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Research Report

MSc (Property Development and Management)

An Overview of the Initial Performance of South African Real Estate Investment Trusts.



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A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science (Building).

Johannesburg, 2016

Declaration

I declare that this research report is my own unaided work. It is being submitted to the Degree of Master of Science (Building) in Property Development and Management to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

…………

19th day of August, 2016

Abstract

South Africa implemented the REIT structure in 2013 with the intention of encouraging local and international investment. A year after implementation South African listed property was reported to have performed better than the UK, European, and Asian REITs. This report assesses the initial performance of South African REITs and their portfolio diversification benefits when paired with Shares, Bonds, T-Bills, and other Listed Property in a mixed-asset portfolio, over the period May 2013 to December 2015. The findings show that REITs are the second best performing asset, risk-adjusted. REITs are a return-enhancer when included in a mixed-asset portfolio, and tend to contribute at the higher end of the risk spectrum. This reports contributes to the few that exist on emerging markets, it is a study of the only major REIT market in Africa, and is significant as it discusses South African REITs from their implementation.

This work is dedicated to my sister:

Nokukhanya Nompumelelo Ntaka (1980 – 2016),

and my parents:

M.K and Nathaniel Ntuli

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1. Chapter One: Introduction

1.1 Introduction

A Real Estate Investment Trust (REIT) is a listed property investment vehicle consisting of companies that acquire their income through the management, operation, and/or ownership of property assets. They have been in existence since the 1960s. REITs, which can be a company or a trust, offer investors worthwhile tax benefits and considerable income-streams.

Table 1.1: Timeline of Introduction of REITs

1960 – 1970	1971 – 1980	1991 – 2000	2001 – 2010	2011 – 2015
Netherlands New Zealand Taiwan United States of America	Australia Puerto Rico	Belgium Brazil Canada Costa Rica Japan Singapore Turkey Greece	Bulgaria Dubai Finland France Germany Hong Kong Israel Italy Lithuania Luxembourg Malaysia Mexico Pakistan Philippines South Korea Spain Thailand United Kingdom	Bahrain Chile Hungary Ireland Kenya Saudi Arabia South Africa

(Source: EPRA, 2015, compiled by author)

Table 1.1 by EPRA (2015) is a timeline of the introduction of REITs globally.

Table 1.2: Global Comparison of REIT Markets

Country	Number of REITs	Market Capitalisation	% of Global REIT Index	Comparative Ranking
EUROPE				
Belgium	8	8 054 million Euros	0,55	12
Bulgaria	18	400 million USD	0	20
France	20	113 125 million Euros	1,85	**8**
Germany	4	3 801 million Euros	0,17	15
Greece	3	1 873 million Euros	0,03	20
Ireland	1	1 448 million Euros	0,11	19
Italy	2	5 520 million Euros	0,11	18
Netherlands	5	28 145 million Euros	3,05	**6**
Spain	10	46 336 million Euros	0,48	13
Turkey	32	6 697 million Euros	0,2	14
United Kingdom	33	201 959 million USD	6,95	**3**
AMERICAS				
Canada	Not determinate (changes in distribution requirements)	58 825 million Euro	3,14	**5**
Mexico	12	62 445 million Euros	0,75	11
USA	409	827 676 million Euros	63,9	**1**
ASIA-PACIFIC				
Australia	43	100 455 million Euro	8,28	**2**
Hong Kong	12	17 697 Million Euros	1,51	**10**
Japan	46	10 068 Billion JPY	5,93	**4**
Malaysia	16	8 640 Million USD	0,13	16
New Zealand	4	3 710 Million USD	0,11	17
Singapore	37	67 Billion SGD	1,87	**7**
South Korea	5	1 364 million USD	0	21
Taiwan	6	2 615 million USD	0	22
Thailand	50	8 079 million USD	0	23
AFRICA				
South Africa	33	51 404 million Euro	1,74	**9**

(Source: EPRA, 2015; compiled by author).

Table 1.3: Global Comparison of REIT Structures

Country	Min. Share Capital	Max. Gearing of Total Asset Value	Distribution	Distribution	Taxation	Taxation	Property Development Permitted
			Income to Shareholders	Capital Gains	Current Income	Capital Gains	
EUROPE							
Belgium	EUR 1,25 million	65% (condtions allow for 33%)	80% of net profit	No obligation to distribute if reinvested within 4 years	Rental Income exempt	Exempt	Yes, if held for min. 5 years
Bulgaria	EUR 255,646	20% for max. 1 year	90% of net income	Special Requirements	Exempt	Exempt	Yes, but limited
France	EUR 15 million	Non specific	95% of profits	60%	Exempt	Exempt	Yes, if doesn't exceed 20% of book value
Germany	EUR 15 million	66,25%	90% of net income	50% may be deferred; to be absorbed or distributed	Exempt	Exempt	Yes, if held for min. 5 years
Greece	EUR 25 million	75%	50% of annual net profits	No requirement	10% of *i* rates by ECB + 1%	Exempt	Yes, if cost does not exceed 40% of assets
Ireland	EUR 25 000	Profit Financing Ratio of 1,25: 1	85% of property income	No obligation	Exempt	Exempt unless gain is from disposal of land and non-rental assets	Yes, with tax implications
Italy	EUR 40 million (with exceptions)	Determined by company by-laws	70% of tax-exempt profit	50%	Exempt if from rental/leasing activities	Exempt, with exceptions	Yes, taxed
Spain	EUR 5 million	No restrictions	80% (and 100% from other entities)	50%	0% (19% on dividends paid to particular shareholders)	0% (19% on dividends paid to particular shareholders	Yes
Turkey	TRY 30 million	5 x shareholder equity (for short-term debt)	Determined by company by-laws	Included and considered in profit distribution	Exempt	Exempt	No
UK	GBP 50 000	Financing cost ratio: Profits to be 1,25 greater than debt.	90% (100% from other entities)	No obligation	Exempt	Exempt	Yes, with cost and holding period restrictions
AMERICAS							
Mexico	No requirement	3:1 Debt-equity (can apply to exceed)	95%	N/A	30% with allowances	Normal tax rates apply	Yes
USA	No requirement	No restrictions	90%	No obligation	Exempt	Exempt	Yes

(Continued from Table 3)

Country	Min. Share Capital	Max. Gearing of Total Asset Value	Distribution	Distribution	Taxation	Taxation	Property Development Permitted
			Income to Shareholders	Capital Gains	Current Income	Capital Gains	
ASIA-PACIFIC							
Australia	$1	Non-specific but generally accepted to be 60% of gross assets	No requirement but common practise is 100% to avoid tax penalties	Considered as per incomed	Exempt if distributed, if not, max. tax rate applies	50% exempt, 50% as per income conditions	Yes
Hong Kong	No requirement	45%	90%	As per trust by-law	Profits tax: exempt; rental income tax: 15%	N/A	No, with exceptions
Japan	JPY 100 million	No restriction; generally accepted as 55 - 60% loan to assets ratio	Above 90% (based on accounting adjustments)	As per income because CG is not identified separately	35% (conditions allow for dividends to be deducted)	As per income	No
Malaysia	RM 100 million	50%	90%	N/A	Exempt	Exempt, with exceptions	No
New Zealand	No requirement	No restriction	No requirement but varies per structure	No requirement	28% (Standard corporate tax)	Dependent on conditions	Yes
Singapore	SGD 300 million	45%	90%	No requirement	Exempt	Exempt	Yes
South Korea	KRW 7 billion/ 5 billion (dependent)	Debt: Equity Ratio 2:1	90%	Included in income	Exempt	Exempt (with conditions for 11% surtax)	Yes
Taiwan	NT$ 300 million - NT$ 2 billion (dependent)	50%	As per REIT contract	As per REIT contract	Exempt	Exempt	Yes
Thailand	Baht 500 million	35% or 60% (if assets are investment grade)	90%	90%	No tax except for 12.5% of rental income	Exempt	Yes, with restrictions
AFRICA							
South Africa	R 300 million	60%	75%	No requirement	Exempt, undistributed income tax: 28%	Generally exempt	Yes

(Source: EPRA, 2015; compiled by author).

There are a number of structural requirements that must be met before REIT status may be granted. These include limitations on gearing levels, minimum asset values, distribution requirements, and restrictions regarding sources of income for the REIT. Full details of this are provided by EPRA (2015). Table 1.2 is a global comparison of REIT structures in terms of their market capital. The top 10 REIT markets have been highlighted; South Africa has the 9th largest REIT market globally. The United States market has the highest number of recognised REITs: 409. The country with the second highest number of REITs has 359 less REITs that the USA, with 50 REITs (Thailand). South Africa has 33 REITs and trails behind Singapore, Japan and Australia in terms of the number of REITs. The REIT market with the largest market capital (in USD) is the United States of America, followed by Australia. South Africa is ranked 10th in this regard and is approximately 1/16th the size of the leading market. The largest contributor to the global REIT index is the USA, again, with a contribution of 63.9%. This is followed by Australia with a comparatively small 8.28%. South Africa, at 1.74%, is smaller than South Korea, Taiwan, and Thailand. Table 1.3 is a detailed comparison of the structural requirements per REIT market. Comparatively, Taiwan appears to have the least restrictive properties of the REIT markets. A REIT may be formed with a minimum share capital of $14, 5 million USD. Income and capital gains distribution requirements are REIT dependent and none of these income sources are taxed. Additionally, property development activities by the REIT are permitted, although with restrictions. Other countries with no/low minimum share capital requirements are Hong Kong, Australia, New Zealand, Mexico, and the USA, along with the UK, Ireland, and Bulgaria. France and Mexico have the highest income distribution requirements, that is, 95% of income is to be distributed to shareholders. Australian REITs tend to distribute 100% of income in order to avoid the tax penalties (maximum taxation applies to non-distributed income). South Africa, with a distribution requirement of 75%, is the third lowest (after Italy and Greece) of those countries whose requirement is determined by company by-laws. The majority of the markets are not required to distribute capital gains, and these gains are tax exempt, and the majority of the markets allow REITs to engage in property development activities, although with some limitations.

The introduction of REITs to South Africa has allowed for a global comparison and interaction of the South African and international property markets, and it allows for and encourages international investment through improving transparency, clarifying legislation, and allowing for comparison by having internationally recognised structure (Boshoff and Bredell, 2013; KPMG Services, 2013).

Economic Relevance and Significance of REITs in South Africa

REITs were introduced to South Africa in 2013 in order to address issues identified with the then used property investment vehicles: Property Loan Stocks and Property Unit Trusts. Although often referred to as REITs in the past, PUTs and PLS differ from REITs structurally, particularly within the areas of legal, tax, and legislation matters (Olaleye, 2011), whereby the PLS and PUT structures were mostly criticized for the double taxation that they imposed on the investor. In order to address these problems the REIT structure was introduced to South Africa in 2013 thus converting some existing PLS into Company REITS and PUTs into Trust REITs. REITs' straightforward and favourable taxation system makes it appealing to the investor and, by being similar to international structures, SA REITs present themselves more favourably to and for global investment. Additionally, this structure allows for an easier comparison of SA REIT performance with other global REITs.

According to SA REIT Association (2015) 2014 saw SA listed property outperforming all asset classes, whereby it outperformed SA Equities and SA Bonds. At a global level SA listed property performed better than UK, European, and Asian REITs in 2014. This is possibly an example of the finding of Jin, Grissom and Ziobrowski (2007) that a mixed-asset portfolio from an emerging economy tends to perform better than that of a developed one (their study used direct property, however). With SA REITs holding more than R 300 billion (in 2014) in property assets despite their youth it is evident that understanding their past performance and being able to predict future performance is paramount, and based on the differences between PUTs and PLS, and REITs, it cannot be merely assumed that they will perform the same, particularly

within the context of a mixed asset portfolio. In a South African study comparing Broad-based Black Economic Empowerment (BEE) compliant property companies, and non-compliant property companies Akinsomi, Kola, Ndlovu, and Motloung (2016) find that during 2008 and 2012 overall, BEE compliant property companies outperformed non-compliant property companies in terms of both risk-adjusted and non- risk adjusted return, and were found to have lower risk, the same applying during the Global Financial Crisis. This finding is independent of the changing number of firms that are BEE compliant and non-BEE compliant. While Akinsomi et al. (2016) do not attribute the results of the study to BEE-related factors the finding is important to REITs in the South African market as a number of the firms surveyed in the study are now legally recognised as REITs, and BEE compliance is continually being promoted within the business market. Through a survey of literature Olaleye (2011) finds that portfolio diversification benefits provided by REITs and direct property have a propensity of being greater than those of property shares.

Within a global comparison of countries it was found that on the 2015 index South Africa is ranked as the 72nd most economically free country in the index (The Heritage Foundation, 2015). The economic score for South Africa is currently lower than what it was in 2011 and 2012 but it appears to be improving- it is greater than what it was in 2013. According to The Heritage Foundation (2015) South Africa has experienced declines in investment and business freedom, thus propelling a negative investment outlook of the country, this being exacerbated by falling commodities prices. South Africa has secure property rights that are upheld by the law and avenues utilised to own property are legal and mostly non-onerous. This contributes to making the local market more favourable for property investment. Support of the favourability of the South African property market is found in a study by Akinsomi, Pahad, Nape, and Margolis (2015), who investigate the diversification practices and preferences of South African listed property companies. The study finds that South African listed property companies consider property rights and their protection to be the most important factor when selecting a market to enter (legal and title risk), and the lack of security regarding property rights is the main contributor to a reluctance to diversify geographically into the rest of the African continent (Akinsomi et al., 2015). Economic uncertainty, corruption, political factors, and a lack of resources to manage diversification are noted

as reasons South African listed property companies shy away from geographical diversification, however, of the companies that do embrace the strategy there is no preferred location. Interestingly, the majority of the companies who do not diversify have noted no plans to invest into the rest of Africa, while the companies that do diversify are more interested in investing into Africa than international markets (Akinsomi et al., 2015).

It is evident that as a well-performing asset the behaviour of South African listed property should be better understood, and the matter is not a clear-cut one based on the differences in the performance of different listed property types. With minimal research being done on REITs in the African market the aim of this research is to determine the initial performance of SA REITS and to understand the behaviour of SA REITs with other assets and within a mixed asset portfolio thus allowing their return enhancement and portfolio diversification benefits to be examined.

1.2 Background to the Problem

Investors hold property in order to create wealth and property investment is appealing owing to steady income that flows to the investor, the appreciation of the property's capital value, and its diversification potential (Lee, 2010).

The overall purpose of portfolio diversification is to increase an investor's returns (for a given amount of risk) and/or decrease their risk (for a given amount of return) by having a number of different assets within one portfolio. The extent of which risk reduction is achieved through portfolio diversification is dependent on the relationship between assets, specifically the co-integration/correlation (Levy and Sarnat, 1970). The active pairing of negatively correlated assets (or low-to-moderate levels of positive correlation) within a portfolio may result in multiplier effects on return maximisation and risk reduction. Despite the potential of benefits individual investors are found to not maximise their opportunity to diversify, although their levels of diversification improve over time. However, the extent of diversification is not deemed to be adequate merely by the number of assets held within a portfolio (Goetzmann and Kumar, 2008). The

diversification of a portfolio is determined by the nature of relationships between the various assets. Goetzmann and Kumar (2008:434) present this as 'passive diversification': holding multiple assets, and 'diversification skill': maximising performance through asset selectivity, whereby they note that the former is more prevalent than the latter for investors. It is noted that while investor diversification is improving this is not because of increased skill, ability, or understanding of the relationship between assets on the part of the investor. Rather, this is owing to changes in the (US) equity market (Goetzmann and Kumar, 2008). While it is clear that property serves to be financially beneficial to an investor literature surveyed in this research reveals that there is no clear behaviour by REITs within different markets.

REITs, listed property stocks, and direct property, despite all having property as the underlying asset, do not behave similarly. REITs display the characteristics of being both a stock and of being an immovable asset, owing to that they do not perform exactly like the stock market, nor the direct property market (Morawski, Rehkugler, and Fuss, 2008). While Hoesli and Oikarinen (2012) state that overall, the performance of REITs is not heavily influenced by major occurrences/ "shocks" within the direct property and equity markets, Lee (2010) shows that REITs are notably affected by economic and legislative structural changes.

A survey of studies containing REITs and listed property consistently show REITs performing better than listed property stocks, and REITs being less risky than listed property stocks (Newell, Pham and Ooi, 2015; Newell and Peng, 2012). While Peng and Newell (2012) and Pham (2011) find the same as the previously mentioned studies regarding risk and diversification, within their studies the REITs performed worse than listed property. However, the degree of performance and diversification of these two assets differ greatly per study. Furthermore, these studies find that REITs are positively correlated to common stocks but the extent varies between studies, for example, r = 0.84: Singapore (Newell et al., 2015); r = 0.67: Thailand (Pham, 2011); and r= 0.72: France (Newell et al., 2013). Some studies have identified a relatively low correlation between REITs and listed property, for example, r= 0.70: Singapore (Newell et al., 2015) and r=0.47: Hong Kong (Newell et al., 2010). The difference in characteristics between REITs and listed property is the reason correlations are not closer to one. The similarity/consistency of the results of the studies above suggests

that predictions on the performance of REITs and the nature of their relationship with other assets may be drawn from these studies.

Holding Period of Property

REITs are dual in nature. In the short-term they display properties similar to that of common stocks, and are influenced by the same market factors which common stocks are affected by; however, in the long-term REIT display great behavioural similarities to direct property (Morawski et al., 2008). This 'duality' presents difficulty in determining the best holding period for REITs shares for the individual investor.

In a study concerning direct property Cheng, Lin, and Liu (2010) note that it is common industry practise to determine the holding period for property arbitrarily. They note how the holding period is used heavily for asset valuation purposes but there is a lack of focus on determining which holding periods optimise asset performance, despite that the holding period indeed influences the maximisation of returns and minimisation of risk. Collett, Lizieri, and Ward (2003) echo the importance of the holding period by illustrating how determining a benchmark interest rate for an asset is dependent on the holding period, and how asset allocation for optimal portfolio performance is dependent on timing, and thus holding periods. Using a theorem they developed Cheng et al. (2010) find that the optimal holding period is affected by systematic and non-systematic factors on the asset: all else equal, a market with low liquidity and high transaction costs tends to a longer holding period, while high price volatility suggests a shorter period (Cheng et al., 2010: 15). With the application of this theorem Cheng et al. (2010) find that, dependent on the risk appetite, the optimal holding period for property ranges from 4.3 to 5.3 years, whereby a high appetite often leads to a longer holding period.

In a study of commercial real estate owned by institutional investors Collett et al. (2003) found that the average holding period for real estate in the period 1984 to 1996

was 13 years; the average holding period for small office was 10 years, and for industrial real estate 11 years. Interestingly, the research found that the average holding period consistently decreased from 1981, where it was 12 years, to 8 years in 1997. Meanwhile, Brown and Geurts (2005) found in a study about small residential building investments that the holding period is 4.5 years. The study suggests that it is the characteristics of the individual investor that influence the holding period of an asset rather than the macro-economic factors. This supports similar findings by Cheng et al. (2010).

REITs and mutual funds are similar in that REITs offer a pooled investment into property in the same way that mutual funds do to stocks and other securities. In an analysis of mutual funds over 60 years Bogle (2005) notes how in the 1950 and for some time onwards mutual fund investments were held for 16 years. However, the passage of time and the development of more fund options has seen the average holding period dramatically fall to 3 years by the year 2002 (Bogle, 2005), this change being attributed to market timing strategies used by fund managers to optimise portfolio asset allocation. This holding period increased to 4 years in 2003. Whether REITs perform like mutual funds overall is not clear in current literature. Additionally, it is evident that literature has not identified a single optimum holding period for direct and listed property. Literature has shown the period to vary within the different property types and studies such as Brown and Geurts (2005) and Cheng et al. (2010) etc. find that the optimal holding period is determined mostly by the factors and preferences of the private or institutional investor rather than macro-economic factors.

The Role of REITs to an Investor

To the average investor with limited knowledge of REITs the benefit of holding REITs in a mixed asset portfolio may be unclear. While in the short term REITs display similarity to stocks, in the long term they perform similarly to direct property, whereby negative correlation with equities may occur. In the long term, REIT returns have components of both income and capital appreciation (Hudgins, 2012). In terms of risk

REITs have the appeal of not being involved in particularly high-risk investments such as brownfield and greenfield developments, and investments into debt (this is dependent on the structural requirements of the REIT's market). REITs also have inflation hedging properties (Hudgins, 2012).

Based on studies it is determined that REITs offer both return enhancing and risk reducing effects on an investor's portfolio (Olaleye, 2011; Oyedele, McGreal, Adair, and Ogedengbe, 2013; Oyedele, 2014, Newell and Pham, 2015). The bulk of current studies regarding REITs in a mixed-asset portfolio have analysed the behaviour of REITs during the Global Financial Crisis and have concluded that post-GFC property in a mixed-asset portfolio has larger return-enhancing benefits than compared to the benefits from the reduction of risk, whereby before the GFC the return benefits and the risk reduction benefits were similar (e.g. Olaleye, 2011, Newell et al., 2015). These findings suggest that REITs have not recovered from the GFC, and now they have a greater correlation with other assets such as stocks. This implies to an investor that REITs may not be useful to mitigate portfolio losses during economic turmoil but have significant recovery ability.

1.3 Problem Statement

The previously used forms of listed property, PLS and PUTs, were replaced in May 2013 by the REIT structure, which boasts simple and favourable characteristics. This, along with the long-standing success of REITs globally, is likely to lead to this structure being preferred by the property investor. With the adoption of this new structure of listed property investors need know how South African REITs perform in the context of a mixed-asset portfolio. This provides vital information to assist the property investor with achieving the main objective of their investment which is to create wealth by maximising returns and minimizing risk through holding optimum asset combinations.

1.4 Research Question

How have SA REITs performed since inception, and how does the inclusion of South African REITs in a mixed-asset portfolio influence the risk-returns characteristics of the portfolio?

1.5 Research Objectives

The following is a list of research objectives that will be met in this research:

- To analyse the significance of the SA REIT market is relation to other markets globally, particularly emerging REIT markets.
- To analyse the initial risk-adjusted performance of South African REITs since inception and compare this performance with that of other assets.
- To investigate the risk-return characteristics of South African REITs, on their own and in the context of a mixed-asset portfolio, thus determining if these characteristics differ from those generally accepted in literature.

1.6 Contribution of Study

According to industry reports, despite being young, SA REITs have consistently outperformed more established markets (SA REIT Association, 2015) and currently have a market capitalisation of approximately R 300 billion (in 2014). Owing to the magnitude of the South African property market it is worthwhile to confirm the accuracy of published performance figures through the use of a micro-level analysis, and to expand this by viewing the risk-adjusted performance, risk, and diversification properties of South African REITs, separately and in relation to a selection of other assets. The factors of performance analysed allow for the comparison of individual REIT behaviour, thus making this report more relevant for an investor to use to model

future analysis of individual REIT behaviour. Goetzmann and Kumar (2008) find that investors tend to under-diversify although effective portfolio diversification contributes to higher investor returns. This may be attributed to a lack of understanding regarding the interrelationship between asset classes. It is evident through a review of literature that the significance of SA REITs, their initial risk-adjusted performance, interaction with other assets, and their potential portfolio diversification benefits are under-researched.

1.7 Delineation

The study focuses on JSE recognised South African REITS that are a part of the FTSE/JSE Real Estate Investment Trust (J867)[1] as of January 2016. The other assets are Shares (J203)[2], Bonds (ALBI)[3], and the 90 Day Treasury bill, and Listed Property (J253)[4] will be considered in order to highlight potential differences occurring with REITs.

1.8 Limitations

The REITs in the study have been formally recognised as REITs for the period from May 2013 to December 2015, and thus the returns will be calculated over this short period. The common holding period for property by fund managers is a minimum of 5 years (Cheng et al., 2010; Brown and Geurts, 2005; and Bogle, 2005). Therefore, within this report, analysing the performance of REITs in a mixed-asset portfolio is not optimal. Newell and Osmadi (2009) and Newell, Wu Yue, Wing and Kei (2010)

[1] The FTSE/JSE Real Estate Investment Trust index consists of companies that meet the relevant legal structure to be recognised as REITs, and it includes companies recognised as REITs in other countries along with in South Africa.
[2] The FTSE/JSE All Africa Share Index consists of 99% of full market capital equities, approximately 160 companies, which are screened for a minimum liquidity of 15%, and are subject to other screenings.
[3] The FTSE/JSE Composite All Bond Index consists of the top 20 bonds which are screened for liquidity and market capitalisation. The index does not include bonds with terms less than 1 year
[4] The FTSE/JSE Listed Property Index consists of the top 20 companies in the sectors for Real Estate Investment Services and Real Estate Investment Trust. This companies are identified using market capitalisation and are screened for liquidity at 15% minimum. Additionally, the index is free float market cap weighted.

conducted studies using a 2 year period of monthly returns that are annualised. They analysed the significance, risk-adjusted perform and portfolio diversification benefits of REITs in a mixed asset portfolio. This two year period was broken down into sub-periods in order to isolate the Global Financial Crisis (GFC) and view how REITs were affected. This review of performance during the GFC was the strength of the research. Owing to the Global Financial Crisis (GFC) a number of studies around REITs have worked with “sub-periods” in order to avoid the influence of the extreme events of the GFC to unduly influence attempts at making generalisations on REIT performance.

1.9 Assumptions

The following research assumptions applied to this study echo those of Markowitz (1952) in a paper about asset portfolios.

- Investors want to maximise expected return at a given risk level, and/or investors want to minimise risk for a given level of return
- Investors are rational (“Homo economicus”)
- Perfect market conditions exist
- Diversification is beneficial to an investor.

2. Chapter Two: Literature Review

The following literature review provides background information regarding the main topic areas of the research question. A literature framework is developed and it contains the sub-headings indicated below. The review will discuss property investment as an activity, REITs within the South African context, portfolio diversification as an investment concept, and the behaviour of REITs within a portfolio and in relation to other asset classes.

2.1 Property Investment

Property (or real estate) as a form of investment can present itself in two forms: 1. as a tangible asset- whereby the associated volatility is low, or 2. as a share of a company that holds that property. Property investment has the benefits of a steady income flowing to the investor, the capital appreciation of the underlying asset, and its diversification potential (Lee, 2010). The trade of property in its physical form can be onerous owing to that it is time-consuming, it requires specialised management and professional legal input (i. e. conveyancer), and, in the case of purchase, it requires large output of equity. Additionally, the legal processes concerning title deeds can be extensive. For these reasons and more investment in property through stocks has become more favourable; it is liquid, easy to value by the market as opposed to a valuation of a physical asset, and offers tax benefits (Morawski et al., 2008). Stemming from the United States of America the most popular indirect property investment vehicle is Real Estate Investment Trusts.

2.2 REITs in South Africa

Before the implementation of REITs in 2013, in South Africa indirect property was traded through the use of Property Loan Stocks (PLS) and Property Unit Trusts (PUTs): investment vehicles for immovable property (Boshoff and Bredell, 2013). The

structure of PUTs and PLS is not internationally recognised and thus does not encourage foreign investment, this being worsen by that these two entities are subject to different rules and legislation despite both trading in property shares, and the unclear tax matters regarding PLS (KPMG Services, 2013).

The aim of introducing the REIT structure to the country is to address these issues and more, an example of this being that the REIT structure simplifies matters by taxing the incomes once (Boshoff and Bredell, 2013). The REIT structure, published by the National Treasury, came into operation on 01 May 2013, and PUTs and PLS could convert to REIT form thus becoming a 'Trust REIT' and a 'Company REIT', respectively. The introduction of REITs to the country now allows the South African property market to compete on a global scale, and it allows for and encourages international investment (Boshoff and Bredell, 2013; KPMG Services, 2013).

Table 2.1 is a comparison of the listed property structures REIT, PUT, and PLS. The debt which the listed property entity may carry is noted in the table. PUTs are restricted to having debt of less than 30 % of the gross asset value of the entity. PLS offers the most flexibility based on the extent of debt being determined by the company's articles. REITs are required to pay a minimum of 75% the entity's taxable earnings to the investor. This allows the entity to then deduct this payment as an expense. The earnings are taxed only once, that is, when they are in the hands of the investor, and are taxed at the rate applicable to that investor. A PUT is not required to pay tax on its earnings if these are distributed to the investor, and a PLS get tax relief on profits paid to the investor, in the hands of which the profits are then taxed. The management of the listed property entities differ; internal management refers to the entity being run directly by its own employees, while external management occurs when the entity has to engage the services of an asset management company. Company REIT can be managed either internally or externally, and a Trust REIT is managed externally. A PLS is required to pay tax on Capital Gains, while a PUT is not required to pay tax if the profits are distributed to the investors. A REIT does not pay Capital Gains Tax.

As evident in Table 2.1 REITs are more favourable to the individual investor in terms of the flexibility of REIT operations, higher access to leveraging which may increase investment risk but is likely to also increase returns (Morawski et al., 2008), high pay-out of REIT earnings, and being exempt from paying Capital Gains Tax.

Table 2.1 Comparison of Investment Structures

	REIT	**PUT**	**PLS**
Debt	Debt < 60% of Gross Asset Value	Debt < 30% of Gross Asset Value	Extent of debt is limited to company's articles
Income/Tax	Pay out minimum 75% of taxable earnings to the investor.	No tax paid on income that flows to investor	Interest paid to debenture holders is tax deductible
Management	Dependent on REIT type	Managed externally	Externally or Internally managed
Other Investments	Can invest in other listed companies within the course of business	Cannot invest in other listed companies	Can invest in other listed companies
Capital Gains Tax	No CGT	No CGT if profits distributed to the investors	Pay CGT

Source: Compiled by Author, Source Boshoff and Bredell, (2013) and EPRA, (2015).

Table 2.2 displays the top 10 REITs (2016) in the South African market. It is interesting to note that all of the REITs listed in the top 10 invest in the retail sector, and the commercial sector follows closely behind.

Table 2.2: Top 10 South African REITs by Market Capitalisation

1 USD= R15.22 (22 March 2016)

Name	Market Cap (ZAR)	Market Cap (USD)	Sector	Properties
Growthpoint Properties Ltd	R 69 131 934 732	$ 4 542 177 052	Retail, Commercial, Industrial	525
Redefine Properties	R 55 199 742 550	$ 3 626 789 918	Retail, Commercial, Industrial	333
Resilient REIT Ltd	R 51 206 162 067	$ 3 364 399 610	Retail	16
Hyprop Investments Ltd	R 29 416 693 449	$ 1 932 765 667	Retail, Commercial	16
Fortress Income Fund Ltd (B)[5]	R 36 594 244 234	$ 2 404 352 446	Retail	101
Fortress Income Fund Ltd. (A)	R 16 240 673 233	$ 1 067 061 316	Industrial, Retail, Commercial, Residential	
SA Corporate Real Estate Fund	R 10 750 326 558	$ 706 328 946	Industrial, Retail, Commercial, Residential	166
Vukile Property Fund	R 10 745 208 553	$ 705 992 678	Retail	74
Investec Property Fund	R 9 385 527 298	$ 684 575 295	Retail, Commercial, Industrial	69
Emira Property	R 7 616 854 093	$ 555 569 226	Industrial, Retail, Commercial	146
Arrowhead Properties	R 6 914 197 046	$ 504 317 800	Commercial, Industrial, Retail, Residential	185

Source: Compiled by Author using INetBFA Company Reports, 2016.

[5] Fortress Income Fund is a REIT trading on the JSE and is structured to offer units based on the risk appetite of investors: A and B linked units. These units trade independently on the stock market.

2.3 Portfolio Diversification

According to Seiler, Webb and Myer (1999: 163) “[D]diversification is defined in a mean-variance context as the complete removal of unsystematic risk in an effort to minimise the fluctuations of a portfolio\s return in excess of what the market will reward”. The main purpose of portfolio diversification is to increase an investor’s returns (for a given amount of risk) and/or decrease their risk (for a given amount of return) by having a number of different assets within one portfolio, whereby these assets do not perform similarly during the same market trends. The extent of which risk reduction is achieved through portfolio diversification is dependent on the relationship between assets, specifically the correlation (Levy and Sarnat, 1970) whereby high, positive correlation suggests poor reduction of risk. Goetzmann and Kumar (2008) specifically state that analysing the number of assets within a portfolio is not enough to determine the extent of diversification as this does not speak of the diversification’s nature, that is, the relationship between the combinations of assets. Goetzmann and Kumar (2008), in a study of individual investors and their portfolio diversification tendencies and skills, view diversification as a two part system that combines the risk of holding multiple assets, and that of holding non-correlated assets. Within their study it is found that high transaction costs and limited portfolio size are not necessarily the causes for under-diversification on the part of an individual investor, although it is noted that an investor can under-diversify owing to holding superior information regarding the market and future asset movements. Hoesli and Oikarinen (2012) find that in the long-run REITs display risk and diversification characteristics that are more similar to that of the direct property market than the stock market, so much so that the authors suggest that an investor needs not be overly concerned about poorly performing REITs during financial crises because REITs have tenacity and a high ability to recover in terms of performance.

2.3.1 Determinants of Portfolio Performance

The behaviour of REITs in a mixed-asset portfolio (in terms of returns and risk) is influenced by the combination of assets and the asset allocation in the portfolio, that is, the choice of which asset types to hold in a portfolio, and what percentage of the portfolio should be held by which asset. The following sub-section will briefly discuss the determinants of portfolio performance, and how diversification is measured.

A study by Brinson, Hood and Beebower (1986) identified four key areas/decisions that determine portfolio performance. Those are 1) deciding which asset classes to include in the portfolio, 2) deciding on the weighting of each asset in the portfolio, 3) determining how to combine the assets, this being based on achievable yields through using market timing ability to avoid negative short-term fluctuations, and 4) the selection of specific investments within an assets class in order to achieve the highest returns relative to that asset class. Of these four key areas the selection of asset classes and their weighting are determined to be of particular importance, these being identified as ‘investment policy’ (Brinson et al., 1986: 137).

2.3.2 REITs and Diversification

Webb, Curcio and Rubens (1988) stated that in the absence of perfect correlation between various assets within a portfolio, diversification will reduce the risk associated with that portfolio, and the degree of risk reduction is dependent of the relationship between the assets, that is, the correlation. By using the Fama beta (found in the Fama-French Three Factor Model) an investor can calculate the return that justifies not diversifying a portfolio. This would be achieved by deriving systematic risk that would lead to portfolio risk equalling market risk (Rudd, 2015).

While Goetzmann and Kumar (2008) state that the number of assets in a portfolio does not necessarily mean that there is diversification, the findings of a study by Kuhle (1987) suggested that an increasing number of total assets within a portfolio decreases the risk associated with the portfolio. However, Kuhle further explains that this is more effective within a portfolio holding a majority of common stocks than a majority of REITs. In the event where assets within a domestic portfolio are showing worrisome degrees of positive correlation and thus limiting the risk reducing characteristics of that portfolio, international diversification may be a solution. Levy and Sarnat (1970) explained that diversification may be achieved through international diversification by combining assets from countries whose economies are not highly correlated.

2.4 The Role of REITs in a Mixed-Asset Portfolio

Multiple studies of REITs over various periods of time have allowed for literature to generalise the expected performance of REITs in a mixed asset portfolio. Within the context of this report 'performance' refers to risk-adjusted performance of the asset class. Risk-adjusted performance is the term given for relative performance for assets when adjusted to the same volatility of the overall market.

2.4.1 Measuring Risk

Risk can be measured using historical data, or measured using forecasts: "ex post" and "ex ante risk" (Rudd 2015). Risk can be measured by variance or standard deviation, whereby the greater the amount of uncertainty regarding a return's movement, the greater the risk. The Sharpe ratio is often used in order to predict past performance and provide a comparison of return and risk. However, it is noted that the ratio is often used incorrectly to refer to risk-adjusted returns whereas it serves only to provide the measure of volatility of adjusted returns (a higher Sharpe ratio is desired) (Rudd, 2015). Rudd (2015) notes that covariance and the Sharp ratio are two tools that are influenced by sample size and the time period of analysis. While the Sharpe

ratio is the most popularly measure used, the measure called M^2 is particularly suitable. It is the average portfolio return plus the Sharpe ratio, multiplied by the difference between the portfolio's standard deviation and the benchmark's (Rudd, 2015). However, within this research the Sharpe ratio will be used in order to allow for comparisons with other studies that have used this ratio.

2.4.2 REITs and the Portfolio

As previously discussed, REITs display the characteristics of being a stock and of being an immovable physical asset. This "duality" is the cause of REITs not performing exactly the same as the stock market, or the same as the direct property market. Morawski et al. (2008) discuss this "duality" of property. These authors point out that the results of an empirical analysis on the "duality" of property are also dependent on research procedure factors, that is, the length of the period of study, or the methodology utilised, a longer period of study was thus suggested. Overall, Morawski et al. (2008) found through literature that early studies of the nature of REITs tended to show that REIT returns and the stock market have behavioural similarities. Hoesli and Oikarinen (2012) echo this finding that in the long run property displays behavioural characteristics that a more similar to that of the underlying asset, than of a stock market, (the opposite is true in the short run), where REITs and direct property show a stronger relation than REITs and the stock market. The study further finds that the performance of REITs is not heavily influenced by major occurrences within the direct property and equity markets.

Within the South African context the risk-return behaviour of South African PUTs and PLS as individual assets are similar when the asset is a part of a mixed-asset portfolio (Mc Donald, 2013). This similarity is contributed to that both assets are related to the underlying direct property; Mc Donald (2013) finds empirical evidence that direct property and listed property have return behaviours that perform with a positive relationship, although the same does not apply for risk. The risk of mixed-asset portfolios consisting of shares, bonds, and PUTs and PLS is lower than that of single

asset type portfolios. A study on listed property in South Africa before the adoption of the REIT structure found a suggested relationship of co-integration between listed property (PUTs and PLS) and shares, thus, within a context of a mixed asset portfolio, greater diversification was identified when listed property replaced shares (Olaleye, 2011). Interestingly, PUTs and PLS are found to have positive correlations with shares and bonds during economic recession (Mc Donald, 2013). This is consistent with findings South African Listed Property lost some of its risk reduction benefits in a mixed-asset portfolio after the Global Financial Crisis, although the asset continued to perform well in terms of returns (Olaleye, 2011). Mc Donald (2013) thus suggests that, in this context, good diversification of the mixed-asset portfolio is not necessarily achieved only in the event of negative correlations (or low positive correlations) between the individual assets.

Studies have shown the behavioural similarity of REITs and stocks and/or REITs and the underlying property to vary. A study based on the Nigerian capital market by Olaleye and Ekemode (2014) finds that listed property and non-property equity are highly integrated, that is, listed property performs more similarly to stocks than to the underlying real estate asset. This means that there will minimal diversification benefits derived from combining listed property and non-property equity in a portfolio. In contrast, Lee (2010) finds that by virtue of being based on the property market the performance and behaviour of REITs is highly influenced by the property cycle, particularly the structural changes that occur within it. This is identified as important as structural changes may result in REITs being more comparable to small-cap stocks than to the underlying asset (Glascock, Lu and So, 2000). Glascock et al. (2000), found that this small-cap behaviour of REITs is prevalent after 1992, similar to Lee's finding (2010), where this behaviour may be caused by that REITs legislation required REITs to distribute a larger portion of their income to the investor.

Lee (2010) finds that the behaviour/effect of REITs in a mixed asset portfolio is significantly influenced by structural changes that occur within the relevant property market. A structural change may be caused by extreme market behaviour (i.e. a recession/boom) or a change in legislation, for example. Lee (2010) identifies a major

structural change in 1999/2000 which is a major pivot point for REIT behavioural trends. The study by Lee (2010), which compares the risk and returns of REITs and seven other assets, has found the following for each sub-period demarcated by a structural change (findings by Glascock, Lu and So (2000) have been included in this summary):

- *Before 1993*: REITs performed at an average level, return-wise REITs were outperformed by 3 other asset types, and had the fifth highest risk, REITs performed similarly to the underlying property asset. Before 1991 REITs are completely unrelated to stocks.
- ***PIVOTAL POINT 1993***: Introduction of Revenue Reconciliation Act of 1993
- *1994 – 1999*: Returns increased, risk decreased. During this time period REITs start to behave similarly to stocks.
- **PIVOTAL POINT 2000**: Introduction of the REIT Modernisation Act of 1999
- *2001 – 2009*: REITs returns increased further and so did risk.

Table 2.3 is a breakdown of each sub-period's structural change, the effect on REIT behaviour, and the cause of the particular behaviour.

Table 2.3: Structural Changes and their Effects (adapted from Lee, 2010).

Period	**Structural Change**	**Cause**	**Effect on REIT Behaviour within a Mixed Asset Portfolio**
Up until 1976	'Oil price recession'	Leveraging hurt REITs owing to interest rate risk (the rates rose), and development exposure was high	REITs had a negative diversification and return relationship with other assets, which were

		owing to focus on construction/physical development activity. REITs were financially strained.	performing better than REITs
Early 1980s	Property Cycle Upturn (boom)	Pent-up demand resulting from the "Oil Price" property downturn and the use of long-term debt, along with changing REIT activities in order to avoid short term debt.	Asset values increased and thus REITs showed significant risk-return benefit, poor diversification benefit
1986	Property cycle upturn (boom)	Tax Reform Act was introduced which gave REITs tax relief and better management controls. Incomes increased. REITs were characterised by having a small market capitalisation, stock price tended to be less than book value, and yields were high	Good return and diversification benefits,
From November 1987 onwards	Property cycle downturn (crash)	Stock market crash, oversupply of property, shortage of investment capital	Poor return benefit, insignificant

		owing to 1989 Financial Institutions Reform Act	diversification benefit
New ERA REIT 1993	Allowing umbrella partnerships to form and the introduction of the Revenue Reconciliation Act of 1993	New legislation passed and interest in investing in REITs by Pension companies increased; low interest rates thus REIT yields appeared more favourable	Good returns benefit
1999	Introduction of REITs Modernization Act of 1999	The income distribution requirement of REITs was decreased: change in tax and income portions of legislation.	Very good return benefit
2007 Up until 2009	Credit Crunch and recovery	USA sub-prime crisis created by very poor lending practises.	Negative return benefit but improving diversification benefits.

(Source: Lee, 2010; adapted by author).

It is implied that the behaviour of REITs would perform differently based on the state of the property cycle. Table 2.3 indicates that REITs reacted sharply to both common stock market-related events and forces (e.g. 2007 Credit Crunch) and direct property market-related events and forces (e.g. early 1980s Property Cycle Upturn). It is evident

that the majority of market shocks occurred in the stock market, even if they are eventually felt within the direct property market. This is owing to demand and supply forces. Overall, in a study based in the US and UK property markets it was found that listed property stock is correlated to common stocks in the short run, but in the long run listed property stock behaves more similarly to the underlying asset although REIT returns tend to be greater (which is attributed to infrequent valuations of direct property, for example) (Morawski et al., 2008). The explanation presented for this phenomenon is that short run investment is affected by investor reactions to economic changes, thus causing a reaction that is consistent throughout the entire financial market. The extent of the effect on REITs a reaction can cause is dependent on whether investors treat property as an individual asset class or not. For direct property, reactions to events often have a time-lag owing to building times, and lease terms, thus adjustment takes time (Morawski et al., 2008).

2.4.3 REITs vs. Listed Property

A REIT is a form of listed property but listed property is not necessarily a REIT. In a study by Newell, Pham and Ooi (2015) on the performance of Singaporean REITs in a mixed-asset portfolio, whereby Singaporean property companies were included in the portfolio, it is found that the REITs outperformed listed property companies in terms of risk- adjusted performance. The REITs performed better than the overall stock market and property companies, whereby there is a greater difference in performance for the former. Furthermore, in terms of risk the REITs are found to be riskier than stocks but not property companies. This is attributed to growth in rentals and capital value of the tangible assets. Within the period of the study, 2003 – 2013, there was greater diversification between REITs and property companies ($r = 0.7$) than compared to REITs and stocks ($r= 0.84$). This particular result is attributed to different characteristics between property investment activities as compared to property development activities, which refers to REITs and property companies respectively (Newell et al., 2015).

In a similar study conducted by Newell and Peng (2012) on the Japan property market, the study finds the risk associated with REITs (19.22%) was smaller than that of listed property (27.56%). For the period of study, 2001 -2011, both REITs and bonds outperformed listed property on a risk-adjusted basis. There is less correlation between REITs and shares, than listed property and shares, that is, Japan REITs provide greater diversification benefits than compared to those of property companies (Newell and Peng, 2012). Overall, J-REITs have consistently performed better.

For Hong Kong REITs investigated over the period of December 2005 to December 2008 it was found that in terms of risk-adjusted performance HK-REITs were ahead of both stocks and property companies (indirect property). Property companies were shown to have the highest risk levels, although not that far off from those of REITs and shares, which have similar risk levels. Of that period bonds were significantly the best performing asset in terms of both returns and risk (Newell, Yue, Wing and Kei, 2010). In terms of asset combinations, it is found that listed property and stocks (r=0.86) have a greater correlation that REITs and stocks (r=0.40). Interestingly, the correlation between REITs and listed property was r= 0.47, this being attributed to their differences in characteristics (Newell et al., 2010). In a study by Lee and Hwa (2008) conducted on Malaysian securitised real estate (including both property shares and REITs) 1991 – 2006 it was found that there was no significant diversification and/or return benefit in including property shares in an asset portfolio. REITs, however, yielded different results. Stocks had a higher correlation with property shares than compared to the REIT portfolios. Equally weighted REIT portfolios and value weighted portfolios did not perform similarly, and the results suggested that equally weighted REIT portfolios have greater return benefit and significantly higher risk benefits than value weighted portfolios, this being despite that equally weighted portfolios had the highest asset risk (Lee and Hwa, 2008).

In contrast to the aforementioned, a study conducted over 2003 – 2010 shows Thai-REITs as having performed the worst among stocks, bonds, and property companies, in terms of annualised return and risk-adjusted return. However, T-REITs (10.42%) had a significantly lower risk level than both stocks and property companies (27.54%

and 35.92% respectively), although T-REITs are found to have better diversification potential than property companies (Pham, 2011). This poor performance is attributed to T-REITs having an unfavourable structure for investment and heavy restrictions. They are taken to be less flexible and restrictions of leverage, for example, worsen their favourability (Pham, 2011).

Peng and Newell (2012), in a study on Taiwan REITs find that, on a risk-adjusted basis Taiwan REITs were out-performed by bonds and listed property, while shares come in as the worst performing asset. Regarding diversification, it is found that Taiwan REITs with stocks show better diversification levels than listed property and stocks do. Overall, on a risk-adjusted basis REITs are seen to outperform and be less risky than listed property. It must be noted that the listed property asset, in the form of construction shares, makes up 88% of the property market (Peng and Newell, 2012).

To summarise the results of some of the studies in the Asian-Pacific markets, in established REIT markets the risk-adjusted performance of REITs tends to be greater than that of stocks and listed property (Newell et al., 2010, Newell and Peng, 2012, and Newell et al., 2015). In comparison with other assets REITs often do not have the highest risk level and, in terms of diversification benefits studies differ regarding whether REITs and stocks have greater benefits than REITs and listed property combinations. For the studies where REITs and listed property have the best diversification benefits this is attributed to differences in characteristics between the two (Newell et al., 2010, and Newell et al., 2015).

2.4.4 Relationships between Assets in a Mixed Portfolio

A correlation analysis of property, be it REITs or not, has consistently found moderate-to-high levels of correlation with shares and low/negative levels of correlation with bonds, this being dependent on the nature of the property cycle. The following is the findings of studies focused on listed property:

Olaleye (2011): South Africa, whose research period was from 1999 – 2009, finds suggested co-integration between South African listed property and common stocks, evidenced by a high positive correlation between the two (r = 0.719). Diversification benefits of adding property into the portfolio was achieved only when it replaced shares, dependent on the extent of replacement. Nguyen (2011): Philippines, whose research period was from 1999 – 2010, indicated that listed property and shares have a positive correlation as high as r = 0.88. Philippines listed properties is considered as being high in risk and low in returns; this is attributed to their property market having been subjected to the 1997 Asian Crisis and the GFC. Oyedele, McGreal, Adair, and Ogedengbe (2013): Europe, whose research period was from 2001 – 2010, found that for the period of the study European listed infrastructure and stock have a high positive correlation with stocks (r = 0.74), whereby pre GFC is was r = 0.56, during GFC increased to r = 0.81, and post GFC increased further to be r = 0.88.

The following is the findings of studies focused on REITs:

Newell et al. (2013): French, whose study was from 2003 – 2012, found that French REITs showed positive correlation with stocks (r = 0.68), whereby during the GFC it increased from r = 0.32 to r = 0.72. Post GFC the correlation is still very high at r = 0.75. However, the correlation with bonds has become favourable for diversification post GFC. Pham (2011): Thailand: shares and property companies have the highest correlation for the period 2003 – 2010 (r = 0.83). REITs are positively correlated to both shares and property stocks (for both r= 0.67). REITs have a negative correlation with bonds. Newell et al., (2015): Singapore, 2003 – 2013, found that during this period the REITs were high correlated with stocks to the same extent at which property companies are correlated (r = 0.84). For REITs, the current correlation levels are better than those during the GFC but they have not reduced to the pre GFC levels, but for property companies post GFC has shown no improvement.

Interestingly, in an instance where both REITs and listed property are being considered, the following is found: during the GFC the correlation between stocks was found to be greater with European listed infrastructure than with REITs (r = 0.56) (Oyedele et al., 2013). A study by Pham (2011) finds the same. In a study with property companies and REITs the correlation between REITs and property companies is lower than the correlation between REITs and stocks (r= 0.70 compared to 0.84) Newell et al., (2015). Various studies done worldwide confirmed that post GFC the return benefit of REITs is greater than the risk reduction one (within the context of listed property development companies/infrastructure and REITs) e.g. Olaleye, 2011; Oyedele et al., 2013; Oyedele, 2014, Newell and Pham, 2015. These specific studies concluded that property in a mixed-asset portfolio has larger return-enhancing benefits as compared to the benefits from the reduction of risk.

The research above consistently showed positive correlation levels between property and other assets (excluding bonds) having increased during the GFC and the effects are still being seen, whereby correlations can double (Chiang, Tsai and Sing, 2013). Co-integration/correlation in this context is problematic because, according to portfolio diversification theory, the best risk-reduction benefits of diversification are achieved when the asset classes in a portfolio are *not* integrated (Webb et al., 1988; Shipway, 2009). Kuhle (1987) found that the overall performance of a portfolio containing only common stocks and one containing a mix of REITs and common stocks did not differ, unless the concentration of the REITs is very high.

In a study of individual investor portfolios whereby the investor's sensitivity to risk is taken into consideration along with risk premiums, it is found that for an individual investor the degree of the allocation of REITs in a portfolio and the returns of the REITs and the stocks is far more significant to portfolio performance than the levels of correlation between the REITs and the Stocks (Bhuyan, Kuhle, Ikromov, and Chiemeke, 2014). Furthermore, it is found that the optimal allocation of a REIT in a portfolio does not vary based on the risk tolerance of the investor, although investors with a higher appetite for risk may benefit return-wise from holding portfolios with high REIT-stock correlations (Bhuyan et al., 2014).

2.5 Synthesis and Conclusion

Indirect property investment such as REITs can perform and display the characteristics of both stocks and the indirect property market, whereby they performs similarly to stocks in the short term and indirect property in the long term (e.g. Morawski et al., 2008; Hoesli and Oikarinen, 2012). The most recent stance is that the number of assets within a portfolio is not an adequate identification of the degree of diversification within that portfolio (Goetzmann and Kumar, 2008). The degree of risk reduction achieved through diversification is based on the relationship between the various assets the investor holds (Webb et al., 1988), and the behaviour of a REIT in a mixed-asset portfolio is influenced by structural changes occurring within the property market (Lee, 2010). This possibly explains the varying behaviour of REITs with other assets, when REITs in various countries are compared.

The majority of the studies reviewed find that in a stable environment REITs perform better than stocks and listed property (e.g. Newell et al., 2010, Newell and Peng, 2012, and Newell et al., 2015), and within a portfolio REITs tend to not have the highest risk level among the assets. Typically, REITs have moderate-to-strong positive correlation with shares but some of the studies' findings show that there is greater diversification between REITs and Shares, while others find that there is greater diversification between REITs and Listed Property. REITs tend towards having a low/negative correlation with bonds.

The results discussed in the literature review are mostly of markets that have been in existence for a number of years, i.e. 10 years and above, particularly of US, European, and Asia-Pacific markets. Few studies exist on young markets (included in this review is one study on Islamic REITs in Malaysia, but general REITs in Malaysia have existed since 2005). In a study of Asian REITs it is found that emerging markets tend to display a greater reaction to macroeconomic changes than compared to developed REIT markets (Loo, Anuar, and Ramakrishnan, 2016). In a comparison of the monthly means of REITs in developed markets and in emerging markets it is found that the developed market has higher means, and, overall, the risk associated with the returns

is lower for emerging markets (Loo et al., 2016).Therefore, although studies tend to find similar behavioural patterns for REITs and non-REIT listed property in a mixed-asset portfolio these findings may not be applicable to young markets.

With the survey of literature being focused on REITs, specifically, the majority of the studies surveyed included a pre- and post- Global Financial Crisis analysis. The results of these studies tended to be similar, that is, REITs in a mixed-asset portfolio lost some of their risk reduction properties when compared to pre-GFC performance, and this loss has not recovered. As discussed in the literature Lee (2010) finds that REITs in a mixed-asset portfolio are influenced by structural changes in the property market, where such changes may be caused by extreme economic market behaviour such as the GFC. Therefore, the results of studies of more mature markets may not provide a fair basis of comparison for a market as young as South Africa because REITs were not in existence during the GFC. Based on this it is evident that a gap in literature exists where young markets and their initial performance is to be addressed; South Africa being particularly noteworthy as it is the only major REIT regime in Africa.

3. Chapter Three: Method

This section details the research methodology used in this report. The steps for the collection of the data are given, and the data analysis procedure is discussed in detail.

3.1 Nature of the study

The research problem of the study is divided into two components: (1) the risk-adjusted performance of SA REITs since 2013, and (2) the performance and behaviour of SA REITs in relation to other assets. The main hypothesis for the study is:

> H_0: $\mu_1 - \mu_2 = 0$. There is no significant difference in the performance of a portfolio with REITs and a portfolio without.
>
> H_1: $\mu_1 \neq \mu_2$. There is a significant difference in the performance of a portfolio with REITs and a portfolio without

The study is quantitative. This allows for numerical data to be mathematically and statistically analysed in order to draw conclusions. Positivism is ideal because it allows for trends within results to be identified, and for relationships between variables to be determined.

The design of the study is cross sectional; the study is observational and the researcher cannot interfere with the data based on that it is of past performance. Cross sectional design allows for the comparison of SA REITs and other assets, and this comparison may be done simultaneously.

3.2 Data Analysis Procedure

The methodology that will be used will be derived from studies discussed below:

Olaleye (2011) conducted a quantitative study to examine the performance of South African listed property in a mixed- asset portfolio. The data considered in the study were average yearly total return indices of South African listed property stock, all bond, and all share, and T-bills. Performance is analysed using historical mean returns, standard deviations (for risk-adjusted returns, calculated using the Markowitz mean variance model), coefficient of variation, and correlation coefficient, and the construction of 5 portfolios with varying asset allocation. Newell et al. (2015) conducted a quantitative study to examine the performance of Singaporean REITs in a mixed-asset portfolio. Monthly total returns are used for a 10 year period, for stocks, bonds, and property companies. Risk-adjusted returns are analysed using the reward-to-risk ratio, and the Sharpe ratio. Portfolio diversification benefits are analysed using correlation analysis. The role of the REITs in a portfolio is analysed using efficient frontiers and asset allocation diagrams. The study by Oyedele et al. (2013) is quantitative and examines the role and performance of European infrastructure in a mixed-asset portfolio. Monthly return indices over a 10 year period and hypothesis testing are used. An analysis of average annual returns, annual risk, and the Sharpe Index (a risk-adjusted measure of return) is carried out, and this is followed by the construction of efficient frontiers. Correlation analysis is conducted in order to investigate potential diversification characteristics. Newell and Osmadi (2009) conducted a study of the preliminary performance of Islamic REITs in Malaysia, a quantitative study to determine their significance and performance. Owing to data limitations the authors constructed their own market cap-weighted total return performance series. Weekly total returns over a two year period were assessed, and were compared to stock and bonds, but not direct property. Correlation analysis was used to determine portfolio diversification benefits, and these benefits were assessed using an efficient frontier.

The methodology of the studies discussed above is very similar. This common methodology will be used in the study at hand for the purposes of ensuring comparability of the results with those determined globally. The methodology of Newell and Osmadi (2009) is particularly noteworthy as their study used returns over a two year period because that was the maximum period available. This is similar to the study at hand whereby REIT performance while be analysed from May 2013 – January 2016 owing to REITs being recognised from May 2013. However, unlike the study by Newell and Osmadi (2009) the study at hand uses an existing REIT index.

Therefore, the methodology for the study is to derive an annualised average monthly return off the closing prices of the indices representing the assets in the study, i.e. REITs, Shares, Bonds, T-Bills, PUTs, PLS, and Listed Property. The annualised standard deviation (risk), Sharpe ratio, and Reward to Risk ratio is derived for each asset. A correlation matrix is used to do an initial analysis of the potential diversification properties of the assets. A covariance matrix is drawn up as it is to be used in determining the efficient frontier. Rolling correlation and rolling risk graphs are used to investigation asset-pair relationships. The efficient frontier of the assets is drawn up and analysed, along with an asset allocation diagram.

Data

- Monthly total returns are analysed over the period of 01 May 2013 to 31 December 2015. Asset types under consideration are: Bonds, South African REITs, Listed Property, Shares, and T-Bills.
- The total return index for SA REITs used is FTSE/JSE J867, available from iNet BFA Expert. The majority of companies formerly recognised as PUTs and PLS are now listed in the REIT index because they have converted to this structure. Included in this index is non-South African REITs (i. e. companies identified as REITs in foreign markets). As of 18 March 2016 there are 20 REITs in the index, all of which are South African REITs except for 3.

- The listed property index used is FTSE/JSE SAPY (J253). It consists of the top 20 listed property companies in the Real Estate-related sectors, which have their primary listing on the JSE. This means that the companies included may or may not be companies recognised at REITs. The companies are screened for liquidity and are weighted using free float market capitalisation. J253 (SAPY) and J867 (REITs) have 13 REITs in common as of 18 March 2016.
- Stock series to be used is the FTSE/JSE All Share Index (J203) Constituents, available from iNetBFA Expert. The index consists of 99% of eligible equities using their full market capital. These equities are listed on the main board of the JSE. It is approximately 160 companies, is screened for liquidity and is free float market capital weighted.
- The bond index used is All Bond Index (ALBI). It consists of the top 20 conventionally listed basic bonds, whereby bonds with a term of less than one year are not included. The bonds are ranked using average liquidity and average market capitalisation.
- Treasury Bills (91 Day) yield rates that are taken from the South African Reserve Bank website.
- Direct property is not considered in this report.

Performance Measures

The four performance indicators below are chosen in order to analyse the performance of South African REITs (using the FTSE/JSE index J867), All Share index (J203), and Bonds (GOVI). These indicators were selected based on the methodology used in similar studies such as Goetzmann and Kumar (2008), Newell and Osmadi (2009), Olaleye (2011), Alias and Soi Tho (2011), Oyedele et al. (2013), Olaleye and Ekemode (2014), and Newell et al. (2015).

Modern Portfolio Theory (MPT) is an investment framework that is used extensively in corporate finance, including the property market. It is the product of work by Harry Markowitz, who first contributed to the Markowitz Portfolio Theory in 1952, and works

in tandem with work by William Sharpe, who formed his Capital Asset Pricing Model in 1964. The capital asset pricing model (CAPM) by Sharpe and Lintner was developed in 1964/5 and is commonly used for asset pricing. It is very popular owing to its simplicity (Fama and French, 2004). The CAPM was developed by building on the work of Markowitz, with the Mean-Variance Model in 1959, which believes that investors want to maximise expected return at a given risk level, or investors want to minimise risk for a given level of return, thus resulting in efficient frontiers. The CAPM thus allows this mean-variance relationship (the risk and expected return) to be tested by identifying an efficient portfolio (Fama and French, 2004).

The MPT theory serves to allow asset portfolios to be created and selected based on the expected performance of the portfolio and the amount of risk the investor is willing to tolerate. This is based on the possibility of greater returns and lower risks being realised by distributing one's investment into multiple assets as opposed to a single asset, based on the generally accepted belief that an investor wants maximum returns and minimum risk, and, to do so, will invest in assets that will yield the maximum expected return (Markowitz, 1952). However, it is noted that the diversification of assets to investment does not completely remove the associated risk, and diversification does not necessarily mean that there is no single asset that will outperform a diverse portfolio in terms of risk and returns. (Markowitz, 1952).

Sharpe Ratio, which can be ex-ante or ex-post, was derived in 1966 by William Sharpe. It is a risk/return measure where it shows excess returns earned for extra risk taken, therefore, it is used as a measure of portfolio performance. A widely used measure in practise owing to its simplicity, the measure is easy to manipulate and this has contributed to the birth of similar ratios.

Correlation and Covariance play a major part in portfolio theory as they describe the relationship between assets, which in turn influences the performance of a portfolio. Pearson product-moment correlation is a measure of the linear relationship between two assets, to identify dependence. Covariance is a measure of the extent at which

two random variables move together. Correlation coefficient was derived from work by Francis Galton, whose first concept was linear regression, and expanded on by Karl Pearson who then cemented the concept of correlation coefficient, r, although Pearson is not responsible for the initial formulae for correlation (Stanton, 2001).

- Average Annual Rate of Return

This measure is used to in order to analyse the historical performance of an investment. It is particularly suitable for measuring long-term performance, and, considering that property is typically a long-term investment, the performance indicator is used here. It indicated the per-year return achieved when considering a set number of year's return. This allows an investor to compare the 10 year performances of two assets, for example, as opposed to comparing each single year, the return of which may be highly affected by extraordinary but low effect events. Monthly total returns are used to analyse performance.

$$\bar{r} = (r_1 X\, r_2 \, \ldots X\, r_n\,)^{1/n}$$

(1)

Where n = number of years

- Annual Risk

Annual Risk is measured using variance or standard deviation. It measures how far off portfolio performance is from the performance of a market portfolio.

$$s = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}}$$

(2)

- Reward to Risk Ratio

This indicator is the amount of returns expected based on a certain risk undertaken. In order for the investment to be worthwhile the amount of return gained over and above the risk free rate should be worth the additional risks undertaken to achieve it.

Reward to Risk Ratio

$$= \frac{Er - Rf}{\beta}$$

(3)

Where the R_f= risk free rate, i.e. 90 Day T-Bill

β = the idiosyncratic risk of the investment compared to the risk of the entire market, where a Beta > 1 signifies volatile markets, and Beta < 1 indicates low volatility to the market or low reaction of prices to market occurrences.

- Ex-post Sharpe Ratio

This is used to calculate the risk-adjusted return of the investment using past returns. The greater the ratio the more attractive the risk-adjusted return is as compared to other returns. However, the ratio is for comparative purposes only and does not indicate whether a single risk-adjusted return is good for an investor or not. Additionally, in order for this measure to be used accurately the data set needs to be normally distributed. This is uncommon for investment data yet the use of this measure remains popular.

Sharpe Ratio =

$$\frac{\bar{r} - Rf}{s} \tag{4}$$

- Correlation and Diversification

The relationship between the assets is observed using correlation. The correlation between two assets refers to the extent of similarity in the movements of the two variables, or the tendency of those assets to react in the same way given an identical set of stimuli. Pearson's Correlation Coefficient Formula:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}} \tag{5}$$

Where n = number of observations

x= Asset 1

y = Asset 2

Efficient frontiers and asset allocation are used in order to further analyse diversification, and to understand the role that South African REITs have in a mixed-asset portfolio. Efficient frontiers show which are the best portfolios based on risk and return, that is, the best return for given risk, or the lowest risk for given return.

4. Chapter Four: Findings

4.1 Asset Performance

Table 4.1 presents findings on the performance of the listed asset types from May 2013 to December 2015.

Regarding the overall performance of the assets Shares performed the best in terms of annualised monthly returns (1.00%). The second best performing asset was REITs with 0.41%, T-Bills (0.38%), Listed Property (0.03%), and the worst performing asset was Bonds with a negative return/loss (-0.73%).

Despite having the worst performance Bond does not have the highest volatility. Listed Property has a volatility of 4.47% (the highest), REITs is at 3.59%, Shares at 3.51%, Bond (2.56%), and T-Bill has a volatility of 0% which is in line with its status as a highly secure and thus very low risk asset.

The Sharpe ratio is a measure used to determine risk-adjusted return of an asset or portfolio, whereby a higher ratio is more favourable. As evident in the formula a negative Sharpe ratio indicates that the asset's return was less than that of the risk-free rate. Shares has the highest Sharpe ratio (0.18), followed by REITs (0.01), and T-Bills (0). Bonds and Listed Property both have a negative Sharpe Ratio, - 0.43 and –0.08 respectively. Therefore, Bonds has the poorest risk-adjusted return of all the assets, and Shares has the best.

Shares has the highest reward-to-risk ratio (0.01), closely followed by REITs and T-Bills (both with a ratio of 0). With an investment into Bonds and Listed Property there is a risk of losing more than that which was invested should things go pear-shaped, with Bonds having the highest possible loss.

Because Shares (J203) was used as the market proxy the asset's beta is 1. REITs has a beta of 0.41, and Bond is 0.16. As all the betas are below 1 it is suggested that the assets are less volatile than the market, where T-Bills have the lowest volatility, followed by Listed Property.

Table 4.1 Annualised Average Monthly Performance of Assets

Asset Type	Monthly Return	Volatility	Sharpe Ratio	Reward to Risk Ratio	Asset Beta
REITs	0,41% (2)	3,59%	0,01 (2)	0,00	0,41
Shares	1,00% (1)	3,51%	0,18 (1)	0,01	1,00
Bond	-0,73% (5)	2,56%	-0,43 (5)	-0,07	0,16
T-Bills	0,38% (3)	0,00%	0,00 (3)	0,00	0,00
Listed Property	0,03% (4)	4,47%	-0,08 (4)	-0,05	0,07

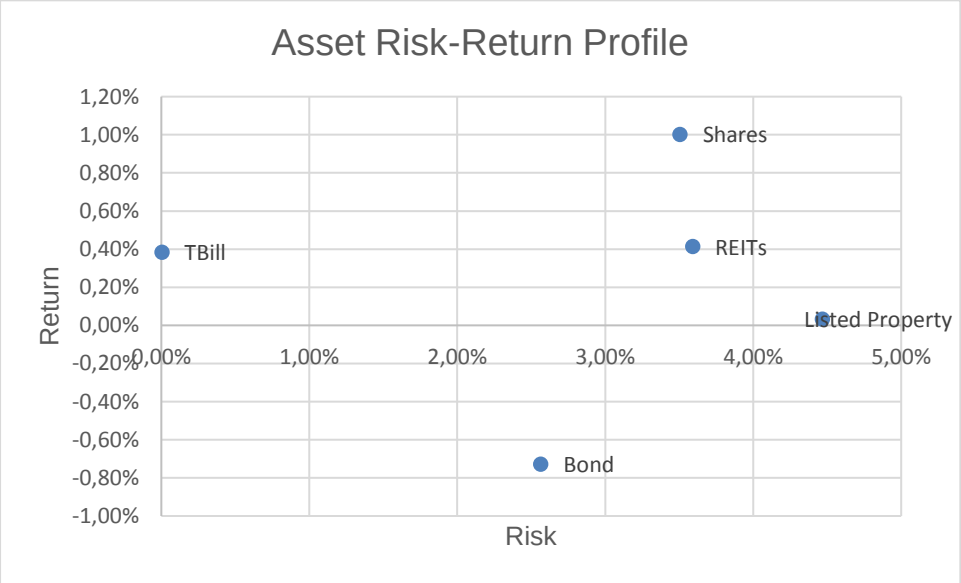


Figure 4.1 Asset Risk-Return Profile

For easier comparison, presented in Figure 4.1 is the risk-return profile of the assets. T-Bills and REITs have returns that differ by only 0.03% but as illustrated in Figure 4.1 REITs have a greater element of risk. Shares have a greater return than REITs but the risk levels of the two assets do not vary notably. Listed property has the lowest

positive return yet the highest risk, and Bond has negative return for medium risk when compared to the range.

Yearly Performance

2013: A review of the assets for the period of May 2013 to December 2013 three of the assets have negative return rates (REITs, Bonds, and Listed Property). Shares had more than double its overall return during the period of 2013 (that is, 2.24%). T-Bill had a return of 0.37% (0.01% less that the overall return for T-Bills). Shares were the best performing asset risk-adjusted, and REITs, coming in third, had a negative Sharpe ratio: -0.20.

2014: In 2014 all the assets had a positive return with Listed Property performing the best (1.43% (1)), closely followed by REITs (1.37% (2)). Shares had a return of 0.61% (3), T-Bills (0.39% (4)), and Bonds have the lowest return of 0.11% (5). In terms of risk-adjusted performance REITs were the best performing asset (Sharpe ratio = 0.35), followed by Listed Property (0.30). Bonds were the only asset with a negative Sharpe ratio.

2015: All the assets had a negative Sharpe ratio in 2015. T-Bills were the best performing asset risk-adjusted wise, additionally, T-Bills had the highest return (0.39%). In both respects T-Bills is followed by REITs, then Listed Property, and then Shares. Bonds were the worst performing asset, and was the only asset with negative average monthly return.

The table containing the results of the individual yearly analyses can be found in Appendix A.

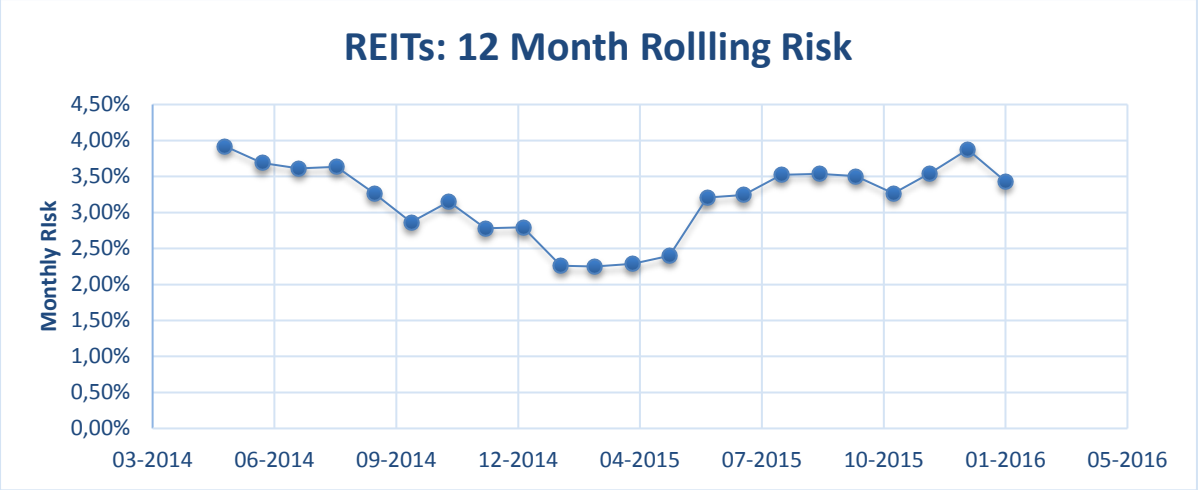


Figure 4.2 12 Month Rolling Risk for REITs

Figure 4.2 shows the 12 month rolling volatility of REITs. The risk ranges between 2.25% and 3.92%. Up until February 2015 the volatility of the asset has a decreasing trend, following which it starts to increase again. On January 2016 the volatility is 3.43%. The asset is relatively stable with a volatility shift of 1.67%.

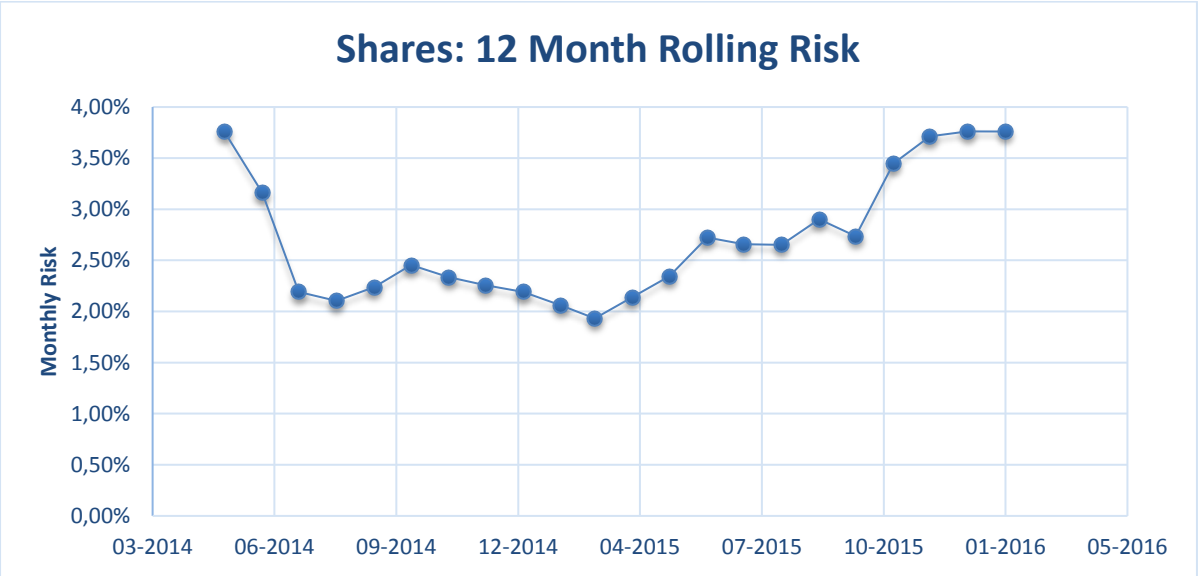


Figure 4.3 12 Month Rolling Risk for Shares

Of the four assets Shares has the second widest range of volatility, ranging between 1.93% and 3.76%, a difference of 1.83%. As seen on Figure 4.3 the volatility had the largest decrease between April and June 2014, which almost coincides with an increase of the repo rate in July 2014. From July 2014 the rolling risk increases until September 2014, following which it starts to decrease again. At January 2016 the rolling volatility is 3.76%, the highest in the range.

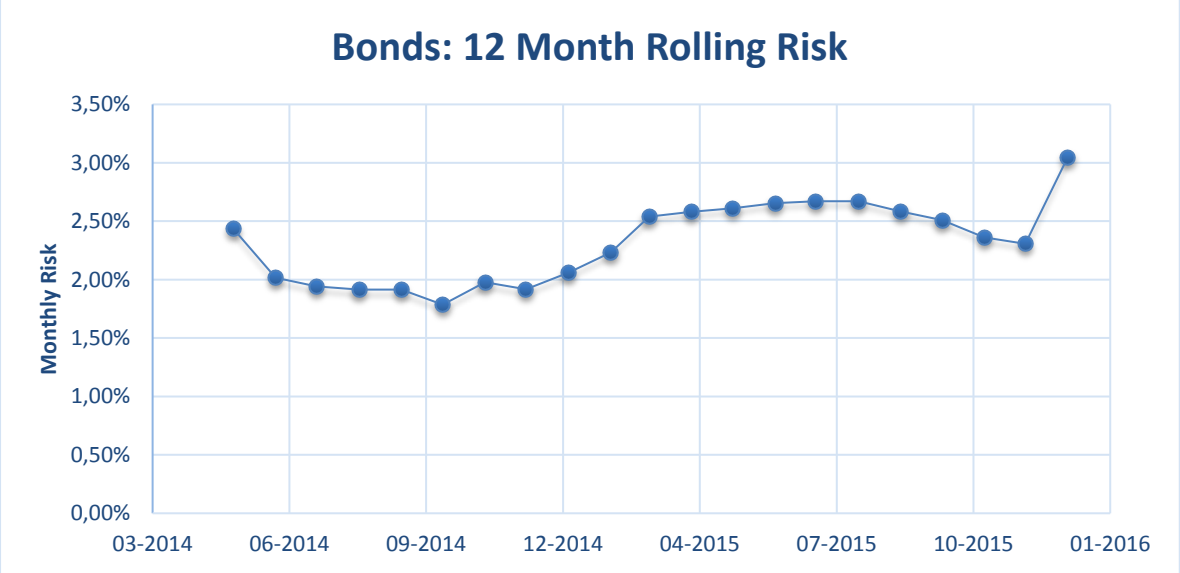


Figure 4.4 12 Month Rolling Risk for Bonds

Figure 4.4 shows the rolling volatility for Bonds. This asset has a narrow range of variation in its volatility, except from December 2015 onwards. The repo rate was increased in January 2016 and thus it is possible that the reaction of Bonds in terms of risk was prompted by the expectation of a repo rate increase. The total range of risk is between 1.79% and 3.05% (difference= 1.26%), and the range for the period before December 2015 is 1.79% to 2.44% (difference= 0.65%).

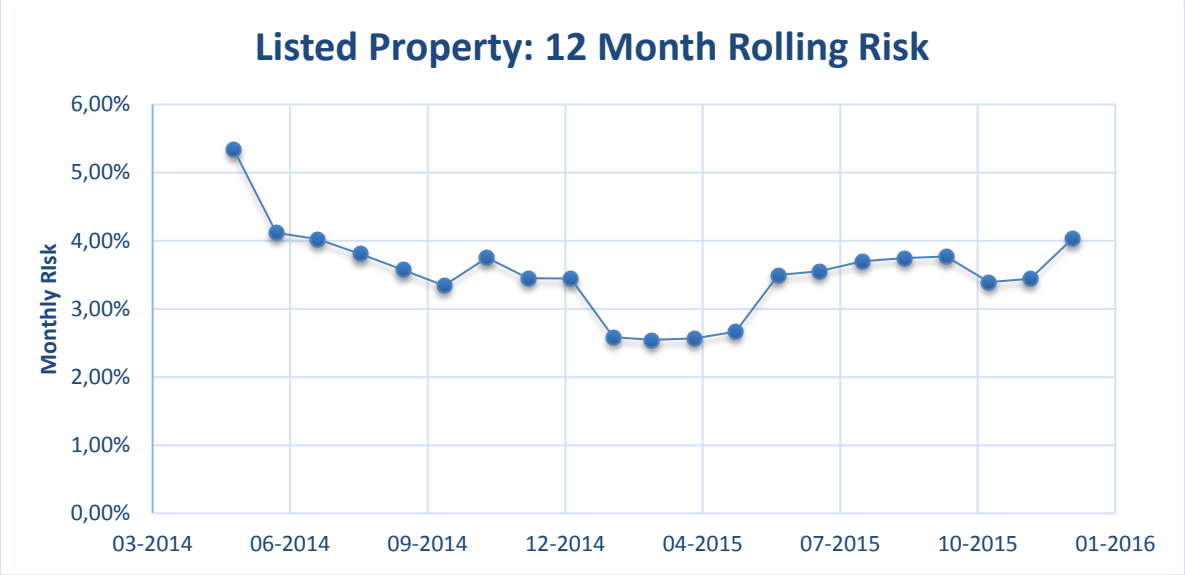


Figure 4.5 12 Month Rolling Risk for Listed Property

The rolling risk for Listed Property is displayed in Figure 4.5. The volatility ranges between 2.55% and 5.34% (difference= 2.79%). This asset has the widest range for the rolling risk.

The rolling risk for T-Bills is not included because this asset is used as the risk-free rate.

4.2 Diversification

Table 4.2.1 presents the correlation matrix of the assets in the study from May 2013 to December 2015. Correlation allows for the relationship between assets to be predicted, thus enabling an elementary estimate of how asset pairings in a portfolio will react in the event of specific market circumstances. Despite this, correlation does not imply causation. In the study Shares and Bonds have a positive but low correlation where r = 0.21. Shares and REITs have a positive but relatively low correlation (r = 0.40). For these asset pairs the low correlation value means that the assets react similarly to the same market stimuli but not to a similar extent. With r = 0.80 Bonds

and REITs are highly correlated. T-Bills has a low negative correlation with two of the assets, whereby the asset that is the least aligned with T-Bills is Shares (r = -0.32). T-Bills and REITs have a correlation of r = 0.06, and T-Bills and Bonds have a negative correlation where r = -0.06. Listed Property has a high correlation with REITs (r = 0.85), and this relationship has the strongest correlation relationship between all the asset pairs. Listed property also has a strong positive correlation with Bonds (r = 0.76), and has a very weak positive correlation with Shares (r = 0.05) and T-Bills (r = 0.14).

Table 4.2 Correlation of Assets

Asset Type	REITs	Shares	Bond	T- Bills	Listed Property
REITs	**1**				
Shares	0.40	**1**			
Bond	0.80	0.21	**1**		
T-Bills	0.06	-0,32	-0.06	**1**	
Listed Property	0.85	0.05	0.76	0.14	**1**

Yearly Performance

2013: In 2013 Bonds and REITs had the highest positive correlation where r = 0.88. Listed Property and Bonds also had a high positive correlation (r = 0.79). Share had a very weak to moderately weak negative correlation with Bonds (r = -0.05), T-Bills (r = - 0.42) and Listed Property (r = -0.53), meanwhile, it had a positive yet weak correlation with REITs (r = 0.22). T-Bills had a negative correlation with all the assets except Listed Property. REITs had a moderate positive correlation with Listed Property (r = 0.67).

2014: Listed Property and REITs have the highest positive correlation of r =0.97. Bonds has a strong positive correlation with REITs (r = 0.81) and Listed Property (r = 0.79). The only negative correlation was between T-Bills and Shares (r = -0.15). Bonds and T-Bills have the smallest correlation, positive (r = 0.05).

2015: Again, the highest correlation is between Listed Property and REITs which have a positive relationship (r = 0.95). T-Bills has a negative correlation with all the assets. REITs have a positive correlation with Shares (r = 0.56) and Bonds (r = 0.74), and Bonds have a positive correlation with Listed Property (r= 0.74). Shares and Listed Property have a correlation of r = 0.55.

The table containing the results of the individual yearly analyses can be found in Appendix B.

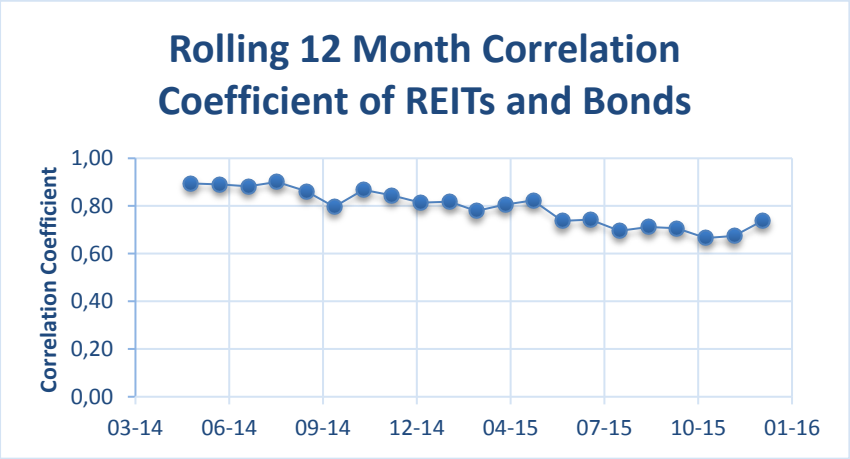


Figure 4.6: Rolling 12 Month Correlation Coefficient of REITs and Bonds

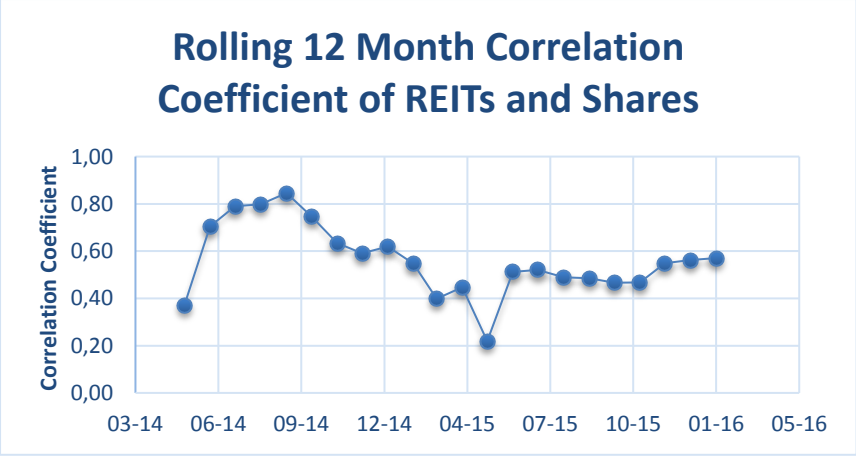


Figure 4.7: Rolling 12 Month Correlation Coefficient of REITs and Shares

Figures 4.6 and 4.7 show 12 month rolling correlation between REITs and Bonds, and REITs and Shares pairings respectively. REITs and Bonds have a strong positive correlation meaning that they move in the same direction. Starting with a high correlation of r=0.89 in May 2014 the trend shows a correlation that is gradually decreasing but is still positive. By the end of the period of study, December 2015, the rolling correlation is r = 0.74. The correlation between REITs and Shares is positive for the 12 month rolling correlation shown in Figure 4.7. It ranges between r = 0.22 and r = 0.85. In August 2014 the rolling correlation has reached r=0.85, in the middle of 2015 the correlation is positive and weak (r=0.22) (this occurring during the repo rate increase in July 2014) but then increased to r = 0.57 in January 2016.

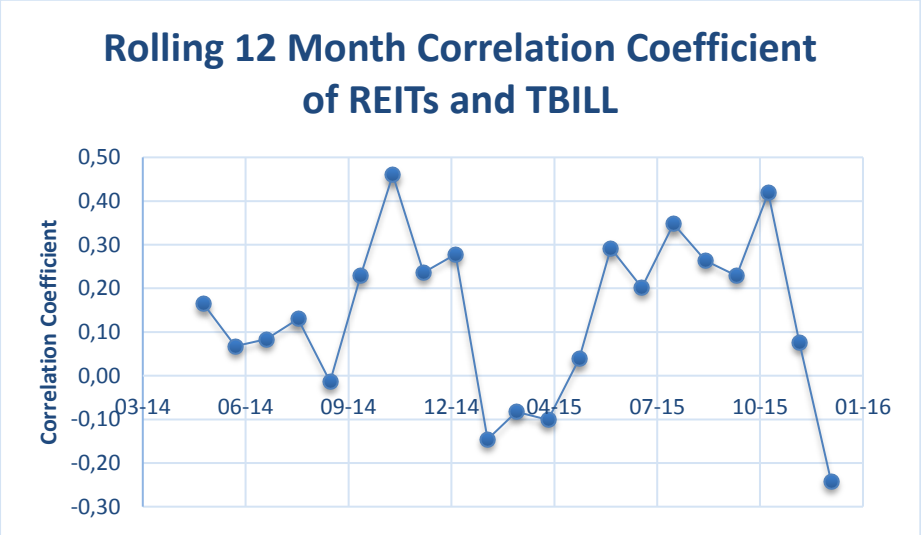


Figure 4.8: Rolling 12 Month Correlation Coefficient of REITs and TBILL

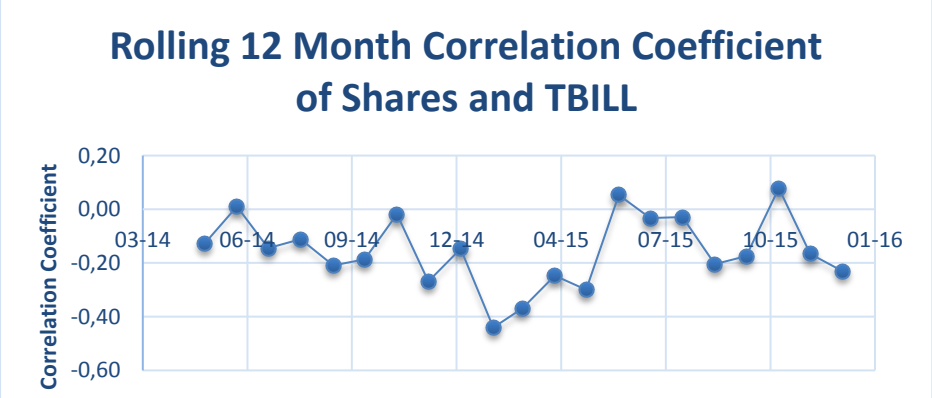


Figure 4.9: Rolling 12 Month Correlation Coefficient of Shares and TBILL

Figures 4.8 and 4.9 show 12 month rolling correlation between REITs and T-Bills, and Shares and T-Bills pairings respectively. The rolling correlation between REITs and T-Bills varies greatly but is mostly positive. It varies from weak negative to weak positive. It has a range of r = -0.24 and r = 0.46. In November 2015 the repo rate increased; this period saw the largest change in correlation where the relationship went from r = 0.42 to r = -0.24. The rolling correlation between Shares and T-Bills varies between positive and negative, and tends to be very weak, with it ranging between r = 0.08 and r = -0.44. The correlation had a change from what it was in the previous period in January 2015 and again in May 2015 where it was weakly negative for a number of months. Comparatively, the relationship between Shares and T-Bill has a more consistent linear relationship than REITs and T-Bills.

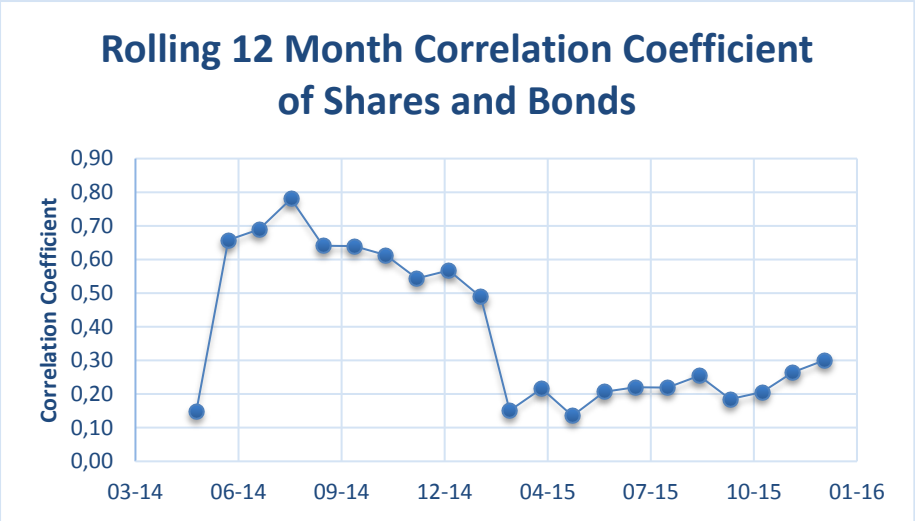


Figure 4.10: Rolling 12 Month Correlation Coefficient of Shares and Bonds

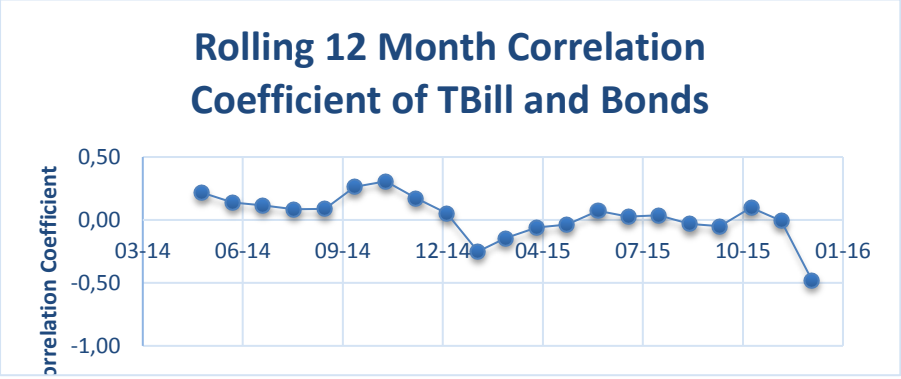


Figure 4.11: Rolling 12 Month Correlation of T-Bills and Bonds

Figures 4.10 and 4.11 show 12 month rolling correlation between Shares and Bonds, and T-Bills and Bonds pairings respectively. The correlation between Shares and Bonds is positive and ranges between r=0.14 and r =0.78, from weak to strong. From February 2015 to December 2015 the relationship is positive and relatively weak. In July 2014 the relationship is positive and strong (r =0.78) and then gradually weakened. Having started at r =0.15 in April 2014 the assets returned to having a weak positive relationship towards the end of the period. The relationship between T-Bills and Bond is very weak, it varies between positive and negative, and ranges between r = -0.48 and r = 0.31. The strongest correlation is during October 2014 and the weakest is in December 2015.

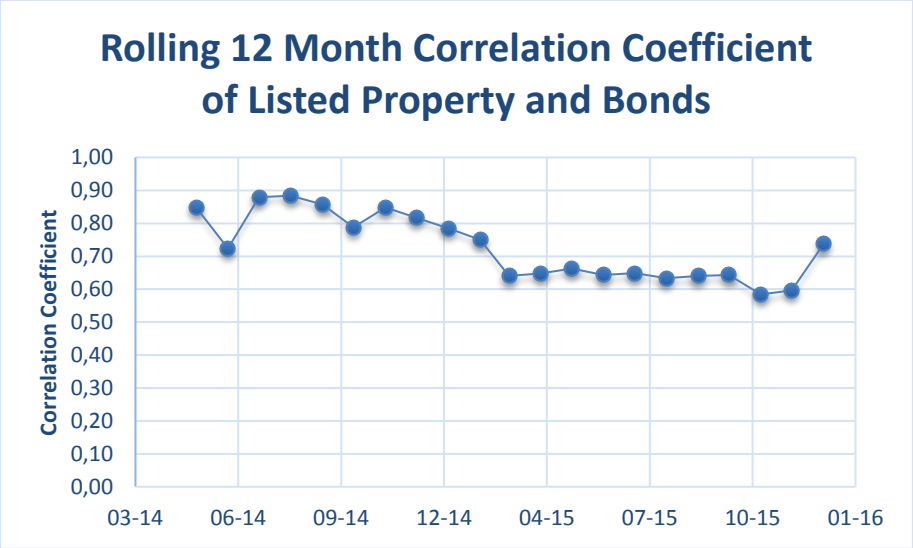


Figure 4.12: Rolling 12 Month Correlation of Listed Property and Bonds

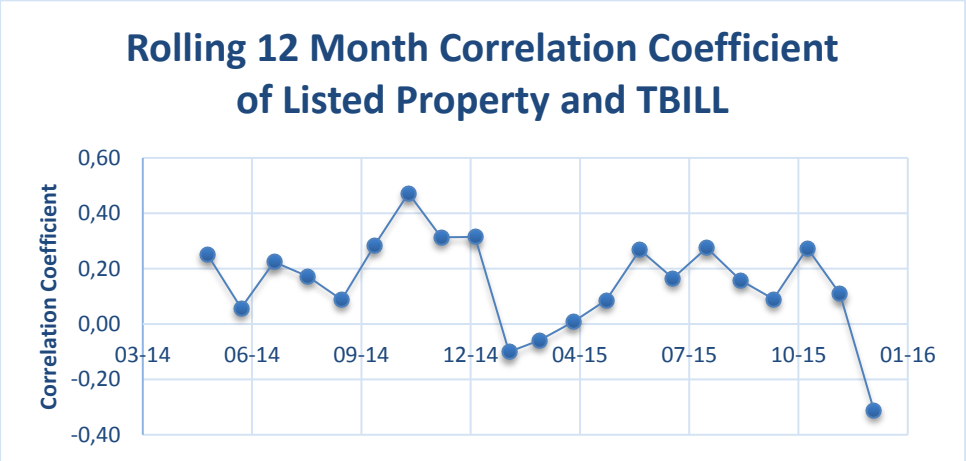


Figure 4.13: Rolling 12 Month Correlation of Listed Property and Bonds

Figures 4.12 and 4.13 show 12 month rolling correlation between Listed Property and Bonds, and Listed Property and T-Bills pairings respectively. As per Figure 4.12 the correlation, which is positive, ranges from moderate to strong. During 2015 the relationship was moderate but the correlation increased towards the end of the year (r = 0.74). The relationship ranges between r = 0.58 to r = 0.88. The correlation between Listed Property and T-Bills is weak, as seen on Figure 4.13. While mostly weakly positive there is a period of weak negative correlation in January – February 2015, and again in December 2015. The correlation ranges between r = -0.31 to r = 0.47.

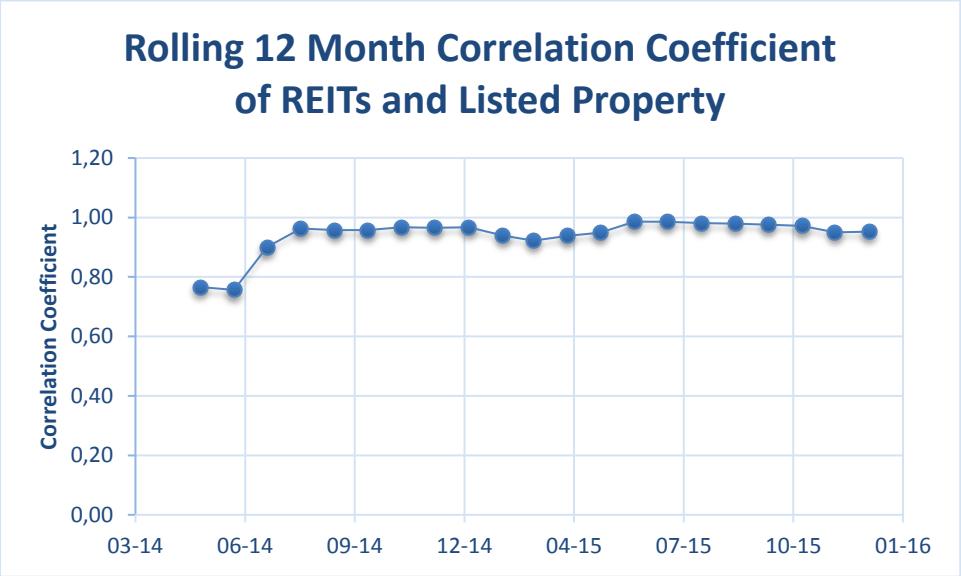


Figure 4.14: Rolling 12 Month Correlation of REITs and Listed Property

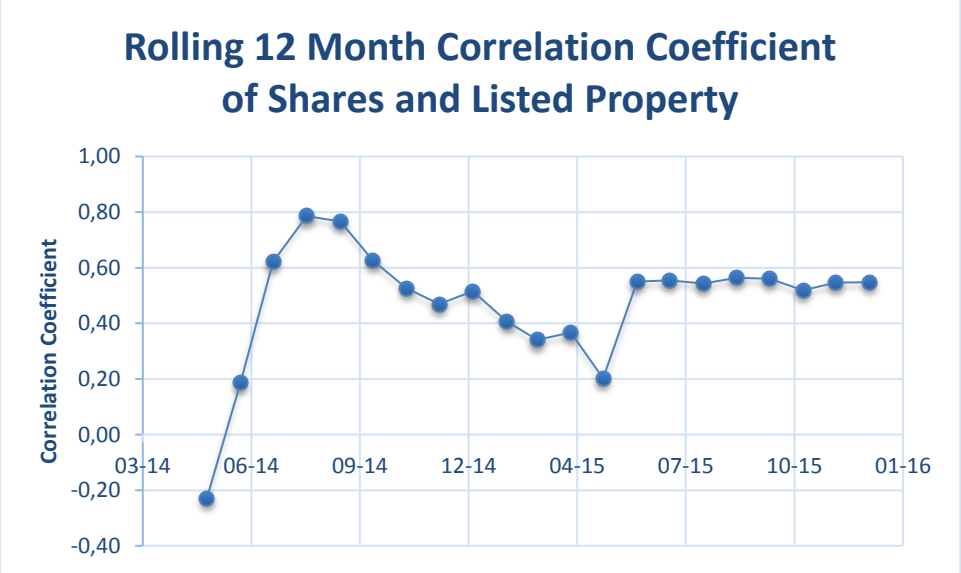


Figure 4.15: Rolling 12 Month Correlation of Shares and Listed Property

Figures 4.14 and 4.15 show 12 month rolling correlation between REITs and Listed Property, and Shares and Listed Property pairings respectively. The correlation between REITs and Listed Property is very strong and positive, ranging from r = 0.76 in the start of the period and then, as the period continues, the correlation remains consistent and varies around r = 1. As indicated on Figure 4.15 the relationship between Shares and Listed Property is positive except for April 2014 (r = -0.23). The relationship ranges from weak (r = 0.20) to strong (r = 0.79). From May 2015 to December 2015 the relationship is consistently moderate, in July 2014 it peaked and, apart from April 2014, it was its weakest in April 2015.

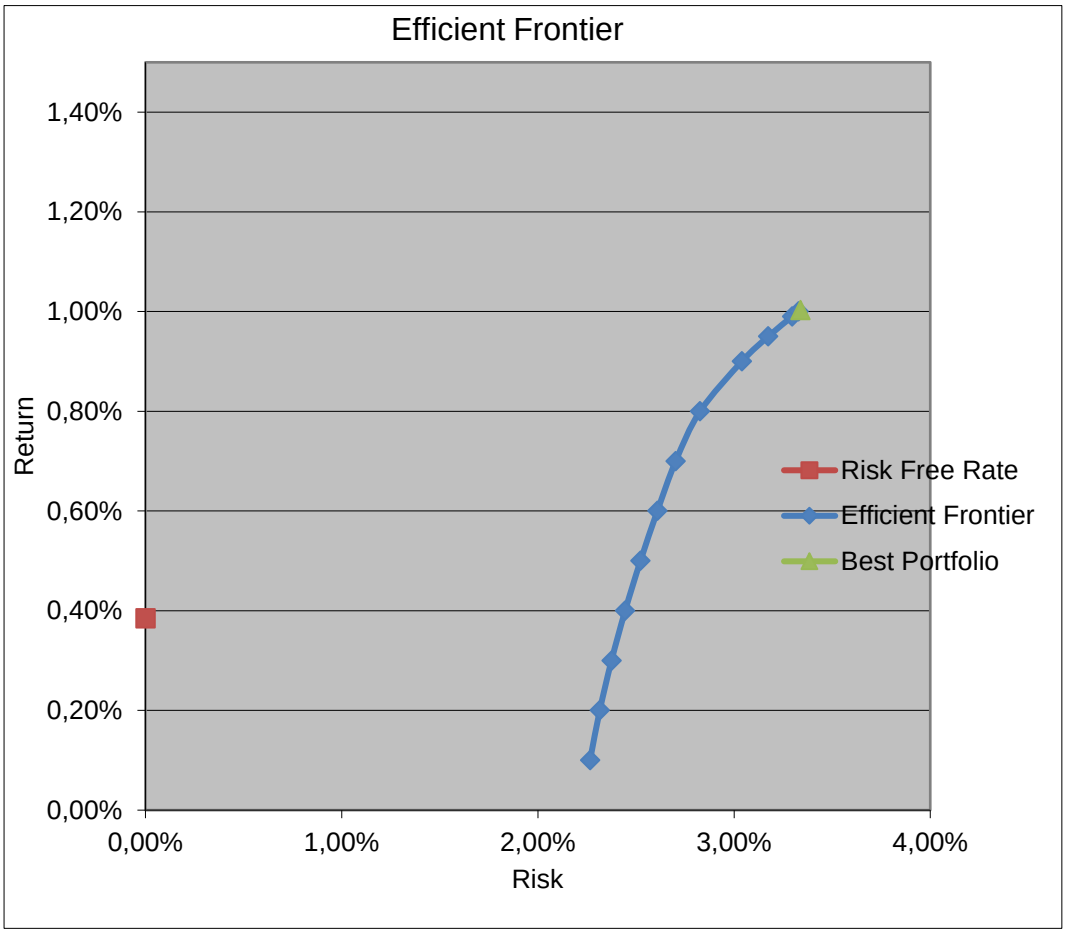


Figure 4.16 Efficient Frontier

Figure 4.16 displays an efficient frontier for the assets in the portfolio. T-Bills, as the risk-free asset, was excluded from the construction of the efficient portfolio in order to

show the best return-risk combinations for risky assets. The risk-free rate, 0.38%, is indicated on the graph, however, the returns used to construct the frontier are nominal returns, that is, risk-free rate has not been subtracted from them. The most optimum asset combination is found at the point where the tangent (with risk-free intercept) touches the efficient frontier, that is, where the capital market line and the efficient frontier meet. In this report the optimum/market portfolio has a standard deviation of 3.34% (risk), an annualised monthly expected return of 1.00%, and the following weightings for assets:

- REITs: 0%
- Shares: 100%
- Bonds: 0%
- Listed Property: 0%

This optimum portfolio is to be expected because Shares have the highest Sharpe ratio.

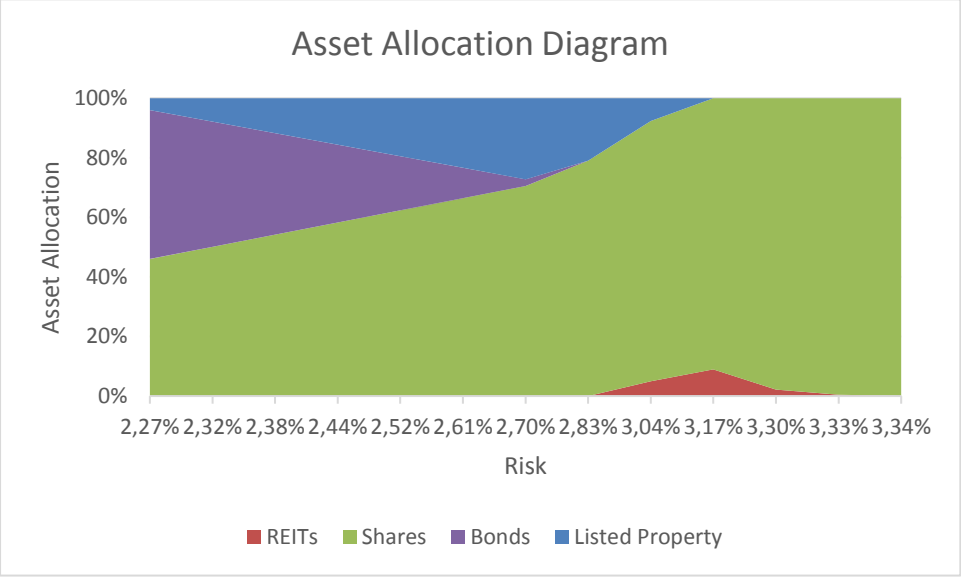


Figure 4.17 Asset Allocation Diagram

Figure 4.17 is the asset allocation diagram for the efficient frontier. It is clear that Shares play a major role in the risk spectrum of the portfolio. Bonds play a role at low

to medium risk level, whereby the allocation starts off at approximately 50% and then proceeds to decrease. Listed Property plays a greater role than REITs. The role of Listed Property increases with increasing risk level until 2.70% where they reach their maximum contribution and start to taper off. REITs have the smallest contribution to the portfolio where they make a small contribution at high risk levels.

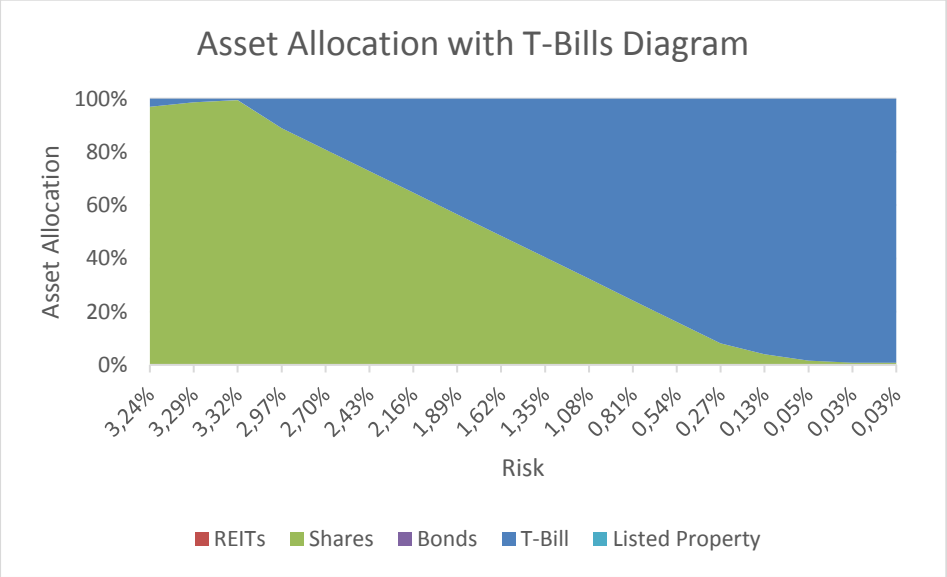


Figure 4.18 Asset Allocation Diagram with T-Bills

The asset allocation diagram with T-Bill included in the portfolio is illustrated in Figure 4.18. The portfolio only has an allocation to Shares and T-Bills, whereby at lower risk levels there is a greater allocation to Shares, and at higher risk levels the allocation to T-Bills increases. When the Sharpe Ratio of the portfolio is maximised the best portfolio is found, which is has a risk of 0.03%, an expected monthly return of 0.01% and an allocation of 99.19% to T-Bills.

Byrne and Lee (1995) found that assets with low risk overwhelm a mixed-asset portfolio in terms of allocation. Therefore, the allocation of such assets needs to be constrained in order to better represent the portfolio of a reasonable investor, who is willing to take on varying levels of risk in order to achieve maximum returns.

Echoing Byrne and Lee (1995) Stevenson (2000) maintains a maximum allocation for cash at 10% owing to its overwhelming presence when included in a portfolio, and a maximum allocation for property at 20% which in line with literature surveyed by Stevenson (2000). In this study it was found that in an unconstrained portfolio the inclusion of property was at low risk levels and low returns levels of the efficient portfolio. In fact, the smallest allocation of property in the portfolio resulted in an efficient frontier consisting of shares and bonds. However, in a constrained portfolio property achieved a larger presence and was found at higher risk levels than compared to an unconstrained portfolio (Stevenson, 2000). When the unconstrained portfolio is constrained the returns of the now constrained portfolio are slightly increased, however, the risk aspect increased significantly. The comparative method of unconstrained-constrained portfolios used in the study by Stevenson (2000) will be used in this report in other to better emulate the asset allocation techniques used by fund managers and thus attain results that are useful.

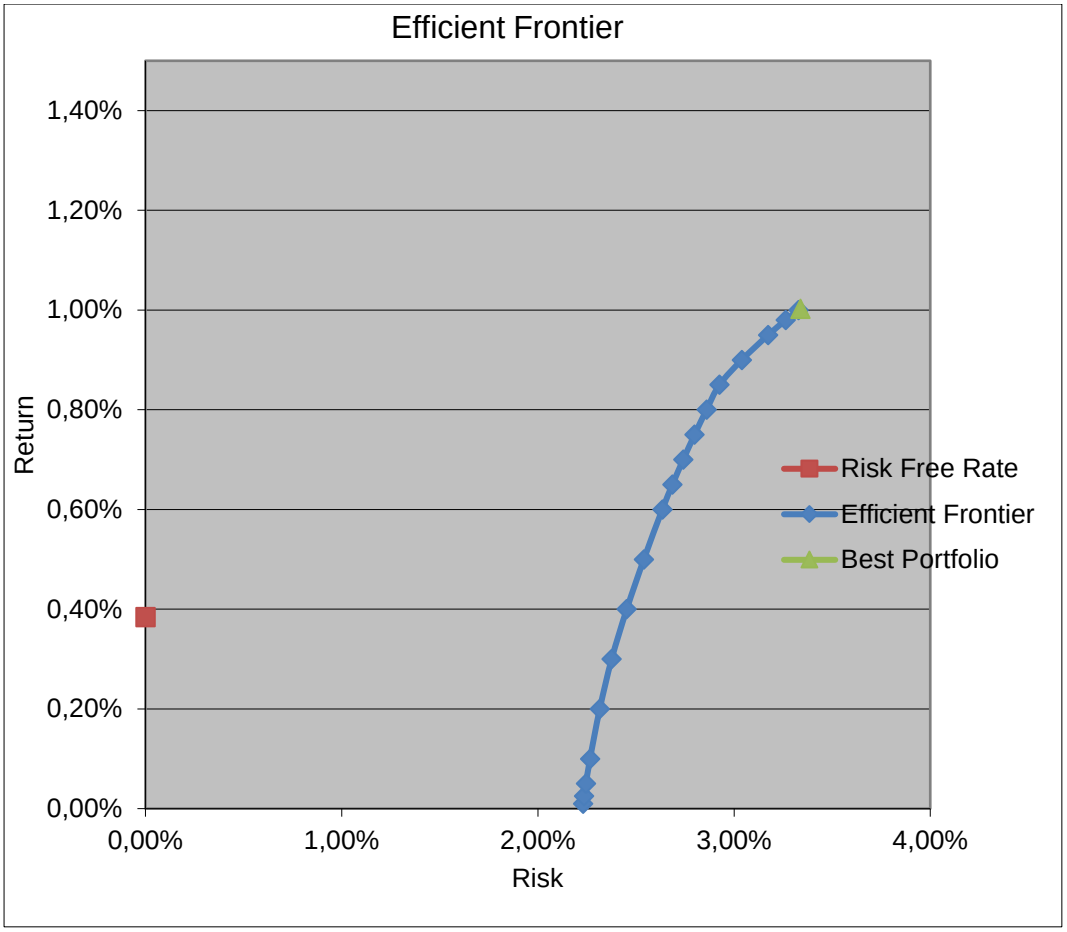


Figure 4.19 Constrained Efficient Frontier

Figure 4.19 displays the constrained efficient frontier for the assets in the portfolio. Here, the contribution of REITs and Listed Property to the portfolio is restricted to a maximum of 10% each (in line with studies by Lee, 2003; Hoesli, Liljeblom, and Loflund, 2012; and Pagliari, 2016; who find 20%, 10-15% and 13% as the upper boundaries of property allocation in a mixed-asset portfolio, respectively). Again, T-Bills, as the risk-free asset, was excluded from the construction of the efficient portfolio in order to show the best return-risk combinations for risky assets, and the risk-free rate, 0.38%, is indicated on the graph, however, the returns used to construct the frontier are nominal returns, that is, risk-free rate has not been subtracted from them. The optimum portfolio is Shares as it is the asset with the highest Sharpe Ratio.

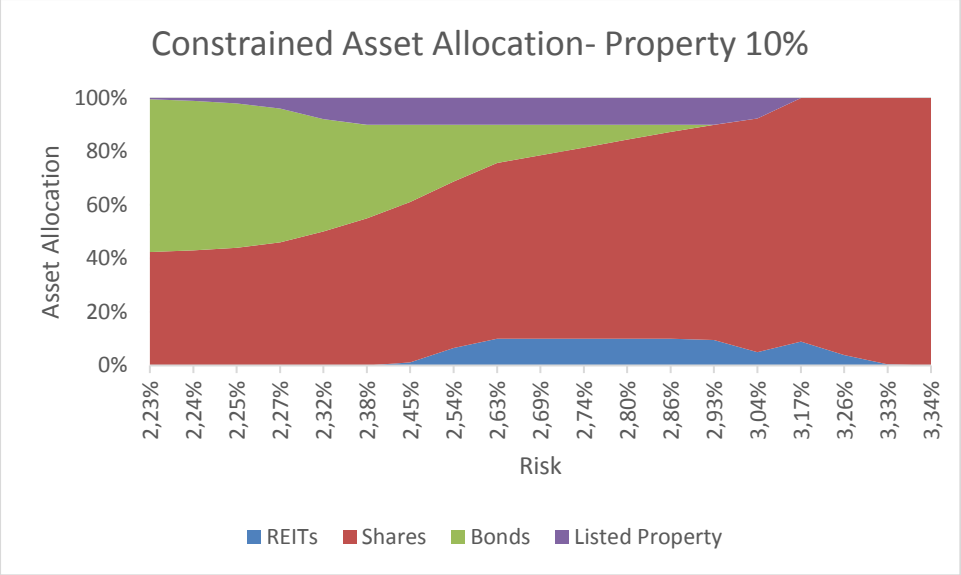


Figure 4.20 Constrained Asset Allocation Diagram: Property

Figure 4.20 is the asset allocation diagram for the constrained efficient frontier. When in a constrained portfolio Bonds play a bigger role at the lower risk levels. Shares are the largest contributor to the portfolio, and Listed Property and REITs have a small allocation but over a wide risk range. Again, REITs play a role in the portfolio at higher risk levels than Listed Property.

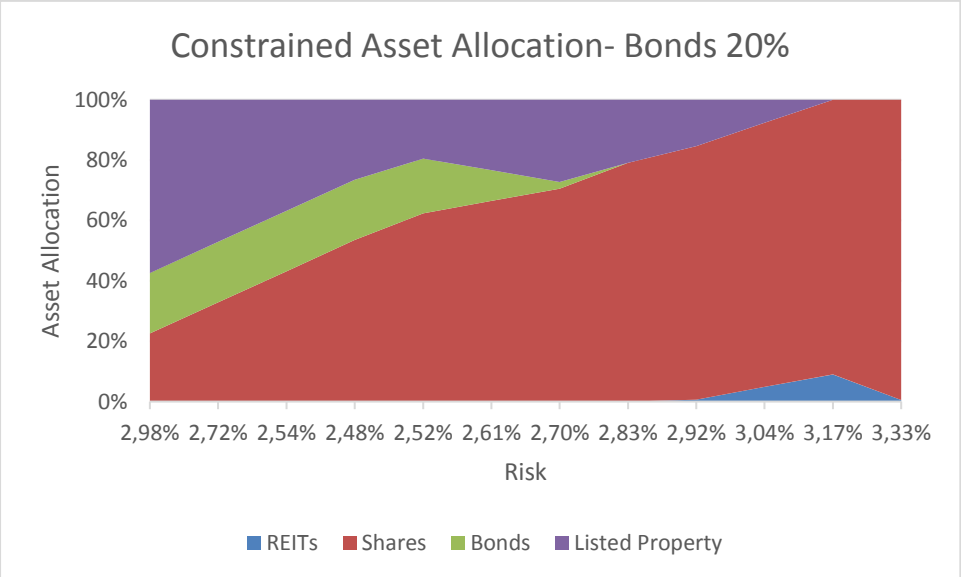


Figure 4.21 Constrained Asset Allocation Diagram: Bonds 20%

A constrained asset allocation diagram has been drawn up using a portfolio where Bonds are limited to a maximum of 20% (Figure 4.21). A comparison of this diagram and the original asset allocation diagram (excluding T-Bills) shows that when Bonds are restricted Listed Property contributes to the portfolio at early risk levels at a greater allocation than compared to when Bonds are not constrained. Shares maintain their trend of an increasing allocation with increasing risk levels, and REITs are allocated at higher risk levels but not with bigger allocation percentages.

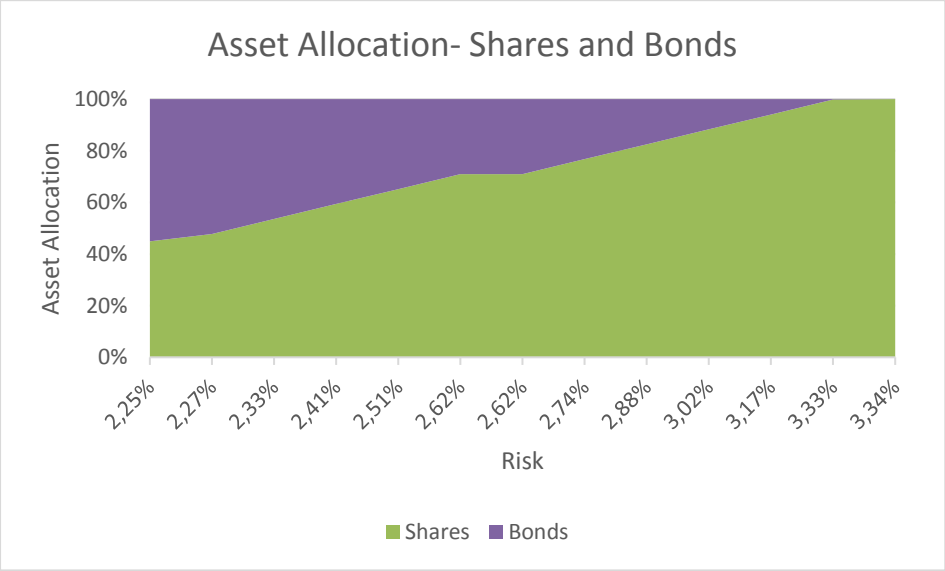


Figure 4.22 Asset Allocation Diagram of Shares and Bonds.

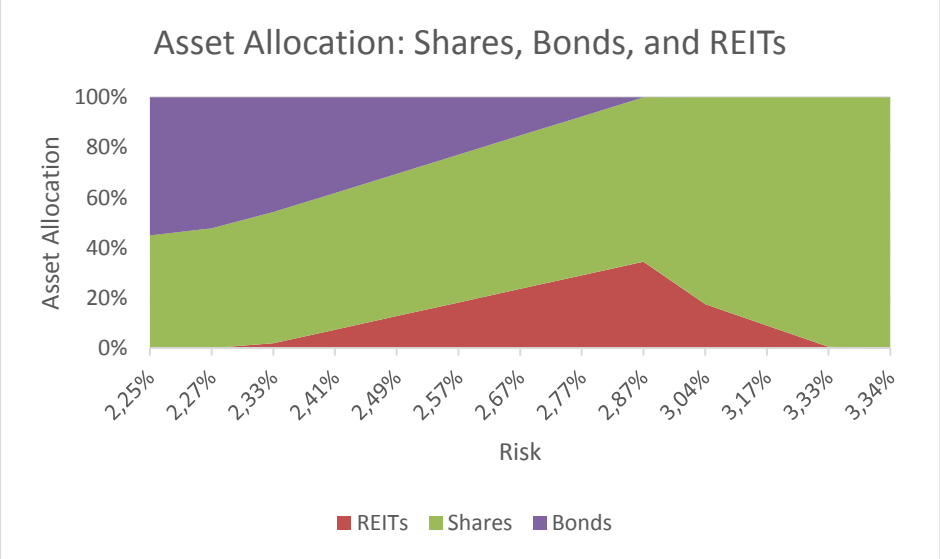


Figure 4.23 Asset Allocation Diagram of Shares, Bonds, and REITs.

Figure 4.22 and Figure 4.23 show the allocation diagram of two portfolios, one consisting of Shares and Bonds only, and one consisting of Shares, Bonds and REITs. These portfolios were constructed to observe the influence of REIT in a mixed-asset portfolio and thus Listed Property has not been included. When REITs is included in the portfolio its maximum allocation levels are less than approximately 40%, and they replace both Bonds and REITs. REITs cover a very wide risk spectrum. Bonds cover a smaller risk spectrum (at the lower levels) and Shares continue to cover the full spectrum.

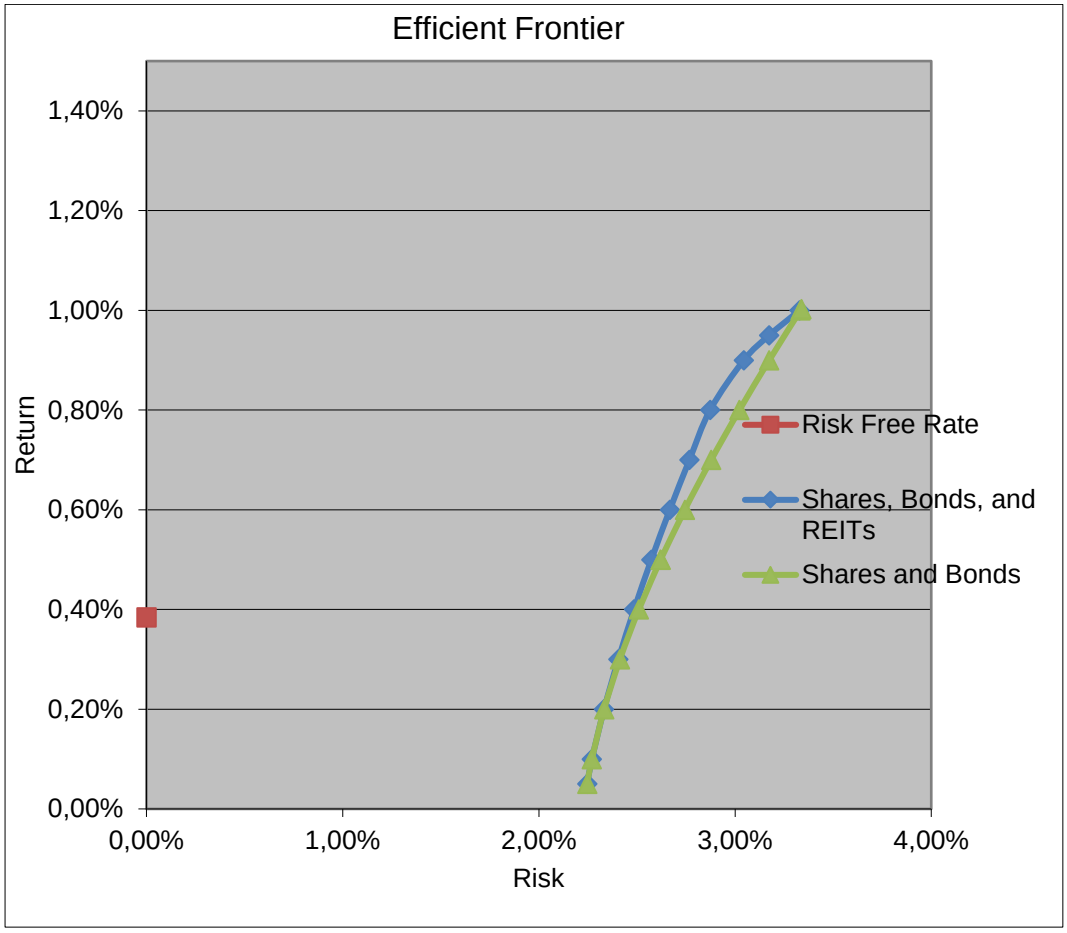


Figure 4.24 Efficient Frontier Comparison

As evident in Figure 4.24 the portfolio which includes REITs is superior to the one that has Shares and Bonds only. At a 3% risk tolerance the expected return and asset allocation of a portfolio of Shares and Bonds is:

- Expected Return= 0.79%
- Shares = 87.41%
- Bonds = 12.59%

And at 3% risk tolerance the expected return and asset allocation of a portfolio of Shares, Bonds, and REITs is:

- Expected Return= 0.88%
- REITS = 20.86%
- Shares = 79.14%

(At the 3% risk tolerance Bonds does not get allocated in the portfolio).

5. Chapter Five: Discussion

5.1 Asset Performance

In terms of annualised average monthly returns from May 2013 to December 2015 Shares was the best performing asset, followed by REITs, T-Bills, Listed Property, and Bonds, in descending order of performance. Interestingly, in the literature surveyed Shares yielding the highest annualised average monthly return is not common. In a study conducted in South Africa before the REIT structure was implemented Olaleye (2011) finds that in terms of returns the order of best performance was Listed Property, Shares, Bonds, and then T-Bills.

In terms of risk-adjusted performance Shares and REITs were the two best performing assets, with Listed Property being the second worst performing asset. In line with literature (e.g. Newell et al., 2010; Newell and Peng, 2012; Newell et al., 2015) REITs have consistently outperformed Listed Property, risk-adjusted, however, unlike these studies, Shares, as opposed to REITs, is the best risk-adjusted performing asset overall. The differences in performance between Listed Property and REITs is noteworthy because, as discussed in the methodology section of this report, the two indices representing these two assets have a very high number of constituents in common.

In the study, Bonds is the worst-performing asset, risk adjusted. Of the studies surveyed Singapore (Newell et al., 2015) is the only market where this, too, was the case. In fact, in the Philippines (Nguyen, 2011), South Korea (Pham, 2011), Taiwan (Peng and Newell, 2012), Japan (Newell and Peng, 2012), and France (Newell et al., 2013) Bonds were the best or second best performing asset, risk adjusted.

Interestingly, in the year the REIT structure was implemented in the South African market (2013) both REITs and Listed Property had negative annualised monthly returns, and Shares, in comparison, performed particularly well (2.24%), but in 2014,

in line with industry reports that South Africa listed property outperformed South African equities and bonds (SA REIT Association, 2015), indeed the findings show that in terms of risk-adjusted performance REITs and Listed Property lead the pack. In 2015 REITs outperformed Listed Property and Shares (risk-adjusted).

In terms of overall risk Listed Property has the highest volatility followed by REITs, Shares, and then Bonds, respectively. As per studies by Newell et al. (2010), Pham (2011), Newell et al. (2012), Newell and Peng (2012), and Newell et al. (2015) the findings of this research show that REITs has a lower risk than Listed Property, and as per the studies by Newell et al. (2010), Nguyen (2011), Newell and Peng (2012), Newell et al. (2013) Newell et al. (2015) REITs and/or Listed Property has a higher risk than Shares. In a South African study (Olaleye, 2011) Shares are the riskiest asset, followed by Listed Property, Bonds, and then T-Bills.

5.2 Portfolio Performance

Diversification

Overall, the strongest positive correlation between asset pairs is between REITs and Listed Property, where r=0.85. This is expected because the representative indices of these two assets have a high number of constituents in common. The 12 month rolling correlation between the two assets shows a consistent very strong positive correlation. This implies that having both assets in a mixed-asset portfolio would contribute negatively to that portfolio's diversification characteristics. The risk and returns of the assets are influenced by similar factors and move (increase/decrease) in the same direction. Bonds have a moderately strong to strong correlation with indirect property (that is, both REITs and Listed Property). The rolling correlation shows that the relationship between Bonds and REITs is very consistent but the relationship between Bonds and Listed Property, although remaining positive and moderately strong varies more, and is showing a decreasing trend. During the period of analysis of this report there were multiple interest rate increases. Bonds are sensitive to changes in the interest rate whereby if the rate increases the value of the bond decreases. REITs, theoretically, are not as sensitive as REIT companies may have fixed loans on their

property. Additionally, an increase in interest rates may lead to an increased demand in rental properties because securing a home-loan may be more difficult or expensive for the prospective homeowner. This is a benefit to REITs. REITs are not as sensitive to inflation as interest rate increases are passed on to the end-user/tenant with in increasing of rental prices, although, in a cash-strapped market, consumers are not able to take on the increase. Despite this, the findings show a strong positive correlation between Bonds and property, both REIT and non-REIT. This suggests that REITs are, in actual fact, sensitive to interest changes because this affects the ability of the REIT to acquire more property, and anticipation of interest rate changes may cause risk premiums to increase because of increase uncertainty, thus resulting in a downward pressure on property prices and capital gains (Investopedia, 2015).

Despite Shares and REITs sharing similar characteristics in the short term, the asset pair has a weak positive correlation, r = 0.40, and Shares and Listed Property have an even weaker positive correlation (r = 0.05). This differs from other studies that consistently find strong positive correlations between Shares and REITs (e.g. Singapore, Thailand, and France), and Shares and non-REIT Listed Property (e.g. Philippines, South Africa, Japan, and Taiwan). However, these papers have significantly longer periods of study. This may be credited to REITs sharing characteristics with Shares in the short-term, and behaving more like direct property in the long-term. The sometimes varying positive correlation between REITs and Shares suggests that the asset pair may, at times, provides diversification benefits to a portfolio because the assets are not highly dependent. REITs and Shares are not fully influenced by the same factors, and that REITs have unique risks.

T-Bills has a weak negative correlation with Shares and Bond, and a weak positive correlation with REITs and Listed Property. The rolling correlation between T-Bills and REITs show that although there are periods where the relationship is weakly negative, overall, it is consistently weakly positive (r=0.06). This is similar to a study of South African non-REIT Listed property where r= 0.002 (Olaleye, 2011). This suggest that the asset pair would be a good contributor to the diversification of a mixed-asset portfolio. T-Bills and Bonds have a very weak negative correlation, whereby the rolling

correlation shows that it does not move far from zero (0). This is expected because T-Bills, a short term investment, and Bonds, a medium to long term investment, are not similarly influenced by interest rate changes. T-Bills are not highly influenced as they do not have enough time to react to interest rate increases, however, theoretically inflation contributes to T-Bills interest rates increasing. This may occur by that increasing interest rates may discourage investors who then seek a less risky asset, that is, T-Bills. This, in turn, creates a demand which causes the price of T-Bills to increase again (Emelda, 2011).

Correlations between assets in a mixed-asset portfolio may change owing to economic factors that affect the financial markets. Correlations that change often and drastically between two assets may present an issue for the property investor in terms of maintaining well diversified portfolio with the highest achievable returns for the risk level preferred. In the event of major changes in correlations between two assets the asset allocation of the portfolio may need to be reviewed. The correlation of two assets is often used as an indication of risk and thus a reaction to changing correlations by the property investor is determined by risk appetite. Therefore, viewing correlations between assets does not provide an investor with enough information to make investment decisions unless an investment strategy is being implemented. An example of this is to minimise the risk in a portfolio by selecting assets with low correlations to each other, whether positive or negative, thus ensuring that assets are affected “individually” by relevant economic factors. Alternatively, an investor may prefer well-performing assets with high correlations, that is, in order to have the chance that both assets will produce good returns the investor is willing to take on the risk that both assets may produce very poor returns simultaneously.

Efficient Frontier and Asset Allocation

REITs and Listed Property both contribute to a mixed-asset portfolio but at varying risk and asset allocation levels. In an unconstrained efficient frontier of risky assets Listed Property plays a significantly bigger role than REITs, whereby Listed Property makes its biggest contribution at mid-risk levels. Shares dominate the portfolio throughout,

and particularly at high risk levels. This is because it has the highest Sharpe ratio, that is, it is the best performing asset risk-adjusted. In a constrained portfolio where REITs and Listed Property are limited to a maximum of 10% REITs play a bigger role in the portfolio than compared to in an unconstrained portfolio, and is present across a larger risk spectrum. Listed Property, on the other hand, although contributing to the portfolio from low to early high risk levels makes a smaller contribute allocation wise. Bonds contribute to the portfolio at lower risk levels whereby they make a significant contribution (approximately 50%) and gradually taper off. The portfolio where Bonds are constrained to a maximum of 20% shows that Listed Property thus has a greater allocation at low risk levels: a trade-off of sorts.

Therefore, Bonds contribute at low risk levels, Shares contribute all throughout, and REITs are associated with higher risk levels than Listed Property, hence suggesting that Listed Property would be more desirable in the portfolio. Interesting, REITs was the second best performing asset, risk-adjusted, while Listed Property was fourth. Therefore, the poor representation of REITs in the mixed-asset portfolio is explained by that REITs have the strongest correlation with each asset than other asset pairings combined (apart from Listed Property and Bonds), and most of the correlations are positive. However, the minimal differences in correlation when doing a year-by-year comparison of correlation suggest that the short period of analysis in this report did not have a major influence on the results in this particular regard. Between 2014 – 2015 the following asset pairs' correlation change by more than 20 values: T-Bills and REITs, T-Bills and Bonds, T-Bills and Listed Property, and Shares and Bond (20 values is taken to be a difference significant enough for a correlation to change from weak to strong, and vice versa, and 2014 is chosen as the first point of analysis as it is the first full year of the operation of South African REITs, and this is the year that South African Listed Property as a whole performed well).

A comparison of a portfolio with Shares and Bonds, and Shares, Bonds and REITs was conducted. Listed Property was excluded from the portfolio because when the very strong correlation between REITs and Listed Property is taken into consideration only one of these assets would be chosen for inclusion into the portfolio in order to

preserve the diversification properties. The comparison of these two portfolios shows that REITs is a return-enhancer. This is expected considering that this asset is the second best risk-adjusted performer.

Byrne and Lee (1995) noted that data manipulation when conducting an MPT analysis may have an influence on the results on optimum asset allocations in a portfolio, although this manipulation (e.g. smoothing data) is necessary. The study found that unconstrained asset allocation particularly of low risk assets tends to overwhelm the portfolio and restricts the inclusion of property (Byrne and Lee, 1995). This finding is illustrated in this report where the allocation of Listed Property in a portfolio increases once Bonds is constrained. Byrne and Lee (1995) thus noted that data and asset allocation adjustments need to be made during analysis or one might end up with allocation that are not practical for implementation by an investor.

General Performance

The poor performance of Bonds can be attributed to increases in the repo rate, which in turn causes the value of Bonds to decrease. In the period of study, 2013 to 2015, the repo rate increased with no decreases. From mid-2015 to 2016 there were multiple increases to the rate; these increases can partially be attributed to investor reactions to political factors in South Africa. The rate remained unchanged for the longest period of time between mid-2014 to mid-2015. This is reflected on the risk levels of Bonds which did not change much during this period. However, the risk level on Bonds sharply increased at the end of 2015, which coincided with another increase of the repo rate, along with the politically-influenced economic turbulence caused by “Nene-gate”: the unexpected removal of the South African minister of finance. The risk levels associated with Shares were highly affected by the same factors affecting Bonds. The aforementioned politically-influence economic turbulence affect investor confidence in the South African market and this is reflected on the performance of Shares. Additionally, owing to the nature of REITs and Listed Property changes in the Repo Rate also affect the property market.

The South African market has not been devoid of strike action, and this possibly affects performance of assets and, in turn, their correlation to each other. During the period of the study, 2013 to 2016, the South African economy has seen strikes (and aftereffects thereof) in the platinum mines, national airline, national post office services, metalworkers, and municipal refuse removal services, to name a few. For large industries such as mining and manufacturing strike action and decreases in commodity prices (as experienced in the time period of study) can have a large impact on the performance of indices.

The risk-return performances of REITs and Listed Property may be affected by the same factors affecting the performance of Shares, as discussed above. Specifically, REITs and Listed Property, along with Shares were also affected by load-shedding in South Africa, that is, the scheduled terminated supply of electricity to certain areas at certain times because the national electricity grid was unable to supply the demand. Oversupply of commercial space, for example, has affected the performance of the property market where vacancies in some nodes are notable despite the fact that demand is decreasing.

6. Chapter Six: Conclusion

The introduction of REITs to the South African market has made investing in South African property more appealing to both local and international investors. Investors hold a portfolio of assets that includes REITs in order to attempt to maximise returns and minimise risk by holding optimum asset combinations.

This paper has discussed the introduction of REITs to the South African market in May 2013, along with the specific features that South African REITs have, thus differentiating them PLS and PUTs. Additionally, the history of REITs, their development and their features was briefly discussed. The paper analysed the initial performance of South African REITs, compared the performance with that of select assets, and observed the nature of relationship between the various assets in the context of a mixed asset portfolio, using monthly returns indices from INetBFA.

The report finds that Shares are the best risk-adjusted performing asset, followed by REITs. This finding is not consistent with the literature surveyed, however, REITs outperformed Listed Property and this, along with REITs having lower risk levels than Listed Property, is in line with literature. There is a varying positive correlation between REITs and Shares which suggests that the asset pair may provide adequate diversification properties to a mixed-asset portfolio. These two assets are not fully influenced by the same factors. Therefore, this asset pair is suitable for both high-risk and low-risk investors. The poor performance of bonds suggests that the risk management of a mixed-asset portfolio should not be implemented only through the inclusion of low risk assets into the portfolio, but it should achieved through utilising correlation relationships between assets that reduce risk through diversification as opposed to dependence on low risk assets. In a constrained portfolio consisting of Shares, Bonds, and REITs the latter presents itself as a return-enhancer. This would appeal to a high-risk investor who may forgo an investment solely in Shares and Bonds, in order to achieve the greater returns an inclusion of REITs presents. The poor performance of Bonds in this report supports the strategy of low risk assets being constrained within a mixed-asset portfolio owing to their undue influence. A yearly

analysis shows that in the year REITs were introduced to the South African market REITs and Listed Property had negative annualised monthly returns. With the short period of analysis for this report this may have had an influence on the overall results, or it may be caused by investor's initial uncertainty regarding the successful introduction of the REIT structure. The REIT index and the Listed Property index have a high number of constituents in common and thus these assets have a consistent strong positive correlation. This makes the asset pair a poor contributor to the diversification of a mixed-asset portfolio. There is a poor diversification relationship between Bonds and REITs (and Listed Property). This suggests that although REITs can pass on some interest rate increases to the end-user the effect that these increases have on incoming-producing property is greater than what can be passed on. T-Bills have a consistently weak correlation with all the assets thus making them beneficial to include in a mixed-asset portfolio. However, as a low risk asset their allocation must be constrained.

The efficient frontiers and respective asset allocation show that while REITs have a higher return and lower risk than Listed Property it is Listed Property that has a larger presence in a portfolio. When Listed Property is constrained REITs has a significantly increased presence. Although seemingly peculiar this finding is because Listed Property has weaker correlation with the various assets than compared to REITs and the assets. In a portfolio without Listed Property REITs play a more significant role, and a comparison of a portfolio without REITs and one with REITs shows that REITs is a return-enhancer- these portfolios containing Shares and Bonds as the only (other) assets. South African portfolios are not immune to the effects of low risk assets in a mixed-asset portfolio whereby the low risk asset has an overwhelming presence if not constrained. A rational investor who aims to make maximum returns will thus not use an unconstrained portfolio.

Interestingly, literature has not identified a single optimum holding period for property where studies such as Brown and Geurts (2005) and Cheng et al. (2010) etc. find that the optimal holding period is determined mostly by factors and preferences of the investor rather than broad general macro-economic factors. By virtue of that REITs

have a dual nature where its characteristics resemble Shares in the short-term, and direct property in the long term (Morawski et al., 2008) it is therefore recommended that the study be repeated once a longer time frame is available. This would then make the study in line with current literature whereby the majority of the literature surveyed has a period of study spanning approximately 10 years.

This report contributes to literature by contributing to the few studies that exist on young markets, as they are not necessarily influenced by the same factors and to the same degree as developed markets are. This is particularly the case for South Africa as it is the only fully develop REIT market in Africa. Additionally, recent studies on REIT markets include the Global Financial Crisis in the period of analysis. Such studies do not necessarily provide a fair basis of comparison as South African REITs were introduced in 2013.

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8. Appendices

Appendix A: Yearly Asset Performance

2013						
Asset	**Rate of Return (%)**	**Risk (%)**	**Sharpe Ratio**	**Reward to Risk**	**Asset Beta**	**R-Value of Beta**
REITs	-0,42%	3,98%	-0,20	-0,04	0,21	0,05
SHARES	2,24%	4,23%	0,44	0,02	1,00	1,00
ALBI	-1,25%	2,49%	-0,65	0,52	-0,03	0,00
T-BILL	0,37%	0,00%	0,00	0,00	0,00	0,18
SAPY	-1,53%	5,63%	-0,34	0,03	-0,70	0,28
2014						
Asset	**Rate of Return (%)**	**Risk (%)**	**Sharpe Ratio**	**Reward to Risk**	**Asset Beta**	**R-Value of Beta**
REITs	1,37%	2,79%	0,35	0,01	0,79	0,38
SHARES	0,61%	2,19%	0,10	0,00	1,00	1,00
ALBI	0,11%	2,06%	-0,14	-0,01	0,53	0,32
T-BILL	0,39%	0,00%	0,00	0,00	0,00	0,02
SAPY	1,43%	3,45%	0,30	0,01	0,81	0,27
2015						
Asset	**Av. Annual Rate of Return (%)**	**Risk (%)**	**Sharpe Ratio**	**Reward to Risk**	**Asset Beta**	**R-Value of Beta**
REITs	0,29%	3,87%	-0,03	0,00	0,58	0,32
SHARES	0,15%	3,76%	-0,06	0,00	1,00	1,00
ALBI	-1,04%	3,05%	-0,47	-0,06	0,24	0,09
T-BILL	0,39%	0,01%	-0,01	0,00	0,00	0,05
SAPY	0,20%	4,03%	-0,05	0,00	0,59	0,30

Appendix B: Yearly Asset Correlation

2013					
	REITs	***Shares***	***Bonds***	***T-Bills***	***Listed Property***
REITs	1,00				
Shares	0,22	1,00			
Bonds	0,88	-0,05	1,00		
T-Bills	-0,20	-0,42	-0,02	1,00	
Listed Property	0,67	-0,53	0,79	0,10	1,00
2014					
	REITs	***Shares***	***Bonds***	***T-Bills***	***Listed Property***
REITs	1				
Shares	0,62	1			
Bonds	0,81	0,57	1		
T-Bills	0,28	-0,15	0,05	1	
Listed Property	0,97	0,52	0,785	0,31	1
2015					
	REITs	***Shares***	***Bonds***	***T-Bills***	***Listed Property***
REITs	1				
Shares	0,56	1,00			
Bonds	0,74	0,30	1		
T-Bills	-0,24	-0,23	-0,48	1,00	
Listed Property	0,95	0,55	0,74	-0,31	1