



AN INVESTIGATION INTO SOUTH AFRICAN PROPERTY UNIT TRUSTS: DO ACTIVE MANAGERS ADD VALUE TO INVESTORS?

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Abstract

Active vs passive management is a central debate within asset management, with active managers promising superior market beating performance after fees through their superior knowledge and stock selection. This study investigates the performance of 34 South African property unit trusts over multiple periods between 2005 and 2018. Fund performance was evaluated using three risk-adjusted measures, namely the Sharpe ratio, information ratio and Jensen's alpha, in order to determine whether there is significant outperformance amongst the funds. The benchmark used to compare performance was the South African Listed Property index (SAPY), which is the most common and well established proxy for the South African property market. The sample was divided into three periods, long term 2005-2018, medium term 2008-2018 and short term 2015-2018.

In all periods, outperformance of active funds were shown to be inconclusive, with only a small number of funds showing significant positive alphas and significantly high Sharpe and information ratios. A small number of funds achieved outperformance across multiple periods. On average significant outperformance was uncommon and inconsistent. Furthermore, a number of funds achieved significant underperformance over multiple periods, with inferior risk-adjusted returns and alphas compared to the benchmark. However, the volatility of fund returns were shown to be less than the benchmark on average in all periods, indicating that active managers were able to reduce volatility compared to the benchmark. In the more recent short term period, performance of the active funds were especially low with many negative alphas' present. The best performing fund across multiple periods was shown to be a risk parity portfolio of property stocks, which achieved significantly higher returns whilst having lower volatility than the benchmark and other funds.

Ultimately the results suggest that active managers in the sector do not provide sufficient evidence for outperformance. Hence investors are better of making use of passive indices or a risk parity portfolio if they are looking for exposure to South African listed property. This is in line with other international studies which have also found that active management in the property industry does not provide significant and consistent outperformance. These results provide useful insight to property investors in South Africa and contribute to the debate between active vs passive management within the financial literature.

Plagiarism Declaration

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1. Introduction

Active vs passive management has been a longstanding debate within the investing community, with contrasting findings as to which strategy earns a higher return and adds value to investors. Alpha is the term used to describe the delivery of superior risk-adjusted returns, which active managers aim to achieve. Investors often select their fund managers and investments based on their potential to deliver significant alpha and fund managers are rewarded on this basis. Globally there has been extensive research in multiple asset classes determining whether or not asset managers are able to successfully achieve alpha and outperform the market, with no general consensus being found. Referring specifically to active management within property unit trust market, there have been multiple international studies done, with the consensus being that managers in this industry on average fail to add significant value (Kallberg, Liu and Trzcinka, 2000; Chiang et al. 2008). Within the South African context, little to no research has been done on property unit trusts and whether they are able to provide outperformance to investors. The purpose of this paper is to determine whether there is an informational advantage present in the listed real estate market and whether or not South African property unit trust managers can make use of this to outperform the market.

1.1 Background

The Johannesburg Stock Exchange (JSE) has historically had three categories which encompass property listings, namely: property loan stocks, property, or property unit trusts. Currently there are four types of property entities listed on the JSE, namely property unit trusts (PUTs), real estate investment trusts (REITs), property holding and development companies and property loan stocks (PLS). A property unit trust or mutual fund is a portfolio of investment grade properties that is technically a pooled equity fund that invests in real estate. Property unit trusts invest in listed real estate companies that develop and manage property in various sectors such as commercial, retail or residential. The largest REIT's that make up a substantial portion of the South African listed property sector are the likes of Growthpoint, Redefine and Hyprop Investments. Investing in property unit trusts provides investors with diversification across the real estate market and allows for returns in line with the general listed property sector. The presence of property unit trusts and property loan stocks on the JSE has created an easy entry and exit into an otherwise difficult market for investors, which usually requires large

sums of capital. According to the Association for Savings and Investments South Africa (ASISA), securitised property investments offer investors the following benefits:

- Access to high quality property assets which would ordinarily be unobtainable for the average investor
- Liquidity of investment, compared to investing in direct property which is highly illiquid
- Greater flexibility in responding to market fluctuations and conditions
- The ability to diversify investments across a number of different asset types
- Greater cost reduction of fund management through economies of scale

The advantages listed above are some of the main reasons as to why investors choose to invest in property unit trusts, as opposed to investing directly into property or into property stocks themselves. The question arises whether the managers of active property unit trusts can significantly and consistently outperform the property market or whether investors are in fact better off investing in passive indices. Passive funds simply track the property benchmark and may achieve greater returns net of fees.

From the onset of 2019, the property unit trust market in South Africa consists of 45 funds, of which 34 funds are actively managed and 11 are passive or index tracking exchange traded funds (ETF's). The total amount of capital in the property unit trust industry is currently at R54,621 billion at the end of 2019, which is roughly 10% of the total listed property sector, which has R540 billion assets under management (Fundsdata, 2019). The number of property unit trusts has increased steadily over the past five years, with 16 new funds being opened since 2014 (Fundsdata, 2019). The increase in the number of property funds over the last five years is likely due to the strong performance leading up to 2017, which saw many firms wanting to profit from the bullish run of the property sector.

The general performance of the South African listed property sector has been poor over the last two years, having been the best performing sector in 2017. In 2018, the South African Listed Property Index (SAPY) ended the year with -25.2% return (Fundsdata, 2019). The SAPY is the oldest and most popular listed property benchmark in South Africa and has often shown to be highly concentrated in a small number of large market capitalisation REIT's. The largest five property stocks and REITS make up a significantly high proportion of the index at 63.5% at the end of December 2018. This leads to the performance of the SAPY to be highly reliant on these stocks and thus makes it highly volatile and less diversified than a less concentrated

index. The question arises as to whether active managers in the property industry were able to match the strong performance in the industry leading up to 2018. Furthermore, were active managers able mitigate some of the losses and volatility that occurred during 2018 with superior stock selection and risk management? Lastly, does the highly concentrated benchmark mean that active managers can achieve less volatile and better risk-adjusted returns by avoiding being over allocated to the largest property stocks? These questions will be discussed and analysed in the results of this study.

Figure 1: South African Listed Property Index vs South African Equities performance

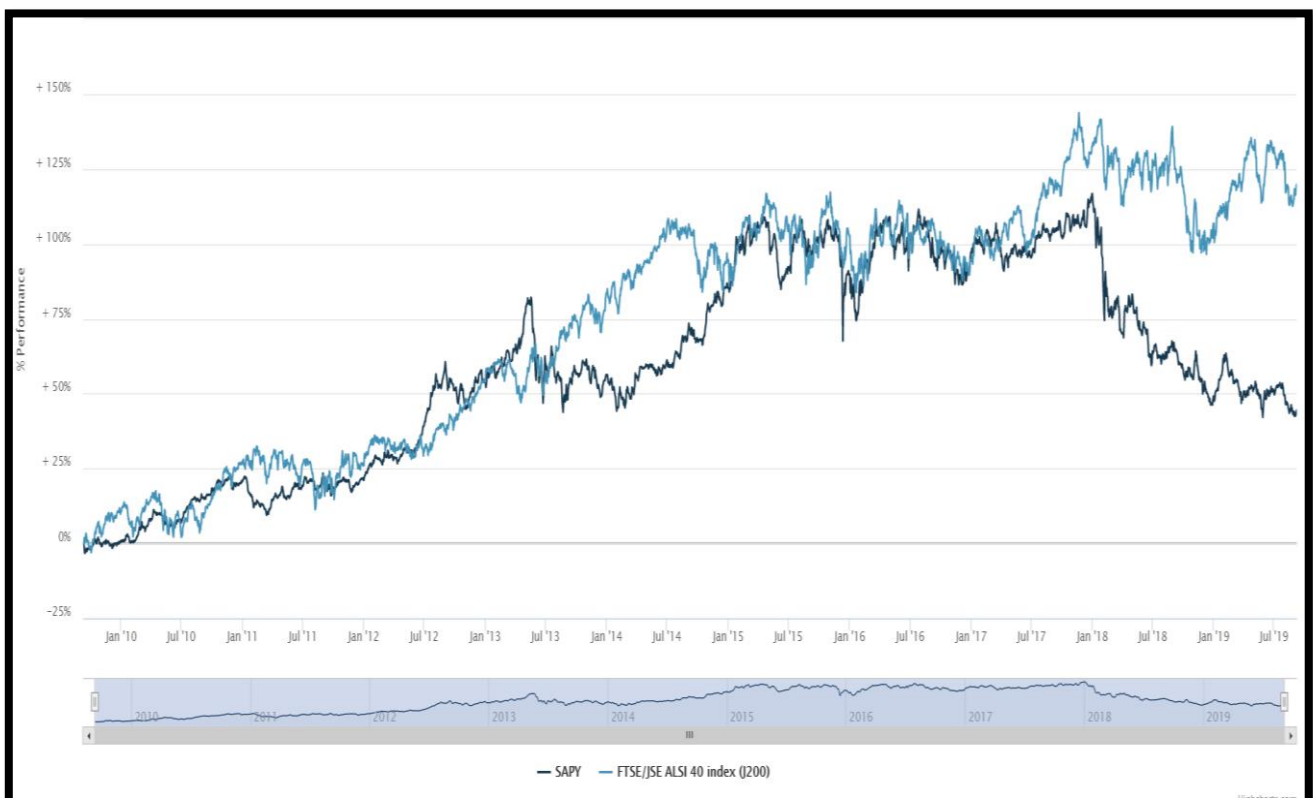


Figure 1 illustrates the performance of the SAPY in comparison to the major South African equity benchmark, the JSE Top 40 index. The graph shows the strong positive performance of the property sector beginning in 2010 up to 2017, in which South African real estate performed similarly to South African equities. However, from the beginning of 2018 one can see the sharp decline in performance in the property sector, which has continued its downward trend into 2019.

Figure 2: Listed Property Vs Residential Property Returns



Figures as at 30/06/2016. Source: Bloomberg, INET, Sharenet. Listed Property (FTSE/JSE Listed Property TR Index - J253T). Residential Property (BIR Residential Property Price Index plus 7% for the yield component).

Figure 2 further illustrates the strong performance of South African listed property up to 2017, with it outperforming residential property over all three time periods. This illustrates the usefulness of listed property to investors seeking exposure to the property market, as returns have been greater than the residential market.

Since 2010, there has been a notable growth of passive property unit trusts, which may be indicative of the market sentiment in the industry. Passive funds may potentially offer superior performance with lesser fees than actively managed funds. The same can be said for the general equity unit trust industry, with passive funds making up 4.5% of the market in 2010 and increasing to 10.8% in 2019 (ASISA, 2019). Determining whether the passive property funds are able to outperform the actively managed ones is a key consideration in this research.

2013 saw the introduction of Real Estate Investment Trusts (REIT's) into the South African property industry, which are companies that invest directly into income producing property and trade like stocks. Since the introduction of REIT's to the South African market in 2013, the listed property sector has seen notable growth, allowing property unit trusts to benefit from having a larger selection of stocks to choose from. Property unit trusts seek outperformance by investing in specialised real estate securities, such as the South African domestic REITs and other property related companies. This would normally be considered as contrary to conventional portfolio diversification theory, which seeks to minimise idiosyncratic risk. This apparent risk taking activity is however explained by the fund manager's specialist ability to

generate outperformance through his/her superior skills and knowledge in the industry (Kallberg, Liu and Trzcinka, 2000).

The empirical debate whether active portfolio managers can outperform passive managers has long been examined in the general unit trust industry. Unit trust managers claim to have superior knowledge and skill which allows them to choose outperforming stocks and thus promise investors outperformance. Grossman and Stiglitz (1980) were the first to develop a theoretical model which explained how managers could possess superior information from asset selection or timing of transactions. However, predominant research into mutual fund performance has provided little concrete evidence to show positive abnormal performance of managers.

This paper aims to analyse the performance of active managers, specifically in the property unit trust sector. It also refers to the performance of general unit trusts as a whole and whether active management provides value through superior performance. Research into unit trust performance appears to show inconclusive evidence of value added in the South African equity unit trust sector. Currently there is minimal existing literature that investigates the performance of South African property unit trusts and whether outperformance is present.

1.2 Research Problem Statement

A knowledge gap exists in the current South African real estate industry, as to whether active managers in this specific sector are able to use their superior information to pick outperforming stocks and provide outperformance to investors.

1.3 Aims of the Study

The primary aim of this study is to analyse and investigate the performance of South African property unit trusts and determine whether they are able to outperform the market and provide value to investors. In doing so one can determine whether the South African property market has any informational advantage or inefficiencies which unit trust managers can take advantage of.

1.4 Objectives of the Study

The objective of this study is to gather total return data on all available property unit trusts and the relevant property industry benchmark, in order to determine whether the funds are able to

outperform the market. This will be conducted using a sample of funds from the South African property unit trust market, covering the period 2005-2018.

1.5 Significance of the Study

This paper aims to make an empirical contribution to the body of knowledge of the South African unit trust industry. This study will critically evaluate the performance of South African property unit trusts and determine which funds are able to provide outperformance to investors. Deciding whether active or passive management in the property unit trust industry is highly relevant to investors, as they can make a more informed decision. Ultimately, this study aims to add to the existing literature in a meaningful way as it provides a performance evaluation on an industry that has yet to be analysed in detail. Furthermore, it seeks to provide further insight as to whether or not there is an informational advantage specific to the real estate sector which managers can take advantage of.

Studies addressing this issue have been done abroad but not in a South African context, analysing property unit trusts specifically. International studies by Kallberg, Liu and Trzcinka (2000) and Chiang et al. (2008) investigating performance in property unit trusts, found inconclusive evidence of significant outperformance and persistence of performance. Other South African studies such as those by Meyer-Pretorius and Wolmarans (2006) Bertolis and Hayes (2014) as well as others, have focused primarily on general equity unit trust performance and persistence. There are however, none on property unit trusts per se.

There are further concerns of market inefficiencies in the South African property industry, as the market is recognized for being highly concentrated in a small number of shares. Whether active managers in this sector can make use of these inefficiencies is of interest to investors.

1.6 Outline of the Study

The remainder of the paper will be structured as follows: Chapter 2 is a review of the existing literature relating to unit trusts which will be analysed. Relevant findings and methodologies will be discussed which are pertinent to this study. Following this, the research methodology and data used in this study will be presented in chapter 3. Next, the data will be analysed and the results of the analysis will be presented and discussed in chapter 4. Finally, concluding remarks and investment recommendations will be given in chapter 5, followed by recommendations for future research.

2. Literature Review

2.1 Introduction

This section begins by discussing the theory behind active and passive managers and discusses the principles behind outperforming the market. Next, there will be a review of international literature on general unit trust performance in order to determine whether there is significant outperformance outside of South Africa. The methodologies used in these studies will also be highlighted. Following this, the results of South African unit trust studies will be discussed to determine whether or not there is outperformance in the South African equity market. Thereafter there will be a review of the international literature specific to property unit trusts and a review of the performance of these types of specialised unit trusts abroad. Lastly, there is a summary of the various findings and a conclusion on the consensus given by the literature.

2.2 Theoretical Reasons for Active vs. Passive Management

This section will analyse the existing literature and theories surrounding asset performance. These theories contrast one another on the effectiveness of active vs passive management.

2.2.1 Efficient Market Hypothesis

When reviewing active vs passive performance, which is a common theme for unit trust performance, a key piece of literature to consider is the Efficient Market Hypothesis (EMH). The EMH claims that financial stocks always reflect all the available information and it is therefore impossible to “beat the market” on the risk-adjusted basis, since market prices are considered to be correct. The implication of the EMH is that when new information arises, it spreads quickly and is immediately incorporated into the price of a security with no delay (Malkiel, 2003). Many investing techniques such as technical analysis or fundamental analysis, make use of either historical prices or financial information such as company earnings, to predict the future performance of a share. According to the view of Malkiel (2003), neither technical analysis of a stock, nor even fundamental analysis can be used to determine so called “undervalued” stocks, which would allow investors to achieve greater returns compared to randomly selected portfolio with similar risk. Thus according to the EMH these strategies are senseless, as there should be no informational advantage between managers which would lead to outperformance. The EMH brings into question the purpose and effectiveness of active

management of portfolios, given that managers should in theory not be able to outperform one another on an informational advantage perspective.

The efficient market hypothesis comes in three strengths, namely weak, semi-strong and strong form. Each form has separate implications for managers if they are found to be true. The weak form claims that investors cannot outperform the market given only historical prices and volume data, thus technical analysis is considered futile. The semi-strong form states that investors are unable to outperform the market using only publicly traded information such as fundamental data and analyst recommendations. The strong form claims that one can only outperform the market with insider information which is considered illegal. Lastly, the strong form of market efficiency states that investors can never outperform the market, primarily because the market prices contain all the available information whether they be public or private (Goetzmann, Grinold and Kahn, 1996).

The general consensus in the literature is that unit trust investment performance is consistent with at least the semi-strong form of EMH. This implies that any effort and resources spent on research and trading is futile, given that stock prices already include all available information (Ippolito, 1993). The EMH argues that active managers should not be able to outperform the market on an unleveraged basis and therefore passive management should be preferred. In the context of South Africa, studies have been conducted to determine what form of market efficiency is prevalent in its market. A study by Smith and Dyakova (2014) showed that the South African market is the most efficient market in Africa due to its size and liquidity compared to others in Africa. Their results show that the degree of market predictability is relative to size liquidity and market quality, of which South Africa was the largest. They conclude that with markets being mostly efficient, profit opportunities for active managers exist only from time to time. Thus according to the literature there should be a small opportunity for active managers to outperform (Smith and Dyakova, 2014). The South African market has been shown to be mostly efficient, making persistent outperformance difficult (Smith and Dyakova, 2014).

A key idea associated with the EMH is that of a 'random walk', which refers to how to price a series where all subsequent price changes represent random departures from the previous price. It states that price movements from one period to another are independent and approximate to

those in a random walk (Malkiel, 2003). The implications of prices representing a random walk is, if information is already reflected in the current stock price then prices in the next period will reflect the information present in the future period and will be independent of the previous prices (Nana, 2011). Ultimately there should be no zero risk opportunities present which would allow investors to achieve above average returns without taking on higher risk (Malkiel, 2005). News is by definition unpredictable, the resulting changes in price are defined as unpredictable and attributed as a random walk. Given the fact that markets are efficient and that prices appear to represent a random walk, Malkiel (2005) concludes that markets are largely unpredictable. This therefore provides further evidence against the usefulness of active management and once again points towards passive management as offering the more rational strategy.

However, the EMH is not infallible nor devoid of criticism, as evidence has emerged that some of the assumptions of the EMH may in fact be erroneous. Evidence emerged that stock returns may not in fact be independent over time, as some returns appeared to be positively correlated over short periods and negatively correlated over longer periods (Chordia and Swaminathan, 2000). Furthermore, there has been further evidence of various seasonal and day-of-the-week price patterns which challenge the validity of the EMH (Berument and Kiyamaz, 2001). Lastly, there is also evidence which show that stock prices have a considerable degree of predictability given their fundamental variables, such as dividend yields, price-earnings ratios, price-to-book and market capitalisations (Nana, 2011). These findings show that there appears to be some degree of inefficiency in markets which is in contradiction to the EMH. This indicates that there may indeed be value in active management and stock selection based on these factors.

Ultimately if the EMH holds and markets are assumed to be efficient, then it can be assumed that active management is futile as managers cannot use superior information to outperform the market. In support of the EMH, Malkiel (2003) states that the most convincing evidence of market efficiency is the fact that profitable arbitrage opportunities are not yet readily available and professional investors are not able to outperform the collective market as a whole. A study from Berk (2005) also points out the evidence that active managers as a group do not outperform the market. However, a later study done by Berk and van Binsbergen (2017) found their sample of active managers were on average skilled and did in fact outperform their benchmarks. The evidence for outperformance among active managers is mixed and inconclusive, hence the efficiency of markets fluctuates.

The implications for this on the property unit trust industry are mixed, as managers in this industry may similarly possess or not possess any extraordinary skills that would allow them to outperform the market. However if one accepts the EMH, then the theory suggests that on a reasonable basis, active managers may not be able to outperform the market and that passive management is therefore the most sensible choice.

2.2.2 Alternative Theory: Grossman and Stiglitz Hypothesis

The EMH appears to give a reasonable theoretical reason as to why active managers should not be able to outperform in an efficient market. There are however some theories which refute this claim and propose that there may still be ways in which active managers can outperform and add value.

A paper by Grossman and Stiglitz (1980) hypothesised that there was significant value in private information that allowed managers to make advantageous decisions. They showed that abnormal returns will exist if there are costs in gathering and processing information. These abnormal returns are necessary to compensate investors for their work in gathering and processing information (Grossman and Stiglitz, 1980). They further postulate that in a large and liquid market, information costs would likely only account for a small abnormal return, but that the return would still be noticeable. Grossman and Stiglitz (1980) conclude by claiming that perfectly informationally efficient markets are an impossibility, because if markets are perfectly efficient then the return on gathering information will be zero. This would lead to no reward, resulting in the futility of the existence of markets.

Damodaran and Liu (1993), in an American study, added to this concept when they discovered that there was material information present in the appraisal process of real estate investments. Insiders had access to this information prior to public release, which caused a material impact on the pricing of REIT's. Furthermore, this concept was later supported in a real estate mutual fund performance paper by Kallberg, Liu and Trzcinka (2000) who also postulated that there was an informational advantage in the property industry. Thus early hypotheses by many in the investing community speculate that there are certain informational advantages present which can allow some managers to outperform the market. Given the rise in number of actively managed unit trusts over the last 40 years this idea seems to be logical, as there is clearly a demand for active managers globally. Whether or not this demand is justified in the South African property fund sector remains to be seen. Given the hypothesis of Grossman and Stiglitz (1980), the EMH does not hold and active managers should be able to outperform.

2.3 Global Unit Trust Performance Evaluation

This section will analyse the existing literature on general unit trust performance and methodologies used for determining performance. The findings and methodologies used are expected to be similar to those in the property unit trust industry. The most common methods used to evaluate performance can likely be used in this study. Evaluating the findings and results will allow for a better understanding of whether active managers can outperform in the case of general equity portfolio management and this can further be linked to the property industry. Understanding the performance of international unit trusts and comparing this to South African fund performance can also be useful in determining whether the South African markets act similarly to larger and more established markets abroad.

One of the earliest and most predominant attempts to evaluate unit trust manager's performance was done by Jensen (1968). Making use of the Capital Asset Pricing Model (CAPM), Jensen showed a method in which a manager outperformance could be captured by the intercept term, alpha, in the model. In his sample of mutual funds from 1958-1967 he found that the average value of alpha was in fact negative, implying that managers underperform their benchmark and actually destroyed value. This was the first significant study which illustrated that active managers underperformed and claimed that passive investment strategies would be of greater value to investors. The most common approach in the literature to measure fund outperformance, is the use of Jensen's alpha. It calculates the performance of a fund as its return in excess of the expected return of a passively managed portfolio following similar risk and investment strategies. The existence of abnormal performance or their stock picking skills are assessed by the statistical significance of a t-test (Zhao, Macgregor and Schultz, 2013).

After Jensen's initial study a large amount of research followed which evaluated the performance of unit trusts in more recent periods. A prominent and often cited article by Grinblatt and Titman (1989a), identified the presence of skill in some fund managers who were able to outperform the market in gross returns. However, when adding fees to the calculation the superior performance diminished, thus again showing the fund managers inability to actually outperform and add value. The effect of fees dampening returns and making outperformance insignificant is a recurring theme in the literature according to Bond and Mitchell (2010).

Ferson and Schadt (1996) made use of the Jensen's alpha method, as well as two market timing models which incorporated conditional information. Their results indicated that equity mutual

funds had negative alphas on average, once the returns were adjusted for fees. They included conditional performance measures in their study and found that after adjusting for these performance increased. However, the performance was still considered below par and illustrates that the active managers were unable to add significant value and outperform the market.

Further studies by Malkiel (1995) and Daniel et al. (1997) found that there were small or zero abnormal returns in unit trust returns in the US. Furthermore, a study by Sorenson et al. (1998) found that only 11% of unit trusts outperformed the US market index S&P500. These results were similar to those found later by Malkiel (2003), who found that as many as 71% of funds had underperformed the S&P500 net of fees. These results make it evident that a passive investment approach would be advisable, given the managers inability to outperform significantly. This sentiment was later shown by Fama and French (2010) who showed that there were varying levels of skill amongst fund managers with very few of them actually being able to outperform the market. These results appear in line with the EMH as managers are unable to outperform which is expected in an efficient market.

The study by Daniel et al. (1997) investigated whether unit trusts could make use of superior stock selection to allow them to earn back a portion of their fees and expenses. What they found is that the unit trusts, especially the aggressive growth funds, exhibited some stock selection ability but no characteristic timing ability. Furthermore, Massa and Patgiri (2008) claim that most fund managers are rewarded for generating alphas, however most managers produce poor or negative alphas by taking on liquidity risk through holding illiquid assets to maturity. They further found that higher incentive contracts induce the managers into taking additional risk and reduce the funds probability of survival. As a result, however, the unit trusts with high incentives contracts delivered higher risk-adjusted returns and their superior performance remained persistent (Massa and Patgiri, 2008).

It appears as though in the international general unit trust market the consensus is that a small number of managers do outperform, however when taking fees into consideration the excess returns become negligible. This ultimately leads to the conclusion that active managers in the general equity unit trust industry are unable to provide significant value. Whether the same consensus is achieved in the South African unit trust market will be discussed below, followed by the results of property unit trust specific studies.

2.4 South African General Unit Trust Performance Evaluation

A number of studies have been done focusing on the South African unit trust industry and evaluating their performance. Similar to the international studies, there appears to be conflicting evidence in which some studies prove that managers do outperform their benchmark on a risk-adjusted basis, while other studies show that they do not.

In one of the earliest studies done on South African unit trust performance, when the industry was still in its infancy, Du Plessis (1974) found that in two unit trusts the absolute trust returns had a positive relationship with fund risk, measured by beta. A study by Kerber (1974) continued this research into unit trust performance and found that of the 10 available funds, all of them underperformed their benchmark on an absolute basis. However, no risk-adjusted returns were used as performance measures in these studies, questioning their accuracy. Gilbertson (1976) and Taylor (1997) expanded on this research by identifying the limitations of the earlier studies and included risk-adjusted performance measures. They found that two out of 11 funds outperformed the market on a risk-adjusted basis, however their findings were not statistically significant. The general consensus at the time was that South African equity unit trust funds had underperformed between 1970 and 1977.

Gilbertson and Vermaak (1982) were the first to perform a risk-adjusted performance study with significant results. They examined the 11 available unit trusts over the period 1974 to 1981. They found that the fund returns were generally below the returns of the stock market indices. However, when risk-adjusted measures are used such as the Sharpe ratio, Treynor ratio and Jensen's alpha, it was found that the funds outperformed overall on a risk-adjusted basis. Furthermore, some funds showed significant outperformance on a consistent basis. Gilbertson and Vermaak (1982) concluded that their results proved as evidence against the Efficient Market Hypothesis and that the JSE was therefore inefficient over the period. In a follow up study performed by Knight and Firer (1989), 10 funds were examined over a longer period from 1977 to 1986. They also found that five out of the 10 funds were able to significantly outperform the market. They too made use of the Sharpe, Treynor and Jensen's measures in order to evaluate performance. This was the first study to show significant evidence of outperformance for South African unit trust managers and was in contradiction to the findings of Gilbertson and Vermaak (1982) and other earlier studies.

A more recent study by Oldfield and Page (1997) investigated whether managers of South African equity unit trusts were able to earn abnormal returns through asset selection or market

timing decisions. Oldfield and Page (1997) claimed that unit trusts would be attractive investments if the fund managers were proven to add significant value through their skills in stock selection and market timing. The study looked at a total of 17 funds, eight general equity and nine specialist funds, over the period 1987-1994. Their results indicate that the managers were not able to add statistically significant value through stock selection or market timing. Therefore, according to their results active managers were unable to outperform and add value (Oldfield & Page 1997).

A study by Nana (2012) examined 151 South African equity unit trusts from a period 2001-2010 to establish whether they exhibit superior performance and persistence in performance. The study made use of six performance measures, namely nominal returns, capital asset pricing alphas, Sharpe ratios, Fama and French (1993) three factor models, Cahart (1997) four factor alphas and Ferson and Schadt (1996) conditional alphas to test for outperformance. The results were similar to other studies and confirmed that there was no significant evidence of outperformance in the equity unit trust industry. Furthermore, there was some evidence of short term performance persistence. The study was unable to avoid survivorship bias present in the data, however this did not impede on his results as the results still indicated underperformance which makes its effects negligible. Nana (2012) ultimately concluded that the study was unable to provide conclusive evidence of South African unit trust managers possessing superior skill.

A further study by Bertolis and Hayes (2014) investigated the performance of South African unit trusts against the FTSE/JSE All share index over the period 1994 to 2012. Their results showed that unit trusts outperformed in periods of market growth and underperformed in periods of economic downturns. They further found that overall there was evidence for slight outperformance of unit trusts, but that the outperformance was not persistent and repeatable.

A newer study by Kenneth, Hsieh and Hodnett (2016), reviewed the performance of South African equity trust from 2002-2012. They too made use of risk-adjusted performance measures including the Sharpe ratio, M-squared, Treynor measure and Jensen's alpha. They found that regardless of which performance measure was used, the majority of the funds were unable to outperform the market consistently. They went on to conclude that the manager's performance was dependant on the market cycle and that majority of the funds showed positive performance leading up to the financial crisis in 2008 (boom period) and showed inferior performance during turbulent market conditions post crisis (Kenneth, Hsieh and Hodnett, 2016). This is similar to the conclusions made by Bertolis and Hayes (2014) and re-emphasises

that fund managers' performance appears to be in unison with the performance of the market as a whole. Overall the results of this more recent study appear to match the results of earlier studies that on average South African unit trust managers do not outperform the market consistently.

2.5 International Property Unit Trust Performance Evaluation

This section will analyse the literature surrounding studies done specifically on the property unit trust industry and the findings and methodologies used in these studies. One may expect the results of property unit trust performance to be comparable to equity unit trusts given the implications of the EMH. However, some research has pointed to potential reasons as to why property unit trusts could have a performance advantage. The predominant studies on property unit trusts will be discussed below to form a consensus on whether active managers in the property sector provide significant outperformance above and beyond the performance of general equity unit trusts.

Property unit trusts and mutual funds are funds that specialise in real estate and property stocks. In order to qualify as a property unit trust, the fund needs to invest over 80% of its total investment into securities that mainly engage in real estate operations (Zhao, Macgregor and Schultz, 2013). Past studies done in the US make use of the passive stock index and the real estate index as the benchmark in order to measure the funds' performance (Kallberg, Liu and Trzcinka, 2000; O'Neil and Page 2000, Yin and Yung, 2004). The use of a real estate benchmark can be considered to be a comparable passive alternative to an active fund, due to the excess risk exposure of the funds to the performance of the real estate market as a whole. Thus the use of a property benchmark is preferable to a general equity benchmark.

Original research by Damodaran and Liu (1993) and Kallberg, Liu and Trzcinka (2000) suggest that investment managers in the property industry can produce positive abnormal returns because of their specific valuation skills and superior information regarding real estate investment targets. Damodaran and Liu (1993) discovered that there was material information present in the appraisal process, which insiders had access to prior to public release, which causes a material impact on the pricing of REIT's. This is a main proponent as to why property unit trusts may show outperformance of the market and provide value to investors. This idea was backed up by research done by Kallberg, Liu and Trzcinka (2000), as their study showed that their sample of REIT unit trusts had a net positive alpha after fees. They similarly

discovered that the existence of persistently valuable private information in the real estate market. This conceivably more than in the equity market, given the well documented difficulties in determining accurate estimates in the risk and return in real estate assets. Whether or not this informational advantage applies to a smaller and less liquid market such as the South African real estate market remains to be tested.

The findings of Kallberg, Liu and Trzcinka (2000) allude to strong evidence to suggest that past performance of a real estate fund effected its future performance. This evidence was initially found by Shukla and Trzcinka (1994) who found that the persistence in overall mutual fund performance was a result of the consistently negative performance of inferior funds and the constant positive performance of superior funds. Thus the literature has shown that performance persistence exists in the real estate mutual fund market in the short term. Whether the same phenomenon occurs in the South African market is yet to be determined.

Additional research by Edward and Daniel (2000) looked at property fund returns over a short term three-year period from 1996 to 1998 and found that on average, the funds did not deliver positive abnormal returns. They further went on to conclude that the funds' performance was correlated with expense ratios, turnover and fund age, with larger funds outperforming smaller ones (Edward and Daniel, 2000).

A later study by Lin and Yung (2004) analysed the performance of real estate mutual funds from 1993-2001 and found contrasting evidence to original studies of by Damodaran and Liu (1993) and Kallberg, Liu and Trzcinka (2000). They made use of a Fama and French three factor model and the Cahart four factor model to measure abnormal performance. The rationale behind using the factor models instead of simply the Jensen's alpha method is that the factor models are more comprehensive and capable of revealing influencing factors on the real estate market. Their results showed that the US mutual funds did not outperform both the stock market benchmark and the real estate index. They found that the mutual fund performance was mainly determined by the performance of the real estate sector as a whole. These results are in line with some of the earlier general equity fund performance papers by Bertolis and Hayes (2014) and Kenneth, Hsieh and Hodnett (2016). If the benchmark used was the real estate index, the influence of the benchmark on the funds overshadowed all other factors in the model. They further found that risk-adjusted fund returns were related to fund size, however expense ratios, management tenure and turnover were unrelated to performance of the funds (Lin and Yung, 2004).

This sentiment was followed by a study from Chiang et al. (2008). They found that performance of the funds was sensitive to model selection and specification. Overall they found that the fund managers in the US were unable to produce abnormal returns and outperform their benchmarks. This is in contrast to other studies such as Damodaran and Liu (1993) and Kallberg, Liu and Trzcinka (2000). Chiang et al. (2008) went on to conclude that although the property funds were unable to outperform their benchmarks, they were able to create higher returns than other mutual fund categories over the period. Thus there appears to be some form of advantage to investing in real estate funds as they were still able to outperform competing funds, despite not being able to outperform their benchmarks. This highlights the potential usefulness of investing in a passive fund that is able to accurately and cost effectively track the real estate market.

In terms of persistence of property funds' performance, a paper by Derwall et al. (2009) confirm the existence of a momentum effect in US REIT mutual funds. Derwall et al. (2009) found that funds with relatively high past returns continue to earn high returns on average. Their results thus indicated that a momentum strategy, which buys funds with the highest past returns and sells short funds with the lowest past return, will produce a return that is significantly higher than a common stock momentum strategy (Derwall et al., 2009).

A further argument made as to why property unit trusts may be able to provide further outperformance, is due to their ability to provide additional diversification benefits. Many REITS are specialised, as they may own only apartment buildings or healthcare facilities etc. Furthermore, these unit trusts can provide greater liquidity than REITS as they often have more access to capital than REITS do alone (Ntuli and Akinsomi, 2017). However, a reason for underperformance is the fact that many of the companies and REITS that the unit trusts invest in are also property funds, which means that investors have to pay two management fees before they see returns. Other research on funds of funds has indicated that real estate fund managers can outperform by investing in illiquid REITs with small market capitalizations to create superior returns. (Chiang et al., 2008).

A study outside of the US by Lee (1999) on a sample of 27 UK property funds over the period 1987 to 1998, also found that managers were unable to statistically outperform the market. The study made use of both traditional performance measures such as the Jensen's alpha as well as conditional methods similar to those originally used by Ferson and Schadt (1996). Jensen's alpha for the funds were on average negative, which is interpreted as evidence of inferior performance. However, when the conditional methods are used for measuring performance,

fund performance improves to neutral risk-adjusted performance, instead of underperformance. The relatively poor results found in previous studies using traditional measures can hence be attributed to the time variation in conditional betas as well as the expected return of the market (Lee, 1999).

Further studies from outside the US looked at performance of 17 Italian real estate mutual funds from 2005-2008 (Morri and Lee, 2009). They compared performance of funds using the Sharpe ratio and found that the average Sharpe ratio was 0.13 across the funds, with five funds managing to outperform. The results were however insignificant and therefore did not indicate that there was substantial outperformance in the Italian property unit trust market over the period (Morrie and Lee, 2009)

Most of the original literature reviewing property fund performance use only the net returns of funds and do not consider the interaction between fund costs and performance (Kallberg et al., 2000; Lin and Yung, 2004; Chiang et al., 2008). Hartzell, Mühlhofer and Titman (2010) were the first to examine a funds returns before and after fees to determine whether they were able to outperform before fees were taken into account. Their study made use of three types of REIT based benchmarks, which include three factors, namely a property type factor, characteristic factor and a statistical factor. They found the fund performance was dependant on the choice of benchmark. This highlights the importance of selecting an appropriate benchmark in order to obtain the most accurate results and ensure that any performance differences are in fact accurate. The effects of benchmark selection on performance evaluation will be discussed in more detail below.

Ultimately it appears as though the results of numerous property unit trust studies indicate that outperformance of managers is inconclusive, with replicable results being difficult to achieve. This is in line with the EMH discussed earlier, as in an efficient market all public and relevant information should be known by all members and informational advantages between managers should not exist. However, a number of key studies have indicated to some managers being able to provide significant outperformance and that performance of funds in some markets does persist. Higher performing funds have been shown to perform better than the lower ranked funds and this can provide some value to investors seeking the best fund performance. Ultimately the consensus for the property unit trust market appears to be similar to the general equity unit trust market, with mixed and inconclusive results.

2.6 South African Property Unit Trust Literature

Studies done on South African property unit trusts have been rare, with the most recent one being done by Potelwa (2013). Their study looked at the performance of all listed property in South Africa, including property loan stocks, property holding and development companies, real estate investment trusts as well as property unit trusts. The aim of their research was to determine whether any of the categories provided superior performance over the others. The results indicated that there was no significant difference between the performances of the various categories. Furthermore, the findings from the study showed that all of the property categories in fact had negative alpha values, indicating that they underperformed the market on a risk-adjusted basis (Potelwa 2013). This finding is in line with many of the international papers and again shows that these types of actively managed funds were unable to outperform the market significantly. This study however made use of a custom spliced index and did not use the SAPY directly as the benchmark. The results from this study need to be taken with some caution, as there were only five unit trusts used in the study, thus these results are in no way conclusive or robust. This highlights the need for further in-depth research on this topic, to adequately determine whether South African property fund managers are able to add value to investors and outperform the market.

2.7 Benchmark Selection and Concentration

A key factor when performing fund performance evaluation is the consideration of what proxy to use as a benchmark for market performance. A number of unit trust performance papers have alluded to the importance of appropriate benchmark selection and how that can influence the outcome of one's results. The characteristics of an appropriate benchmark were initially set out by Bailey (1992). Benchmarks are required to be transparent, unambiguous, easy to replicate and measurable.

Alpha is the term used to measure outperformance of a fund. Calculating alpha requires the definition of an appropriate benchmark, which should be a reasonable reflection of the investable equity in the specific sector, in order to compare performance (Bertolis and Hayes, 2014). Studies by Lin and Yung (2004) and Hartzell, Mühlhofer and Titman (2010) suggest that the results of a fund's performance are sensitive to the initial choice of benchmark. They go on to define a custom benchmark that is suitable for real estate investments specifically.

Lin and Yung (2004) make a contrasting argument that the choice of benchmark is immaterial, due to the high correlation between the various real estate indices. Similar results were found by Myer and Webb (1993), who used a multi-factor Jensen’s alpha method to evaluate performance on 47 real estate funds. They found that the choice of benchmark made little difference to performance results, as the fund alphas were not significantly different when various real estate benchmarks were used. This is in contrast to what was found by Hartzell, Mühlhofer and Titman (2010), Shukla and Trzcinka (1994) and others, who found that the choice of benchmark was a significant factor in determining the outperformance of managers.

2.7.1 Benchmark Choices in South African Property Market

2.7.1.1 South African Listed Property Index J253 (SAPY)

The most common and well established benchmark for the South African property sector is the South African Listed Property Index (SAPY). The SAPY makes use of capitalisation weights, with maximum weightings of 20% per share. A summary of the characteristics of the SAPY can be found in table 1 below.

Table 1: SAPY Characteristics

Characteristic	Description
Name	SA Listed Property
Index Code	J253
Alpha Code	SAPY
Index Category	Specialist Property
Universe	All Share Index (J203)
Fixed No. of Companies	20
Liquidity Screening	Yes
Free Float Screening	Minimum of 15%
Other Screening	Companies that have a primary listing on the JSE and are listed in the Real Estate Investment & Services (8630) and Real Estate Investment Trusts (8670) sectors
Weighting Methodology	Free Float Market Cap Weighted
Capping Methodology	N/A
Index Review	Quarterly in March, June, September and December
Buffer Size	3
Dissemination	60 seconds
Live Date	2004/06/01

Source: Johannesburg Stock Exchange (JSE), (2019)

One of the main issues with the SAPY is that it has shown to be highly concentrated in a small number of large cap stocks in the property sector. Table 2 shows the extent of high concentration that is present in the SAPY. The top five holdings make up an average of 60.6% of the index from 2013-2018. Furthermore, the top two holdings over the period make up on average 35.2% of the index, which further illustrates the high level of concentration present. Large real estate investment trusts such as Growthpoint, Redefine and the Resilient group of companies make up a significant portion of the index and make it highly concentrated and exposed to these shares. These disproportional weights in a small number of the largest shares in the REIT and property industry, lead it to being considered excessively risky due to its concentration. For comparison sake, the top five holdings in the JSE All Share index make up only 41.78% (profiledata.co.za, 2020) at the end of 2018. This again highlights the extent of the overconcentration in the property market compared to the general equity market.

Table 2: SAPY Top 5 Holdings

	31-Dec-18	31-Dec-15	31-Dec-13
Growthpoint	21.36%	17.90%	22.71%
Redefine	16.13%	12.84%	14.73%
Nepi Rockcastle	12.65%	11.73%	NA
Fortress REIT A	6.73%	NA	NA
Hyprop Investments	6.53%	7.78%	9.50%
Fortress REIT B	NA	6.78%	
Lighthouse Capital	NA	NA	7.46%
Resilient	NA	NA	6.81%
Total % top 5 holdings	63.40%	57.03%	61.21%
Total % top 2 holdings	37.49%	30.74%	37.44%

Strongin, Petsch and Sharenow (2000) highlight the issue with many capitalisation weighted benchmarks that have large amounts of concentration of share-specific risk in a small number of mega-cap shares. Strongin, et al. found that market capitalisation weighted benchmarks are not adequately diversified, which contributes as a primary reason for the tracking error of many funds, rather than their choice of stock selection. This type of highly concentrated market weight index is clearly a concern in the South African listed property sector due to the significant concentration that is present. This may be a contributing factor as to why some funds underperform their benchmark.

An example of the negative impact of the high concentration of the SAPY can be found by examining the controversy which occurred in early 2018 surrounding the Resilient stable of companies. Resilient came under fire for questionable accounting practices which saw it trying to artificially inflate its share price and dividend payments in order to be included in the JSE's Top 40 index. This led to a significant sell off of the Resilient group shares due to fears that these companies may be the next in a Steinhoff like collapse.

The Resilient group consisted of four other listed REIT's, namely Resilient itself, Fortress, Lighthouse Capital and Nepi Rockcastle. These funds combined made up 42.2% of the SAPY at the end of 2017 before the incident occurred in early 2018. The group's share price as well as the affiliated funds were severely affected by this and dropped by 58.3% on average by the end of 2018. This had a significant effect on the SAPY, due the Resilient group of companies being such a large constituent of the index. The Resilient scandal made clear the negative impact that high concentration in a portfolio can have, as it severely impacted the returns of the SAPY.

Despite the significant shortcoming of the SAPY due to its high concentration, it is still the most popular and prevalent choice of benchmark in the property unit trust industry. Given that the property funds in this study are local and focus their exposure to local funds, it is still the most representative benchmark of the local property industry. Furthermore, almost all funds in this study use the SAPY specifically as their benchmark of choice.

2.7.1.2: Alternative property Benchmarks

The JSE has recently introduced additional benchmarks focusing on various sectors within the listed property sector, which are outlined in table 3 below. These alternative benchmarks were introduced to allow for more accurate benchmarking of specific sectors, such as Real Estate development and services (J863), SA REIT's (J805) and overall REIT's (J867). While many of these new benchmarks are useful to compare sector specific performance, they are not all useful when comparing property unit trust performance, as they do not represent the market that unit trust managers are investing in.

Table 3: Alternative Property Benchmarks Summary

Index Name	Index Code	Intended Use	Universe	ICB	Capping	Weighting Methodology
All Property	J803	Benchmarking & Performance of the listed property sector	SWIX All Share (J403)	Real Estate Super Sector (8600)	15%	SWIX Investable Market Cap
Tradable Property	J800	ETFs, Passive Funds, Derivative Contracts, Structured Products	Large & Mid Cap (J206)	Real Estate Super Sector (8600)	15%	SWIX Investable Market Cap
SA REIT	J805	Benchmark of SA REIT Industry, providing a SA-bias and increased Yield-bias	All Share (J203)	Designated as an SA REIT	15%	Investable Market Cap
Real Estate Development and Services	J863 JS84	Benchmarking of companies classified in ICB Real Estate Development and Services Sector	All Share (J203)	ICB Real Estate Development and Services Sector (8630)	No	Investable Market Cap and SWIX Investable Market Cap
Real Estate Investment Trust	J867 JS85	Benchmarking of companies classified in ICB Real Estate Investment Trust Sector	All Share (J203)	ICB Real Estate Investment Trust Sector (8670)	No	Investable Market Cap and SWIX Investable Market Cap

Source: JSE, 2017

Of the newly introduced benchmarks, the most appropriate benchmark for use in property unit trust performance evaluation would be the All Property Index (ALPI). The ALPI was created in 2017 and seeks to address some of the concentration issues present in the SAPY. The ALPI caps its weightings by 15% and incorporates dual listed property companies, with close to 50% of its earnings being derived from outside of South Africa (JSE, 2019). Allowing for dual listed companies such as Capital and Counties, INTU and Hammerson, significantly changes the exposure to South African only REIT's and hence reduces the concentration in the index. Whilst the ALPI is designed to be used as a benchmark for listed property in South Africa, it's inclusion of foreign property shares make it unsuitable to evaluate South African property unit trusts, given that these unit trusts can only invest in South African REIT's. Furthermore, given the recent introduction of the index, it makes comparisons of performance prior to its introduction more difficult. Thus despite the shortcomings of the SAPY, it is still the most appropriate benchmark to evaluate local property unit trust performance.

2.7.2 Benchmark Selection Conclusion

The effects of benchmark selection on performance evaluation must be emphasised. It is further noted that the SAPY has some drawbacks as a use of a market proxy, due to its concentration. However, due to it being the longest running and most popular property index used by funds explicitly, it remains suitable for this study as a benchmark for performance evaluations. While alternative property benchmarks have been introduced, these are not appropriate for property unit trusts specifically as they do not represent the market that these funds invest in.

2.8 Survivorship Bias

A key factor discussed in the research of fund performance is that of survivorship bias in the data. Survivorship bias is defined as the tendency to exclude failed companies or funds from performance studies because they no longer exist. This causes the results of many studies, which have excluded failed funds, to be skewed higher as a result of only the successful companies remaining in the dataset (Pawley, 2006). Thus unit trust performances may in fact be misleading due to survivorship bias, as asset management companies may merge funds or discontinue underperforming funds, which removes these funds from many analyses.

Making use of data sources such as Morningstar as done by Kallberg et al., 2000; 2000; O'Neal and Page, 2000; Chiang et al., 2008, introduces a built in survivorship bias to the findings. It is apparent that many studies done on fund performance fall victim to survivorship bias as data is only obtained on funds that are still present during the research period and often excludes the data on funds which have been eliminated. Thus survivorship bias causes overestimation of performance which needs to be taken into account when analysing results. Making use of data samples that include closed down funds is preferable when possible. If survivorship bias cannot be avoided, then the estimates of performance must be noted as being overly optimistic and biased upwards.

3. Data and Methodology

3.1 Introduction

This chapter introduces and explains the data and the research methodology used to investigate the research objectives set out in chapter 1. First there will be a discussion around the selection of the sample and the property funds included in this study.

3.2 Data and Data Sources

The data used for this study has been provided by Profile Data and consists of the monthly total return indexes (TRI) of all South African property unit trusts from 2005-2018. Furthermore, the monthly TRI index for the JSE SAPY (J253) has been obtained. TRI's will be used for both the funds return and the benchmark return because it is the most appropriate figure, considering its inclusion of dividends to returns. Given that property funds have high dividend returns it is logical to make use of a variable that is inclusive of all returns to calculate its performance. Despite the shortcomings mentioned of the SAPY with regard to concentration discussed earlier, it is still the most useful and appropriate index to use as a benchmark, as the majority of the funds in this study state directly that this is their preferred benchmark. The 3-month Johannesburg interbank average rate (JIBAR) was obtained from the South African Reserve Bank website, which will be used as the proxy for the risk-free rate. The use of the 3-month JIBAR rate is in line with other South African and international fund performance studies such Brink (2003) Botha (2007) and Favre and Apache (2003) who make use of the 3-month JIBAR and LIBOR (London Inter-Bank Offered Rate) respectively. The risk-free rate will be used to calculate excess returns for all the funds as well as the benchmark. Furthermore, the monthly TRI's for the risk parity portfolio of property stocks were obtained from the Salient Quants database.

With many of the unit trusts in question being newer funds which were created recently, the time period of analysis will be divided into multiple subcategories to allow for the more recent funds with only four years of performance data to be included in the analysis. The periods will be broken down as follows:

- Period 1: 2005-2018 - 10 Funds
- Period 2: 2008-2018 - 18 Funds
- Period 3: 2015-2018 - 34 Funds

- Out of sample period: 2008-2015 - 18 funds

Dividing the analysis into these periods will allow for more recent funds which opened after 2005 to be included in this study. Furthermore, it will accommodate for the different market periods before and after the financial crisis of 2008 to be analysed and compared. The financial crisis caused a large amount of market volatility, hence it will be useful to analyse performance before and after this high volatility event to determine whether active managers were able to reduce risks over this period. This allows for a detailed comparison between funds over differing lengths of time and aids in analysing whether funds are able to outperform in multiple periods. This also allows for the inclusion of an out of sample period from 2008-2015, which enables the funds' performance to be evaluated against a separate period within the sample to ascertain whether performance is consistent outside of the specified ranges.

The newest funds with less than four full years of performance data will be excluded from the study. Hence the decision to use 2015 as the start of period 3 is made in order to include the largest amount of funds in the analysis by allowing them to have at least 4 full years of returns data. This leaves 34 funds to be included in the study, with 29 being active funds and five being passive funds.

The full list of funds with their acronyms can be found in table 4 below.

Table 4: Property Unit Trust Acronyms

JSE Code	Fund Name
ABPE	Absa Property Equity Fund A
AFICA	Ampersand SCI Flexible Property Income Fund A
ASMPB1	Ashburton Multi Manager Property Fund B1
CPEF	Coronation Property Equity Fund A
CSAPF	Citadel SA Property H4 Fund B1
CSPEF	Catalyst SA Property Equity Prescient Fund A
DFPF	Discovery Flexible Property Fund A
DSPFA	Optimum BCI Property Fund A
DWPF	Sharetel BCI Property Fund A
FMFCA	Autus Prime Property Fund A
HPPFC	Hollard Prime Property Fund B
ISPU	Alexander Forbes Investments Property Equity Fund A
MCPFA	Mazi Asset Management Prime Property Fund A
MPIF	Marriott Property Income Fund A
MXPR	Plexus Wealth BCI Property Fund A
NIPCA	Nedgroup Investments Property Fund A
OMRE	Old Mutual SA Quoted Property Fund A
OPEFD	Oasis Property Equity Fund D
PEPI	Prudential Enhanced SA Property Tracker Fund A
PEPTF	Prudential Enhanced SA Property Tracker Fund D
PPFA	Investec Property Equity Fund A
PPFH	Investec Property Equity Fund H
PTXSPY	CoreShares PropTrax SAPY ETF
PTXTEN	CoreShares PropTrax Ten ETF
RBPF	Momentum Real Growth Property Fund A
SAPF	SIM Property Fund A
SAPIF	Satrix Property Index Fund A1
SLPCA	Sygnia Listed Property Index Fund A
SPIFB1	STANLIB Property Income Fund B1
SSPF1	Sesfikile BCI Property Fund A1
STPI	STANLIB Property Income Fund A
STPROP	STANLIB SA Property ETF
TNICA	True North IP Enhanced Property Fund A
VAPF	Select BCI Property Fund A

3.3 Research Design

This section will discuss the methods used to calculate and evaluate a fund's performance.

3.3.1 Nominal Return Measures

The performance figures of the selected funds are evaluated relative to other funds in the sample as well as the market benchmark represented by the SAPY. The nominal return statistics of the funds and the benchmark are evaluated by computing their yearly mean returns and standard deviations.

3.3.2 Jensen's Alpha

Similar to many studies discussed in the literature review, the Jensen's alpha will be used to determine which of the property funds are consistent in outperforming the market on a risk-adjusted basis. Jensen's alpha represents the average return on a portfolio, above or below that predicted by the Capital Asset Pricing Model, when using the portfolio's beta and a benchmark as a proxy for the average market return.

Jensen's alpha is shown by the following equation:

$$R_{Pt} - R_{Ft} = \alpha_P + \beta_P(R_{Mt} - R_{Ft}) + \epsilon_{Pt} \quad (1)$$

where:

- R_{Pt} = Unit trust portfolio return for month t .
- R_{Ft} = risk-free rate for month t , given as South African 3 month JIBAR rate.
- α_P = Jensen's Fund specific alpha which is the intercept term and performance measure.
- β_P = measure of systematic risk of a unit trust fund, relative to the market risk premium.
- R_{Mt} = total return of the market portfolio for month t , given as the JSE SAPY total return index.
- ϵ_{Pt} = regression error term or residual, with an expected value of zero.

Theory states that a positive alpha value indicates a portfolio or fund whose returns are greater than that implied by the funds specific level of systematic risk, indicating superior performance of that fund. Similarly, a negative alpha value indicates inferior performance for that fund. Thus a significant positive or negative value for alpha can be interpreted as superior or inferior performance which is attributable to the skills of the portfolio manager. The use of the Jensen's alpha to determine unit trust performance in this study is consistent with previous literature covered in chapter 2 of this paper.

3.3.3 Sharpe Ratio

The Sharpe ratio is used to determine the ratio between excess average return of a portfolio and its risk and is useful to compare the return of an investment relative to its risk. When evaluating fund performance, it is not sufficient to take only the returns into consideration, as one needs to include a risk measurement that can be included and adjusted for. The Sharpe ratio allows investors to rank possible investment options on the basis of their Sharpe ratios (Sharpe, 1966).

The Sharpe ratio is given by:

$$\frac{(R_{Pt} - R_{Ft})}{\sigma_{Pt}} \quad (2)$$

where:

- R_{Pt} = Unit trust portfolio return
- R_{Ft} = risk-free rate, given as South African 3-month JIBAR rate.
- σ_{Pt} = Standard deviation of unit trust portfolio's excess return

The Sharpe ratio is calculated by subtracting the risk-free rate from the return of the portfolio and dividing that result by the standard deviation of the portfolio's excess return.

To determine whether a unit trust has delivered superior performance, the Sharpe ratio for each fund is calculated and compared to the Sharpe ratio of the market benchmark, in this case the JSE SAPY total return index. If a fund has a Sharpe ratio that is larger than the ratio of the market, it is said to have delivered superior risk-adjusted performance. A Sharpe ratio lower than that of the market, implies the unit trust is said to have delivered inferior risk-adjusted performance.

The Sharpe ratio is useful to rank portfolio's performance in normal market conditions when excess returns to the risk-free rate are positive. However, when excess returns are negative the Sharpe ratio becomes biased and may lead to misleading results (Israelsen, 2005). This is because a negative Sharpe ratio with a large amount of volatility will in fact make the ratio less negative, which implies its performance gets better as volatility increases, which is counterintuitive. To offset this phenomenon Israelsen (2005) suggests making use of a modified Sharpe ratio as follows:

$$\text{Modified Sharpe Ratio} = \frac{(ER)}{\frac{ER}{\sigma^{abs}(ER)}} \quad (3)$$

where:

- ER = Excess return of the fund over the risk-free rate
- σ = Standard deviation of the fund's excess return
- Abs = Absolute value

When negative excess returns are present the term 'absER' will also be -1. The modified Sharpe ratio will have different values for the Sharpe ratio when negative excess returns are present, however the ranking of the funds will be correct. The modified Sharpe ratio will be useful in this analysis when the performance of the funds is below the risk-free rate, which leads to negative excess returns. Making use of the modified Sharpe ratio leads to an outcome that is more realistic estimate of the amount of return per unit of risk taken (Israelsen, 2005). Given that the South African property market saw a significant decline at the end of 2018, it will be

fitting to make use of the modified Sharpe ratio to compare risk-adjusted performance of funds in a negative excess return environment.

This is one of the risk-adjusted measures that will be used to compare the property unit trusts performance relative to one another as well as relative to the market benchmark, to assess whether they are able to outperform on a risk-adjusted basis. The Sharpe ratio is useful when

3.3.4 Information Ratio

The information ratio (IR) is one of the most commonly used performance evaluation metrics as a measure of the mean-variance characteristics of an active portfolio. The IR is defined as the ratio of annualised residual return to the residual risk of a portfolio. It is a measurement of a portfolios return beyond that of the benchmark, compared to the volatility of those returns. It is calculated by dividing the active return by the standard deviation of the active return, known as the tracking error, as seen in the formula below (Grinold and Kahn, 2000).

$$IR = \frac{Rp - Rb}{\sigma_{pt}} \quad (4)$$

where:

- Rp = Return on the portfolio
- Rb = Return on the benchmark, the SAPY Index
- σ_{pt} = Standard deviation of the active return (tracking error)

The IR is used to determine a manager's skill level through their ability to generate excess returns to a defined benchmark. A positive IR indicates that the fund manager outperformed the benchmark on a risk-adjusted basis, whilst a negative ratio indicates the manager destroyed value and underperformed the benchmark. An IR of greater than 0.5 is considered good performance, 0.75 is considered very good and a ratio greater than 1 is considered excellent performance (Grinold and Kahn, 2000). A positive IR indicates outperformance, however an IR below 0.3 is considered insignificant outperformance as it leads to lower t-statistics and hence lower statistical significance.

In order to test the significance of outperformance, a hypothesis test can be used to determine whether a funds excess returns are statistically greater than the benchmark. The hypothesis test will look as follows:

H_0 : Fund excess return less than or equal to zero, or $\overline{ER} \leq 0$

H_1 : Fund excess return is positive, or $\overline{ER} \geq 0$

In order to test this hypothesis, a t-statistic can be calculated as the ratio of average excess return, divided by the standard error of the average excess return (Goodwin, 1998). The formula for the t-statistic is directly linked to the IR, as the IR is part of the formula. The t-statistic can thus be calculated as shown below:

$$\begin{aligned} t\text{-Statistic} &= \frac{\overline{ER}}{\hat{\sigma}_{ER} / \sqrt{T}} \\ &= \frac{IR}{1 / \sqrt{T}} \\ &= \sqrt{T}(IR). \end{aligned} \tag{5}$$

Thus the significance of a fund's excess return over the benchmark can be calculated by multiplying the fund's IR by the square-root of the number of observations. This t-statistic has a t-distribution with T-1 degrees of freedom, which can be compared to the standard t-tables to determine the result of the hypothesis test (Goodwin 1998). If the t-statistic is greater than the corresponding value on the t-tables, then one can reject the null hypothesis and conclude that the outperformance of the fund is significant.

In order to ensure that the outperformance is considered significantly robust, a hurdle value can be introduced to ensure that slight outperformance does not lead to a larger number of funds having significant t-statistics. Due to having a large number of observations, the t-statistic can become large, despite the IR being low. Thus in order to ensure that low IR's of below 0.5 are not considered to indicate significant outperformance, a hurdle value of 0.5 for the IR can be introduced. This way it is more likely that a significant t-statistic can be said to be due to adequate outperformance with a large IR, rather than simply due to a large number of observations.

4. Results and Analysis

This section will discuss the results of data analysis on fund performance and aims to provide insight as to whether or not a significant number of funds provide outperformance and add value to investors.

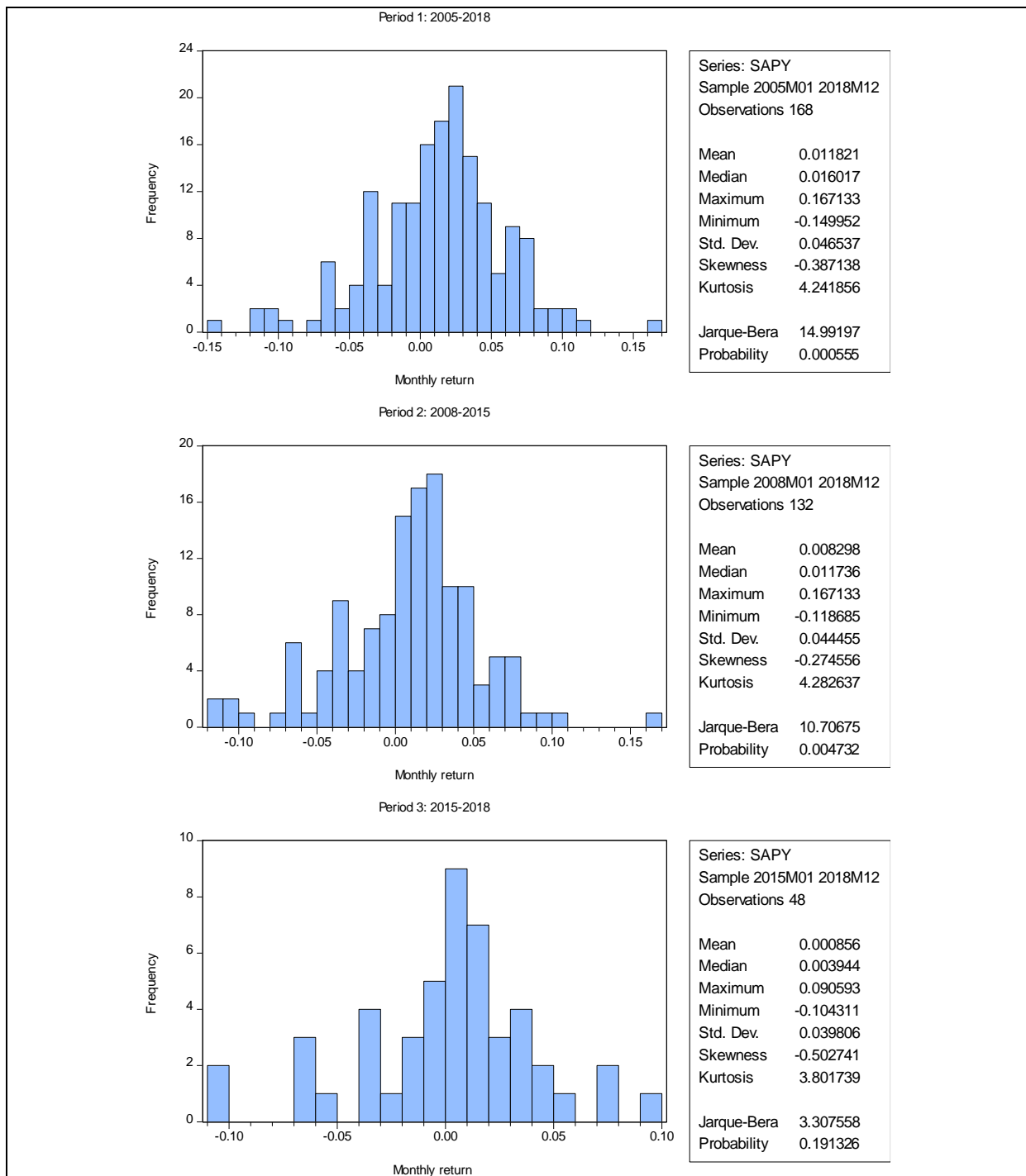
The analysis is divided into three major time periods, the first one covering the entire period making use of the available funds from 2005-2018. The second period includes additional funds from 2008-2018. The third period looks at all available funds in a more recent 4-year period from 2015-2018. Lastly, an out of sample period from 2008-2015 is also included in the analysis in order to determine whether or not significant performance was consistent across time frames and was not due to abnormalities in the market. The performance of each period will be analysed using the three aforementioned performance measures, namely the Sharpe ratio, information ratio and Jensen's alpha. Summaries of each time period will be provided as well as an overview of the best and worst performing funds in each period.

4.1. Overview of SAPY Benchmark Performance

Figure 3 shows the spread of monthly returns of the benchmark over all three periods. It is evident that the returns for all periods are not normally distributed as there is a skew to the left in all periods. This is not surprising given that the returns of the market are expected to be above 0, given that equity returns are projected to be positive in the long run. The mean monthly return is largest over the full 2005-2018 period, with a mean monthly return of 1.2%. A kurtosis value of 4.24 indicates that the returns are non-normal and that there is a significant skew present.

The mean return of the benchmark in period 2 is slightly below that of period 1, with the skewness not being as severe as in the longer period. The returns in period 3 are the most normally distributed, with a mean of 0.0008 and a kurtosis value of 3.8, which is still considered high but significantly lower than the other periods. This shorter period has more of an emphasis on the large sell off and decline in the South African listed property market which occurred in early 2018 and therefore the performance in this period is understandably the weakest.

Figure 3: 2005-2018 South African Listed Property Index Return Histograms



4.2. Period 1: 2005-2018

10 funds were included in this period as they were the only available funds which were present over the entire period. All funds in this period are actively managed and do not seek to directly replicate the benchmark. Any deviations in returns from the benchmark are hence attributed to the funds being actively managed and having different weightings and allocations to shares than the benchmark.

4.2.1 Tracking Error Correlation

Table 5 below shows the correlation of the tracking error of the funds. There appears to be high correlation present across the tracking error of many funds. A correlation coefficient of 0.3 is generally considered to be low but significant correlation. This is seen by the cells highlighted in green. The significance of the correlation is shown in the table above through a scale of colours from green to red. As the correlation coefficient increases the shade of green darkens, with the correlations above 0.5 shown in dark green. Correlation of under 0.3 is seen in yellow, below 0.05 and negative are seen in orange and red. A small number of funds appear to show zero or somewhat negative correlations, such as the STANLIB property income fund A (STPI), which had low and sometimes negative correlation with some funds. This is likely explained by the STPI having the largest beta of all funds of 0.994 and hence having returns that are most similar to the benchmark. Overall it is evident that the funds tracking errors appear to be significantly correlated with one another, which is unsurprising given that the returns of the funds can be expected to be similar due to the lack of diversification and choice in the listed property market. Thus the returns of the funds can be expected to be fairly similar given the correlations present amongst their tracking errors.

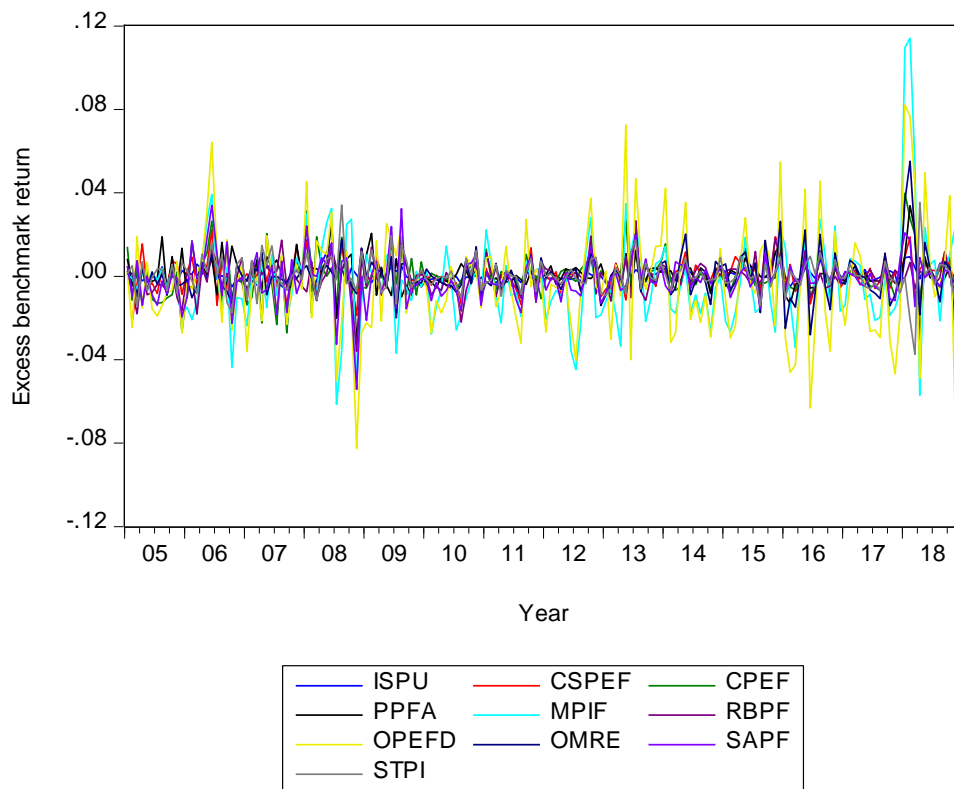
Table 5: Period 1 Benchmark Tracking Error Correlation Matrix:

	ISPU	CSPEF	CPEF	PPFA	MPIF	RBPF	OPEFD	OMRE	SAPF	STPI
ISPU	1.00									
CSPEF	0.45	1.00								
CPEF	0.52	0.34	1.00							
PPFA	0.46	0.28	0.36	1.00						
MPIF	0.46	0.36	0.53	0.45	1.00					
RBPF	0.24	0.60	0.29	0.22	0.29	1.00				
OPEFD	0.54	0.38	0.74	0.49	0.71	0.35	1.00			
OMRE	0.39	0.63	0.44	0.42	0.59	0.41	0.58	1.00		
SAPF	0.36	0.65	0.56	0.23	0.48	0.54	0.58	0.45	1.00	
STPI	0.29	0.55	0.04	-0.05	-0.03	0.42	0.03	0.28	0.41	1.00

Figure 4 further illustrates the correlation between the fund returns that is present by graphing the excess benchmark return over the period. From figure 4 it is apparent that the excess returns of the funds mostly move together over time, with a small number of funds having larger spikes than others. Whilst there appear to be some outliers, such as the Marriot property income fund A (MPIF) and the Oasis property equity fund D (OPEFD), the funds in general appear to have similar movements in excess returns and hence similar tracking errors. These two outlying funds have the lowest beta's and their returns therefore differ the most from the benchmark.

Overall this figure again highlights that one can expect the performance of the funds to be similar, with a small number having returns that deviate significantly from the benchmark. The largest deviations in returns from the benchmark appear to occur in 2008-2009 and in early 2018. This is likely due to volatility in the market caused by the 2008 financial crisis and the selloff in listed property which occurred in early 2018.

Figure 4: Excess Return over Benchmark 2005-2018



4.2.2 Nominal Performance Measures

Table 2 below summarises the most important performance statistics and comparative figures of the funds for period 1. It appears that the funds in this period are on average less volatile than the benchmark, as nine out of 10 funds achieved lower standard deviation than the SAPY. This can further be seen by the average betas of the funds, of 0.867, indicating that the funds on average were less volatile than the market. The mean return of all funds is however slightly below the benchmark, as the funds achieved a mean of 13.7% compared to the benchmark mean return of 14.2% over the period. Of the 10 funds six achieved average returns greater than the benchmark, indicating that positive nominal returns over the benchmark were indeed possible for many funds. However, in order to test the statistical significance of outperformance

of returns, it is necessary refer to the risk-adjusted measures with t-statistics such as the information ratio and Jensen's alpha.

Table 6: Annualised Performance Summary 2005-2018

Fund Name	Standard deviation	Mean return	Sharpe Ratio	Information Ratio	t-stat	Mean Excess return	Tracking error	Jensen's Alpha	p-value	Beta
<i>Alexander Forbes Investments Property Equity Fund A</i>	15.38%	15.06%	0.51	0.629	8.127**	0.87%	1.38%	1.21%**	0.000	0.951
<i>Catalyst SA Property Equity Prescient Fund A</i>	15.48%	15.51%	0.536	0.437	5.648**	1.19%	2.71%	1.58%*	0.024	0.945
<i>Coronation Property Equity Fund A</i>	14.09%	14.36%	0.507	0.049	0.627	0.17%	3.50%	1.15%	0.111	0.859
<i>Investec Property Equity Fund A</i>	15.21%	15.26%	0.529	0.369	4.769**	1.07%	2.91%	1.57%**	0.031	0.928
<i>Marriott Property Income Fund A</i>	11.12%	10.76%	0.319	-0.452	-5.84**	-3.43%	7.58%	-0.84%	0.505	0.628
<i>Momentum Real Growth Property Fund A</i>	15.36%	13.60%	0.416	-0.209	-2.705**	-0.58%	2.79%	-0.16%	0.818	0.94
<i>Oasis Property Equity Fund D</i>	11.62%	10.52%	0.284	-0.411	-5.305**	-3.67%	8.94%	-0.95%	0.581	0.609
<i>Old Mutual SA Quoted Property Fund A</i>	15.31%	14.45%	0.473	0.077	0.992	0.27%	3.48%	0.77%	0.386	0.928
<i>SIM Property Fund A</i>	14.68%	12.82%	0.382	-0.37	-4.781**	-1.37%	3.70%	-0.60%	0.496	0.889
<i>STANLIB Property Income Fund A</i>	16.30%	14.88%	0.47	0.236	3.048**	0.69%	2.94%	0.74%	0.355	0.994
Fund average	14.45%	13.72%	0.443	0.035	N/A	-0.48%	3.99%	N/A	N/A	0.867
SAPY/Benchmark	16.12%	14.19%	0.433	N/A	N/A	0	0	0	N/A	1
Funds that outperform Index	9/10	6/10	6/10	1/10	N/A	6/10	N/A	3/10	N/A	N/A

** Indicates significance at the 99% confidence level. * Indicates significance at the 95% confidence level.

4.2.3 Sharpe Ratio 2005-2018

The average Sharpe ratio for the funds over this period was 0.443, which is close to the Sharpe ratio for the SAPY which was 0.433. Six out of the 10 funds have higher Sharpe ratios than the benchmark, which indicates they were able to produce higher risk-adjusted returns than the benchmark. This can likely be explained by the fact that these funds are actively managed and therefore differ more noticeably from the benchmark. Due to the high concentration of the SAPY highlighted previously, funds can allocate their holdings more evenly across stocks in the industry and are less concentrated in a small number of stocks which generally leads to

lower risk. This can be seen by the generally low standard deviation in the returns of many of the funds. The SAPY returns are shown to be highly volatile at 16.1%, which is higher than all funds except for the STANLIB property income fund A and is notably higher than the average of the funds at 14.45%. This illustrates the comparatively high volatility of the listed property market which is likely caused by the high concentration in the index which leads to larger swings in performance.

The top three best performing funds according to their Sharpe ratios were the Catalyst SA property fund A with 0,536, Investec property equity A with 0,529 and the Alexander Forbes Investments property fund A with a Sharpe ratio of 0,51. Generally a Sharpe ratio of below 1 is considered suboptimal and shows negligible risk-adjusted outperformance (Grinold and Kahn, 2000). However, comparing to the benchmark Sharpe ratio of 0.433 and the average Sharpe ratio of the funds of 0.443 these funds appear to show slight outperformance.

The worst performing funds according to their Sharpe ratios were the Oasis property fund D with 0,284 and the Marriott property income fund A with 0,319. These ratios fall short of the Sharpe ratio of the index of 0.433 and hence they underperformed. It must be noted however, that the two weakest performing funds also had the lowest volatility and beta which contributed to their muted performance. However, despite the lower volatility these still underperformed on a risk-adjusted basis.

4.2.4 Information Ratio 2005-2018

The IR differs from the Sharpe ratio by measuring returns beyond those of a benchmark, rather than the risk-free rate. It is used as a measure of a unit trust manager's skill and ability to generate excess returns above the benchmark. It also aids to identify consistency of performance by incorporating the tracking error into the calculation. An IR of 0.5 is considered good performance, 0.75 is considered very good and a ratio greater than 1 is considered excellent (Grinold and Kahn, 2000). Whilst a positive ratio indicates outperformance, IR's below 0.3 are considered to not reliably outperform as they lead to lower t-statistics and hence lower statistical significance. This is an important consideration as t-statistics become more significant as the number of observations increases. Hence in a period from 2005-2018 there are 168 observations which increases the likelihood of the t-statistics being significant, despite there only being minimal outperformance.

The average IR of the 10 funds was 0.035, which is considered to be indicative of poor or minimal outperformance. This low average IR was caused by the 4 lowest performing funds,

which all had negative ratios, indicating they significantly underperformed the benchmark. The best performing funds according to their IR were once again the Alexander Forbes property fund A, Catalyst SA property equity fund A and Investec property equity fund A, with IR of 0.629, 0.437 and 0.369 respectively. These are the same funds which achieved the highest outperformance according to their Sharpe ratios.

When testing the outperformance for significance, it was found that these 3 funds all had sufficiently high t-statistics such that they were considered significant at the 99% confidence level. It must be noted that although these funds had IR that were considered statistically significant, only the Alexander Forbes fund achieved an IR of above 0.5, which would be considered noteworthy outperformance. Furthermore, when analysing the IR of the top performing Alexander Forbes fund, we see that the reason for its high IR is due to its low tracking error of 1.38%. It only achieved a mean excess return above the benchmark of 0.87%, which indicates relatively weak outperformance. This highlights the issue that can occur with t-statistics, as although they have been shown to be significant, they do not address the extent or amount of outperformance. In this case the amount of time periods is high at 168 and this causes the t-statistic to further become significant simply due to there being a large number of observations. Thus, although three of the funds had statistically significant IR's, it is evident that outperformance was negligible as the ratios were significant due to small tracking errors, with minor mean excess returns. The Catalyst SA property equity prescient fund A achieved the highest mean excess return above the benchmark and even this was slight at 1.19%. Thus, although statistically significant, outperformance was present in four of the 10 funds according to their IR's. It is noted that the amount of outperformance appears to be minimal and is only significant due to low tracking errors and a high number of observations

Four of the funds had negative IR over the period, which indicated the funds lost value relative to the benchmark and hence underperformed significantly. The t-statistics for these funds were also all significant at the 99% confidence level, indicating that the poor performance was likely not due to chance. The worst underperforming funds according to their IR were Marriot property income fund A, Oasis property equity fund D, SIM property fund A and Momentum Real Growth property fund A, whose ratios were -0.452, -0.411, -0.370 and -2.09 respectively. These four underperforming funds were also the funds with the lowest Sharpe ratios, indicating that they underperformed under both a risk-free rate and benchmark focused metric.

4.2.5 Jensen's Alpha 2005-2018

The program Eviews was used to calculate Jensen's alpha and beta for each fund. The funds' excess returns were regressed against the benchmarks excess returns. Funds with alpha's greater than zero and p-values less than 0.05 are said to have outperformed the benchmark.

Only three of the 10 funds had significant alphas, with p-values below 0.05. Once again these three funds are the top performing funds from the previous metrics, namely the Alexander Forbes Investments property equity Fund A, Catalyst SA property equity prescient fund A and Investec property equity fund A. These funds had alphas of 1.23%, 1.62% and 1.63% respectively. While these alphas are considered statistically significant, they are relatively small and indicate that outperformance is slight over the benchmark. These results are however in line with the previous two metrics above and provide evidence that these three funds managed to outperform the benchmark on a risk-adjusted basis and add value to investors.

Two of the funds had negative alphas for the period, namely the Oasis property equity fund and the Marriot property income fund, which were two of lowest performing funds in the previous two metrics. However, the p-value of these two funds are not significant, therefore one cannot conclude with certainty that the funds had negative returns compared to the benchmark. The remaining five funds all had alpha's close to zero with insignificant p-values, therefore one cannot claim with certainty whether there was abnormal performance in these funds.

Lastly, when analysing the regressions of each of the funds, the beta of the regression should be analysed. Beta indicates the weight of the independent variable in the prediction of the dependant variable. This measures the volatility of an individual fund in comparison to the unsystematic risk of the market. A beta of below one indicates that the fund has less systematic risk than the market and hence is less risky. A beta of greater than one indicates that a fund is more volatile than the market and therefore is riskier.

Over this period, all of the funds had betas of below one, with an average of 0.867, indicating that these funds were less volatile and hence less risky than the benchmark. The funds with the largest betas are the funds with the highest risk-adjusted returns, namely the Alexander Forbes property fund A, the catalyst property equity fund A and the Investec property equity fund A, with betas of 0.951, 0.945 and 0.928 respectively. The only two funds in this period with a significantly lower beta than the average were the Marriot and Oasis property funds, with betas of 0.628 and 0.609 respectively. These are the funds whose returns were the most different

from the market which had lower returns but also lower volatility than the other funds. These funds clearly had a different approach and stock selection compared to the other funds as their returns deviated from the benchmark the most. However, on a risk-adjusted basis these funds were still shown to underperform as they had the lowest Sharpe ratios as well as negative information ratios.

4.2.6 Performance Summary 2005-2018

Overall out of the 10 funds analysed for this time period, there appears to be statistically significant evidence that some of the funds achieved positive abnormal returns above the benchmark, whilst other funds significantly underperformed and diminished value to investors. However, while some outperformance was achieved, the amount of alpha achieved was small at approximately 1.5% on average. The top three performing funds showed in all three metrics that outperformance was achievable and significant. However, with the remaining funds it is evident that there was inadequate evidence to show outperformance. Overall the results for this period indicate that some active managers in the property unit trust industry do appear to possess some level of skill in outperforming the benchmark, but on average the evidence for outperformance is inconclusive. Whether this skill is persistent over other time frames will be analysed further in the next section.

4.3 Period 2: 2008-2018

This period includes the original 10 funds with an additional eight funds that were operational over this shorter period. This period includes the passive CoreShares PropTrax SAPY fund which aims to track the benchmark as closely as possible. The correlation in tracking error of the funds was once again shown to be high, which can be seen in the correlation matrix in appendix 1. This is also seen in figure 5 below, as the movement of excess return between funds is mostly similar. The most notable outliers in figure 5 are again the Marriot property income fund A and the Oasis property fund D which deviate substantially from the rest. The Coreshares Proptrax (PTXSPY) Index fund appears to have some deviations from benchmark in 2009 and 2012, most likely due to quarterly rebalances of holdings that led to the fund being notably different from the benchmark for short periods. Again the largest swings in the tracking error appear to occur during 2008-2009 and in 2017-2018, which are likely caused by the increased volatility caused by the great financial crisis in 2008 and the listed property market sell off which occurred in the beginning of 2018.

Figure 5: Excess Return over Benchmark 2008-2018

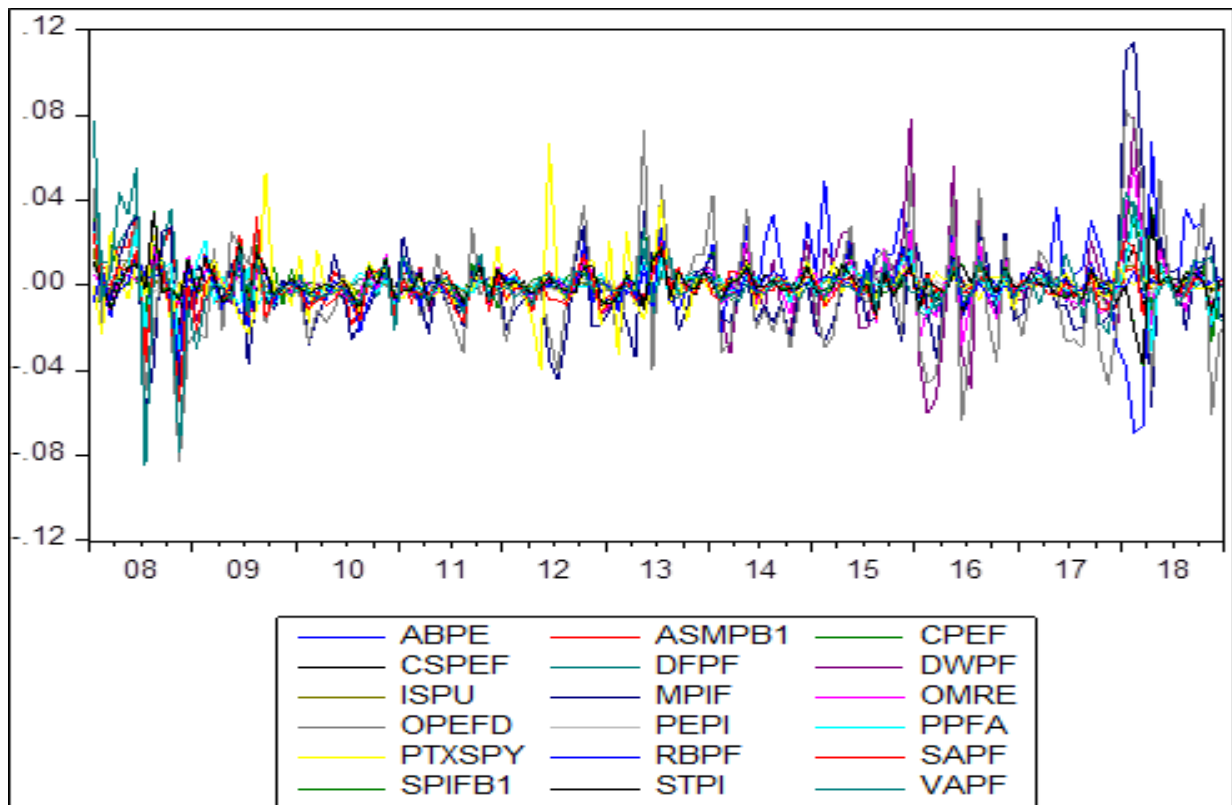


Table 7: Annualised Performance Summary 2008-2018

Fund Name	Standard deviation	Mean return	Sharpe Ratio	Information Ratio	t-stat	Mean excess return	Tracking Error	Jensen's Alpha	p-value	Beta
<i>Absa Property Equity Fund A</i>	16.30%	12.92%	0.368	0.501	5.756**	2.96%	5.91%	3.00%	0.096	0.863
<i>Alexander Forbes Investments Property Equity Fund A</i>	14.59%	11.02%	0.281	0.756	8.690**	1.06%	1.41%	1.23%**	0.000	0.944
<i>Ashburton Multi Manager Property Fund B1</i>	13.52%	11.22%	0.319	0.389	4.465**	1.26%	3.25%	1.68%*	0.026	0.987
<i>Catalyst SA Property Equity Prescient Fund A</i>	14.85%	11.42%	0.304	0.564	6.478**	1.47%	2.60%	1.62%*	0.034	0.951
<i>CoreShares PropTrax SAPY ETF</i>	16.11%	10.49%	0.222	0.12	1.377	0.53%	4.41%	0.51%	0.703	1.006
<i>Coronation Property Equity Fund A</i>	13.76%	11.22%	0.313	0.406	4.659**	1.27%	3.12%	1.63%*	0.034	0.967
<i>Discovery Flexible Property Fund A</i>	13.30%	11.63%	0.354	0.468	5.375**	1.67%	3.57%	2.14%**	0.008	0.845
<i>Investec Property Equity Fund A</i>	13.99%	10.56%	0.261	0.207	2.378**	0.60%	2.92%	0.92%	0.211	0.895
<i>Marriott Property Income Fund A</i>	9.69%	6.81%	-0.011	-0.386	-4.432**	-3.15%	8.16%	-1.81%	0.188	0.56
<i>Momentum Real Growth Property Fund A</i>	14.81%	9.84%	0.197	-0.044	-0.505	-0.12%	2.75%	0.04%	0.961	0.948
<i>Oasis Property Equity Fund D</i>	10.97%	6.20%	-0.065	-0.396	-4.549**	-3.76%	9.50%	-2.45%	0.235	0.57
<i>Old Mutual SA Quoted Property Fund A</i>	14.51%	10.59%	0.254	0.167	1.921*	0.63%	3.79%	0.90%	0.407	0.914
<i>Prudential Enhanced SA Property Tracker Fund A</i>	14.80%	11.01%	0.277	0.838	9.629**	1.05%	1.26%	1.18%**	0	0.958
<i>Select BCI Property Fund A</i>	12.39%	10.10%	0.257	0.025	0.282	0.14%	5.83%	0.89%	0.506	0.754
<i>Sharenet BCI Property Fund A</i>	13.95%	9.73%	0.202	-0.035	-0.405	-0.22%	6.33%	0.30%	0.862	0.827
<i>SIM Property Fund A</i>	14.22%	8.63%	0.121	-0.37	-4.253**	-1.33%	3.58%	-1.02%	0.299	0.901
<i>STANLIB Property Income Fund A</i>	15.76%	10.66%	0.238	0.239	2.751**	0.71%	2.95%	0.69%	0.439	1.004
<i>STANLIB Property Income Fund B1</i>	15.77%	11.05%	0.262	0.367	4.221**	1.09%	2.98%	1.08%	0.234	1.005
Risk Parity Portfolio	12.60%	15.63%	0.692	0.35	4.021**	4.39%	12.55%	6.75%*	0.031	0.513
SAPY	15.40%	9.96%	0.198	N/A	N/A	0	0	0	N/A	1
Fund Average	14.07%	10.28%	0.231	0.212	2.463	0.33%	4.13%	0.001	0.291	0.883
Funds that outperform index	14/18	13/18	14/18	4/18	N/A	N/A	N/A	6/18	N/A	N/A

** Indicates significance at the 99% confidence level. * Indicates significance at the 95% confidence level.

4.3.1 Nominal Performance 2008-2018

The funds' performance in this period appear to again be less volatile than the benchmark on average, which is seen by the average standard deviations of the funds compared to the benchmark. The standard deviation of the SAPY was 15.4% per year over the period, compared to the fund average of 14.1%. Furthermore, the average betas of the funds were once again below one, at 0.884 which shows the lower volatility of the funds. The average fund return was similar to that of the benchmark, with the SAPY achieving a 10% average annual return over the period and the funds achieving an average of 10.3%.

4.3.2 Sharpe Ratio 2008-2018

Looking at the performance of the SAPY benchmark, one can see that it has a fairly low Sharpe ratio of 0.198, which is lower than the average of the funds of 0.231. This is due to it having a substantially higher volatility than the funds, whilst also having lower average returns. The high volatility of the benchmark of 15.4% is again likely explained by its high concentration in a small number of funds. Hence 14 out of the 16 funds achieved lower standard deviations than the benchmark, due to them likely being able to more evenly allocate their funds and diversify more than the benchmark.

The best performing funds based on their Sharpe ratio were the Absa property fund A, Discovery flexible property fund A and the Ashburton multi manager property fund B1. These had Sharpe ratio's which were above 0.3, which whilst not showing overly strong performance, indicate that these funds were able to add some risk-adjusted value over a 10-year period. It is interesting to note that the risk parity portfolio of property stocks managed to outperform the other funds significantly based on it having significantly lower volatility as well as greater returns. The risk parity portfolio managed to achieve a Sharpe ratio of 0.692 which is approximately double as large as the best performing funds. It had relatively low standard deviation of 12.6% whilst achieving the highest average return of all at 15.6%. This once again highlights the issue with the SAPY benchmark and its high concentration, as a simple risk parity portfolio with equal risk weights in each funds, is able to significantly outperform the benchmark and other active managers by having higher returns as well as lower volatility.

The worst performing funds in this period according to their Sharpe ratio were the Marriott property income fund A, Oasis property fund D and the SIM property fund A with ratios of -0.011, -0.065 and 0.121 respectively. The negative Sharpe ratios of the two funds implied that the funds failed to outperform the risk-free rate over the period. They both had average returns

of 6.2% and 6.8% respectively, which is well below the average of the funds of 8.3%. It is worth noting that these underperforming funds also had the lowest volatility of the group with average yearly standard deviations of 9.7% for Marriot property Fund A and 11% for Oasis property fund D. From a risk-adjusted perspective it appears clear that the lowest performing funds failed to perform adequately and gave investors inferior risk-adjusted returns.

4.3.3 Information Ratio 2008-2018

The average information ratio for the funds in this period was 0.183, which is considered fairly low and indicates that on average the funds failed to add significant excess returns to the benchmark. The top 4 performing funds in this period with significant information ratios of greater than 0.5 are the Prudential enhanced SA property fund A, Alexander Forbes Investments property equity fund A, Catalyst SA property equity fund A and the Absa property equity fund A. These are almost identical to the best performing funds from the previous period, with the Prudential fund replacing the Investec property fund A, being the only difference. These four funds had sufficiently high information ratios to produce significant t-statistics. While 10 of the 18 funds achieved t-statistics that were sufficiently high to be statistically significant, only four funds had information ratio's greater than 0.5 which exceed the threshold to be considered substantial outperformance.

When one more closely analyses their tracking error and mean excess return, it is clear that the funds with the highest and most significant information ratios are again those with the lowest tracking errors. For example, the Alexander Forbes and Prudential funds had the two highest information ratios, however their mean excess returns were minimal at 1.05% and 1.06% respectively. However, these funds had substantially lower tracking errors at 1.41% and 1.26%, which causes their outperformance to become significant. However, it is evident that the magnitude of the performance is minimal and this should be considered when interpreting the results. The only fund which had a more noteworthy mean excess return was the Absa fund, at 2.96%, however with a more volatile tracking error of 5.91%. Overall these funds have shown statistically significant outperformance. It should be noted however, that the magnitude of the outperformance is minimal and that these appear significant mainly due to the low tracking errors these funds achieve.

In this period there were five funds which had negative information ratios, indicating they had underperformed the benchmark significantly and failed to add value to investors. The underperforming funds were the Sharenet BCI property fund A, Momentum Real Growth

property fund A, SIM property fund A, Marriot property fund A and Oasis property fund D. These underperforming funds are the same one which had negative information ratios in the previous period, which indicates that their poor performance was consistent across both time periods.

4.3.4 Jensen's Alpha 2008-2018

Out of the 18 funds in this period, six had significant Jensen's alphas with p-values of less than 0.05. The top three performing funds according to their significant Jensen's alpha were the Discovery Flexible property fund A, Ashburton Multi Manager property fund B1 and the Coronation property equity fund A with alphas of 2.14%, 1.68% and 1.63% respectively. These funds were able to add a modest return above the benchmark indicating that they had some significant positive return over the period. While these returns are significant, they indicate that outperformance over the benchmark is not excessively large at 1.6% to 2.1% for the best performing funds.

The average beta of the funds over this period was 0.847 which is considered fairly high and indicates that most of the funds have returns which are similar to that of the benchmark. There were three funds with betas of greater than one, with one of those funds being a passive ETF fund which is expected to have a beta of close to one. The Coreshares Proptax SAPY ETF fund has the highest beta of 1.006, indicating that it accurately tracked the index over the period and produced similar returns. The two other funds with positive betas are the STANLIB property income fund B1 and STANLIB property income fund A, with betas of 1.005 and 1.004 respectively. Whilst these two funds are not classified as passive index tracking funds, the managers were able to very closely replicate the returns of the benchmark. These three funds with the highest betas were not able to add any significant outperformance according to their alphas, as they were all insignificant at the 95% confidence level.

The two funds with the lowest betas which were significantly lower than the average, were the Oasis property fund D and the Marriot property fund A, which are the same results as in the previous longer period. These funds again managed to minimise their volatility by having the lowest standard deviations of the funds, however they also had the lowest average returns, with negative Sharpe and information ratios. The performance of these two funds is evidently the most different from the benchmark, nevertheless based on the risk-adjusted measures these funds significantly underperformed the benchmark.

4.3.5 Performance Summary 2008-2018

This period included a further eight funds to the analysis and showed that positive performance above the benchmark was rare, but possible. The funds on average showed slight outperformance based on their Sharpe ratios, however the difference was not significant. Furthermore, the average information ratio of the funds was 0.231 which is also insignificant and unimpressive. Despite this, there are some funds that like in the first period showed signs of outperformance across multiple measures. The worst performing funds were found to be the same as in period 1.

4.4 Out of Sample Period 2008-2015

An investigation into a shorter out of sample period from 2008-2015 was included in the analysis of the 18 available funds to determine whether performance was consistent across an out of sample period. The performance of this period can be directly compared to that of period 2, as it contains the same funds. If the performance of the funds is found to be similar in these periods one can more confidently ascertain that individual funds' performance is less influenced by the performance of the market but rather determined by the choices of the fund managers. This period also excludes the selloff and negative performance experienced in the property industry in 2018, thereby making it useful to see whether fund performance was greater than the benchmark in a bullish period for listed property.

The performance in this period appears to be similar to the performance in the former period. Most funds returns are higher than the previous period 2, because this period excludes the sell-off which occurred in 2018. The average annual return of the funds is 14.51%, which is in line with the benchmark return of 14.14%. Once again the volatility of the funds is on average lower than the benchmark at 14.43% vs. 15.80%. This is further shown by the higher average Sharpe ratio achieved by the funds of 0.53 vs. the benchmark ratio of 0.46. Overall this is similar to the performance seen in period 2.

The best and worst performing funds in this period appear to also be highly comparable to those in period 2. The highest performing funds on average were again the Absa property equity fund A, Discovery Flexible property fund A, Prudential Enhanced SA property tracker fund A and the Alexander Forbes Investments property equity fund A. The underperforming funds were also identical to the previous period, with the Marriott property income fund A, Oasis property equity fund D and SIM property fund A being suboptimal. This reinforces the fact

that these over and underperforming funds appear to perform consistently despite the performance of the market.

It is interesting to note that the performance of the risk parity portfolio was not as strong as in period 2. The risk parity portfolio failed to have a significant alpha and its information ratio was considered low and insignificant at only 0.191. However, this is somewhat expected because this portfolio has the largest tracking error and is most different from the other funds. This can be seen by its very low beta of only 0.437 which is substantially smaller than those of the other funds. The risk parity portfolio did however achieve the largest mean return of 18.06% as well as the largest Sharpe ratio of 0.885, indicating that it still provided strong risk-adjusted performance. The reason for its insignificant alpha and information ratio is likely because this period excludes the selloff of property funds after 2015 and therefore does not contain the large downward swing in the market. The selloff period is the one in which the risk parity fund is expected to have performed best, due to its lower volatility and increased diversification over the benchmark.

Overall the out of sample period confirms that the performance in this period is comparable to the performance of the previous periods. There appears to be similar levels of outperformance present, with only a small number of funds showing significant outperformance across multiple metrics. Fund performance therefore appears to be mostly unaffected by movements in the market, as performance in this period does not differ significantly despite this being a mainly positive period for property stocks. However, it is worth noting that the risk parity portfolio does not stand out significantly in this period as it does not include the negative performance of the property sector which occurred in 2018. This indicates that the risk parity portfolio therefore seems to outperform the benchmark and other funds more significantly in more volatile and negative markets. This is to be expected given its lower risk attributes and diversification benefits.

Table 8: Out of Sample Period Performance Summary 2008-2015

Fund Name	Standard Deviation	Mean Return	Sharpe Ratio	Information Ratio	t-stat	Jensen's Alpha	p-value	Beta
<i>Absa Property Equity Fund A</i>	15.05%	17.51%	0.710	0.807	9.380**	3.95%**	0.007	0.920
<i>Alexander Forbes Investments Property Equity Fund A</i>	15.02%	15.03%	0.546	0.622	7.224**	1.27%**	0.003	0.947
<i>Ashburton Multi Manager Property Fund BI</i>	13.54%	15.81%	0.664	0.460	5.339**	2.84%**	0.003	0.841
<i>Catalyst SA Property Equity Prescient Fund A</i>	15.46%	15.64%	0.571	0.560	6.501**	1.77%	0.064	0.964
<i>CoreShares PropTrax SAPY ETF</i>	16.68%	14.80%	0.479	0.129	1.504	0.63%	0.733	1.005
<i>Coronation Property Equity Fund A</i>	14.34%	15.36%	0.596	0.437	5.074**	1.97%*	0.017	0.897
<i>Discovery Flexible Property Fund A</i>	13.63%	16.63%	0.719	0.720	8.363**	3.61%**	0.000	0.846
<i>Investec Property Equity Fund A</i>	14.48%	15.16%	0.576	0.386	4.486**	1.71%*	0.032	0.906
<i>Marriott Property Income Fund A</i>	10.51%	7.69%	0.083	-1.012	11.762**	-3.83%**	0.000	0.643
<i>Momentum Real Growth Property Fund A</i>	15.13%	13.89%	0.468	-0.081	-0.936	0.19%	0.859	0.941
<i>Oasis Property Equity Fund D</i>	11.24%	11.15%	0.386	-0.369	-4.284	-0.26%	0.894	0.628
<i>Old Mutual SA Quoted Property Fund A</i>	15.62%	14.93%	0.519	0.283	3.284	0.99%	0.322	0.973
<i>Prudential Enhanced SA Property Tracker Fund A</i>	15.24%	15.56%	0.574	1.228	14.269**	1.70%**	0.000	0.962
<i>Select BCI Property Fund A</i>	12.59%	13.81%	0.555	-0.052	-0.608	1.56%	0.359	0.742
<i>Sharenet BCI Property Fund A</i>	15.09%	14.83%	0.531	0.147	1.714	1.33%	0.410	0.913
<i>SIM Property Fund A</i>	14.55%	12.28%	0.375	-0.481	-5.589	-1.10%	0.383	0.896
<i>STANLIB Property Income Fund A</i>	15.77%	15.34%	0.541	0.462	5.362	1.32%	0.158	0.983
<i>STANLIB Property Income Fund BI</i>	15.77%	15.73%	0.565	0.612	7.109**	1.71%	0.068	0.983
SAPY	15.80%	14.14%	0.463	N/A	N/A	0.00%	N/A	1.000
Risk Parity	12.70%	18.06%	0.885	0.191	2.217	0.63%	0.063	0.437
Average	14.43%	14.51%	0.525	0.270	3.135	1.19%	0.240	0.888
Funds that outperform Index	17/18	13/18	15/18	6/18	N/A	7/18	N/A	N/A

** Indicates significance at the 99% confidence level. * Indicates significance at the 95% confidence level.

4.5 Period 3: 2015-2018

This period encompasses the largest amount of funds as it includes newer funds which opened after 2008. The full 34 funds are included in this period, of which five being passive funds aim to track the benchmark directly. This shorter period emphasises the significant sell-off in listed property shares and is therefore useful in determining how active funds performed relative to the benchmark in a declining market.

4.5.1 Correlation of Tracking Error

The correlation of the funds tracking errors is shown in table 3. On average the correlation between funds tracking error is again shown to be high, with many of the funds having correlations of greater than 0.5. Some of the funds such as the ABSA property fund A (ABPE), STANLIB property income fund A (STPI) and the STANLIB property income fund B1 (SPIFB1) have low and negative correlations to other funds. This is likely due to these funds having the largest betas of over one and therefore being more volatile and the most different from the others. Furthermore, the two STANLIB funds have almost identical returns and standard deviations, with similar betas over one and almost identical tracking errors, hence explaining their joint lack of correlation to the other funds. Furthermore, the two Investec funds A and H both had highly similar betas of 0.856 and 0.857 and the same tracking error of 3.30%. Thus their correlations were one over the period, illustrating that the two funds are expected to perform highly similarly to one another.

Overall, this period has similarly high levels of correlation between the funds tracking error as the previous two periods, whilst having a small number of higher beta funds which differ significantly in variability from the others. Given the high correlation in tracking errors, we should expect that most funds on average should perform similarly.

Table 9: Tracking Error Correlation 2015-2018

2015-2018	ISPU	CSPEF	CPEF	PPFA	MPIF	RBPF	OPEFD	OMRE	SAPF	STPI	ABPE	ASMPB1	PTXSPY	DFFP	PEPI	VAPF	DWPF	SPIFB1	AFICA	FMFCA	CSAPF	PTXTEN	HPPFC	PPFH	MCPFA	NIPCA	DSPFA	MXPR	PEPTF	SAPIF	SSPF1	STPROP	SLPCA	TNICA		
ISPU	1.000																																			
CSPEF	0.557	1.000																																		
CPEF	0.648	0.439	1.000																																	
PPFA	0.640	0.387	0.743	1.000																																
MPIF	0.479	0.339	0.759	0.644	1.000																															
RBPF	0.325	0.775	0.116	0.234	-0.004	1.000																														
OPEFD	0.619	0.497	0.883	0.753	0.746	0.188	1.000																													
OMRE	0.588	0.669	0.804	0.765	0.772	0.450	0.878	1.000																												
SAPF	0.326	0.687	0.570	0.234	0.464	0.448	0.515	0.659	1.000																											
STPI	0.141	0.300	-0.139	-0.430	-0.363	0.279	-0.128	-0.119	0.427	1.000																										
ABPE	0.090	0.193	-0.322	-0.370	-0.618	0.320	-0.187	-0.303	-0.044	0.675	1.000																									
ASMPB1	0.867	0.448	0.637	0.723	0.372	0.295	0.644	0.551	0.221	0.069	0.146	1.000																								
PTXSPY	0.011	0.319	0.191	0.171	0.083	0.352	0.117	0.241	0.381	0.033	-0.137	0.032	1.000																							
DFFP	0.680	0.452	0.734	0.978	0.673	0.289	0.780	0.814	0.271	-0.387	-0.339	0.723	0.169	1.000																						
PEPI	0.625	0.440	0.688	0.623	0.558	0.129	0.716	0.616	0.455	-0.108	-0.109	0.611	0.151	0.640	1.000																					
VAPF	0.249	0.512	0.577	0.345	0.706	0.307	0.536	0.646	0.660	-0.118	-0.367	0.139	0.263	0.390	0.491	1.000																				
DWPF	0.692	0.624	0.633	0.716	0.549	0.411	0.750	0.761	0.391	-0.040	0.027	0.714	0.118	0.791	0.588	0.382	1.000																			
SPIFB1	0.136	0.300	-0.144	-0.436	-0.367	0.279	-0.134	-0.124	0.425	1.000	0.677	0.063	0.030	-0.392	-0.110	-0.118	-0.045	1.000																		
AFICA	0.651	0.608	0.751	0.683	0.694	0.320	0.783	0.825	0.610	0.019	-0.119	0.570	0.066	0.708	0.670	0.541	0.754	0.013	1.000																	
FMFCA	0.589	0.476	0.532	0.729	0.386	0.426	0.716	0.652	0.160	-0.162	0.056	0.737	0.124	0.751	0.539	0.205	0.775	-0.169	0.607	1.000																
CSAPF	0.648	0.558	0.665	0.511	0.613	0.229	0.603	0.621	0.607	0.072	-0.131	0.486	0.217	0.541	0.727	0.520	0.560	0.073	0.668	0.309	1.000															
PTXTEN	0.044	0.293	0.173	0.029	0.111	0.223	0.214	0.201	0.372	0.038	0.033	0.060	0.551	0.068	0.462	0.511	0.130	0.039	0.108	0.064	0.373	1.000														
HPPFC	0.710	0.387	0.747	0.913	0.645	0.242	0.687	0.696	0.234	-0.408	-0.343	0.746	0.053	0.883	0.619	0.401	0.620	-0.412	0.653	0.619	0.536	0.032	1.000													
PPFH	0.640	0.386	0.743	1.000	0.644	0.233	0.753	0.765	0.233	-0.430	-0.370	0.722	0.171	0.978	0.623	0.345	0.716	-0.436	0.683	0.729	0.510	0.029	0.913	1.000												
MCPFA	0.387	0.403	0.336	0.624	0.394	0.329	0.407	0.473	0.066	-0.349	-0.168	0.481	-0.003	0.663	0.354	0.247	0.711	-0.349	0.480	0.612	0.340	0.029	0.592	0.624	1.000											
NIPCA	0.487	0.413	0.788	0.665	0.767	0.023	0.782	0.755	0.579	-0.146	-0.324	0.453	0.016	0.661	0.743	0.562	0.635	-0.149	0.861	0.443	0.666	0.115	0.624	0.665	0.395	1.000										
DSPFA	0.383	0.670	0.446	0.424	0.322	0.526	0.583	0.626	0.448	0.060	0.121	0.389	0.377	0.492	0.433	0.359	0.664	0.059	0.494	0.539	0.452	0.364	0.331	0.424	0.428	0.360	1.000									
MXPR	0.486	0.589	0.469	0.539	0.205	0.505	0.577	0.539	0.323	0.045	0.309	0.597	0.149	0.553	0.607	0.306	0.649	0.043	0.611	0.703	0.382	0.256	0.477	0.538	0.431	0.547	0.553	1.000								
PEPTF	0.625	0.439	0.689	0.623	0.557	0.128	0.716	0.616	0.455	-0.108	-0.109	0.612	0.151	0.640	1.000	0.489	0.588	-0.109	0.670	0.538	0.727	0.463	0.619	0.622	0.354	0.743	0.433	0.606	1.000							
SAPIF	0.526	0.496	0.415	0.364	0.310	0.394	0.293	0.416	0.461	0.042	-0.115	0.398	0.246	0.392	0.616	0.418	0.279	0.046	0.345	0.127	0.671	0.457	0.464	0.363	0.220	0.361	0.277	0.313	0.616	1.000						
SSPF1	0.618	0.586	0.733	0.868	0.638	0.458	0.692	0.800	0.478	-0.247	-0.296	0.663	0.192	0.846	0.562	0.521	0.646	-0.252	0.738	0.628	0.531	0.075	0.924	0.868	0.588	0.659	0.428	0.537	0.562	0.437	1.000					
STPROP	0.239	0.461	0.200	0.186	0.113	0.475	0.152	0.351	0.406	0.130	0.082	0.172	0.242	0.204	0.159	0.248	0.214	0.130	0.332	0.179	0.235	0.108	0.230	0.187	0.074	0.137	0.223	0.237	0.158	0.262	0.390	1.000				
SLPCA	0.599	0.535	0.411	0.408	0.265	0.456	0.321	0.452	0.503	0.153	-0.028	0.472	0.282	0.444	0.613	0.354	0.414	0.156	0.398	0.237	0.714	0.375	0.458	0.407	0.292	0.370	0.374	0.342	0.613	0.919	0.454	0.267	1.000			
TNICA	0.695	0.536	0.706	0.600	0.615	0.343	0.814	0.723	0.371	0.001	-0.004	0.668	0.128	0.677	0.531	0.420	0.826	-0.006	0.708	0.769	0.503	0.114	0.574	0.600	0.488	0.565	0.631	0.580	0.531	0.188	0.579	0.144	0.274	1.000		

Figure 6: Excess Return over Benchmark 2015-2018

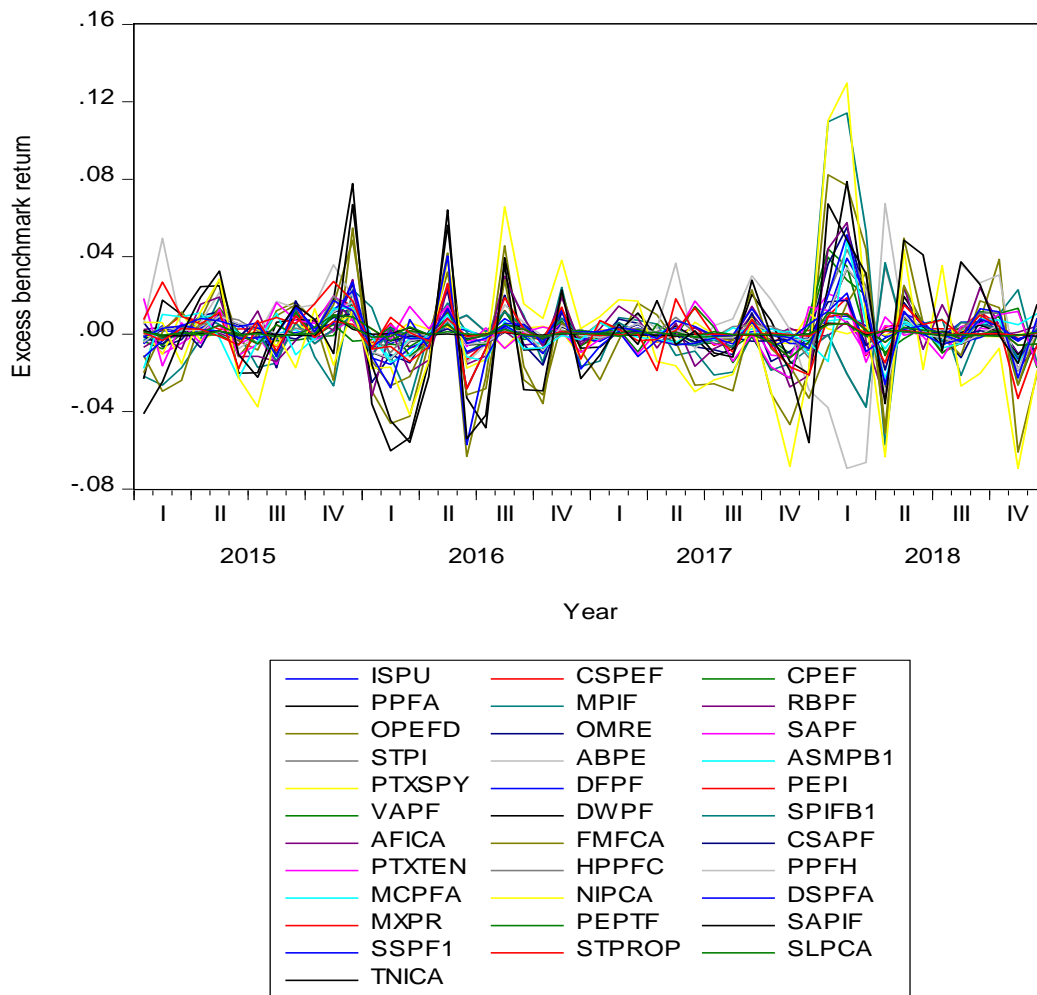


Figure 6 further highlights the correlation of the funds excess returns and makes it evident that the returns of most funds are highly correlated. The three largest outliers with the largest deviations from the rest were the Nedgroup Investments fund A (NIPCA) and the Marriot property fund A (MPIF) and the Oasis property fund D (OPEFD). These funds had the largest tracking error and hence the largest volatility and deviations from the benchmark return. These funds also had the smallest betas at 0.347, 0.374 and 0.383 respectively. Despite these outliers, it remains evident that the excess returns of the funds on average are correlated, indicating that the returns of the funds on average are expected to be similar.

4.5.2 Nominal Performance Measures 2015-2018

Over this period the benchmark return was 1.03% per annum, illustrating the significant downward trend in listed property performance which began in early 2018. The average mean returns of all the funds over this period was 2%, indicating that on average the funds appeared

to outperform the benchmark. Furthermore, the average volatility of the funds was lower than the index at 12.3%, compared to the SAPY with 13.8%. Table 10 below provides the summary of the funds returns and performance metrics over the period.

Table 10: Annualised Performance Summary 2015-2018

Fund Name	Standard deviation	Mean return	Modified Sharpe Ratio	Information Ratio	t-stat	Mean Excess return	Tracking Error	Jensen's Alpha	p-value	Beta
<i>Absa Property Equity Fund A</i>	17.96%	6.87%	0.000	0.683	4.732**	5.84%	8.56%	6.77%	0.115	1.156
<i>Alexander Forbes Investments Fund A</i>	12.83%	3.05%	-0.005	1.357	9.405**	2.03%	1.49%	1.60%**	0.01	0.927
<i>Ampersand SCI Flexible Property Income Fund A</i>	10.12%	2.37%	-0.005	0.209	1.446	1.35%	6.45%	-0.66%	0.771	0.660
<i>Ashburton Multi Manager Property Fund B1</i>	12.69%	2.28%	-0.006	0.610	4.226**	1.25%	2.05%	0.74%	0.389	0.913
<i>Autus Prime Property Fund A</i>	11.43%	-0.11%	-0.008	-0.168	-1.161	-1.14%	6.81%	-2.78%	0.338	0.723
<i>Catalyst SA Property Equity Prescient Fund A</i>	12.77%	3.64%	-0.004	1.049	7.270**	2.61%	2.49%	2.10%	0.065	0.913
<i>Citadel SA Property H4 Fund B1</i>	12.70%	1.79%	-0.007	0.439	3.044**	0.76%	1.74%	0.27%	0.686	0.916
<i>Coronation Property Equity Fund A</i>	11.55%	2.34%	-0.005	0.365	2.529**	1.31%	3.59%	0.23%	0.860	0.818
<i>Discovery Flexible Property Fund A</i>	11.74%	2.03%	-0.006	0.278	1.927*	1.00%	3.60%	-0.01%	0.993	0.829
<i>Hollard Prime Property Fund B</i>	11.90%	4.67%	-0.003	1.007	6.974**	3.64%	3.62%	2.69%	0.071	0.839
<i>Investec Property Equity Fund A</i>	12.09%	1.84%	-0.006	0.247	1.714*	0.82%	3.30%	-0.03%	0.981	0.856
<i>Investec Property Equity Fund H</i>	12.09%	2.30%	-0.006	0.386	2.672**	1.27%	3.30%	0.42%	0.754	0.857
<i>Marriott Property Income Fund A</i>	7.78%	3.15%	-0.003	0.204	1.411	2.12%	10.42%	-1.58%	0.596	0.374
<i>Mazi Asset Management Prime Property Fund A</i>	12.23%	0.94%	-0.007	-0.023	-0.158	-0.09%	3.99%	-0.97%	0.581	0.851
<i>Momentum Real Growth Property Fund A</i>	13.68%	2.34%	-0.006	0.662	4.586**	1.31%	1.98%	1.21%	0.234	0.982
<i>Nedgroup Investments Property Fund A</i>	10.55%	-0.21%	-0.008	-0.095	-0.658	-1.24%	13.02%	-5.10%	0.293	0.347
<i>Oasis Property Equity Fund D</i>	9.52%	-2.69%	-0.009	-0.319	-2.209	-3.72%	11.66%	-7.37%	0.076	0.383
<i>Old Mutual SA Quoted Property Fund A</i>	10.97%	2.39%	-0.005	0.255	1.767*	1.36%	5.33%	-0.16%	0.936	0.742
<i>Optimum BCI Property Fund A</i>	12.55%	0.32%	-0.008	-0.148	-1.023	-0.70%	4.78%	-1.56%	0.482	0.855
<i>Plexus Wealth BCI Property Fund A</i>	12.71%	3.00%	-0.005	0.426	2.949**	1.97%	4.62%	1.20%	0.584	0.869

Table 10 extended:

Fund Name	Standard deviation	Mean return	Modified Sharpe Ratio	Information Ratio	t-stat	Mean Excess return	Tracking Error	Jensen's Alpha	p-value	Beta
<i>Prudential Enhanced SA Property Tracker Fund A</i>	12.96%	1.75%	-0.007	0.484	3.354**	0.72%	1.49%	0.34%	0.578	0.936
<i>Prudential Enhanced SA Property Tracker Fund D</i>	12.96%	1.86%	-0.007	0.559	3.875**	0.83%	1.49%	0.46%	0.460	0.936
<i>Select BCI Property Fund A</i>	12.10%	2.04%	-0.006	0.248	1.717*	1.01%	4.07%	0.07%	0.968	0.841
<i>Sesfikile BCI Property Fund AI</i>	11.90%	4.92%	-0.002	0.988	6.842**	3.89%	3.94%	2.90%	0.081	0.832
<i>Sharenet BCI Property Fund A</i>	9.70%	2.28%	-0.005	0.132	0.912	1.26%	9.55%	-1.64%	0.634	0.510
<i>SIM Property Fund A</i>	12.95%	0.85%	-0.008	-0.066	-0.457	-0.17%	2.61%	-0.63%	0.608	0.923
<i>STANLIB Property Income Fund A</i>	14.68%	0.67%	-0.009	-0.104	-0.717	-0.35%	3.42%	-0.14%	0.934	1.036
<i>STANLIB Property Income Fund BI</i>	14.71%	1.05%	-0.009	0.008	0.053	0.03%	3.47%	0.25%	0.888	1.037
<i>True North IP Enhanced Property Fund A</i>	8.41%	1.73%	-0.004	0.063	0.436	0.70%	11.14%	-3.08%	0.379	0.361
Passive Funds										
CoreShares PropTrax SAPY ETF	13.87%	1.56%	-0.007	0.316	2.187*	0.53%	1.69%	0.04%	0.545	0.999
CoreShares PropTrax Ten ETF	13.92%	2.54%	-0.006	0.418	2.899**	1.51%	3.61%	0.11%	0.459	0.976
Satrix Property Index Fund AI	13.60%	1.57%	-0.007	0.803	5.564**	0.54%	0.67%	0.04%	0.171	0.986
STANLIB SA Property ETF	13.73%	1.82%	-0.007	0.439	3.041**	0.80%	1.82%	0.06%	0.439	0.987
Sygnia Listed Property Index Fund A	13.60%	1.68%	-0.007	0.930	6.445**	0.66%	0.70%	0.05%	0.105	0.985
Risk Parity Portfolio	12.59%	7.92%	0.078	0.819	4.914**	6.89%	8.42%	5.30%	0.174	0.731
SAPY	13.79%	1.03%	-0.008	N/A	N/A	N/A	N/A	N/A	N/A	1
Fund Average	12.32%	2.02%	-0.006	0.372	2.576	0.99%	4.48%	-0.18%	0.527	0.828

** Indicates significance at the 99% confidence level. * Indicates significance at the 95% confidence level.

4.5.3 Sharpe Ratio 2015-2018

All of the funds in this period had negative Sharpe ratio's due to the mean returns being lower than the risk-free rate over this period. This highlights the substantial underperformance of the property sector over this period as it was unable to achieve returns greater than the risk-free

rate. As discussed earlier, a negative Sharpe ratio can be difficult to analyse and utilise because it gives misleading results. This is because a negative excess return with large volatility leads to the Sharpe ratio being less negative, indicating better performance (Israelsen, 2005). Therefore, ranking negative Sharpe ratios becomes problematic, as funds can achieve a larger ratio by having high volatility with negative excess returns. Given that the interpretation of negative standard Sharpe ratio's is problematic and does not lead to useful comparisons, modified Sharpe ratios have been calculated based on Israelsen (2005).

Using the modified Sharpe ratios to rank the best performing funds, we see that the best performers were the ABSA property equity fund A, Sesfikile BCI property fund A1 and Hollard prime property fund B. The Sharpe ratio for the SAPY was notably low in this period, with it being outperformed by all but four of the funds. This was because it once again had higher average volatility than the funds, whilst achieving a return of 1.02% a year compared to the fund average of 2%. The poor risk-adjusted performance of the SAPY over this period again highlights the concerns of its high concentration, which in turn diminishes its ability to provide satisfactory risk-adjusted performance. Many of the funds achieved higher returns over this period with less volatility than the SAPY which can be seen as beneficial for investors.

However, a number of funds managed to underperform substantially by having higher volatility and lower returns than the benchmark which is undesirable. These poor performing funds were the STANLIB property income fund A, Oasis property equity fund D and STANLIB property income fund B1, all of which underperformed the benchmark according to their Sharpe ratios.

Based on average returns and volatility, the best performing funds were the ABSA property fund A, Sesfikile BCI property fund A1 and Hollard Prime property fund B, with returns of 6.9%, 4.9% and 4.7% respectively. The ABSA property fund achieved the highest return by also having the largest volatility, with a standard deviation of 18%, significantly above the average of 12.3%. It is worth noting that the risk parity portfolio was the only one to achieve a positive Sharpe ratio of 0.078, with the highest average return of 7.9% over the period.

4.5.4 Information Ratio 2015-2018

Looking at the information ratio of the funds, it appears that on average there was some positive outperformance, with a mean information ratio of 0.385. The three top performing funds with information ratios above one were the Alexander Forbes Investments property fund A, the Catalyst SA property equity prescient fund A and the Hollard Prime property fund B. These

funds provided significant outperformance according to their information ratio's and successfully managed to outperform the index. On closer inspection we see that the Alexander Forbes Fund A with the highest information ratio of 1.357, achieved this by having a significantly low tracking error of 1.49%. Its mean excess return over the benchmark was slight at only 2.03%. While outperformance appears to be significant, it is worth noting that the effect size of the outperformance is not substantial. The other two top performing funds achieved a more noteworthy excess return of 2.1% and 3.64% respectively, albeit with larger tracking errors. This reemphasises the important consideration when analysing the significance of information ratios for all the funds. The effect size and degree of outperformance should be considered, not only whether it is significant or not.

From table 10 it appears as though the outperformance measured by the information ratio is statistically significant across the majority of funds, as they all show significant t-statistics. With reference to the t-statistics, the value is calculated by multiplying the information ratio by the \sqrt{T} and needs to be above a certain critical value in order to be significant. In this period in order to be considered statistically significant mean excess return over the benchmark, the information ratio needs to be larger than 0.244 in order to produce a significant t-statistic at the 95% confidence level. This can be problematic as an information ratio of 0.244 is generally considered weak outperformance according to Grinold and Kahn (2000). Thus, in order to be considered significant outperformance a hurdle value is used for the IR of greater than 0.5. This will require a t-statistic of 3.34 in order for a funds outperformance to be considered significantly robust (Goodwin, 1998).

Given this hurdle value, only eight of the 29 active funds achieved an information ratio above 0.5, indicating good performance relative to the benchmark. 14 funds achieved minimal outperformance with an information ratio between 0.2-0.5. Seven funds had negative information ratios indicating they destroyed value relative to the benchmark.

It should further be noted that many funds achieve significant information ratios of greater than 0.5 simply by having very low tracking errors, with minor outperformance over the benchmark. For example, the Prudential Enhanced SA Property Tracker Fund D achieved a significant information ratio of 0.559, indicating outperformance over the benchmark. However, it's tracking error was one of the lowest at 1.49% and its mean excess return was only 0.83% which does not indicate substantial outperformance over the benchmark. This can further be seen with the passive funds, which unsurprisingly have some of the lowest tracking errors. The Sygnia

Listed Property Index Fund A has a low tracking error at 0.7%, with a mean excess return of 0.66% indicating that outperformance was minimal. However, its information ratio is one of the highest at 0.93, leading one to believe it had strong outperformance over the period. Ultimately this emphasises the important concern of considering the effect size when interpreting the significance of these results. While many funds achieved statistically significant t-statistics, indicating outperformance over the benchmark, when one considers the minimal size of this outperformance it becomes less remarkable, as the amount of outperformance is small and only significant due to the returns being highly similar to that of the benchmark. This further highlights the fact that most funds fail to achieve noteworthy or substantial outperformance over the benchmark.

4.5.5 Jensen's Alpha 2015-2018

Moving onto the Jensen's alphas of the funds over this period, only the Alexander Forbes Investments property fund was able to achieve a significant alpha at the 95% confidence level, with a p-value of 0.0067 and an alpha of 1.6%. Four funds achieved significant alphas at the 90% confidence levels, with the best performers being Sesfikile BCI property fund A1, Hollard Prime property fund B and Catalyst SA property equity fund A with alphas of 2.9%, 2.69% and 2.1% respectively. These results are in line with the Sharpe and information ratio results, as these funds appear to be the strongest performers over the period. It should be noted that the alphas achieved were not statistically robust at the 95% confidence level and were further not substantial at 2.1%-2.9%.

Of the underperforming funds with negative alphas, the Oasis property equity fund A had the most significant alpha of -0.6% with a p-value of 0.076. While not statistically significant at the 95% confidence level, this reinforces the fact that the Oasis property equity fund is again one of the weakest performing funds in this more recent time period as well.

The average beta for the active funds over this time period was 0.8, which is lower than the longer time periods. This indicates that on average the funds avoided tracking the market directly over this period, which is logical given the significant poor performance that the SAPY experienced.

Table 11: Passive fund performance Summary 2015-2018

Fund Name	Standard Deviation	Mean Return	Sharpe Ratio	Information Ratio	T-stat	Jensen's Alpha	p-value	Beta	Tracking error
CoreShares PropTrax SAPY ETF	13.87%	1.56%	-0.007	0.316	1.894	0.04%	0.545	0.999	1.69%
CoreShares PropTrax Ten ETF	13.92%	2.54%	-0.006	0.418	2.510	0.11%	0.459	0.976	3.61%
Satrix Property Index Fund A1	13.60%	1.57%	-0.007	0.803	4.819	0.04%	0.171	0.986	0.67%
STANLIB SA Property ETF	13.73%	1.82%	-0.007	0.439	2.634	0.06%	0.439	0.987	1.82%
Sygnia Listed Property Index Fund A	13.60%	1.68%	-0.007	0.930	5.582	0.05%	0.105	0.985	0.70%
Risk Parity Portfolio	12.59%	7.92%	0.078	0.819	4.914	5.30%	0.175	0.731	8.42%
SAPY	13.79%	1.03%	-0.008	N/A	N/A	N/A	N/A	1.000	N/A

Of the five passive funds in this period, performance across funds was comparable, with similar returns and volatility, which is to be expected. The fund with the largest information ratio was the Sygnia Listed Property Index Fund A with 0.93. None of the passive funds had significant alpha's, which is to be expected and they all had betas of close to one. The CoreShares PropTrax Ten was the best risk-adjusted performer, with the largest mean return, likely because it tracks a different benchmark and has maximum weighting of 10% per share which reduces its holding in one specific share. Looking at the tracking error of the funds, the best performing passive funds were the Satrix and Sygnia funds. These had tracking errors of 0.67% and 0.7% respectively, which shows that they successfully tracked the index with minimal deviations from the benchmark returns. These two funds hence also had the highest information ratios out of the passive funds, of 0.803 and 0.930 respectively. The passive funds had on average higher information ratios than the active funds in this period, because they had substantially lower tracking errors than active funds whilst still achieving somewhat larger mean returns than the benchmark. This reinforces that the information ratio's over this period can be somewhat misleading, as many funds achieved significantly high ratios simply because they had low tracking errors, not because they had notable excess returns over the benchmark.

4.5.6. Risk Parity Portfolio Performance 2015-2018

The best performing fund in this period was the risk parity portfolio of property stocks, which had an average return of 7.9% for the period and the only positive Sharpe ratio of 0.078. It achieved the largest Sharpe ratio as well as one of the highest information ratio of 0.82, which was above the average of 0.385. Whilst having an insignificant Jensen's alpha, this portfolio managed the largest average yearly returns while having a beta of 0.73, indicating its risk was well below that of the market. This indicates that having a diversified equally distributed risk weightings of stocks may be the most successful way to achieve superior returns in the property industry. This is again likely due to the high concentration of the SAPY in a small number of large REIT's which increases its volatility. The strong performance of the risk parity portfolio was also seen in the previous period as it achieved higher risk-adjusted and nominal performance compared to both the active and passive funds.

Despite it having the largest tracking error over the period at 8.42%, this is acceptable given it achieved lower volatility than the benchmark and substantially higher mean returns. Given the shortcomings and drawbacks of the main property benchmark, the SAPY, investors appear to be better off in a risk parity portfolio of property stocks rather than an active or passive fund. Passive funds have been shown to effectively track their benchmark, however if the benchmark is flawed and overly concentrated, investors are better off investing in a different approach such as a risk parity portfolio.

4.5.7 Performance Summary 2015-2018

Overall this period has given insight into how the funds performed when markets were bearish. The previous time periods were biased towards strong performance of the property industry, however this highlights the notable market downturn which began in 2018. Overall the results in this period are somewhat mixed. Most funds managed to achieve similar or higher returns than the SAPY whilst having lower volatility. Furthermore, most funds achieved outperforming Sharpe ratio's, with a small number of funds managing to achieve positive risk-adjusted performance across the 3 performance metrics. Whilst there appears to be evidence that the majority of the funds achieve similar returns to the benchmark with less volatility, this was not shown to be statistically significant. Only one fund achieved a significant alpha over the period and a small number achieved noteworthy t-statistics with significant information ratios. Furthermore, these outperforming t-statistics were mainly achieved through low tracking errors and not through notable excess returns over the benchmark. Thus the evidence

for this period indicates that outperformance of active funds was inconclusive. The standout performing fund in this period was the risk parity portfolio which achieved the highest mean returns and excess return over the benchmark, whilst having lower volatility. This highlights the main concern with the SAPY benchmark due to its over-concentration in a small number of stocks which causes it to be excessively risky and achieve suboptimal returns compared to a risk parity portfolio.

The best performing active funds were the Alexander Forbes Investments property equity fund A, Catalyst SA property equity prescient fund A and Hollard Prime property fund B, all with information ratios greater than one and Jensen's alpha's of 1.6%, 2.1% and 2.69%. While outperformance in these funds was significant, the magnitude should still be noted. Furthermore, the volatility of the majority of funds was significantly lower than the benchmark which is another benefit to active management in the sector, which can diversify better than the overly concentrated benchmark.

4.6 Summary of Results and Comparison to Literature Review

The analysis of the 34 South African listed property unit trust has overall shown that outperformance of funds is inconclusive and minimal. Over multiple periods and through numerous metrics it has been shown that funds in this sector fail to provide robust and significant evidence of outperformance of the benchmark. A small number of funds such as the Alexander Forbes, Absa and Catalyst property funds showed that statistically significant outperformance was achievable over numerous time periods. These funds should be noted for their superior risk-adjusted returns over the benchmark and their peers. However, the outperformance of even the strongest funds listed above has been shown to be minimal and mainly significant due to their low tracking errors and similar returns to the benchmark. Furthermore, on average it is evident that the majority of funds show minimal significant evidence of superior abnormal returns over the benchmark, with some funds like the Oasis property fund and Marriot property fund showing significant underperformance over multiple periods. Despite the shortcomings and issues with the listed property benchmark, managers mostly failed to outperform and add value to investors. The best performing fund over the most recent time periods from 2008 onwards was shown to be the risk parity fund of property stocks which achieved significant excess returns over the benchmark while having notably lower volatility than the benchmark. The results therefore make it evident that active managers in this sector fail to outperform and significant alpha and value to investors.

The findings of this research are in contrast to the early studies by Damodaran and Liu (1993) and Kallberg, Liu and Trzcinka (2000) who found that active managers in the property could achieve positive abnormal alpha. Damodaran and Liu's (1993) discovery of material information being present in the appraisal process which had a material impact on the pricing of REIT's was not found to be present in the sample of South African property fund managers as they failed to outperform. While Kallberg, Liu and Trzcinka (2000) confirmed the existence of outperformance in US property unit trusts, the same was not found in the South African market, as managers failed to outperform notably.

However, the results of this study are in line with more recent international research by Lin and Yung (2004) who also found insignificant outperformance in their sample of US property unit trusts from 1993-2001. Their findings were that fund performance was mainly determined by the performance of the real estate sector as a whole. The same can be said for the results of this study, as there is evidently high correlation amongst the funds tracking errors and on average the funds returns are similar to those of the benchmark. These results are further supported by Chiang et al. (2008), who similarly found that their sample of US property unit trusts failed to produce abnormal excess returns over the benchmark.

Comparing the results of this study to other South African general unit trust performance analysis, we see that similar results have been found across other asset classes. A recent study by Bertolis and Hayes (2014) showed that general equity unit trusts achieved slight outperformance the FTSE/JSE All share index over the period 1994-2012, but that this outperformance was not persistent and repeatable. These results are further similar to broader international unit trust studies which also indicate that there is minimal outperformance of active managers. Jensen (1968) was the first to show that active managers underperformed their benchmarks and failed to add value to investors. Grinblatt and Titman (1989a) further showed that after taking fees into consideration, active equity unit trust managers failed to show superior performance over their benchmark. These results are therefore in line with results of the general equity unit trust literature, as the evidence for outperformance of active managers is inconclusive.

These results are further in line with the semi-strong form of the efficient market hypothesis, as active management and stock selection have failed to significantly outperform the market benchmark. This implies that the markets are semi-strong. This is in line with previous South African literature by Smith and Dyakova (2014) on market efficiency, who showed that South

African equity markets were at least semi-strong form efficient. Furthermore, these results are in contrast to the alternative theory presented earlier, namely the Grossman and Stiglitz Hypothesis. Despite their claim that markets cannot be efficient as this would lead to zero return on investors gathering information, the results of this study indicate that active managers are unable to notably outperform. This reinforces the idea that the South African listed property sector appears to be at least semi-strong efficient as there is minimal outperformance of active managers.

Overall the results of this study are in line with more recent international studies which found similar lack of performance across property unit trusts. Thus there appears to be minimal evidence to suggest that active managers in this sector are able to produce abnormal excess returns, which is in line with the efficient market hypothesis. If we further factor in survivorship bias into the results of this study, the underperformance of funds would likely be even greater. The funds which were excluded due to being closed would likely have been underperforming funds and hence would have made the evidence of underperforming funds even greater. Despite the shortcomings of the South African listed property benchmark, active funds were still unable to outperform significantly on average.

5. Conclusion

Active vs passive management is an ongoing debate within the financial literature, with mostly inconclusive and mixed findings as to which strategy provides superior returns to investors. This study set out to analyse the performance of unit trusts in the South African listed property sector to determine whether active managers are able to outperform their benchmark and thereby add value to investors. 34 South African property unit trusts were analysed to determine whether outperformance was present across multiple time periods. The results have shown that active funds on average do not add significant and persistent outperformance across a number of performance metrics. Whilst a small number of funds such as the Alexander Forbes Investments and ABSA property funds showed significant outperformance across multiple periods, on average the funds showed mixed performance and were not able to outperform the benchmark significantly. The Sharpe and information ratios further showed that some funds are able to outperform the benchmark by achieving slightly larger mean returns whilst having lower volatility than the SAPY. However, when conducting hypothesis testing on the information ratio as well as Jensen's alpha, this outperformance was shown to be minimal and only present in a small number of funds.

Ultimately these results are in line with numerous international studies on property unit trusts, since despite the theoretical reasons as to why property funds may be expected to outperform, outperformance of South African funds has been shown to be insignificant. This study has highlighted a main concern with the South African property sector, namely the issues of the main listed property benchmark, the SAPY. This index has been shown to be highly concentrated and therefore excessively risky, as well as being unrepresentative of the property unit trust sector. Despite these shortcomings, fund managers were on average unable to outperform the index, although they did on average achieve lower volatility than the benchmark. The results have shown that the best performing property fund over the period was the risk parity portfolio of risk weighted property stocks which achieved significantly higher average returns than the benchmark whilst having lower volatility and beta. Making use of a strategy which minimises risk by weighting the proportion of shares based on their risk contributions has been shown to be highly effective in the property sector. Thus the results suggest that investors wanting to get exposure to the listed property market in South Africa are better off making use of a risk parity portfolio of property stocks, as it has been shown to achieve larger returns with less volatility than the property benchmark and other funds. This

study was the first of its kind looking specifically at South African property unit trusts to determine whether there is outperformance present in this sector.

6. Limitations and Recommendations for Future Studies

This study was unable to avoid the effects of survivorship bias, as data on funds which have since closed down was not available. This means that there is a bias present in the data making it more likely that the funds in the sample show outperformance simply because they are the more successful funds over the period. This has been considered when analysing the results. However, ultimately this issue has not impacted the overall results substantially, as the results showed that only a small number of funds achieved noteworthy outperformance and the majority of funds failed to outperform, even underperforming the benchmark. It would however have been useful to include funds which had closed in order to assess their performance compared to the benchmark.

A further limitation is that this paper excluded funds that opened after 2015. Although this was done in order to have at least 4 years of performance data per fund, it is still possible to analyse these newer funds and determine their performance since inception. This is especially useful since many of the newer funds are passive ETF funds which would have been useful to include in this study, as there were only 5 passive funds present in this study. Furthermore, many of the newer passive funds make use of different benchmarks than the SAPY and therefore their performance is of interest. Further research can look at more recent time periods and include newer passive funds in the analysis.

A further area of research related to this study is to more closely analyse the performance of these funds to determine the reasons for abnormal performance across funds. This study did not look at asset holdings data of funds which may be useful to determine potential reasons for abnormal performance of funds. There is scope to look deeper into each fund's asset allocations and holdings of shares to determine why some funds out/underperform. This was not included in the scope of this paper, however it can be investigated in further research.

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