market cap; as this metric does not show the performance of a REIT, particularly when a company is at IPO stage. Portfolio managers, asset managers, investors (public or private) etc., should consider using the best cash flow depending on the nature of their investments. Furthermore, it is imperative for M&A and investment practitioners to also use different cash flows in valuing REIT firms and also for negotiation. In addition to the importance of valuing a firm based on its funding-type, one should consider assessing different macroeconomic qualitative variables, this also includes geographical diversification which affects different discount cash flows. Geographic diversification has been proven to improve the value of a firm - therefore funds and investment organisations should consider geographic diversification, in addition to sectoral focus as an investment strategy.

The second hypothesis suggests that institutional investors, individual investors and wealth managers and other key stakeholders, should consider the FFO of a REIT as this measure for bankruptcy based on the log-linear model which has predictive power in terms of its ability to assess a REITs financial health. Subsequently, it is imperative that due to the highly-levered nature of REITs and the 70% regulatory debt-to-equity ratio; REIT investors and REIT firms should assess FFO and retained earnings/total assets. Furthermore, this thesis confirms that there is value to avoid and assess a distressed company with potential to go bankrupt – a traditional ratio still remains valuable in demonstrating potential bankruptcy. However, as evidence suggests the use of all measures will be beneficial to the firm in terms of assessing for bankruptcy.

Lastly, the third hypothesis which assessed the beta factor illustrated and emphasised the importance that historical betas should continue to be emphasised as they depict non-diversifiable risk - this is particularly important for policy and risk mitigation strategies. Furthermore, consistent with Cannon and Beard (2017) a fair assessment of any business should evaluate both qualitative and quantitative characteristic for that business. This research does not depart from the findings

emphasised above, but further supports the fact that the measure of any firm should disentangle both the qualitative and quantitative betas jointly.

6.5 Future Research Areas

- Evolutionary dynamic cash flows

The first hypothesis proves market values based on different DCFs at a specific point in time, this thesis provides the market values using a 5-year horizon; as in accordance to best practice; notwithstanding the abovementioned it would be interesting to observe what the market value of varying cash flows would be over a longer period of time i.e. comparing same DCFs say a period of over 5-years; particularly in real estate as real estate assets are usually held for longer periods.

- Optimal capital structure

Hypothesis one confirmed the advantages of a mixed funding method approach (i.e. the use of both equity and debt as part of a firm's capital structure). However, this thesis does not confirm the proportional maximum level of debt-vs-equity for the capital structure of a REIT firm.

- Dynamic cash flows

Hypothesis one used a laboratory of South African REITs; which are diversified. The question therefore that the thesis does not answer is whether the same analytical findings hold on American REITs, which are largely specialised.

- Predicting bankruptcy in emerging markets

Hypothesis two confirmed with the use of the following three models (i) step-wise regression, (ii) ascending absolute order of Altman (1968) variables and (iii) the ascending absolute orders step-wise regression that deteriorating financial health and positions leads to potential bankruptcy in REIT firms; therefore, the question still stands if the same would hold for other emerging market REITs with a different geopolitical and economic makeup than the one in South Africa.

- Other qualitative betas

The third hypothesis endeavoured to assess the presence of beta factors in REITs, as such the thesis made use of both qualitative and quantitative risk measures. The use of qualitative betas is not as popular as the adoption of quantitative risk methods; therefore, the study made use of a more encompassing one qualitative beta, namely MASCOFLAPEC. Thus, would the other mentioned qualitative betas in the paper lead to the same conclusive qualitative beta findings.

- Beta factor versus volatility theory

The third hypothesis confirmed the similarity that exists in the South African REIT market between the beta factor - which is market risk, thus diversifiable and volatility theory - which is firm specific risk, thus undiversifiable. Hypothesis three sought to identify beta factors in REITs. Notwithstanding, the above it is therefore encouraged to further assess the relationship between beta factors and volatility theory in the REIT market.

6.6 Recommendations

In as much as this thesis attempted to address the valuation of REITs in the South African context, which can further be applied in emerging markets; it does not come without extracting recommendations that can be applied in investment strategies, investment decision-making process, policy creation and asset allocation.

- It is insightful to note that in a unique industry such as REITs, customised discounted cash flow should be calculated so as to account for their capital structure among other factors.
- Customised discounted cash flows, which are based on funding-types are sensitive to selected macroeconomic variables which includes debt, equity and funds from operations and management (board and executive) variables.
- Portfolio managers and investment committees in emerging markets should structure their investment strategy such that it includes geographical diversification - as this adds value in the context of South African REITs.
- Institutional investors should closely assess the firms PV(CCF) as they tend to reflect the reality for the REIT industry.

- That funds from operations can be used as financial measures to be assessed by the REIT regulatory authorities in emerging markets.
- That probabilistic models can be used to measure early detection of bankruptcy in REITs in emerging markets.
- The adoption of traditional measures and probabilistic measures jointly to detect potential bankruptcy in emerging markets-considering the political and economic instabilities in these markets.
- The use of historical betas should continue to be emphasised along with other beta risk measures.
- The determination of different beta types as it was found that jointly, the use of different quantitative betas reveals more on beta risk.
- Beta effect should not be limited to the traditional quantitative methods; however, the adoption of both quantitative and qualitative factors should be determined as a fair assessment of any business.
- Institutional investors, investment practitioners and other stakeholders should ensure that before investing into a REIT firm that there is a downward trajectory in beta overtime.

6.7 Limitations of the Study

Although, this study offered contributions to the research field of valuation in emerging markets REITs, there were limitation emanating from this thesis.

- The enactment of REITs in South Africa in 2013 came on the backend of a Global Financial Crisis; this had a severe effect on the South African economy as such the laboratory of REIT firms listed on the Johannesburg Stock Exchange only 21 as such the sample size of this research was small.
- The time horizon assessed was 5 years.
- The thesis only focused on South Africa as an emerging market in Africa because other African countries REIT market is small with, South Africa leading with 21 REITs in 2013, followed by Nigeria with 4 REITs. Thus the findings of this research might not necessarily apply to developed markets.

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