UNIVERSITY OF CAPE TOWN

Analysis of South African listed real estate to serve as an inflation hedge versus other asset classes

DISSERTATION

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DECLARATION

I, Warren Erasmus, declare that this thesis and the work presented in it are my own. It is submitted in partial fulfilment of the requirements of the degree of Masters in Commerce, Financial and Risk Management at the University of Cape Town. Where I have consulted the published work of others, this is always clearly attributed and where I have quoted from the work of others, the source is always given.

Signed: …………………………………………

Date: …………………………………………

Abstract

Purpose – The analysis of the South Africa property sector to provide an effective inflation hedge has not been researched to the same extent as other more developed countries. In addition, the South African property sector has been excluded from international studies owing to its underdevelopment and inconsistent legislative environment. However, post 2013 the new SA REIT legislation was promulgated putting it on par with its international counterparts. In addition from 2012-2013 the market capitalisation of the sector doubled. The study reviews inflation's relationship with direct and indirect property, and the study compares this relationship to other asset classes available to investors. It further reviews the difference between inflation hedging versus inflation protection, using different measures of inflation hedging and also reviews the various component parts of inflation being expected versus unexpected inflation.

Design/methodology/approach – The methodology in this study is adopted from the extensive research previously applied to other more developed markets. Additionally, technical and fundamental analysis of returns, correlations, risks and returns were applied.

Findings - Listed property was shown to be favored for long term protection against inflation while general equities were preferred in the short term as an inflation hedge. Where shocks were exhibited listed property showed resilience outperforming all its peers on a returns basis. The correlation finding of negative correlation to inflation along with listed property behavior resembling that of small cap stocks and being correlated to the wider equity market was consistent with international papers. This negative correlation increased when broken into the expected component part and showed no correlation to the unexpected component part. The findings were also consistent with existing market views on the relationship between bond yields and property valuations. Correlations to global listed property were shown to increase when looking at post 2010 data which pointed to a larger integration and involvement in international property markets, potentially sparked off by the SA REIT legislation promulgated in 2013. A capital structure analysis revealed evidence that a more highly geared fund would perform better during high inflationary periods as the cost

of debt becomes cheaper to the borrower. A direct measure of inflation protection was adopted from Case (2011) and it provided for an inflation success rate of between 50-60% for listed property. The ALSI and Top40 indices provided a success rate of over 70% and the bond index provided an 80% success rate. The property success rate increased when market shocks are considered for exclusion. It highlighted that listed property responds more successfully to the effects of expected inflation over the longer term and the case for evaluating inflation protection rather than inflation hedging as calculated using correlation coefficients was strengthened.

Contents

1. Introduction

South Africa as an emerging market is often excluded from international studies when evaluating the inflation hedging characteristics of indirect or listed property. These include the evaluation of the relationship between direct and indirect property, its performance relative to other asset classes as an inflation hedge or the diversification benefits of including it in a multi asset portfolio.

The returns of listed property are often viewed as being independent of the rate of inflation, the predominant influence coming from real factors such as supply and demand in the relevant market; hence the expectation is that it would therefore provide a suitable hedge against inflation. Analysing the extent of inflation hedging offered by the listed property market is important for a number of reasons but not limited to maintaining an investor's purchasing power or maintaining value where liabilities are linked to the inflation rate, such as inflation linked pension entitlements; Both require a suitably accessible asset class and listed property provides this as an indirect method of obtaining property exposure.

From 2010-2013 the market capitalization of South African listed property doubled[1] and with the 2013 adoption of internationally recognized REIT (Real Estate Investment Trust) legislation, property funds are set to increasingly win international appeal. With the maturing of the market, listed property in South Africa should consistently start exhibiting more and more of the characteristics of mature property markets like the USA, Australia and the UK. Research studies covering these markets should now more than ever provide relevant and accurately deductible observations for the South Africa market. This study outlines prevailing international and local market consensuses on the inflation hedging characteristics of listed property and evaluates their applicability with reference to the South African market.

A literature review is provided on property and inflation, reviewing inflation's relationship with direct and indirect property, inflation hedging versus inflation protection, property valuations, different measures of inflation hedging, the various

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[1] http://www.sareit.com/101_Performance.php

component parts of inflation, listed versus direct real estate and the recent structural changes provided by SA REIT legislation in 2013.

Using this as a basis the study analyses the inflation hedging potential of South African indirect property as represented by listed property indices and compares it to other inflation-sensitive asset classes. Retail investors do not possess superior forecasting abilities and hence the effectiveness of listed property to provide inflation protection rather than hedging (as often measured by correlation coefficient) during different market cycles is assessed. In addition, it takes the view that these investors don't actively manage their portfolios but rather adopt a strategic and tactical asset allocation approach to preserve purchasing power over the long run.

To assess this, a number of measures of the effectiveness of passive inflation protection are applied in addition to correlation coefficient. The analysis also includes a view on Global REIT returns relative to South African listed property returns in high versus low inflationary periods, pointing to the benefit of a globally diversified property portfolio. In addition, throughout this study, listed property returns are compared to other asset class returns to assess the interrelation between listed property and other asset classes and their comparative behaviour to inflation.

Finally, a direct measure of inflation protection is adopted and applied to SA indices to assess the effectiveness of tactical asset allocation for inflation protection between asset classes. The direct measure would allow investors to discern the deployment of capital into asset classes that are expected to perform well during high inflationary regimes.

The research questions addressed in this study are as follows:

1. *Over the last ten years how has local listed property performed on its own, against inflation and versus the global property market*?
2. *Applying the Sharpe ratio, how well has listed property performed on a risk return basis*?

3. *How well has listed property performed against other asset classes at preserving investor purchasing power during different investment horizons*?

4. *How well have all asset classes represented in this study performed against inflation and each other as measured by their correlation coefficients. Furthermore, was this performance inline with studies in international markets and prevailing market views*?

5. *How well has listed property performed against other asset classes to preserve investor purchasing power during periods of both expected and unexpected inflation*?

6. *How well has listed property performed as an inflation hedge during periods of significant inflation movement?*

7. *How well has listed property performed to preserve investor purchasing power during low inflation regimes*?

8. *During periods of higher than expected inflation, how has the performance of highly geared funds faired relative to less highly geared funds*?

9. *Is CPI or PPI the preferred inflation indicator for measuring the correlation of inflation to other asset classes*?

10. *How well has listed property performed as a means of inflation protection rather than as a means of inflation hedging and are these results not more consistent with investor behaviour and expectations?*

Chapter 2 represents the literature review, which is followed by chapter 3, which explains the data and methodology employed in the study. Chapter 4 sets out the analysis and results and Chapter 5 is the final chapter of the study, which sets the conclusion and avenues for further research.

2. Literature review

In a recent paper by McDonald (2012), the inflation hedging potential of listed property funds in South Africa was briefly assessed. Correlation coefficients of the listed indices for Property Unit Trusts and Property Loan Stocks were calculated against the Consumer Price inflation (CPI) covering the period November 2002 to December 2009. This period exhibited a negative correlation. However, when correlated to CPI during the period January 2010 to July 2012 both indices provided a

positive correlation indicating property's inflation hedging potential. Assuming that the underlying fundamentals of property companies are the predominant indicator of market returns in the long term, one would expect a positive correlation between market prices and inflation, as the underlying assets of these funds have properties which have long term rental agreements with inflation linked escalation clauses. This however was disproved as direct property over the same period was shown to have a negative correlation.

This was contrary to findings by Park and Bang (2012) and Lee (2010) but supported by findings in the US from Ross and Zisler (1991) and Ling and Naranjo (1999), which concluded that the returns being derived from listed property closely resembled the wider equities market, with no reliable evidence to suggest correlation with direct real estate. Lee (2010) does however point out that the lack of integration between the US REIT market and direct real estate is to be expected given the index composition and the fact that REITs follow a different return-generating process than the underlying real estate market.

Bhardwai, Hamilton and Ameriks (2011) and Fisher and Sirmans (1994) also found evidence that the price component of REITs is significantly correlated to equities with the latter paper pointing their behaviour to better resemble the behaviour of Small Cap stocks. The concern from this is that if REITs are correlated to equities then they too will exhibit the same relationship to inflation as equities and hence a diversified portfolio including asset classes other than property, small cap stocks and/or general equities should be sought. Simon and Ng (2009) claim that the co-movement between the wider stock market and REIT returns have increased over a similar time period while Hoesli and Serrano (2007) provided evidence of a decreasing correlation between the equity markets and securitized real estate.

In his book "Investing in REITs", RL. Block writes that the premise that Real Estate would act as an inflation hedge only came about from the fact that real estate did well during the inflationary 1970's in the US compared to stocks and concluded that it's a myth that it's an inflation hedge at all. Rather the value of real estate is determined by multiple factors such as net income, the price multiple or capitalization rate and the replacement cost. Inflation is just one of many factors that affect these value

determinants (along with market prices, economic conditions, monetary and fiscal policy, interest rates, wages increases, consumer spending, unemployment levels and demand for space). On the contrary in the book "Stocks, Bonds, Bills and inflation" (1995) published by Ibbotson Associates, general equities and real estate are highlighted as good inflation hedges but neither are reported as being better than the other in this regard. Liu et al (1995), using data from Australia, France, Japan, South Africa, Switzerland the UK and the USA over the period March 1980 – March 1991 and found a negative or insignificant relationship between real estate returns and inflation.

In order to appropriately assess inflation hedging, the measure for inflation needs to be broken down into its component parts, being expected and unexpected inflation. Expected inflation is indicated or represented by the consensus long-term view on future inflation and unexpected inflation represents the unforeseen risk element, not captured in the price. This analysis generally forms part of a number of research studies that review inflation hedging, including Bodie (1976), Fama and Schwert (1977), Hoesli (1995) and more recently Bhardwai, Hamilton and Ameriks (2011). The general consensus of these studies is that stocks provide a negative or insignificant hedge against inflation for both their expected and unexpected components, and in most instances the results were inconclusive. Hoesli's (1995) findings were consistent with the view that UK shares were a better inflation hedge than commercial property, which in turn was a better inflation hedge than UK bonds.

Bond and Webb (1989) found only residential property to be a complete hedge against inflation, with the income portion of residential returns providing most of the hedge. Only T-Bills and business real estate provided a complete positive hedge against the expected component of inflation and for unexpected inflation residential and farmland provided a complete hedge. Fama and Schwert (1977) found that residential property offers a positive hedge against both expected and unexpected inflation.

The use of correlation coefficients alone is criticized by Case (2011) for the following three reasons. Firstly, it applies equal weights to prior periods without regard to whether inflation was high or low in those periods; most investors are only concerned

about hedging against high inflationary periods. Secondly, not all assets returns react to inflation in the same month, and there could be a lead or lag relationship to inflation especially if it is unexpected. Thirdly, the correlation coefficient is a measure of co-movement but not a measure of whether returns preserve purchasing power.

According to Ralls (2010) there is a difference between "inflation hedging" and "inflation protection", the first being a short-term approach versus the latter being a long-term approach. Most investment capital is employed in the market with a long-term view to protect against inflation, while hedging against unexpected inflationary shocks would be sought out in a diversified multi asset portfolio. A perfect inflation hedge exists where an investment moves at the same time, in the same direction and by the same amount, as inflation. However, inflation protection seeks to achieve returns in excess of inflation rather than the highest correlation.

Case (2011) further points out that many investors do not actively manage their portfolios and attempt to calculate the optimal hedge ration rather they rely on an informal combination of strategic and tactical asset allocation that are expected to perform well during high and low inflation regimes. Ultimately it is inflation protection and not a perfect inflation hedge that should be sought to preserve investors' purchasing power.

However most research papers stress the use of correlation to prove sensitivity of an asset to inflation and hence to determine whether it possesses good inflation hedging properties or not [Bhardwaj, Hamilton & Ameriks [2011]; Lomelino, Gillett & Komarynsky (2011) and Ralls (2010].

Correlations between indirect and direct property, and indirect property and inflation, while fundamentally sound, have provided varied findings. Some countries are able to evaluate these relationships on a sector-by-sector level, due to the existence of sector specific funds. This is not possible in South Africa as only four sectors exist and most listed property funds incorporate all of these sectors. Inflation diversification within the listed property sector is therefore limited and cross sector if correlated to equities would also be limited. The use of correlation coefficients is consistent with most studies and there is a need to evaluate correlation coefficients using both the expected

and unexpected inflation component parts.

In addition to the unexpected and expected component parts of inflation, Lawson (1995) distinguishes between core inflation and shocks to inflation while Matysaik et al. (1995) and Barkham et al. (1995) both distinguish between short-term inflation and long-term inflation. Both of these additional components are evaluated. The expectation is that the property assets of listed property funds should provide resilience to market shocks due to locked in rental escalation clauses. Additionally inflation escalation clauses should ensure that in the long term, returns are protected against inflation. Investor behaviour and needs vary and these externalities need to drive any analysis of inflation hedging.

2.1 Conceptual review

2.1.1 Gordon Growth model

Case (2011) refers to the use of the Gordon Growth model to value listed property, particularly when listed property is a perfect inflation hedge.

The Gordon growth model is a model used to determine the intrinsic value of a stock based on future dividends or cash flows that grow at a constant rate. Dividend cash flows for REITs are considered to be consistent in that they are required to pay 75%[2] of taxable earnings to investors each year and hence are suitable to be valued using this model.

Real estate value should be determined by the Net Present Value of these consistent future dividends assuming a constant growth rate g (see formula below) and discounted by the appropriate nominal rate r (expected return on equity or return on property assets, see formula below). The impact of inflation on g and r for property is considered to be the same; hence the overall impact on the price is considered to be nil indicating that the price is not affected by inflation. Property is thus a perfect inflation hedge. A shortcoming of the model is that is assumes that economic

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[2] http://www.sareit.com/101_WhatIsReits.php

conditions remain constant. For instance that g won't change and won't be greater than r and the return on equity won't be affected by supply and demand changes and other externalities.

$$\text{Formula: REIT Equity Price} =$$
$$\text{NPV (Future Dividends)} = \text{Next Period Dividend}/(r - g)$$

High demand (monetary/fiscal policy driven) for property results in an increase in property prices and rentals and the opposite is true for the supply of property. The effects on rentals and hence property prices are delayed when rental contracts don't provide for market shocks and cycles.

2.1.2 Measures of inflation

Inflation is defined as a continued increase in prices or depreciation in the purchasing power of consumers. Where CPI[3] measures the increase in costs experienced by consumers, PPI[4] measures the increase in costs of production. Other measures of inflation exist that assess employment, imports and exports, and gross domestic product. However the best measure of inflation depends on the intended use of measurement. CPI is considered to be the best measure when evaluating the cost to consumers, whether in relation to their desires to preserve purchasing power or to assess the opportunity cost of hedging between multiple investments.

While the CPI basket includes the inflationary impact of housing, it is unclear if this impact is just residential or also commercial and industrial. Another interesting observation in the November 2014 basket is that actual year on year inflation for rental housing was 5,1% versus the all in CPI of 5,8%, and so rentals on housing brought down the total CPI figure. It is submitted that CPI is at best a proxy to measure the inflationary impact on the property sector.

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[3] Consumer Price Index – Published by monthly by Statistics SA

[4] Producer Price Index – Published monthly by Statistics SA

Another indicator of inflation is the producer price index (PPI). PPI is mainly used by business as a contract price escalator[5] and is often referred to as 'factory gate inflation'. It is criticized as not being a general measure of inflation and monetary policy target which CPI is, and not easily applied as a homogeneous measure across industry types as with CPI for households.

2.1.3 Conceptual measure of the component parts of expected versus unexpected inflation

In order to examine the relationship between the returns on stocks (property or otherwise) or a real rate of interest and the expected and unexpected components of inflation, a well-known and widely used model in practice will be used. Jaffe and Mandelker (1976) and Fama and Schwert (1977) and others follow Fama (1975) in using short-term interest rates as predictors for inflation. The change in expected inflation is simply measured as the change in the short-term interest rate, with short-term interest rates leading expected inflation. Unexpected inflation is the ex post difference between the actual rate of inflation and the beginning of period interest rate. Three-month average Jibar (Johannesburg inter bank agreed rate) is used as the beginning of period interest or short-term interest rate in this study and is comparable to the 90 Treasury bill rates used by Fama and Schwert (1997).

With the producer price index acting as the lead indicator of CPI with an average three-month[6] lag in South Africa, the correlation coefficient of CPI and PPI increased from 0,62 to 0,72 when lagged by three months. With the known relationship to CPI, PPI is used as an alternate to CPI for testing expected inflation and in periods where CPI has moved in the opposite direction to PPI these were assessed as periods of unexpected inflation

2.1.4 Listed versus direct real estate

The significant benefit of listed property over direct property is the liquidity the stock exchange affords the investor, their diversification being made up of a portfolio of

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5 http://www.bdlive.co.za/opinion/2013/03/05/changes-to-ppi-improve-calculation-of-inflation

6 http://blog.sharenet.co.za/index.php/der/2010/07/29/consumer_price_inflation_vs_producer_pri

properties, leverage of the underlying fund and the regulations governing its management. In the opinion of Connor and Falzon (2006) it is these structural composition differences between indirect and direct properties, which differentiate their risk/return profiles. For example, with liquidity comes the implied volatility imposed by the market on the price. Equity betas indicate the relative volatility to the market benchmark. Property appraisal valuations may not be able to incorporate all the macro economic risks factors priced in by the market.

There is a risk that the inherent expected inflation hedging ability of direct property is not directly realized in the price of listed property. However, according to McMahan (1994) the diversification benefits exhibited by direct property can be inferred on listed property as the performance of one determines the performance of the other, hence the performance attributes of direct property determine those of listed property, in a multi asset portfolio.

Haran (2013) also demonstrated "that listed real estate has the ability to replicate substantive elements of the performance of direct real estate, albeit with its own performance characteristics, which permit an element of diversification within a real estate allocation". The unresponsive nature of direct real estate relative to indirect real estate markets was noted, and in some countries lagged up to 12 months.

2.1.5 Different real estate structures in South Africa

The direct (listed) and indirect (unlisted) property sector in South Africa comprises of Property Unit Trusts (PUT) and Property Loan Stocks (PLS) structures. The Collective Investment Scheme Act governs property unit trusts the Companies Act governs Property Loan Stocks.

PLS and PUT structures were utilized to provide direct or indirect investment vehicles that would best suit the interests of management and investors while minimizing tax obligations.

Prior to 2013 there had never been a legislative framework for REITs in the South African market even though they may have been listed as such on the exchange[7]. In 2013 the National Treasury in its Taxation Legislation Amendment Bill released a legislative framework for REITs. A tax dispensation under Section 25BB was created to address tax differences between the two vehicles and to create a treatment in line with internationally recognized norms. The dispensation allows for existing listed PLS or PUT vehicles to convert to the new listed REIT vehicle.

The framework provides for no securities transfer tax on the purchase of shares and no dividend withholdings tax. A *look through* for tax purposes to the underlying investor would apply. Tax would include CGT on the capital appreciation of the share in the investors' hands and rental income for the investor from all distributions. The investment vehicle however is tax exempt on meeting the SARS requirements. PLS's distribute a discretionary amount of the net rental income and what ever is not distributed is taxed[8]. REIT's are required to distribute at least 75% of net rental income and 75% of the income must be from direct real estate, undistributed net income is not taxed in the fund.[9]

PLSs entities are complicated structures that came about for managers to avoid the restrictions and regulations of the CIS Act, imposed on PUTs.[10] Hence they are more flexible and over 90% of the structures used in SA are PLSs. This flexibility also affords them the ability to apply virtually unlimited leverage in their portfolios. In contrast, PUTs may only borrow a maximum of five percent for refurbishing properties acquired for their portfolios. This study therefore focuses on the returns of PLS entities as a representation of the market.

Market practice is for both PLS's and PUT's to provide frequent distributions, usually two to four times per year. The income distributions of all these structures are consistently paid out.[11]

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[7] http://ir.jse.co.za/phoenix.zhtml?c=198120&p=irol-newsArticle&ID=1802301

[8] http://www.treasury.gov.za/public%20comments/REITS%20discussion%20document.pdf, Page 3

[9] http://beta.iol.co.za/business/personal-finance/long-term-rewards-in-new-property-entity-1503579

[10] http://beta.iol.co.za/business/personal-finance/long-term-rewards-in-new-property-entity-1503579

[11] http://beta.iol.co.za/business/personal-finance/long-term-rewards-in-new-property-entity-1503579

It is estimated that over 85% of investors in property unit trusts are institutions (pension funds, provident funds and asset management companies)[12] and not private investors. This is not the case in all countries. In Australia private investors dominate the property unit trust sector at about 60%. However, the investment objectives of private investors, pension or provident funds are considered to be aligned and are considered as the core focus group of this study rather than active portfolio managers.

3. Methodology and Data

3.1 Methodology

The first section provides a general analytical review of the listed property sector's performance as represented by various indices. It analyses dividend or distribution yields and capital yields and compares them against inflation during period of expected and unexpected inflation. The main focus is on inflation protection rather than correlation, which is addressed later in the study.

The analytical review of property performance versus inflation is then expanded to compare property against the inflation hedging potential of other asset classes. A technical analysis of the annual returns of indices that represent these other asset classes was first assessed. The use of correlation coefficients was then applied against these indices and compared against those of listed property; both the expected and unexpected component parts of inflation correlation were calculated. Further areas were analysed looking at post release date correlations and consumer vs. producer price inflation. Studies and prevailing market views were assessed and compared to the findings in the local market.

In addition, the risk/return profile of listed property is evaluated against other sectors using Sharpe ratios. Inflation protection will be sought elsewhere if a better risk/return profile is made available. The Sharpe ratio is calculated covering multiple periods; firstly to obtain an historical perspective of risk and returns for the sectors, and secondly to review the risk and return profile of the listed property sector post the

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[12] http://www.sapropertyinsider.co.za/index.php/listed-property-the-highs-and-lows-of-the-past-20-years

promulgation of legislative changes in early 2013. Thirdly, daily monthly and yearly returns were used to provide a comparative historic Sharpe analysis and fourthly an international risk return view is provided across property, bonds, equities and direct property. Lastly this was undertaken on a rolling year on year basis to measure the change in the risk and return profile of listed property versus other sectors over time.

Questions are addressed such as; when did listed property under perform inflation? Did this reflect deficiencies in its ability to be an effective inflation hedge or did other market sectors also underperform? Should one be evaluating inflation hedging or inflation protection as a means to determine if an investor's purchasing power would be preserved? Would it have been better to invest in global listed property or local listed property or other local market sectors as an inflation hedge? How well has listed property at a high level protected investors against inflation?

Correlation co-coefficients between CPI and Commodities, Bonds, Small Cap Stock, ALSI, Top40, Property unit trust, Property loan stock and Global REIT indices are then calculated. In addition, the listed property correlations to equities and small cap stock are compared to the finding of international studies. Correlation coefficient matrixes are prepared to assist with this analysis.

CPI figures are released monthly and have a release date after month end. In testing correlations, the monthly stock returns are compared to the monthly returns year on year CPI as reported by Statistics SA. Even though the CPI figures are reported after month end and could have a market impact on that date, the CPI figures relate to the period for which they are reported and are therefore correlated against the stock returns reported by the respective indices during the corresponding periods.

Being aware that inflation needs to be evaluated in its component parts, being expected and unexpected inflation, the methodology of Fama (1975) is applied against the listed property indices. The literature review sets out how this is calculated. Correlations are tested using data from 2002-2014. However, buckets of post 2010 and post 2013 data are also used in order to evaluate correlations of more recent market trends and the potential impact of the introduction of new REIT legislation in 2013.

In addition, a variety of other technical analysis techniques were applied to assess the reaction of listed property to unexpected inflation adjustments in months following the release date and the markets reaction to unexpected inflation on its release date. Firstly, this was undertaken for months where CPI gained more or lost more that or equal to 1%, secondly, this was undertaken for months where CPI moved more than 25% away from its twelve month moving average and thirdly, this was undertaken for consistent periods of continually high or low inflation growth. These analyses were performed in order to assess how well listed property has preserved the purchasing power of investors and how resilient it has been against inflation.

This study then assesses the capital structure of REITs in order to determine how gearing and debt financing would impact on stock returns. A REIT with higher gearing would be expected to experience higher returns during times of higher inflation as the cost of debt may become cheaper to the borrower and more expensive to the lender. However this depends on how exposed the REIT is to variable rate debt and rental escalation clauses. Fixed escalation clauses may result in a low in value if inflation increases and the REIT is not able to change its escalation clauses in the short-term. However, REITs with higher gearing should experience higher volatility of returns.

Following from the fundamental analysis of the effects of capital structure on property returns, CPI and PPI are evaluated as competing indicators in terms of their relationship to underlying rentals and hence rental income which according to McMahan (1994) should be realized in the listed price of the property.

Finally a direct method of tactical asset selection for inflation protection is calculated. This was proposed by Case (2011), the Senior Vice President of the National Association of Real Estate Investment Trusts, to evaluate the ability of vaious asset classes at preserving the purchasing power of investors.

The need for a method other than assessing correlations is stressed and establised by defining an investment horizon over which inflation protection is sought, two, six or twelve months, ensuring that there are sufficient observations and determining a base

from which anything greater would be considered a high inflationay period (for example median monthly or annualized inflation). Where inflation is considered to be high and if the assets return over the same period is greater than the high inflation rate, then these observations are added to determine the total number of times in percentage terms that a given asset class beats high inflation. High inflation periods are those in which inflation protection is deemed to be sought by investors.

3.2 Data

The data utilised to perform the study rested heavily on the availability of listed index data for use as a proxy of the performance of various market sectors. The indices for these sectors, be it large cap stocks, small cap stocks or bonds were chosen as they were from reputable sources, which provided a general representation of their sector and had comparable data points to the property indices.

The sectors chosen are as follows:
  i.   The JSE All share index representing the market at large[13]
  ii.   The JSE top40 index and MSCI large cap index representing large cap stocks[14]
  iii.   The MSCI South Africa small cap index representing small cap stocks[15]
  iv.   The JSE All share index ex resource to represent the market excluding resource stock[16]
  v.   The JSE resource index representing local resource stocks[17]
  vi.   JSE Africa property loan stock index[18]
  vii.   JSE Africa property unit trust index[19]
  viii.   JSE SA listed property and services index[20]
  ix.   Global REIT index[21]

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[13] JSE: JALSH – Ftse/Jse Africa All Share Index

[14] MSCI: MLCLSAF – MSCI South Africa Large Cap Index & JSE: Top40 – Ftse/Jse Africa Top40 Index

[15] MSCI: MXZASC – MSCI South Africa Small Cap Index

[16] JSE: JSARE - Ftse/Jse All Share ex Resource Index

[17] JSE: Res20 – Ftse/Jse Resource 20 Index

[18] JSE: JPULS – FTSE/JSE Africa Property Loan Stock Index

[19] JSE: JPRUT - FTSE/JSE Africa Property Unit Trust Index

[20] JSE: JSAPY - FTSE/JSE SA Listed Property Index (Includes property services)

x.   JSE Government bond index[22]

In Table 1.1: Historical year on year index returns and data are from April 2002 – April 2014. The start date represented the earliest available period for the indicies shown and the end date the commencement date of the study. The view was taken to include as many observations as possible in the data analysis and to be consistent. Therefore in Table 1.1: all the represented indices include the same number of observations.

In the larger markets of the US and Europe individual property funds relevant to specific property sectors exist, be it retail, office or industrial. There are however no such indices which represent these specific sectors in the local South African market. This has limited the scope of this study to the general property sector.

Inflation rates, be it CPI or otherwise, are released monthly and available as a monthly or yearly figure. The CPI and PPI inflation methodology of Statistics SA has changed over the years, which required that different Bloomberg data codes be used. Statistics SA inflation release dates were obtained through correspondence and inferred from the historic data.

The historic Sharpe ratio was calculated using monthly excess returns data over the risk free rate as the source, then applying an average to this data range and the standard deviation to the same range. The risk free rate proxy of the three-month Jibar (Johannesburg interbank agreed rate) was applied to represent an investor's risk free alternative. The same data was used to calculate post 2012 Sharpe ratio.

Daily monthly and yearly returns were calculated to provide an analysis of the historic Sharpe ratio covering different investment horizons. A rolling Sharpe ratio was prepared graphically in addition to the average returns and the average standard deviation. This would allow for an analysis of the Sharpe ratio over time, allowing one to determine if the increase or decrease in return per unit of risk was as a result of

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[21] GBR250: REITZALC –Global REIT Index – (South Africa local currency base)

[22] Barclays – BEMZ0Z Barclays SA Gov. inflation linked all maturities

a change in risks or returns, and if a change was isolated to a particular sector or relevant to the market at large.

Correlation coefficients were calculated using a base year for all indices of June 2004, and the indices and inflation were all made to start with a base of 100. The log return was used to calculate any correlation coefficient due to the need to normalize data. Log normal distribution is positive while actual market returns are negatively skewed because of larger movements during panic times. For inflation monthly log returns were only possible, which reduced the number of observations used in our correlation matrix. Where the correlation coefficient could be calculated on daily returns this was performed.

Index returns were calculated to correspond with the measure of inflation, so returns in yearly inflation would be correlated to returns in yearly index returns. Monthly index returns in excess of 10% were removed from the data where they were seen to skew the results. Note that for CPI, correlation is calculated using monthly returns but for the other sectors with daily returns available, daily returns are used to ensure the largest possible number of observations.

The MXZASC index, which was used to represent small cap stocks, was the only index that didn't start in 2002 and had a starting date of June 2007. The all bond index was used when comparing risk and returns, as represented by the SHARPE ratio. However, Government 10 year inflation linked bonds were used in correlation coefficient calculations as they better represent the risk free characteristics sought by investors looking to hedge against inflation.

All the index or listed company data was obtained from Bloomberg or financial statement analysis. Market prices were used that included distributions or dividends when calculating risk and return data and correlation data.

4. Results

4.1 Analytical review of South African listed property indices

Research question 1: Over the last ten years how has local listed property performed on its own, against inflation and versus the global property market?

The dividend yield or distributions of Property Loan Stocks (JPULS Index) and Unit Trust (JPRUT) indices has averaged 9% and 8% respectively for the last 10 years with inflation averaging between 5-6%, refer to Table 1.1 below. Over this time period, it was only in 2007 that inflation reached 8.5% which exceeded the DY on the indices (JPULS, 5.88% and JPRUT, 6.03%) and in 2008 when inflation rose further to 9.24% (JPULS, 8.46% and JPRUT, 9.20%). Capital returns provided by listed property have not always been positive. In 2008-2009, 2011 and 2013-2014 returns net of dividends have been negative. Cumulative capital returns from 2009-2013 have only been 2,3% for the JPRUT index and 14,55% for the JPULS index.

In 2008 during the global financial crises the largest capital losses in the market occurred, when the JPRUT lost 24.02% (Table 1.1 Total return -14.82% less DY 9.2%) and the JPULS lost 14.92% (Table 1.1 Total return -6.46% less DY 8.46%). These losses could be seen as being part of an international risk adjustment in property valuations as these have not since been fully recovered.

However in order to maintain investor purchasing power year on year, it is the total return on listed property that needs to outperform inflation. Total returns have only been negative for at most two out of the last twelve years ended 2013. In addition total returns have exceeded inflation from 2002-2007 and 2009-2010, except for JPULS in 2009 where property returns did not outperform inflation. In 2008, all index returns were negative and did not outperform inflation. In 2013, only the JPULS index was negative and all index returns did not outperform inflation.

If we consider inflation targeting of between 4-6% by the Reserve Bank then 2002 and 2007–2009 are the only periods in which inflation exceeded the target inflation range. During these periods (excluding 2008) it is only PLS's whose total returns did

not exceed inflation (see Table 1.1 and Figure 1.1 below). However distributions increased for both indices over 2008-2009, pointing to strong underlying fundamentals and effort to restore investor confidence.

It would seem that listed property has yielded consistently higher distributions compared to inflation and that consumer purchasing power as measured by total index returns has been maintained a majority of the time. This would still need to be assessed alongside other asset classes, however it provides a relatively strong case for "inflation protection" against expected and to a lesser extent unexpected inflation.

Investors at a minimum seek inflation protection and listed property is earmarked as a preferred asset class. The benefits of having underlying fundamental like rental incomes that have inflation escalation clauses and contractually bound into the future provide predictable cash flows and protection of returns during volatile periods hedging against systemic market risks. These benefits are evident in the results listed above.

Table 1.1 Tabular representation of returns

Annual DY	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
JPRUT Index	2,54%	12,33%	9,65%	8,02%	7,04%	6,03%	9,20%	9,46%	8,31%	8,06%	7,37%	7,13%	5,96%
JPULS Index	0,48%	11,86%	41,06%	8,10%	7,02%	5,88%	8,46%	8,69%	7,89%	7,93%	6,39%	8,14%	0,00%
Total Returns	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
JPRUT Index	11,57%	23,33%	26,98%	27,05%	11,49%	16,29%	-14,82%	8,05%	14,87%	3,76%	17,37%	-1,42%	2,77%
JPULS Index	8,53%	22,17%	23,44%	36,80%	24,05%	20,21%	-6,46%	3,75%	19,56%	-0,29%	27,80%	2,76%	-5,36%
REITZALC	23,55%	37,57%	38,74%	32,39%	19,18%	17,68%	-2,17%	17,33%	21,75%	4,39%	30,03%	3,01%	4,10%
CPI	9,02%	5,80%	1,40%	3,40%	4,70%	7,10%	11,50%	7,10%	4,30%	5,00%	5,60%	5,70%	6,10%

Figure 1.1 Historic year on year index returns
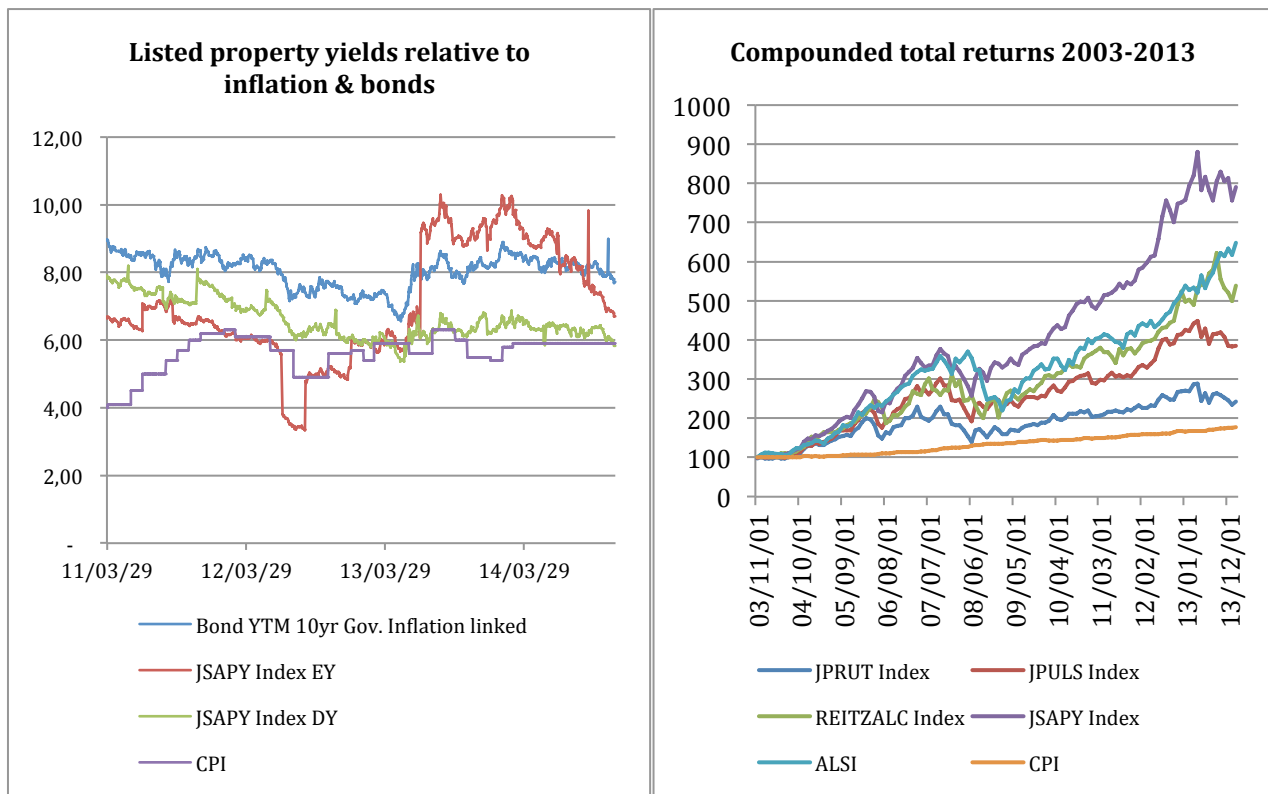
In Figure 1.1 above the PLS index has outperformed the PUT index, this could be explained by the fact that PLS's generally are more highly leveraged and have flexible investment mandates. PLS's have also been characterized by more resilient returns as represented during the 2008 financial crash and the Sharpe ratios represented in Table 2.1 and 2.2 below, where listed property (JPULS - South Africa Index) and REIT (REITZALC – Global REIT market Index) indices provide higher risk adjusted returns. However, it is more likely that this is as a result of PLS's representing approximately 80% of the market and therefore providing a more diversified property basket.

The November 2014 earnings yield premium, as represented by the JSAPY index spread over the 10 year Government inflation linked bond rate, presented in Figure 1.1 was -1,02%. With low yields indicating an overvalued market and returns not currently justifying the risk. This sees a return to the spreads experienced from 2011 to early 2013. Dividend yields have notably tracked inflation linked bond yields.

However, the spread between the two has widened post March 2013, not favouring the investor.

Figure 1.2 JSAPY index yield analysis
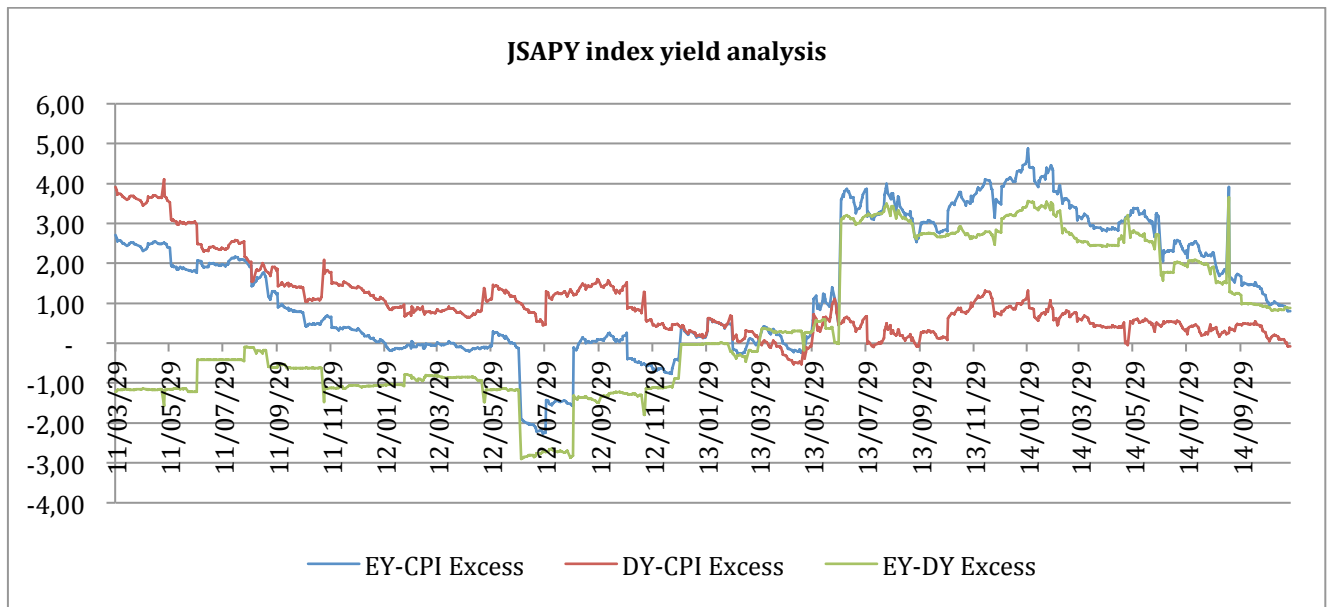
The JSAPY South Africa property index highlights that the dividend yield (DY) excess over CPI has been consistent a majority of the time from 2011-2014, with the period March - May 2013 being the only prolonged period where dividend yields did not exceed CPI. The earnings yield (EY) has been more volatile than the DY while still achieving returns in excess of CPI except for short periods during June – August 2012 and October – December 2012.

The EY represents the percentage of each Rand invested in the index that was earned by the constituent companies; the earnings yield is before dividend distributions. The expectation is that as EY decreases so should DY and inversely so when EY increases. However there seems to be a change in this relationship post May 2013 where the EY increased and DY did not follow suit. The benefit of higher earnings is that companies can aggressively target property acquisitions while maintaining dividend pay-outs.

The higher DY-CPI Excess to EY-CPI Excess from March 2011 to January 2013 would not be sustainable and is not legislated. It results due to the DY yield

calculation. The calculation makes adjustments to a company's market cap for long-term debt and cash and cash equivalents, while the DY calculation is based on an unadjusted market cap. The expectation however is that DY tracks EY and will be sustained as property companies are legislated to distribute 75% of their net rental income.

The legislated 75% payout provides a clearly communicated dividend stream to investors which investors prefer as many investors in equities rely on receiving consistent cash payouts in retirement and at most want their capital to be preserved against inflation, Figure 1.2 illustrates that over the last four years investors would have achieved this objective.

Research question 2: Applying the Sharpe ratio, how well has listed property performed on a risk return basis?

Table 2.1 sets out the Sharpe ratio for different periods for the various indices. The Sharpe ratio is determined by dividing the average excess monthly return by the standard deviation.

Table 2.1: Sharpe ratios[23] [24] [25]

From 2002-2014

	Standard deviation	Average excess monthly return	Sharpe ratio
REITZALC	5,56%	1,02%	18,25%
JPULS	4,71%	0,58%	12,37%
JPRUT	5,18%	0,32%	6,25%
ALSI	4,97%	0,78%	15,76%
TOP40	5,30%	0,74%	13,98%
RES20	7,18%	0,52%	7,26%
JSARE	4,51%	0,74%	16,43%
MXZASC	4,14%	0,07%	1,77%
BEMZ0Z	0,32%	0,04%	13,04%

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[23] The data range is from 6/2002-4/2014 part from the MXZAC index which starts from 6/2007 to 4/2014

[24] The MXZASC index data only commences in July 2007

[25] The BEMZOZ index data only commences in February 2004

From 2012-2013	Standard deviation	Average excess monthly return	Sharpe ratio
REITZALC	4,91%	1,38%	28,06%
JPULS	5,16%	1,27%	24,67%
JPRUT	4,29%	0,66%	15,50%
ALSI	3,11%	1,40%	45,09%
TOP40	3,54%	1,44%	40,61%
RES20	4,70%	-0,03%	-0,68%
JSARE	2,73%	1,65%	60,42%
MXZASC	2,03%	1,05%	51,58%
BEMZ0Z	0,30%	0,04%	13,06%

In Table 2.1 the Sharpe ratio reveals the listed property returns per unit of risk over the period 2002-2014 to be higher than the RES20 and MXZASC Index, while the JPRUT was only better than the MXZASC index. The JSAPY index in Table 2.2 provided the best Sharpe ratio over all the indices. The risk profile of listed property provided no incentive for investors in listed property to seek inflation protection from any other asset class from a risk perspective. Over the period 2012-2013 other asset classes that provide similar or better inflation protection abilities would have been preferred.

Table 2.2 Sharpe ratios calculated using daily, monthly and yearly returns[26] [27]

	Daily			Monthly			Yearly		
	Excess return	Standard Deviation	Sharpe	Excess return	Standard Deviation	Sharpe	Excess return	Standard Deviation	Sharpe
REITZALC	0,06%	1,19%	4,69%	1,02%	5,56%	18,25%	14,24%	18,70%	76,11%
JPULS	0,03%	0,80%	4,30%	0,58%	4,71%	12,37%	9,61%	19,16%	50,19%
JSAPY	0,06%	0,80%	8,09%	4,65%	1,16%	24,93%	17,88%	21,47%	83,31%
ALSI	0,05%	1,31%	3,67%	0,78%	4,97%	15,76%	13,48%	21,06%	64,02%
TOP40	0,05%	1,38%	3,51%	0,74%	5,30%	13,98%	11,97%	20,68%	57,90%
RES20	0,03%	1,68%	1,78%	0,52%	7,18%	7,26%	7,97%	26,29%	30,31%
JSARE	0,05%	1,06%	4,48%	0,74%	4,51%	16,43%	13,43%	20,25%	66,32%
MXZASC	0,01%	0,73%	0,86%	0,07%	4,14%	1,77%	2,00%	19,47%	10,29%
BEMZ0Z	0,04%	0,33%	12,24%	0,04%	0,30%	13,06%	11,26%	4,63%	243,11%

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[26] The JPRUT index has been replaced by the JSAPY index, more emphasis has been placed on the JPULS index and JSAPY index in this Study as the JPULS index has been discontinued in 2014, our Bloomberg data ended 02/05/2014.

[27] The performance of the JSAPY index differs to the JPULS index and JPRUT index in that it includes the full property sectors returns where the JPULS and JPRUT index only represent PLSs and PUTs respectively. In addition the JSAPY includes property service companies and not just property funds. In summary, the JSAPY has a different composition to the JPRUT and JPULS index.

Calculating Sharpe ratios using daily returns revealed a significant decline in Standard deviation for listed property versus other listed equities and the Sharpe ratio for JPULS index was now greater than the equity indices represented. The monthly and yearly analysis from 2002-2014 provides consistent results. This was used to strengthen the reliability of the monthly analysis in Table 2.1.

The resource sector was shown to be the least attractive sector with the highest standard deviation and bonds the most attractive sector with the lowest standard deviation. The return on bonds is high compared to other sectors as no risk free rate was deducted from the bond returns to calculate an excess return as bonds were considered to be risk free; the index is constituted of only Government bonds. However, bond returns do represent long-term yields relative to the short-term rate used in this study.

Global REIT's as represented by the REITALC index have maintained the second best risk return compared to the South African JSAPY index. In addition global REIT's have historically provided the second highest risk return reward when daily, monthly or yearly Sharpe ratios were computed (excluding the BEMZOZ Index). The REITZALC is a subset of the GPR 250 Index[28] and covers all companies on a Global scale having a REIT-like structure.

In the period post 2012, the listed properties standard deviation has significantly increased locally and globally. Listed property represents the most volatile sector analysed in the study post 2012. However average monthly returns have increased along with equities, although not as much so to compensate investors for the increased risk.

The bond market drives the increased volatility of returns and the global market returns impact on the appetite for South African debt which in tern has an impact on property prices and volatility. This is not good for investors wanting to be more risk

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[28] GPR 250 Index - https://www.globalpropertyresearch.com/indices.aspx?id=220

averse and while direct property may be averse to these risks indirect property is not, even though the underlying fundamentals of these property funds are still sound.

Rolling historic returns for the Sharpe ratio, average returns and standard deviation are presented in Appendix 1, 2 and 3. Appendix 1 shows that the Sharpe ratio for SA listed property clearly follows a global trend and has done increasingly so since 2009, providing evidence for the maturing of the local market, increased foreign investment post the REIT legislative changes and increased diversification of SA funds offshore. The post 2008 recovery experience in the SA market was also not an isolated event. The only sectors with a risk return profile that did not graphically track the general market is bonds and to a lesser extent resources.

The findings presented in Appendix 2 reveal that average returns are not dissimilar across all market sectors in their ability to protect investors against earning returns below inflation, with the exception of bonds.

Appendix 3 reveals that investors would however attract a better risk profile by avoiding resources (which exhibit larger reactions to market shocks) and by investing in listed property and general equities as graphically they exhibit different risk profiles even though returns follow a comparable trend. The local property market observably reacts in conjunction with the international market albeit the reaction is earlier felt.

Appendix 2 and Appendix 3 also indicate that the Global REITs market has not provided a different return and risk profile to the SA listed property market, with the two following a similar trend, which is not what one would expect. Investing in a Global index and a South African index would therefore not provide the desired diversification benefits of investing off shore. One would, for example, need to invest in different property sectors not offered in South Africa like hospitals or hotels, or invest into specific countries that yield a differentiated risk return profile.

Table 2.3 provides an international view on the risk return profile of listed property, equities, bonds and direct real estate. While a direct real estate analysis has not been provided for the South African market, the prevailing result in most international

markets is that listed real estate returned higher levels of volatility over the periods 2002-2011. Returns of listed real estate have only exceeded direct real estate returns in France, Sweden and the USA over this period. Listed real estate risk returns were only shown to beat direct real estate in the USA at a risk return ratio of 2,8 and Germany at -6.54% while South Africa provided the lowest risk return ratio internationally (where positive returns were achieved) driven primarily by higher returns. The increased returns are a result of a South Africa being a developing market, offering higher growth potential. South African equity and bond returns have also beaten their international counterparts on ten year annualized returns, while the risk profiles have been comparable. Being a developing country one would have expected the South African risk profile to be higher than those of some of the developed countries presented. The lower risk is seen as a result of the JSE being dominated by multinational companies (the JSE Top 40 represents approximately 80% of the entire market capitalisation of the exchange most of which are international). The listed property market has undergone significant consolidation also reducing the risk profile on the market as a whole.

These international listed property risk figures corroborate the findings outlined in Appendix 3, that South Africa and the Global market exhibit similar risk profiles although the 10 year returns are not comparable owing to a far more matured first world market being exhibited in recent years.

Table 2.3 International comparison of risk return ratios[29]

	Listed real estate (JSAPY)			Equities			Bonds			Direct real estate		
	Ten year annualised returns	Ten year annualised risk	Risk Return Ratio	Ten year annualized returns	Ten year annualised risk	Risk Return Ratio	Ten year annualised returns	Ten year annualised risk	Risk Return Ratio	Ten year annualised returns	Ten year annualised risk	Risk Return Ratio
South Africa[30]	17,88	21,47	1,20	13,48	21,06	1,56	11,30	4,60	-0,41			
France	12,34	30,70	2,49	8,83	24,33	1 172,97	6,08	4,83	0,79	8,83	13,52	1,53
Germany	-5,40	35,34	-6,54	3,01	28,85	19,69	5,96	5,38	0,90	3,01	2,73	0,91
The Netherlands	5,66	25,84	4,56	5,97	28,57	-17,21	6,24	4,36	0,70	5,97	6,45	1,08
Sweden	11,97	27,80	2,32	6,95	39,23	8,24	5,66	6,87	1,21	6,95	12,63	1,82
UK	0,87	30,95	35,62	4,99	20,49	5,60	5,95	5,42	0,91	4,99	23,32	4,68
Pan-Euro	3,35	30,87	9,22	5,71	25,72	-68,06	5,93	5,35	0,90	5,71	8,61	1,51
Australia	0,41	24,44	59,62	9,89	23,26	3,67	6,60	5,99	0,91	9,89	12,88	1,30
USA	9,41	26,37	2,80	7,09	21,24	13,92	5,50	8,30	1,51	7,09	22,13	3,12

[29] International data was obtained from a study by Haran. M, McCord. P, Grissom. T, Newell. G (2013 " Equities or real estate?" An international evaluation of listed property markets"

[30] The period covered for South African data was June 2003 – June 2014

4.2 Listed property performance relative to other asset classes

Question 3: How well has listed property performed against other asset classes at preserving investor purchasing power during different investment horizons?

Comparing listed property annual returns to those achieved by other asset classes, as represented by Table 3 below, it is noted that other asset classes also underperformed inflation in 2008. However, the returns of all the listed property indices were above those of other asset classes in 2008, with the exception of bonds. The Barclays all bond index has outperformed inflation in all periods, other than 2013.

In 2009 listed property returns were slower to recover than equities and commodities, as globally capital had been moved out of listed property and the asset class was being risk adjusted. Then in 2010 and 2011 (excluding JPULS, 2011) listed property outperformed the representative indices, listed property returns in 2010 and early 2011 were mostly attributed to their behaviour in tracking the bond market, and 2011 mostly exceed the representative indices due to a greater impact of muted sentiment surrounding the global economy on their returns. The industry consolidated posted 2008 and took the opportunity to improve their property portfolios and balance sheets. Having international exposure and offering international investors high yields and consistent cash flows in a low interest rate environment, they were able to attract cheap debt and equity financing. In addition, the local property market being characterized by a supply constraint provides international investor competitive rental returns.

In 2012, listed property (excluding the JPRUT index) outperformed all the representative asset classes, the strong performance attributed to a combination of healthy yields (with bond yields bing the underlying driver) and strong distribution growth. In 2013 the Res20 and JSARE indices underperformed inflation.

Table 3: Listed property performance matrix (*data ends April 2014*)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Returns													
Res20	-16,03%	11,40%	-2,13%	52,78%	38,81%	27,33%	-17,06%	31,28%	12,12%	-3,75%	3,95%	3,90%	-11,08%
ALSI	-12,15%	16,48%	23,71%	39,60%	36,94%	19,39%	-18,07%	30,92%	18,81%	4,26%	24,31%	20,50%	12,93%
JSARE					39,11%	26,59%	-20,46%	34,46%	12,30%	-6,13%	1,90%	0,55%	-17,58%
MLCLSAF [31]	-13,89%	6,40%	11,41%	36,42%	29,63%	12,94%	-12,72%	22,73%	16,01%	3,18%	16,29%	17,00%	16,46%
MXZASC						-2,21%	-31,65%	20,08%	22,23%	-0,07%	22,23%	14,65%	15,05%
TOP40 Index	-13,14%	10,87%	19,61%	37,62%	34,70%	17,09%	-22,24%	28,69%	15,30%	1,54%	20,88%	18,87%	9,43%
BEMZ0Z			7,08%	16,11%	9,39%	8,78%	12,78%	7,42%	11,27%	12,3%	17,8%	0,98%	10,82%
Property													
JPRUT Index	11,60%	23,30%	27,00%	27,10%	11,50%	16,30%	-14,80%	8,10%	14,90%	3,80%	17,40%	-1,40%	2,80%
JPULS Index	8,50%	22,20%	23,40%	36,80%	24,00%	20,20%	-6,50%	3,80%	19,60%	-0,30%	27,80%	2,80%	-5,40%
JSAPY Index [32]			34,83%	41,03%	26,15%	24,07%	-2,42%	13,86%	26,28%	8,92%	31,19%	0,55%	-4,38% [33]
REITZALC	23,60%	37,60%	38,70%	32,40%	19,20%	17,70%	-2,20%	17,30%	21,80%	4,40%	30,00%	3,00%	4,10%
Inflation													
CPI	8,98%	0,35%	2,62%	3,50%	5,77%	8,49%	9,24%	6,12%	3,43%	5,90%	5,57%	5,28%	3,10%

In Table 3 above, there is an observable correlation between the local indices and the Global REIT index in 2008, 2011, 2012 and 2013. However, the Global index seems to provide more resilient returns.

In Table 4 below, listed property has performed well versus other asset classes over the last few years. Listed Global REIT's, REITZALC index and the JSAPY index have outperformed the represented commodity, small and large cap indices over the last three years. They have also outperformed the commodity and large cap indices over the last five years.

The JSAPY index is the top performing asset class in three and ten year category, while the ALSI index is the top performer in the five-year category. PLS's performed as well as small cap stocks.

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[31] MSCI: MLCLSAF – MSCI South Africa Large Cap Index

[32] JSE: JSAPY - FTSE/JSE SA Listed Property Index (Includes property services)

[33] 2014 Data ended the 21/11/2014

Table 4: Property versus other asset classes (years ended 2013)

Years	JPRUT	JPULS	REITZALC	JSAPY	ALSI	Top40	Res20	JSARE	MLCLSAF[34]	MXZASC	BEMZ0Z
0-3	19,71%	30,27%	37,42%	49,71%	49,06%	41,29%	4,10%	-3,68%	36,47%	36,80%	31,07%
0-5	42,6%	53,6%	76,5%	89,85%	98,8%	85,27%	47,5%	43,1%	75,2%	79,1%	49,76%
0-10	109,62%	151,62%	182,34%	213,51%	200,37%	172,06%	147,23%	88,32%	152,89%		103,95%

4.3 Correlation coefficient

Question 4: How well have all asset classes represented in this study performed against inflation and each other as measured by their correlation coefficients. Furthermore, was this performance inline with studies in international markets and prevailing market views?

The correlation matrix in Table 5 shows that there is a low (a correlation approaching zero) and negative correlation between CPI and listed property, which is consistent with the studies by Bodie (1976), Fama and Schwert (1977) and Liu et al. (1995), however these finding were not statistically significant at $p > 0.05$. High correlations (a correlation approaching one) are highlighted; both the PRUT and PULS indices show high correlation to the indices represented (at $p < 0.05$). However, the PULS's and PRUT's indices owe their highest correlation to small Cap stocks, MXZASCI index (at $p > 0.05$). This finding is consistent with the study by Fisher and Sirmans (1994).

Table 5: Correlation coefficient matrix

	CPI	REITZALC	PRUT	PULS	ALSI	Top40	MXZASCI	RESI20	GILB
CPI	1,00	0,05	-0,02	-0,02	-0,01	0,08	-0,12	-0,10	-0,12
REITZALC	0,05	1,00	0,03	0,08	0,04	0,04	-0,10	0,00	0,01
PRUT	-0,02	0,03	1,00	0,86	0,30	0,26	0,64	0,02	0,48
PULS	-0,02	0,08	0,86	1,00	0,31	0,28	0,59	0,04	0,51
ALSI	-0,01	0,04	0,30	0,31	1,00	1,00	0,79	0,52	0,07
Top40	0,08	0,04	0,26	0,28	1,00	1,00	0,75	0,52	0,04
MXZASCI	-0,12	-0,10	0,64	0,59	0,79	0,75	1,00	0,29	0,26
RESI20	-0,10	0,00	0,02	0,04	0,52	0,52	0,29	1,00	-0,07
GILB	-0,12	0,01	0,48	0,51	0,07	0,04	0,26	-0,07	1,00

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[34] MSCI – MSCI South Africa Large Cap loc

Question 5: How well has listed property performed against other asset classes to preserve investor purchasing power during periods of both expected and unexpected inflation?

See Table 6. CPI was broken into its expected and unexpected component parts. Both PRUT and PULS indices exhibited positive correlations to unexpected CPI, at 0.03 and 0.02 respectively but negative correlations to expected CPI, at -0.12 and -0.11 respectively, these levels do not indicate strong correlation, as they don't approximate 1 or -1. The significance of the correlation to expected CPI was proven at $p = 0.049$ and $p = 0.068$ respectively. However, unexpected inflation proved to be insignificant at $p > 0.05$. Even though statistical significance wasn't proven for unexpected inflation, having a correlation near zero is in favour of passive investors who desire predictability of returns rather than volatility during market shocks. Negative correlation to expected inflation is not what is desired from investors seeking an inflation hedge from property and is counter to market expectation that listed property provides an inflation hedge.

The RESI20 Index showed a significant positive correlated to expected inflation and an equal negative correlation to unexpected inflation. Previously, in Table 5, the RESI20 index showed an insignificant correlation to CPI as a whole. Table 5 included all history data and Table 6 a limited series. This reflects that in recent times correlations have improved possibly due to increased liquidity in the market, driven by a more matured derivatives market.

Correlations on CPI release date showed observable positive correlations to CPI for the PULS, ALSI and Top 40 indices. This provided evidence that they co-move with inflation but only on release date. This is more inline with expectations that listed property prices would react would react positively in line with the announcement of inflation, factoring in future price increases that result due to higher future rental incomes and the impact of inflation on the bond market. With the available data this move from -0.11 to 0.10 for PULS is a large adjustment (the p value statistical significance increased from 0.25 to 0.06 when reviewing correlation on release date versus the expected inflation component part). This is also in line with the expectation

that prices would move on announcement date rather than the publication date of the data.

Post 2010 CPI correlations were assessed, to identify more recent relationships and remove historic noise. Post 2013 CPI correlations were assessed for expected changes owing to amendment to SA REIT legislation. They revealed that all listed property indices provided negative correlation to CPI and increasingly so post 2013. From Figure 1.1 while inflation was stable from 2012-2014 earning yields on property did not follow suit with global market sentiment impacting on bond and property prices. However, in Figure 1.2 both EY and DY exceeded inflation. This showed that property provided inflation protection rather than hedging as represented by positive correlation coefficient and this negative correlation to CPI did not result due to an inverse relationship with inflation.

Table 6: Unexpected and expected inflation, PPI, CPI release date and post 2010 and 2013 correlations

	Total CPI	Expected CPI	Unexpected CPI	PPI	CPI release date	CPI post 2010	CPI post 2013
REITZALC	0,06	-0,04	0,07	-0,01	0,09	-0,20	-0,50
PRUT	-0,10	-0,12	0,03	0,01	-0,03	-0,36	-0,36
PULS	-0,09	-0,11	0,02	0,08	0,10	-0,38	-0,43
ALSI	-0,05	-0,00	-0,01	0,09	0,11	-0,09	-0,23
Top40	-0,04	0,07	0,06	0,09	0,11	-0,07	-0,05
MXZASCI	-0,14	-0,11	-0,07	-0,10	-0,06	-0,26	-0,37
RESI20	-0,03	0,23	-0,20	0,07	-0,22	0,03	-0,01
GILB	-0,11	-0,14	-0,08	0,03	0,00	-0,21	-0,11

In Table 7, post 2010 and 2013 correlation data relevant to listed property and other industry sectors revealed that listed property price movements are largely positively correlated to those of to Government bonds. Listed property maintained it's high correlation to Small Cap stocks and the MXZASCI index. The correlation to Government bonds wasn't previously evident when a data range from 2002-2014 was assessed, this is attributed mostly due to the maturity of the listed property market in latter years and increased foreign appetite for investing in emerging market debt and equities.

In addition, post 2010 correlations to the ALSI, Top40 and Small Cap indices have shown significant changes relative to Post 2002 correlations. Post 2002, PULS's and PRUT's used to exhibit strong correlations. However, post 2013 they showed weaker correlations. Global REIT's, REITZALC index has interestingly shown a positive correlation to South African listed property indices and stocks. This closer relationship to international property markets could indicate that the new SA REIT legislation which is now in line with international accepted norms, has resulted in increased foreign investment causing prices to increasingly react inline with international market sentiments rather than in isolation. In addition SA property funds have increasingly consolidated, incorporating larger foreign holdings in their portfolios.

Table 7: Post 2010 and post 2013 correlations between asset classes

| | Post 2010 | | | Post 2013 | | |
	REIT	PRUT	PULS	REIT	PRUT	PULS
REITZALC	1,00	0,15	0,17	1,00	0,22	0,24
PRUT	0,15	1,00	0,81	0,22	1,00	0,83
PULS	0,17	0,81	1,00	0,24	0,83	1,00
ALSI	0,25	0,32	0,31	0,43	0,26	0,20
Top40	0,24	0,28	0,27	0,41	0,20	0,14
MXZASCI	0,25	0,59	0,56	0,54	0,67	0,58
RESI20	0,21	0,15	0,16	0,22	0,52	0,44
GILB	0,11	0,61	0,63	0,17	0,80	0,73

4.4 Additional technical analysis owing to criticisms of correlation coefficient

Question 6: How well has listed property performed as an inflation hedge during periods of significant inflation movement?

Owing to criticisms raised by Case (2011) regarding the use of correlation coefficient as a measure of inflation hedging, the following additional technical analysis was performed:

1) During 2002-2014 there were four months where CPI gained more than one percent per month. The prices on the PUT and PLS indices gained on average 1,2% for three of the four months. High inflation leads to high bond yields reducing the cost of debt to the property company resulting in increased valuations, hence prices lag rather than lead inflation. On the inverse where CPI lost more than 1% on consecutive months, seven observations were identified between 31/01/2003-30/11/2003. Both indices made on average 0,23% over the seven observations.

2) During 2002-2014 the monthly movement of annual CPI was compared to its twelve-month moving average, to identify movements greater than 25%. Three periods were identified, 30/08/2004-30/09/2005, 31/05/2006-31/05/2007 and 31/05/2011-31/01/2012 (excluding 2008). Listed property returned more that the average inflation for all three periods. A note worthy observation was that investors in the Global REIT would have achieved inflation-beating returns over the earlier two periods, indicating that having a globally diversified portfolio would have further hedged investor returns during these periods.

3) *Question 7.1: How well has listed property performed to preserve investor purchasing power during low inflation regimes*?
Over a thirteen-month period 30/11/2002-31/12/2003, inflation consistently decreased by a total of 12,1%. During this time, listed property returns increased for both the PUT and PLS indices by 23% and 25% respectively. This showed an ability to maintain returns in a downward inflation regime. Global REITs would have achieved investors inflation-beating returns of 37% over this period.

4) Unexpected inflation could also then be seen to occur during periods where CPI does not lag PPI and moves counter to the PPI indicator. This occurred on two different occasions between 30/09/2009-30/06/2010 and 30/06/2010 - 31/01/2011, PPI increased but CPI decreased. Property returns exceeded both indicators of inflation over these periods. On CPI release date there was no conclusive reaction by the market to the unexpected CPI announcements.

However, the correlation coefficient shifted from -0.09 to 10.00 when analysing PLS returns on release date.

5) Analysing the income portion of PLS returns the annual dividend or distribution yield exceeded year on year inflation approximately 60% of the time (on a monthly basis from 30/11/2004-28/02/2014). For the 40% of the time that it did not exceed inflation, half of these periods were below inflation by only on average 23bps. The other half occurred during 2007-2008, and averaged 3% below inflation. These results applied a South African corporate tax rate of 29%. "Inflation protection" was achieved a majority of the time.

The capital portion of PLS returns exceeded inflation approximately 60% of the time, during similar periods to the income portion. However, it was during 2008-2009 that excessive capital losses occurred relative to inflation, representing a market crash. In addition to the periods 01/2011-04/2012 and 06/2013-01/2014, losses averaged -10% to -15% respectively, also a period of general economic fragility (during the months July-December for both periods). "Inflation protection" was achieved a majority of the time.

6) *Question 7.2: How well has listed property performed to preserve investor purchasing power during high inflation regimes?*
It is during periods of high inflationary growth where most investors want to hedge against the eroding effects of inflation on capital and not during periods of low or negative inflation. If inflation growth is assessed in quarterly periods where it grew between 1-2%, 2-4% and more than 4%, the corresponding property returns as measured by the JPULS & REITZALC indices would reflect, see Table 8.

In periods of extreme growth of 2-4% and greater than 4%, property returns exceeded or closely approximated inflationary growth (excluding 2006 and 2008 which are considered to be shock periods). In 2002 inflation grew by 2,5% during 8/02-12/02 and the PLS index returned 4,3%. Even in periods of high growth of 1-2% per quarter, property returns equalled or exceeded

inflation. These results when analysed strengthened the case for the "inflation protection" benefits provided by listed property.

In a number of quarters where PLS returns were down, Global REITs (see REIT in Table 8 below) were up. A diversified portfolio of both local and global listed property would have significantly reduced losses. South African listed companies like Growth Point offer diversified property exposure, with assets in foreign markets like Australia; as of May 2013 their foreign portfolio exposure approximated 27%.

Table 8: Inflation growth versus listed property returns represented quarterly.

Inflation growth between 1-2%			Inflation growth between 2-4%			Inflation growth > 4%		
Date	PLS	REIT	Date	PLS	REIT	Date	PLS	REIT
11/09/30	-1,6%	2,0%	08/03/31	-14,0%	-10,4%	02/10/31	-0,2%	3,4%
11/08/31	4,6%	5,6%	08/02/29	-10,5%	-12,6%			
11/07/31	3,1%	2,0%	08/01/31	-16,4%	-18,2%			
11/06/30	4,3%	8,7%	06/08/31	-7,7%	-8,5%			
08/08/31	15,6%	20,4%	04/12/31	18,6%	22,2%			
08/04/30	-9,0%	-3,1%	04/11/30	13,1%	24,7%			
07/12/31	-2,1%	1,1%	02/12/31	10,5%	9,9%			
07/11/30	6,7%	8,5%	02/11/30	5,3%	8,8%			
07/06/30	0,0%	-2,4%	02/09/30	-0,4%	5,7%			
06/09/30	5,7%	7,2%	02/08/30	-0,4%	3,6%			
06/07/31	-20,2%	-21,1%						
05/10/31	9,4%	9,2%						
05/01/31	14,0%	19,8%						
04/10/31	8,5%	12,5%						
04/07/31	0,6%	2,2%						

4.5 Capital structure effects of South African listed properties

Question 8: During periods of higher than expected inflation, how has the performance of highly geared funds faired relative to less highly geared funds?

Following from the methodology section of this study, a listed property fund with higher gearing would be expected to experience higher returns during times of higher inflation as the cost of debt becomes cheaper to the borrower and more expensive to the lender. With limited access to company fundamentals this was tested by looking at

the monthly returns for two listed property shares, Redefine and Capital Property Fund. They were considered suitable candidates as over the last 7 years Redefine has maintained an average Debt to Equity Ratio of around 75% while Capital Property Fund had 40%, with the interest cover of Redefine being almost a third of Capital Property Fund. In addition, the hedged debt ratio at Redefine averaged 70% versus Capital Property Fund at 90%.

The medium return of the share prices during periods where inflation exceeded its average was 2,57% for Redefine (higher leveraged shares) versus 2,46% for Capital Property Fund (lower leverage shares). During months of low inflation the inverse held, where Capital Property Fund returned 3% versus 2,15% for Redefine. Even though this is substantive evidence it is not considered to be conclusive due to the small sample size applied in the study (even though on market cap the companies together represent approximately 20% of the industry).

A fundamental analysis of South African listed property companies with a total market cap of 40% was examined. All 40% had entered into SWAP contracts to cover their variable interest rate debt exposure, providing an industry representation of on average 85% variable rate cover. This cover ratio ensures that listed property companies will be well positioned for any upward cycle in Repo rates, favouring those companies with higher gearing and higher variable rate cover (owing to the low 15% exposure to variable interest rate movements).

4.6 CPI versus other inflation indicators

Question 9: Is CPI or PPI the preferred inflation indicator for measuring the correlation of inflation to other asset classes?

Average CPI for the last six years was 5,91% and SA PLS/REITs have on average maintained rental escalations over this period at 8% and above. Retail property offered escalations at the lower end and Commercial and Industrial Property at the higher end of the average.

Inflation brings higher escalations in property rentals partly due to their higher cost base. The contractual increase in this cost base caused by the likes of property maintenance costs is expected to be as a direct consequence to increase in the producer price inflation indicator, PPI. "The PPI is mainly used by businesses as a contract price escalator… and not as a general measure of inflation and a monetary policy target which the CPI is"[35]. In Figure 2 below it can be seen that PPI mostly exceeded CPI from 30/04/2010-30/06/2012 and would have resulted in shrinking margins hence the subsequent escalation in CPI evidenced over this period. The major contributor to rental escalation is however more likely to have been caused by property supply constraints and high demand.

In Figure 2 below PPI has exceeded CPI from 2010-2012. Rental escalations higher than the CPI average for this period would therefore be justified; this would ensure that profit margins are not eroded by the higher PPI.

Figure 2: Percentage CPI relative to PPI and cash
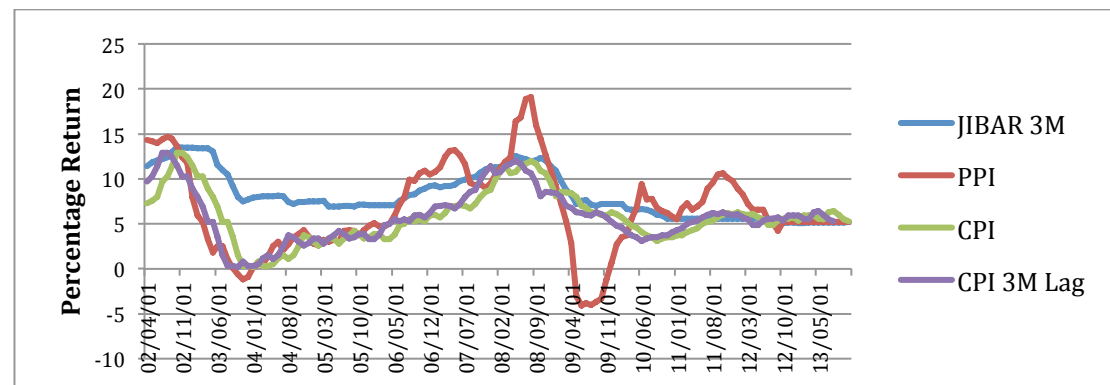
At rental escalations of 8% and above, vacancy levels mostly declined from 2011-2014 for the following listed property funds: Emira with a decline from 11,5% to 4,5%, Redefine from 5,8% to 5,5%, Capital Property Fund from 6,3% to 4,2% and Growth Point from 4% to 4,9%. This showed that demand for property is buoyant and there is no significant excess supply of property stock, supporting the higher rental

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[35] Patrick Kelly, executive manager: price and employment statistics at Statistics SA. Picture: FINANCIAL MAIL, http://www.bdlive.co.za/opinion/2013/03/05/changes-to-ppi-improve-calculation-of-inflation

escalations above CPI. In addition, lease expiries beyond one year averaged 80% for the above sample, providing resilience for future market conditions.

Property fundamentals are closely linked to pricing decisions around PPI and CPI. In addition, PPI is viewed in the market as the lead indicator of CPI (CPI 3 month Lag is tighter fit to PPI), so too are rental escalations to factors of supply and demand and costs increases. CPI is accepted as the preferred indicator of inflation in this study.

4.7 Direct method of tactical asset selection for inflation protection

Question 10: How well has listed property performed as a means of inflation protection rather than as a means of inflation hedging and are these results not more consistent with investor behaviour and expectations?

The various asset classes represented in Figure 3 below were assessed for their comparitive ability to protect against inflation using the Case (2011) methodology outlined in section 3. The data included 143 obervations (dependant on the availability of data from Bloomberg for the various indicies). The analysis performed looked at two, six and twelve month rolling inflation periods using the median inflation rate as the base. Anything greater than this was considered to be high inflation. Median monthly inflation rates for the two, six and twelve month ranges were 0,8%, 2,5% and 5,4% respectively.

The buckets in Figure 3 below represent the number of times inflation fell within the inflation ranges based on rolling monthly CPI inflation. The median can be seen to fall within the 2-3% range for six month rolling inflation.

Figure 3: Distribution of month on month CPI inflation rates
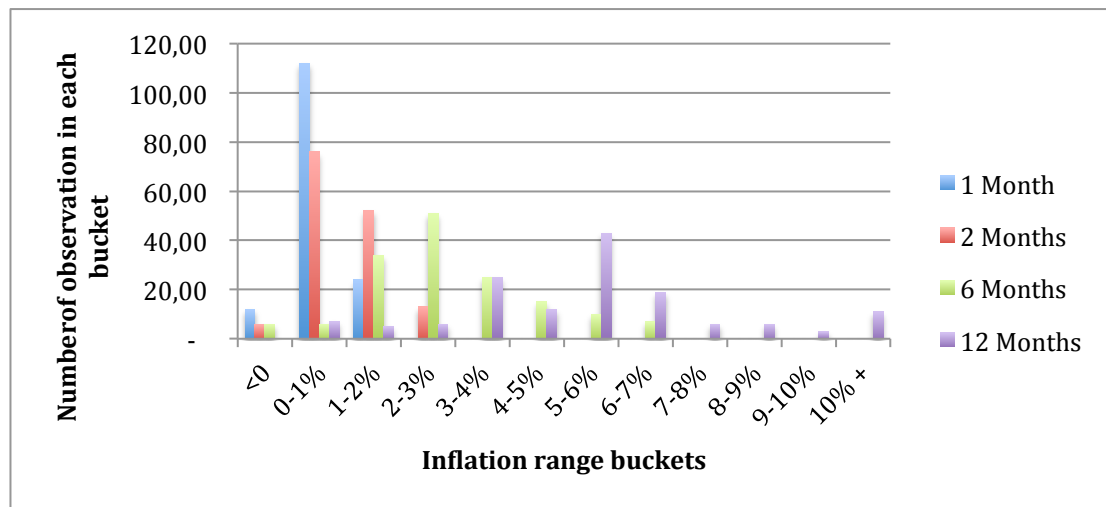
The number of times inflation exceeded the median rate where a six-month period was considered was 57 out of the total 143 periods. For these 57 periods, each index was assessed to determine where its comparative six-month return exceeded the 57 "high inflation" periods. The success rates shown in Table 9 below show Bonds provided the best protection with a success rate of 95% and Top40 second at 72%. These in addition to Resources outperformed the three listed property indices.

Table 9: Inflation protection success rate

	REITS			EQUITIES			RESOURCES	SMALL CAP	BONDS
	JPRUT Index	JPULS Index	JSAPY Index	FTSE/JSE Africa All Share Index	FTSE/JSE Top40 Share Index	FTSE/JSE All Share (ex Resources)	RESI20 Index	MXZASC Index	BEMZ0Z Index
Two Month	49%	54%	50%	52%	61%	55%	44%	49%	53%
Six Month	53%	57%	58%	71%	72%	69%	61%	57%	95%
Twelve Month	56%	59%	56%	72%	71%	66%	47%	57%	86%

It is noted that a success rate that is higher on a shorter investment horizon of two months would reflect indices whose returns respond quickly to unexpected inflation moves. While a higher success rate on a longer term horizon would reflect indices that more closely track expected inflation. In this case Bonds would best hedge expected inflation in the long term and Top40 in the short term.

The listed property indices all provide similar success rates, although they have different risk and return profiles, they are better than resources, RESI20 in Table 9 at

protecting against expected inflation (twelve months) on par with Small Caps, MXZASC. They are comparatively as good as the other indices at protecting against unexpected inflation (two months) in the short term, with the exception of the Top40 share index.

5. Conclusion

Since 2002 listed property has consistently yielded higher dividend/distribution yields when compared to yearly inflation. Consumer purchasing power was preserved a majority of the time as total returns on listed property also exceeded yearly CPI. In periods of financial crises, as in 2008, listed property outperformed all other asset classes (other than bonds).

In fact, in 2008-2009 listed property distribution yields increased to historical levels pointing to strong underlying fundamentals and a legislative environment that protects the investor interests. The predominant factor causing the increase was lower market prices but it was contractual, legislative and structural reasons that ensured distributions remained buoyant over this period. Favouring investors reliant on passive income streams.

In general PLS returns have outperformed PUT returns, this was attributed to more flexible investment mandates allowing for higher gearing and flexible distributions. The PLS index exhibited more resilient returns with a Sharpe ratio of 12% versus the PUT index of 6% over the last 10+ years, during 2008 they lost half the capital relative to the PUT index. The PLS index represented a majority of the listed property market and so also benefited from increased diversification.

The global REIT index and PLS index exhibited higher Sharpe ratios to commodities and bonds, however bonds provided a 13% ratio at a significantly lower risk to property and equities. Over the period 2012-2013 the ALSI reduced its risk to below the property indices and doubled its Sharpe ratio versus listed property to 45%. Preferring equities over listed property in the short term as an inflation hedge and listed property over equities in the long term for inflation protection.

In 2008 the returns of all property indices were above those of the other asset classes and all asset classes underperformed inflation, with the exception of inflation linked bonds. Inflation linked bonds outperformed inflation from 2002-2012 with the exception of 2013. Proving to provide the best guarantee of inflation protection over the long and short term and during periods of market shock.

Overall, listed property was shown to have performed extremely well as an asset class on its own relative to inflation and compared to it peers. Where shocks were exhibited listed property showed resilience outperforming all its peers on a returns basis. (However the direct method in section 4.7 showed only the Top40 to provide a distinct advantage against short-term inflation shocks, with bonds second.)

Listed property as represented by the JSAPY index outperformed all other asset classes over the last 10 years. Small caps and large cap's outperformed the JPULS index over the last 3 and 5 years ended 2013 but not the JSAPY index.

The correlation coefficient analysis of total inflation from 2002-2013 provided evidence that equity and property returns are all negatively correlated, this was consistent with studies by Bodie (1976) and Farma and Schwert (1977). While local listed property showed significant correlations to equities, 0,3 ALSI and 0,64 small cap stocks.

The findings of Jeffery D, Fisher and F.Sirmans (1994) were proven in that listed property behaviour resembled small cap stocks and the finding of Zisler (1991) and Ling and Naranjo (1999) were proven in that listed property was shown to be correlated to the wider equity market. The expected inflation correlation coefficient to both the PLS and PUT indices increased under Fama (1975) to -0,11 and -0,12 respectively (with $p = 0.049$ and $p = 0.068$ respectively but showed no statistical significance to unexpected inflation with $p > 0.05$).

In addition, looking at post 2010 correlations coefficients Government bonds revealed a rate of 0,63 to the PLS index and a rate of 0,56 to the small caps index. Data from 2002-2013 had shown no noticeable correlation to bonds but a small cap correlation of 0,59. These findings were consistent with the South African listed property market

view on the close relationship between bond yields and property valuations. When bond yields rise listed property prices fall. The market rational behind this is that valuations in South Africa are based on yields and not net asset value (as in other countries), because listed properties pay out all their income to investors.

Another interesting observation was that the PLS and PUT index showed increasing correlation to global listed property, looking at post 2010 and post 2013 data. This represented an increase from 0,17 to 0,24, which corresponded to earlier findings of an observable relationship of the SA and global property return profiles, specifically during 2008, 2011, 2012 and the 2013 financial years. The graphical representation in Appendix 2 further supported these finding. One explanation for this occurrence is that SA property funds are consistently looking to offshore markets to diversify their portfolio and foreign investors are increasing looking for higher yields offered in developing countries like South Africa. In an article by the SA REIT Association they state "Offshore earnings now make up almost 20% of the SA listed property sector. "Around eight years ago, local companies had no offshore exposure at all," states Ndlovu"[36].

The global listed property market showed a mostly neutral correlation to the SA indices represented in Table 5, which is desirable for investors seeking to reduce the volatility of their portfolios in the SA market. However, in Table 7 the positive correlation increased showing that diversification benefits maybe eroding as SA becomes more integrated in the international market. Appendix 2 revealed a different picture showing a graphical positive relationship between the rolling average annual returns of REITZALC and PULS and PRUT; the correlations in Table 5 only exhibited p-values of 0.14 and 0.39 respectively and hence were not considered to be statistically significant. Despite these observations, our later findings still highlighted that including both global with local listed property in a portfolio would reduce an investors exposure to the effects of both expected and unexpected inflation.

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[36] http://www.sareit.com/news-129.php

Unexpected inflation was tested against listed property returns using methods other than correlation coefficient, evaluating both periods of high and low inflation to determine if investor purchasing power would have been preserved.

1) Where yearly CPI increased more than 1% and lost more than 1% on a month-to-month basis, listed property returns on average exceeded CPI.

2) Three periods where identified where inflation increased month on month by more than 25% of its trailing average. Listed property returns exceeded inflation for all periods.

3) A thirteen-month period of consistently decreasing inflation was identified. Inflation decreased by 12,1% over this period. However, listed property returned approximately 25% over this period.

4) In addition, quarterly periods where identified where yearly CPI grew on a monthly basis by 1-2%, 2-4% and more than 4%. During these periods of extreme inflation movements listed property returns exceeded or closely approximated inflation.

Inflation protection was exhibited be it as a direct consequence of a relationship between expected or unexpected inflation and listed property or not.

The capital structure analysis revealed evidence that a more highly geared fund would be expected to perform better during high inflationary periods as the cost of debt becomes cheaper to the borrower. This result was not conclusive owing to the extent of market research performed. However, seeing that most South Africa funds are approximately 85% covered against variable rate movements this benefit would definitely reflect in the price.

The direct measure of inflation protection adopted by Case (2011) provided for an inflation success rate of between 50-60% for listed property. While the ALSI and Top40 indices provided a success rate of over 70% and the bond index an 80% success rate. The listed property success rate is considered to be very low considering the expectation that as the underlying assets of these funds are properties with inflation linked escalation clauses, and hence one would assume that listed returns would prove to follow inflation with a higher success rate. This strengthens the findings of a negative correlation to direct property found my W McDonald (2012). It

also supports the finding in the US from Ross and Zisler (1991), Ling and Naranjo (1999).

The success rate of listed property did however increase from a two to a six and twelve month period. Highlighting that listed property responds more successfully to the effects of expected inflation over the longer term, providing stronger inflation protection against expected inflation. This is consistent with findings, using Fama (1975).

A reason for the low success rate could be due data irregularities. Where the data included the effects of market shock periods like in 2008 and/or lead lag relationship between CPI changes and the resulting impact on the share price.

Market shock periods were identified while analysing the annual distribution yield of PLS indices on a monthly basis. The distribution or dividend yields exceeded inflation 60% of the time. 20% of the time the difference was small and for a further 20% it resulted due to market shocks as in 2008. The capital portion also exceeded inflation 60% of the time and also sighted external shocks for the loss periods. The success rates against unexpected inflation shocks in section 4.4 corroborate those found in section 4.7.

These tests and their findings strengthened the case for evaluating inflation protection rather than inflation hedging and confirmed the criticisms of testing inflation hedging by only using correlation coefficients. Firstly, not all periods should be evaluated with equal weights, as periods such as the 2008 financial crises would skew results. Secondly, most investors are only concerned with hedging against high inflationary periods, which extend beyond one month. This is because most investors do not intend to actively manage their portfolios. Thirdly, there were observable lead or lag relationships to the expected and unexpected parts of inflation, especially if it is unexpected. This is because property funds have long-term rental contracts, 80% of which extend beyond one year. Fourthly, correlation coefficient is only a measure of co-movement. Where the findings proved an insignificant correlation coefficient between inflation and listed property other findings proved that investors would have preserved purchasing power over the same period.

Overall SA listed property has not been immune to capital market volatility but long-term fundamentals have prevailed and provided positive returns to investors against both the expected and unexpected parts of inflation. This was comparable to and in most cases better than the other asset classes represented. In addition to their historically strong risk adjusted returns listed property provides for a valuable addition to any portfolio.

6. Future research

The below areas of further research and analysis are proposed:

1) Listed properties track the forward yields of bonds in the South African market, this relationship was not analysed in depth.
2) The capital structure effects of high or low gearing during inflationary regimes on the price of listed property funds were assessed but the data could be extended to provide more conclusive results.
3) Direct and indirect property correlations were not independently calculated in this study.
4) IPD.co.za recently sold a global intel data package to the University of Cape Town. They have a vast amount of data that has not been evaluated. Including their own Index which could be applied as a comparative to the findings in this study.
5) Calculate an optimal multi asset portfolio for hedging against expected and unexpected inflation.
6) Other econometric measures such a Modigliani and Miller and Variable Auto regression models were not used to test the component parts of inflation relative to listed property.
7) Listed property sectors were not evaluated independently to inflation.
8) A lead lag relationship was not quantified between inflation and listed property.
9) Research from around the world often suggests that property company shares tend to trade at a discount to NAV (Liow, 2003). Research on the UK property sector showed an average discount to NAV of 22.4%, with the range varying from a maximum of 53% to a premium of 29% (Barkham & Ward, 1999). This was not tested.

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8. Appendices

Appendix 1: Graphical representation of rolling annual average Sharpe ratios from January 2005 to April 2014.[37]

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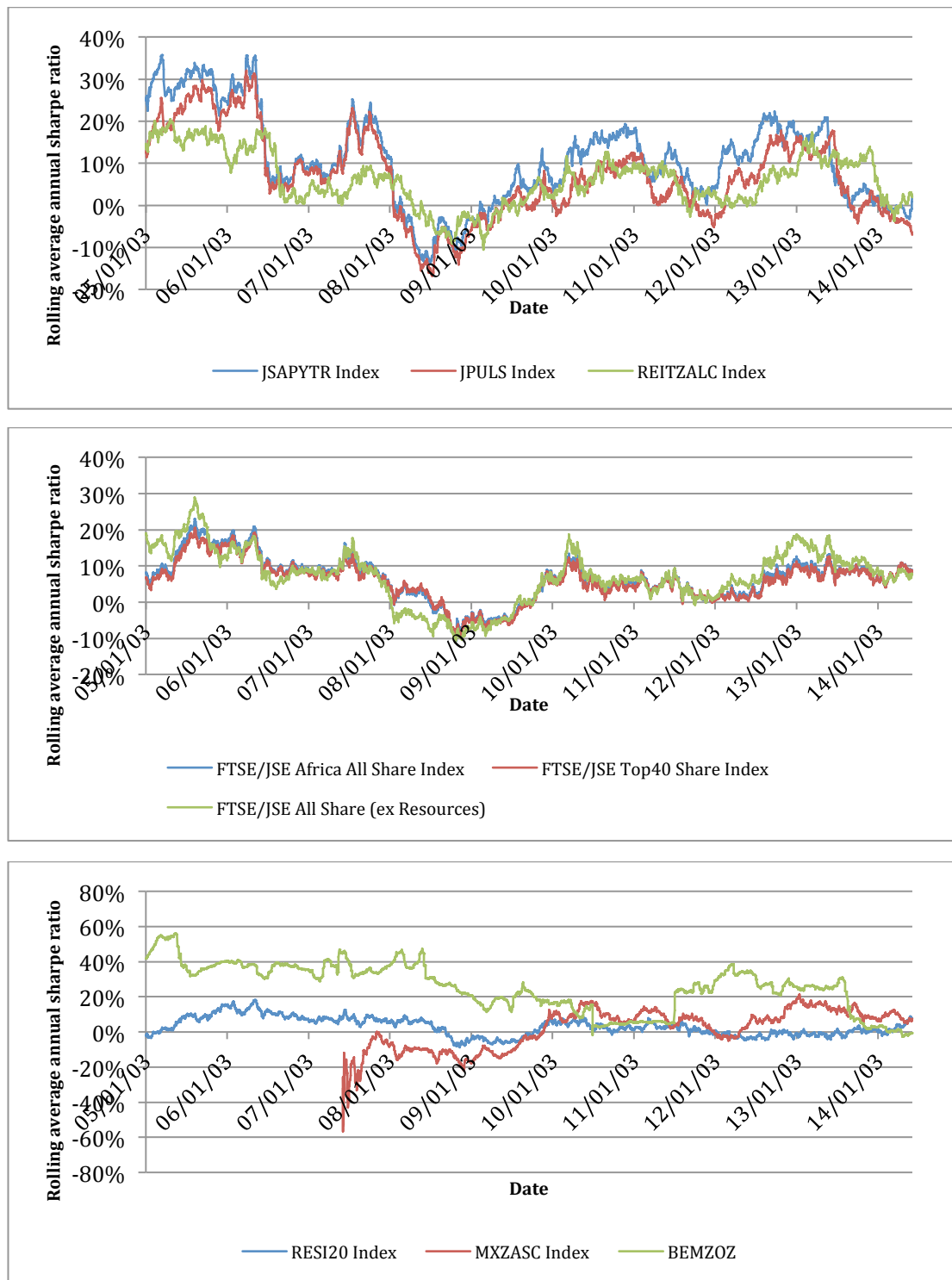
[37] The Sharpe ratio is calculated using the standard deviation of an annual period using returns that have been calculated daily. The daily returns are excess returns above Three-month Jibar.

Appendix 2: Rolling twelve-month average annual returns from January 2006 – April 2014.
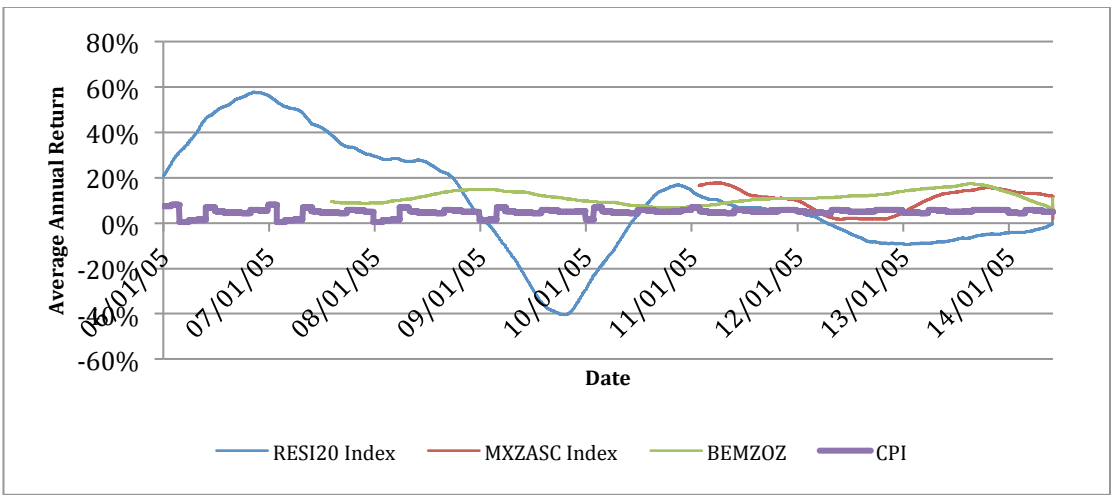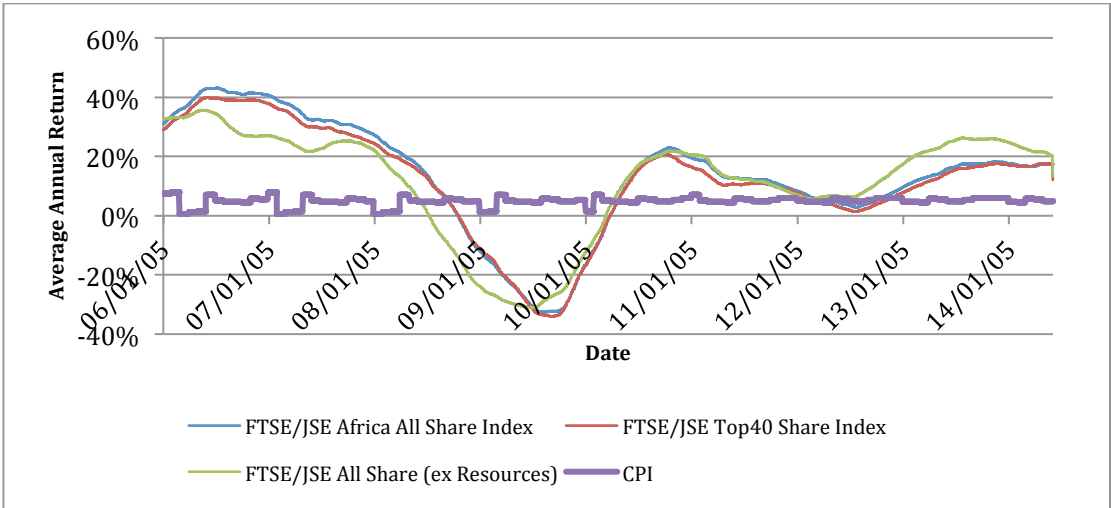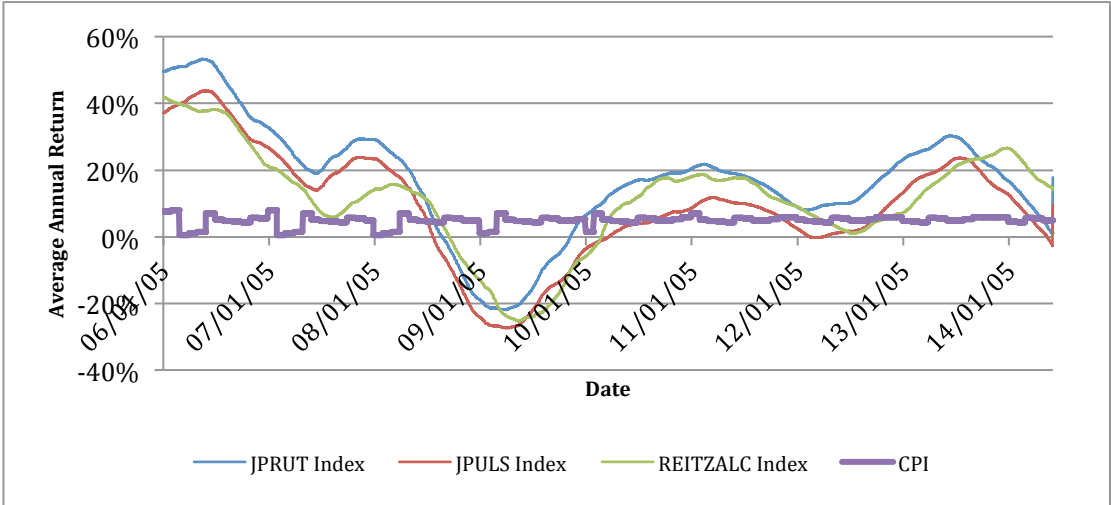
Appendix 3: Rolling twelve-month average annual standard deviation from January 2006 – April 2014.