

The diversification potential of securitized real estate for mixed-asset portfolios in South Africa

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ABSTRACT

Research indicates that investment in un-securitised private real estate in both developed and emerging economies exhibits inflation hedging potential and provides diversification benefits for mixed-asset portfolios, reducing the risk of portfolios that contain mostly common stocks and bonds. This paper examines the risk diversification potential of securitised property funds for investment portfolios comprising traditional asset classes such as common stocks, bonds and cash instruments in the South African context – to establish if they exhibit the same characteristics as un-securitised private real estate. The results indicate that including securitised property funds in a portfolio comprised of traditional assets reduces unsystematic risk in a portfolio by a significant amount. We also assess the affecters of variability in returns of PUT and PLS funds. The results suggest that the variability in PUT and PLS returns can be explained by both the variability in the equity and debt markets (measured by the ALSI and ALBI), and the variability in direct property returns. Importantly, we find that PUT and PLS market pricing is representative of the underlying asset class pricing (direct real estate prices).

DECLARATION

I, Wendy Mc Donald, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in Finance and Investments in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Wendy Mc Donald

Signed at

On the day of 2013

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CHAPTER 1. INTRODUCTION

During the 1960s and 1970s inflation in the US exceeded investment portfolio returns resulting in many funds exhibiting negative returns. As a result, portfolio managers had to find alternative *asset classes*¹ (pg 9) to invest in that possessed different properties from traditional asset classes. They needed to ascertain negative *correlations*² of returns between common stocks, bonds and other assets in order to diversify their portfolios by means of employing asset allocation (pg 7) strategies (Ziering and McIntosh, 1997). Real estate was one of the asset classes that these portfolio managers used to diversify their investments. Consequently many funds now invest a substantial portion of their capital in *alternative asset classes*³ (pg 11) such as real estate, commodities, hedge funds and private equity (Bekkers et al., 2009).

Research indicates that investment in non-securitised private real estate (pg 19) in both developed and emerging economies exhibits inflation hedging potential and provides *diversification*⁴ (pg 14) benefits for mixed-asset portfolios, reducing the risk of portfolios that contain mostly common stocks and bonds (Barry et al., 1996; Barry and Rodriguez, 2004). According to Zhou and Clements (2010) 'Inflation is a rise in the general level of prices of goods and services in an economy over a period of time.' As a result of their tangible properties real estate assets provide an inflation hedge as they appreciate in value (including price appreciation and rental income increases) when prices levels increase. Other researches including Hudson-Wilson et al. (2005), Park and Bang (2012), and Lee (2010) have also observed this property of real estate.

¹ 'An asset class is a group of assets with similar attributes' (Maginn et al, 2007)

² Correlation measures how the prices or returns of two instruments move in relation to each other (Koop, 2006).

³ Alternative asset classes are characterised by risk and return properties that are significantly different from traditional asset classes (Anson, 2008).

⁴ Diversification is a risk management technique used to smooth investment returns (Maginn et al, 2007)

However investing in un-securitised private real estate also has major disadvantages including low liquidity and an inability to diversify your portfolio without investing large amounts of capital. As a result *Real Estate Investment Trusts (REITs)*⁵ (pg 22) and other *property funds*⁶ are often marketed as substitutes for direct private property investment, providing the investor with additional benefits such as liquidity, high dividend yields, special tax considerations and a stable income stream. However much debate exists as to whether securitised property funds such as REITs are a good substitute for direct investments in real estate and whether such funds actually give the investor exposure to the underlying real estate asset class or whether they simply exhibit similar characteristics to common stocks.

According to Ziering and McIntosh (1997), the benefit of including core real estate in a mixed-asset portfolio lies in the fact that this asset class exhibits a negative correlation with other financial assets over a long period and therefore provides good diversification. Investments in listed property funds will only provide the same diversification benefits for a mixed-asset portfolio that un-securitised direct real estate investments provide if these property funds exhibit a negative correlation with *traditional asset classes*⁷ (pg 10) across varying economic periods. Therefore, the characteristics of securitised property fund returns have major implications for their inclusion in mixed-asset portfolios.

Portfolio managers are investing in securitised property funds in order to diversify mixed-asset portfolios based on the belief that securitised property funds are a good substitute for direct investment in private real estate (Bekkers et al., 2009) – this belief remains unsubstantiated. Although researchers have conducted a large number of studies on this topic in an attempt to determine if the variability in

⁵ A REIT is a uniquely structured closed-end investment company that complies with specific regulations, which offers investors the opportunity to invest in real estate based assets (Peterson and Hsieh, 1997).

⁶ Property funds are funds whose portfolios exclusively consist of real estate investments (JSE, 2012)

⁷ Traditional asset classes usually include domestic and non-domestic equities, domestic and non-domestic fixed income instruments, cash and cash equivalents (Maginn et al, 2007).

returns of securitised real estate and the variability in returns of un-securitised private real estate are positively correlated, the literature on this topic highlights that the results that different researchers have found are contradictory. The REIT boom of the 1990s (pg 23) that created many structural changes in the REIT market heightens the contradictions in research results (Clayton and MacKinnon, 2003). This suggests that results that researchers found on data gathered prior to the REIT boom are no longer relevant for use by contemporary portfolio managers.

A knowledge gap exists in the current market about the relationship between securitised property fund returns, the returns of traditional financial assets and un-securitised private real estate returns. There is also a lack of knowledge about whether securitised property funds provide the investor with exposure to the underlying asset class. Further, there is a specific lack of knowledge regarding this subject in emerging markets as most empirical studies focus on developed markets (Zhou and Clements, 2010). In the South African market, researchers have conducted minimal studies on this topic. According to Zhou and Clements (2010), real estate markets are considered 'local' and as a result real estate investments in different markets will exhibit different characteristics. This lack of knowledge is a problem because individual investors are basing their investment decisions on research that is probably not relevant in the South African market. Portfolio managers are investing in securitised property funds as a substitute for direct investment in real estate, based on the belief that that securitised property funds provide the same diversification that direct investments in real estate do. This creates a problem for portfolio managers, as their mixed-asset portfolios may not be as well diversified and may be exposed to higher levels of risk than they may think.

The fact that property funds in South Africa take on a slightly different format than REITs compounds this lack of knowledge (Nsibande, 2006). Therefore, we cannot simply take research conducted on REITs in other countries and infer that the results would necessarily be the same for South African property entities. The use of

two different types of *property entities*⁸, Property Unit Trusts (PUTs) (pg 34) and Property Loan Stocks (PLSs) (pg 37) in South Africa also means that the characteristics and diversification potential of South African property funds may differ. This creates a problem, as without further research in the South African context we cannot simply invest in property funds in order to diversify mixed-asset portfolios without knowing what diversification characteristics different property funds possess.

1.1 Purpose statement

Therefore the main purpose of this dissertation is to **quantify the risk diversification potential of securitised property funds for investment portfolios comprising traditional asset classes such as common stocks, bonds and cash instruments.**

Based on the main objective this research will attempt to establish whether securitised property funds (Property Unit Trust funds and Property Loan Stock funds) provide a good means for portfolio managers to diversify their portfolios in the South African market. This research paper seeks to answer the following questions: Is there a link between the variance in securitised property fund returns and the variance in the returns of traditional asset classes (common stock and bonds)? Does combining instruments from traditional and alternative asset classes in an investment portfolio reduce portfolio volatility? Do Property Unit Trust Funds (PUTs) and Property Loan Stock Funds (PLSs) possess different diversification potentials? Are there certain sub-sectors of the market that are more influential in explaining securitised property returns? Do securitised property funds provide a good means for portfolio managers to diversify their portfolios, and do the correlations between the various asset classes vary across different economic periods? What benefits can portfolio investors achieve by investing in this asset

⁸ The JSE defines a property entity as any investment vehicle that gives investors the ability to invest in real estate through the purchase of securities (JSE, 2012)

class? Do securitised real estate investments possess inflation hedging potential? Do securitised real estate funds give the investor exposure to the benefits of the underlying real estate asset class?

I will discuss the foregoing problems in the literature review and use these as a basis for deriving empirical hypotheses (pg 40).

1.2 Significance of the study

This research adds to existing literature by filling the knowledge gap of the contribution of asset allocation in determining the variability of returns between funds, and specifically in determining the potential that securitised property funds have in providing traditional asset classes with risk diversification.

Little research has been conducted on the diversification benefits of including securitised real estate in mixed-asset portfolios in emerging markets (Zhou and Clements, 2010), and specifically in the South African context where the property funds (PUTs and PLSs) are characterised by different properties than REITs. Prior research on this topic is contradictory across countries and periods. Data collected before the REIT boom of the 1990s is the basis of much existing literature and therefore the results of many of these studies are no longer relevant. This research will therefore assist in establishing which results are relevant in the local South African context, by using current data from the 2002 to 2012 period.

The benefit of this research is that it will use data that are more recent in order to provide results that are relevant to the current market situation. The study will provide guidance to both locally and globally based portfolio managers and investors who are looking to invest in the South African market. This research will be useful for investors who hold mixed-asset portfolios and are attempting to diversify their portfolios by investing capital in emerging economies, as this research will provide information on how securitised property funds can assist in diversifying a portfolio in an emerging market context.

1.3 Delimitations of the study

I will conduct this research in only one emerging market – the South African market, over the period 2002 to 2012. This study will evaluate equity property funds only, excluding mortgage funds. The South African property funds that will be studied are limited to Property Unit Trusts and Property Loan Stocks. I will only study the diversification potential of one alternative asset class (securitised real estate) relative to traditional asset class investments.

CHAPTER 2. LITERATURE REVIEW

The subsequent literature review begins by discussing theories of asset allocation, and using these theories as a basis discusses specific studies that have examined the securitised real estate asset class. It goes on to discuss the current South African securitised real estate market, which forms the basis of this research paper.

2.1 Asset allocation and portfolio investment

Hensel et al. (1991) defined asset allocation as 'the decision of how of a fund should be invested across each of several asset classes, assuming neutral capital market conditions exist'. The observation of risk diversification potential when combining instruments from different asset classes in mixed-asset portfolios deems the practice of asset allocation central to portfolio investment.

Brinson et al.'s 1986 seminal article 'Determinants of Portfolio Investment' is one of the most broadly debated articles written in the past two decades about the importance of asset allocation in portfolio construction and management. The results documented in this study show that the selection and weighting of asset classes, referred to as 'investment policy', determine 93.6% of the variability in returns between funds. Subsequent research finds that asset allocation strategies account for far lower differences in the variability in returns between funds. Ibbotson (2010) and Ibbotson and Kaplan (2000) find that asset allocation accounts for approximately 40% of the variability in returns between funds. While Vardharaj and Fabozzi (2007) find that asset allocation explains between 33 to 75 percent of the variance in portfolio returns Ibbotson (2010) further argues for the split of a total return achieved by a fund into passive and active (excess return) return components. Asset allocation policies are responsible for the passive portion of the total return. This means that asset allocation accounts for 100% of the variability in the passive portion of the total return. Splitting the total return in this manner makes it easier to

determine the exact impact of asset allocation on total return and the reduction of risk.

Consequent research has shown that a variety of practices such as individual security selection, market timing and active management, in conjunction with asset allocation policies are responsible for the variability in returns between funds (Hensel et al., 1991; and Xiong et al., 2010). Although asset allocation is not the only factor that influences the variability in portfolio total returns it is still considered by the most researchers to be a critical facet of portfolio construction and a essential means for reducing portfolio volatility (Bekkers et al., 2009).

In order to assess the diversification potential that securitised real estate possesses, we therefore need to consider asset allocation practices that are rooted in portfolio theory.

2.1.1. Modern Portfolio Theory

Modern Portfolio Theory resulted from Harry Markowitz's work on developing quantitative portfolio optimization methods that accounted for the diversification benefits derived from asset allocation policies. Modern Portfolio Theory became seminal to investment practices post the publication of Harry Markowitz's article 'Portfolio Selection' in 1952 (Bodie et al., 2011). Anderson and Beracha (2011) define modern portfolio theory as the motivation for portfolio diversification in which the investor attempts to achieve an optimal mix of assets, to control the risk of the portfolio while at the same time achieving the maximum return possible and therefore optimising portfolio efficiency. The aim of this type of investment practice is controlling investment risk and return. By combining negatively correlated assets, the investor achieves the aim of creating an investment portfolio with reduced risk. The strength of portfolio investing lies in the fact that the risk associated with the mixed-asset portfolio risk is lower than the sum of the risks of each individual asset if the correlation between the assets is lower than positive one. The lower the correlation the greater the risk reduction. Perfectly

negatively correlated assets whose prices move in opposite directions exhibit a correlation score of negative one. Simply combining assets in a portfolio will not automatically lower risk, but rather selecting and combining assets that exhibit negative correlation scores will lower the portfolio risk. Combining assets in a portfolio that exhibit correlation scores lower than positive one lowers the potential volatility and results in more consistent and stable returns for the investor.

Therefore we can hypothesize that the variances of investment portfolios comprised of mixed-asset classes ($\sigma_{p_1}^2$) are lower than variances of investment portfolios comprised of single asset classes ($\sigma_{p_2}^2$) (pg 40).

A. Mixed-asset portfolios

The definition of a portfolio is a grouping or collection of investment assets, constructed using assets from different asset classes (Amenc and Sourd, 2003; and Bodie et al., 2011). The expected return on a portfolio can be calculated as the weighted average of the returns expected from the individual securities or assets that comprise the portfolio (Elton et al., 2009), where the weight is the percentage of total capital that is invested in a specific asset.

B. Portfolio management and asset classes

When engaging in portfolio management the manager is attempting to use methods of asset allocation and security selection to construct and constantly maintain a portfolio that fits the investor's risk profile and required returns – he is attempting to construct a portfolio with an optimal risk to return ratio (Brueggeman and Fisher, 2011). The 'top-down' investment approach of dividing assets into classes is the basis for asset allocation in a portfolio.

The first step in determining which assets should be included in a portfolio is to group assets into asset classes. 'An asset class is a group of assets with similar attributes' (Maginn et al., 2007). Asset classes are determined by characteristics such as equity or debt properties, physical properties (e.g. gold or real estate), volatility,

the manner in which they behave, and the laws and regulations that they are subject to. These characteristics essentially determine the risk profile of assets that fall into a specific class (Amenc and Sourd, 2003). Assets that exhibit risk levels above the risk free rate pay a risk premium to investors. Expected returns on different assets are therefore a factor of the risk associated with each asset – the return that an investor receives on this investment is a reward for the risk they bear. Subsequent to selecting weighting asset classes, the portfolio manager can then select individual securities that fall into these asset classes.

C. Traditional Asset Classes

Traditional asset classes usually comprise domestic and non-domestic equities (common stocks), domestic and non-domestic fixed income instruments (bonds), cash and cash equivalents (Maginn et al, 2007).

A common stock is a form of equity that indicates that the holder owns a share in a company. This ownership gives the holder the following rights; a claim on earnings, a claim on the firm's assets, voting rights, a right to receive declared dividends, proxy rights, and rights issues (first refusal on secondary equity offerings). Equities classes can be classified by: a firm's size or market capitalisation (small-cap or large-cap stocks), industry, geographic location, growth or value stocks, and according to their dividend policies.

Bonds are debt instruments that represent a fixed loan between issuer and investor. An investor holding this type of debt instrument is entitled to periodic interest payments (called coupon payments) and repayment of their principle investment at maturity. Bond asset classes are determined according the following main characteristics: time to maturity, rating of the issuer, and whether they are issued by a sovereign or non-sovereign entity.

The terms cash and cash equivalents are interchangeable with 'money market instruments'. These instruments are short-term, liquid, low-risk debt securities such

as Treasury Bills, Certificates of Deposit, Commercial Papers and Bankers Acceptances (Bodie et al., 2011).

D. Alternative Investments

Alternative assets are not always easily definable. The main characteristic that they exhibit is that their risk and return properties are significantly different from traditional asset classes. Because of the different risk and return properties that they exhibit, they are able to provide risk diversification for portfolio investments and in some cases returns in excess of those achieved by investments in traditional asset classes (Anson, 2008). Examples of alternative asset classes include real estate, gold and other commodities, hedge funds, private equity, venture capital and private debt.

There are numerous studies on the diversification benefits of including alternative asset classes in portfolios (Amenc and Sourd, 2003). In many cases researchers consider real estate investments (both securitised and non-securitised) an alternative asset class. Whether this classification holds true is dependent on whether the risk and return properties of real estate investments mimic traditional asset classes or whether they exhibit unique characteristics.

E. Asset allocation and portfolio construction using Modern Portfolio Theory

Modern Portfolio Theory makes use of quantitative techniques in order to select groupings of assets. Quantitative techniques differ depending on whether the investment approach is an active or a passive one. The approach of Active Investment Management focuses on continual security analysis in an attempt to take advantage of arbitrage opportunities in the market. Active Investment Managers believe that the Efficient Market Hypothesis is incorrect and that temporary inefficiencies and therefore opportunities for arbitrage exist in the market, whereas Passive Investment Management is a portfolio investment approach that places its focus on highly diversified portfolios. Passive Investment Managers believe that the

market is efficient (Bodie et al., 2011). In this study I will focus on quantitative techniques used in 'passive portfolio' management, a method aimed at reducing portfolio risk by means of asset diversification techniques.

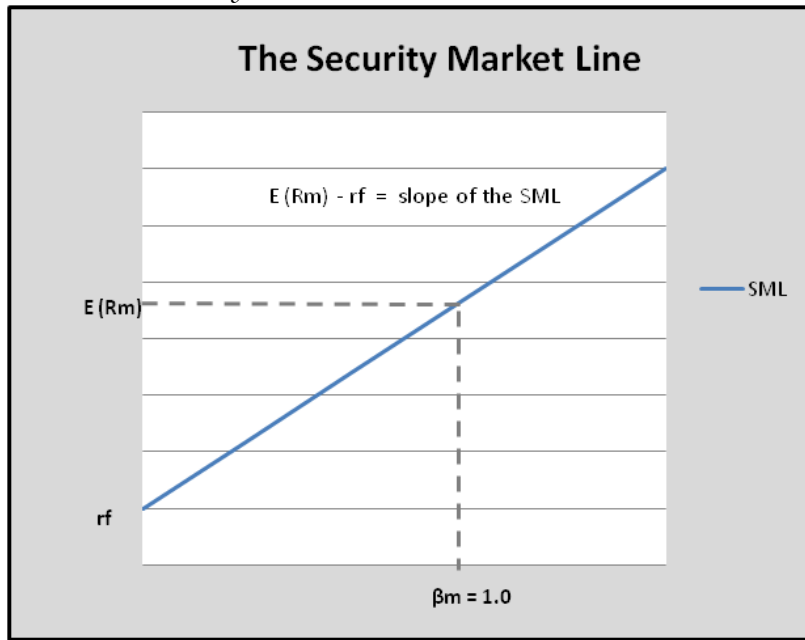
Passive investment management focuses on the broader asset class level rather than at the level of individual securities. This asset allocation method involves determining which groupings of asset classes have negative correlation scores that are closest to negative one (meaning that they are perfectly negatively correlated) (Amenc and Sourd, 2003). By constructing a portfolio of assets that have negatively correlated returns the investor is able to reduce the risk of the portfolio, as when one asset is performing well the other will be performing poorly (and vice versa) – thereby offsetting losses and ensuring that the portfolio offers the investor more consistent and stable returns.

The assets chosen to comprise the portfolio are fundamental to this type of investment practice. Allocating additional assets to a portfolio should be based on the concept of 'asset efficiency' (Brueggeman and Fisher, 2011) – will the new asset both increase the expected return of the portfolio, while at the same time maintaining or lowering the risk level (portfolio standard deviation) of the portfolio.

Asset efficiency can be determined by using the Security Market Line (SML) and Capital Asset Pricing Model (CAPM model). The SML is a positively sloped straight line that depicts the average risk to return relationship (relationship between expected return and Beta) on the market and is used to access whether the risk to reward ratio of an individual asset or portfolio of assets is higher or lower than the market average.

Where the SML is defined as: $SML\ Slope = \frac{E(R_m) - R_f}{\beta_m}$

Figure 2-1: The Security Market Line



The CAPM is defined as: $E(R_s) = R_f + \beta_s(E(R_m) - R_f)$

The CAPM model allows us to map assets against the SML in order to determine if their return to risk ratios are higher or lower than the market average.

Building on the SML, Markowitz developed the ‘minimum-variance frontier’ in order to determine the lowest achievable variance for a portfolio of assets with a given expected rate of return (Bodie et al., 2011). From the minimum-variance frontier, we can determine an efficient frontier. Portfolios of assets that lie on the efficient frontier exhibit the highest expected return for each given level of risk.

F. Systematic and Unsystematic Risk

Risk comprises two components – a systematic risk component (called the Beta) and an unsystematic risk component. Researchers often refer to systematic risk as market risk. Investors cannot avoid this risk through diversification as it is prevalent in almost all assets and influences the entire market. It is the result of market wide effects such as GDP, interest rates, or inflation, and general economic conditions (Firer et al., 2008). Unsystematic risk is the component of risk that is prevalent in either one asset or a small group of assets, and therefore this risk is called unique or

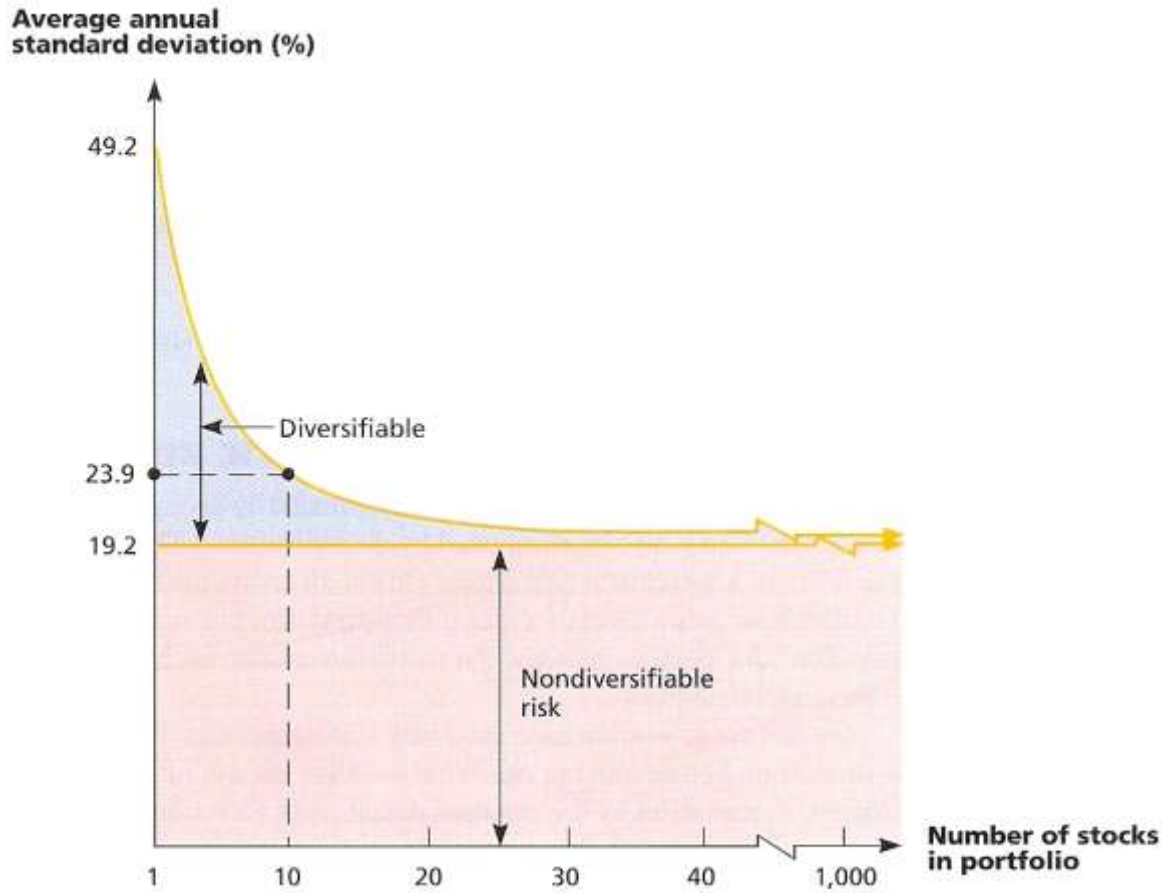
asset specific risk. As a result, a portfolio can combine assets that have different types of unsystematic risk in order to diversify this type of risk.

Diversification only reduces unsystematic risk. Well-diversified portfolios contain no unsystematic risk, or at most very low levels of this type of risk (Firer et al., 2008).

G. The principle of diversification

Combining assets from different classes in a portfolio creates diversification. This lowers investment risk as the investor's exposure to any single asset class or individual security is limited. 'Diversification is often described as the only "free lunch" in finance because it allows for the reduction of risk for a given expected return' (Xiong et al., 2010). The principle of diversification shows that creating a portfolio of different asset classes will eliminate some but not all risk (Firer et al., 2008). Diversification eliminates the unsystematic portion of risk, whereas eliminating systematic risk is not achievable. This principle also shows that combining more assets in a portfolio lowers the unsystematic risk associated with the portfolio – but only up to a certain point. Once a portfolio contains approximately 15 to 25 different securities (the exact number is debatable), adding further assets to the portfolio no longer helps to lower risk – the risk level of the portfolio levels off.

Figure 2-2: Portfolio Diversification (Firer et al., 2008)



Using the efficient frontier, we can construct an 'Efficient Markowitz Portfolio'. When such a portfolio of assets is constructed, there should be no further room for reducing risk by means of diversification.

H. Portfolio Variance and correlation

In order to determine quantitatively the reduction of unsystematic risk we need to be able to compute portfolio variance. We cannot calculate portfolio variance in the same manner as portfolio expected return (i.e. by computing the weighted average of the variances). Rather we need to account for the co-variance when calculating the portfolio variance. Portfolio variance can be computed as (Elton et al., 2009):

$$\sigma_p^2 = w_s^2 \sigma_s^2 + w_b^2 \sigma_b^2 + 2w_s w_b \sigma_s \sigma_b \rho_{s,b}$$

$$\sigma_p = \sqrt{\sigma_p^2}$$

The variance of a portfolio will always be lower than the weighted average of the variance of the individual assets in the portfolio. From this we can ascertain that combining assets of different classes in a portfolio substantially lowers the investor's risk. However, it is not enough to know that combining assets of different classes lowers a portfolio's variance and therefore the investor's risk – we need to be able to compute exactly how much we can offset unsystematic risk by combining different asset classes in order to make informed investment decisions about portfolio construction.

To measure quantitatively the diversification potential that various asset classes possess we can use econometric models that test for correlation. Correlation is a method used to test the relationship that exists between variables (in our case the variables are asset classes) (Koop, 2006). 'R' denotes the correlation between two variables. The mathematical formula used to measure 'r' is:

$$r = \frac{\sum_{i=1}^N (Y_i - \bar{Y})(X_i - \bar{X})}{\sqrt{\sum_{i=1}^N (Y_i - \bar{Y})^2} \sqrt{\sum_{i=1}^N (X_i - \bar{X})^2}}$$

where:

$X \& Y$ are variables that represent different asset classes (e.g. common stock and bonds)

$$r \quad -1 \leq r \leq 1$$

Positive values of r , derived from the above equation, are indicative of a positive relationship between the two variables. The larger a positive value of r , the stronger the positive correlation between the two variables. An r score of positive one indicates perfect positive correlation between two variables. While negative values of r are indicative of a negative relationship between the two variables. The larger the negative value of r , the stronger the negative relationship correlation between variables. An r score of negative one indicates that your two variables are

perfectly negatively correlated (Koop, 2006). An r score of zero indicates that the two variables are uncorrelated.

The standard deviation score of a portfolio (or portfolio variance) is a factor of the correlation score between two individual assets (Firer et al., 2008). In the formula used earlier to compute portfolio variance $\rho_{s,b}$ measures the correlation between two securities or assets, a measure of how the returns of two assets move together. The below equation defines the correlation coefficient:

$$\rho_{s,b} = \frac{\sigma_{sb}}{\sigma_s \sigma_b}$$

Where;

σ_{sb} is the covariance between the two assets (stocks and bonds)

The closer the $\rho_{s,b}$ is to negative one, the lower the standard deviation of the portfolio will be. The standard deviation of the portfolio will then be less than the weighted average standard deviation of the two assets. The standard deviation indicates how much on average the investor can expect returns to deviate from the mean - it measures volatility. As soon as your $\rho_{s,b}$ score is less than one (less than perfectly positive), combining these assets in a portfolio reduces unsystematic risk. This shows that the risk of a portfolio of assets can be quite different from the risk associated with individual assets.

Therefore we can hypothesize that the correlations between traditional asset classes (common stock, bonds and cash instruments) and property funds ($\rho_{a,t}$) are significantly less than positive one (pg 40).

As the number of securities in the portfolio increases, the portfolio variance will decrease until it nears the average covariance. The average covariance between assets in a portfolio explains the effect of diversification on portfolio risk (Elton et al., 2009).

Where the covariance between assets is the expected value of the product of the deviations of the two assets:

$$\sigma_{sb} = \sigma_s \sigma_b \rho_{s,b}$$

Portfolio theory uses correlation to measure the relationship between the returns of different asset classes. Measuring whether returns generated from different asset classes are positively or negatively correlated we can determine combination of assets that will offset unsystematic risk. Assets whose expected returns are perfectly negatively correlated (have a correlation score of negative one) are best suited for diversifying unsystematic risk in a mixed-asset portfolio. This is because when one asset class is performing well (achieving optimal returns) the other asset class will be performing poorly, and vice versa. Because of this, returns that the investor achieves by combining these assets in a portfolio are less volatile and more stable, pointing to a reduction in unsystematic risk.

Using Modern Portfolio Theory, we can determine what the optimal asset class allocation is for a portfolio investment.

Bekkers et al. (2009) study ten different asset classes and attempt to establish which alternative asset class provides the best risk diversification potential and add the most value to a portfolio of traditional assets (common stock, bonds, and cash instruments). They find that real estate (direct and securitised), commodities and high yield assets are the asset classes that add the most value to a portfolio of traditional assets.

This study will examine 'securitised real estate' investments as an alternative asset class.

2.2 Direct and Indirect Real Estate Investments

Investors can invest in real estate assets either through making private or public investments (Niskanen and Falkenbach, 2010). Public investing involves purchasing stocks in securitised real estate companies or funds, while private investing involves the direct purchase of real estate properties.

2.2.1. Direct Real Estate Investments

Ziering and McIntosh (1997) define direct investments in real estate or 'core real estate' as 'fully leased, income producing, private equity'. Direct property investments constitute the acquisition of fixed real estate properties (either residential or commercial), where the investor has a claim on a specific asset. The holder of a direct property investment derives income from rentals and capital gains (both appreciation and value increases).

Research indicates that investment in un-securitised private real estate in both developed and emerging economies provides diversification benefits for mixed-asset portfolios, reducing the risk of portfolios that contain mostly common stocks and bonds (Brueggeman et al., 1984; and Ziering and McIntosh, 1997). Ziering and McIntosh (1997) discuss the results that other researchers find when studying the diversification potential of direct real estate. They consistently find low or negative correlation scores between direct real estate investment returns and returns on other financial assets, even after un-smoothing the returns derived from real estate investments. Researchers observe significant diversification benefits where the allocation of direct real estate investments in a portfolio is between 5 % and 15%. Specifically, Ziering and McIntosh (1997) find the following results when studying the returns on direct property investments (over the period 1972 – 1995):

- A correlation score between direct real estate investment returns and the S&P500 of – 0.042.
- A correlation score between direct real estate investment and long-term government bonds of – 0.295.
- That direct real estate investments are highly correlated with inflation levels. They find a correlation score of 0.66 between inflation (measured by the Consumer Price Index) and returns on direct real estate over the period 1973 – 1995.

- They also find that core real estate investments exhibit less volatility and provide more stable incomes.

The diversification phenomenon prevalent in un-securitised real estate investments is a result of these assets' ability to hedge inflation, possess low volatility, and exhibit different characteristics such as their income characteristics (income from rentals and leases). Inflation hedging is the main diversification benefit that direct real estate investments exhibit. Researchers observe high positive correlation scores between direct real estate investments and inflation. This is advantageous as it indicates that this asset can be used to hedge inflation – when inflation increases the returns on direct property investments increase, preserving the real rate of return (Brueggeman and Fisher, 2011). Their ability to hedge inflation makes direct real estate investments an attractive asset for portfolio diversification purposes. A mixed-asset portfolio that contains direct real estate investment holdings exhibits substantially lower inflationary risk. However, researchers still debate the exact percentage of inflationary protection that it provides. Researchers have theorised that the reason that direct real estate investment hedges inflation is because when price levels increase property owners simply increase rent and leasing prices. Therefore, they effectively pass the inflationary risk onto their tenants.

2.2.2. Indirect (Securitised) Real Estate Investments

We can contrast direct real estate investments with indirect investments in property where the investor purchases shares in a property fund. Indirect property investments are real estate assets that have been 'securitised' - where securitisation is the process of creating financial instruments by pooling a large group of other assets. Securities are financial assets or instruments that entitle the holder to a claim on the underlying real assets (Bodie et al., 2011). To enable selling through a securities exchange or over-the-counter as well as for marketing purposes, these assets are repackaged and priced in different layers. The underlying assets are collateral

against the new financial securities. The process can encompass any type of financial asset (such as real estate), and is used as a means of increasing liquidity and lowering default risk to the individual investor (Investopedia, 2012). The fund pools the capital raised through security issues to purchase real estate assets. The investor will therefore own a claim on a percentage of the entire real estate portfolio rather than on a single real estate property. The investor holding indirect claim on a real asset investment derives income from dividends and capital gain from increases in the funds share price. This investment provides two main advantages: liquidity and ease of diversification into many different properties, property types, and geographic locations because of capitalisation of the pooled funds. Indirect property investments also provide the investor with benefits such as high dividend yields, and a stable income stream.

Securitised property investments can take on three different forms (Brueggeman and Fisher, 2011): *Equity trusts*: an equity fund purchases physical real estate or property related equity instruments, *Mortgage trusts*: purchases mortgage obligations or property related debt instruments, *Hybrids trusts*: invest in both equity and property related debt instruments.

2.2.3. Is securitised real estate a good substitute for direct real estate investment?

There is a dominant perception that exists in the market that says that securitised real estate investments (such as Real Estate Investment Trusts) function as a substitute for direct real estate investments, while providing added benefit such as increased liquidity (Giliberto, 1990). Portfolio managers therefore invest in securitised property funds in order to diversify mixed-asset portfolios. However, the basis of the idea that securitised property funds provide good diversification in mixed-asset portfolios is the belief that securitised property funds are a good substitute for direct investment in private real estate – this belief remains unsubstantiated.

2.3 REITS: Real Estate Investment Trusts

Real Estate Investment Trusts (REITs) date as far back as 1880, but since their creation they have changed substantially in structure (Brueggeman and Fisher, 2011). In 1960, Congress in the United States passed the Real Estate Investment Trust Act making REITs a more widely used investment vehicle. However, the REIT market did not experience significant growth until the 1990's when further legislation amended this act (Peterson and Hsieh, 1997).

Peterson and Hsieh (1997) define a REIT as 'a closed-end investment company which offers investors the opportunity to invest in real estate based assets' (i.e. income producing real estate properties and mortgages). REIT's are tax advantaged investment vehicles that pool investor's capital with the objective of investing in real estate properties and mortgages. These investment vehicles derive their cash flow and earnings from investing directly in income-producing real estate (Bodie et al., 2010). They are vehicles that receive special tax considerations. Distribution of profits occurs prior to taxation and the tax due on profits is then the liability of the investor rather than the fund. Investors can purchase ownership shares in the fund through the relevant security exchange. REITs raise capital for their real estate investment through share and bond issues, and by loaning money from banks. They are often highly leveraged with a typical debt to equity ratio of 70:30. Investing in a REIT offers the investor a liquid method of holding real estate, typically high yields, and a stable income source. Most modern REITs are non-finite and tend to operate more like a going concern than an investment conduit (Brueggeman and Fisher, 2011).

The two main types of REITs are equity trusts and mortgage trusts. Equity trusts are funds that invest in and own real estate property. Equity funds derive their income from rental charged on the properties, while mortgage trusts are funds that invest primarily in mortgage and construction loans, secured by real estate.

Mortgage funds earn their income from the interest payments on these loans. Hybrid REITs also exist; these funds invest in both properties and mortgages.

REITs often manage real estate portfolios that are specialised according to either property type or geographic sector. The extent to which a REIT is specialised affects its risk levels. NAREIT – the United States National Association of Real Estate Investment Trusts classifies REITs into the following categories (Brueggeman and Fisher, 2011): industrial and office, retail, residential, diversified, lodging and resorts, healthcare, self-storage and speciality.

2.3.1. The REIT boom

Investments bring together suppliers and demanders of funds: those who have excess funds to invest and those who need the funds and are willing to pay for them. Both supply and demand factors drove the REIT boom of the 1990s.

On the supply side, regulatory changes allowed REITs to expand rapidly. Before 1986 the managers, directors, and trustees of REITs were restricted from actively managing their REIT portfolios. This resulted in REITs being very passive investment vehicles. The introduction of the Tax Reform Act in the United States in 1986 fundamentally changed REIT management. REITs could now render customary maintenance on the properties they owned, provide services for their tenants, and actively engage in rent collection. Previously REITs outsourced many of these functions because of the regulations that existed in the industry up until 1986. REITs could now have internal departments that carried out these functions – which they were able to manage more actively. As a result the REIT industry became more vertically integrated, REIT performance increased, and the REIT industry started to boom in the 1990s (Brueggeman and Fisher, 2011).

During the 1960s and 1970s, inflation in the US exceeded investment portfolio returns resulting in investors receiving negative returns on their investments. As a result, portfolio managers had to find alternative asset classes that exhibited negative correlations with the returns on common stocks and bonds in order to diversify their

portfolios (Ziering and McIntosh, 1997). As a result of the change in REIT regulations in 1986 (both a move towards more active management structures and tax deferred structures for the transfer and exchange of assets), REITs became a more attractive investment for these portfolios managers who wanted to diversify their portfolios into other assets classes – further spurring the REIT boom in the 1990s.

2.3.2. Development of the REIT industry in the 1990s

During the REIT boom of the 1990s, the REIT industry was shaped by two major public offerings. In 1991, Kimco Realty listed an Initial Public Offering (IPO) of the first properly restructured and vertically integrated REIT. This was the first IPO offering of a REIT designed for internal management from the outset. Taubman Realty made the second momentous public offering when they listed a public ‘umbrella partnership REIT or UPREIT’ – a REIT that owns a controlling interest in a limited partnership that owns the underlying real estate assets (Brueggeman and Fisher, 2011).

Due to these events, most REITs in the current market have a vertically integrated, actively self-managed structure in an attempt to grow these portfolios and generate the highest returns on capital possible. Brueggeman and Fisher (2011) refer to these REITs as ‘modern REITs’. In an attempt to achieve an optimal capital structure and the lowest cost of capital possible these modern REITs focus on actively managing their capital structures, raising capital through public equity and debt issues, private equity and debt, property and portfolio level debt, and joint ventures with other institutional investors.

2.4 Past Studies on securitised real estate and the diversification potential of REITs

Researchers have conducted a great deal of research investigating the relationship that exists between REIT returns (also referred to as indirect or securitised property investments), common stock, bond returns, and un-securitised

real estate returns that are received from direct property investments. These past studies attempt to establish if REITs possess good diversification potential for mixed-asset portfolios that contain mainly common stocks and bonds. Most researchers establish the diversification potential of REITs by determining whether REIT pricing is representative of the underlying real estate assets or if it is simply correlated with returns on the general stock market and therefore rather a factor of general market conditions. They do this by comparing the income derived from direct property investments (in the form of rental income and capital gains on property prices) to the income derived from stocks held in REITs (in the form of declared dividends and capital gains on stock prices). Because of the many studies that show that direct real estate investments provide excellent diversification potential, researchers believe that if securitised real estate exhibits the same return characteristics then we can infer that they possess the same diversification benefits.

The basis for REIT cash flows and earnings are the real estate assets that they invest in. Therefore it would be reasonable to expect the basis of REIT pricing to be the underlying real estate values. However, REITs are also listed securities, so it would also be reasonable to expect the overall market condition to affect their pricing. Much debate still exists as to whether Real Estate Investment Trusts (REITs) are a good substitute for investing in direct investments in real estate, due to the variant results that different researchers have found when studying the same phenomenon. Researchers continue to debate whether REITs actually give the investor exposure to the real estate asset class, assisting in diversifying a mixed-asset portfolio, or if they simply exhibit the same characteristics as common stock.

Therefore, we can hypothesize that the variability in returns of the public equity (common stock), public debt (bonds) and cash markets explains the variability in returns of securitised property funds, where β is not equal to zero (pg 40).

Peterson and Hsieh (1997), Ziering and McIntosh (1997), Barry and Rodriguez (2004); Anderson et al. (2005), Pavlov and Wachter (2008), amongst others find that REIT returns are highly positively correlated with returns on the general stock market, rather than with real estate pricing and returns. The subsequent paragraphs discuss the studies that find these results.

Ziering and McIntosh (1997) observe a shift away from investors holding direct investments in core real estate, to investors focusing on securitised real estate. They suggest that many asset management funds see securitised real estate investments as interchangeable with private direct real estate investment holdings. They believe that as a result of this the investor's portfolios are not as well diversified as they were when they included more direct real estate investments – due to the low correlation in returns that they have found between securitised real estate returns and the returns on direct un-securitised real estate investments. When studying this phenomenon they find a positive correlation between REIT returns and the S&P500 index (correlation score during the period 1972 – 1995 of 0.67), but a negative correlation between un-securitised real estate returns and the S&P500 index (correlation score during the period 1972 – 1995 of -0.04). They also find that positive correlation scores between REIT funds and un-securitised real estate returns are very weak (correlation score during the period 1972 – 1995 of 0.11).

Barry and Rodriguez (2004) study the risk and return characteristics of property indices in 15 individual emerging markets, compared with 21 developed markets. They find that investments in REIT funds and securitised real estate in emerging markets perform differently to direct investments in un-securitised real estate – un-securitised real estate investments exhibit better inflation hedging potential than securitised real estate investments. They also find that real estate investments in both emerging and developed markets consistently underperformed equity investments (for the period 1989 – 2001). However in spite of the lower returns that securitised real estate investments exhibited, they found that when

emerging market real estate investments were included in developed market portfolios of common stock and bonds, they provided good diversification potential, significantly lowering the risk of the portfolio.

Peterson and Hsieh (1997) conduct research using data from the period 1976 to 1992, looking at whether the risk factor and returns on common stock and bonds explain REIT returns in the US. They find a significant relationship between the risk premiums on both equity REITs and the risk premiums on common stock returns and portfolios of common stocks. They also find a significant relationship between mortgage REIT risk premiums, three stock market factors and two bond market factors.

Anderson et al. (2005) further investigate the characteristics and determinants of REIT returns and pricing. They find that un-securitised real estate returns explain only a small percentage of the variance in REIT returns. Their study finds that there is little co-movement between the variance in REIT returns and the variance in un-securitised real estate, but that variance in REIT returns, stock returns and bond returns tend to be more closely related. They found REIT returns and the returns of small-cap value stocks to be more closely related than REIT returns and the returns on large-cap stocks. They also found the returns on growth stocks to be unrelated to REIT returns. Anderson et al. (2005) theorise that the high correlation of returns between small-cap value stocks and REITs may be because many listed property companies in the US take on the form of small-cap value stocks. They conclude that REITs are hybrid securities, as the underlying real estate investments determine their long-run performance, but both the attributes of the underlying real estate assets as well as general conditions of the capital market determine their short-run performance.

Niskanen and Falkenbach (2010) find similar results to Anderson et al. (2005) in their study. They observe a significant positive relationship between REIT returns and the returns of common stocks. They find this relationship to be especially strong

when correlating REIT returns with small-cap and large-cap stocks. They further observe significant negative correlations between REIT returns and the bond returns.

Pavlov and Wachter (2008) attempt to determine if a link exists between REIT returns and the CPPI index (Commercial Property Price Index). This study uses the CPPI index as a proxy for direct real estate investments. This index tracks real estate price changes based purely on the documented prices in completed property transactions, with the objective of supporting the trading of commercial property price derivatives. Repeat-sales regression (RSR) rather than appraisal-based valuations are the basis for the construction of the index (Moody's, 2012). Pavlov and Wachter (2008) find that REIT funds are not a good substitute for direct investment in real estate due to the negative correlations that they observe between these two asset types. They therefore conclude that achieving the same returns produced by an investment in un-securitised private real estate is impossible through a REIT investment.

Conversely, there are various researchers including Giliberto (1990), Gyourko and Keim (1992), Barkham and Geltner (1995), Barry et al. (1996), Quan and Titman (1997), and Oikarinen et al. (2011), who find that REIT returns are positively correlated with un-securitised private real estate returns, indicating that REIT pricing is more closely related to the underlying real estate assets. These findings suggest that investing in REIT funds is a good substitute for direct investment in private real estate, and will afford the investor similar returns and benefits. The following paragraphs discuss studies that find these results.

Barry et al. (1996) study the diversification potential of real estate in emerging markets (they include 26 emerging markets in their study; they define emerging markets by the IFC definition – 'a capital market in a developing nation'). They find that securitised real estate investments are not a perfect substitute for direct real estate investments, but in spite of this they still provide diversification potential for mixed-asset portfolios that contain mainly common stocks and bonds (especially

when securitised real estate investments from emerging markets are included in portfolios that primarily contain developed market financial instruments). They find that real estate investments tend to exhibit high levels of systematic risk in their local contents, but when these same investments are correlated with stock and bond securities in developed markets, they exhibit very low correlation scores – indicating that when combined in a portfolio with these securities they will lower the risk level of the portfolio. Barry et al. (1996) are unable to determine if securitised real estate prices are representative of the underlying real estate investments, due to a lack of available data in the emerging markets in which they conducted their research. However, they theorise that securitised real estate returns are a factor of both market characteristics and the characteristics of the underlying real estate.

Giliberto (1990) studies the relationship between REIT returns and the returns of direct equity real estate holdings. When running a direct correlation between EREIT (Equity Real Estate Investment Trusts) returns and direct real estate investment returns, Giliberto establishes very little correlation. However, he finds a strong link between securitised real estate fund returns and un-securitised real estate, when using a regression method to study the residuals of each data series. He also finds that a time lag on the REIT residuals from the regression assists in explaining the un-securitised real estate residuals. He concludes that there is a real estate factor common to both securitised and un-securitised real estate returns. Barkham and Geltner (1995) study 'price discovery' – 'the process by which asset prices are formed', in order to determine if a price relationships exists between securitised real estate and un-securitised real estate across the US and UK markets. They correct appraisal based returns for smoothing when measuring un-securitised real estate pricing. They find a similar result to Giliberto's when they examine the American and British real estate markets, establishing that un-securitised real estate returns trail REIT fund returns but with a time lag of at least one year. Their results are more immediate and prevalent in Britain than in America. A study conducted by

Gyourko and Keim in 1992 examines the relationship between the returns of common stock and the performance of an appraisal based real estate index. They find the same results as Barkham and Geltner (1995), where lagged values of a securitised real estate portfolio can predict returns on the appraisal based NCREIF index. Quan and Titman (1997) conduct a study in 17 different markets (developed markets as well as Asian emerging economies) on commercial real estate and stock market. With the exception of the US, they find a strong positive correlation between the returns on un-securitised real estate (measured by real estate values and rents) and current and past period common stock returns for REIT funds.

Oikarinen et al. (2011) use the NAREIT (index that tracks the performance of securitised real estate returns) and the NCREIF (index that measures un-securitised real estate returns, calculated on an appraisal basis) to conduct their study. Their results indicate a positive correlation between the returns on these two indices and they conclude that including REIT investments in a mixed-asset portfolio offers the same long-term diversification benefits that a direct investment in private real estate would. However when Moss and Schneider (1996) conducted research on the relationship between the NCREIF index and securitised equity REIT indices they found contradictory results.

Raudszus et al. (2012) recent study on this topic shows that equity REITs exhibit similar characteristics to direct un-securitised real estate during economic recessions.

Clayton and MacKinnon (2003) study the link between REIT returns, financial asset (common stock and bond) returns, and un-securitised private real estate returns. The results of their study indicate that REIT returns are a factor of both the general conditions in the capital market and of un-securitised private real estate. They also find that the influence that these factors exert over REIT returns changes over time – for example; during the 1980's we can observe that large-cap stocks returns were significantly correlated with the variance in REIT returns. Then in the

late 1980s we observe a significant correlation between small-cap stocks returns and the variance in REIT returns. In the 1990s REIT returns become correlated with un-securitised private real estate returns. However both Falzon (2002) and Lee and Stevenson (2007) have conducted research that indicates that during the 2000s there was also still a strong positive correlation between the variance in REIT returns and the returns on small-cap stocks and small-cap value stocks. These studies all indicate that from the 1990s to the present the variability in small-cap stock returns explains the variability in REIT returns. This property of REIT returns could exist because many REIT funds and listed property companies are small-cap rather than large-cap stocks.

Neil Myer and Webb (1993) use two different econometrical models to assess the relationship between the variability in REIT returns and the variability in common stock returns. Each model produces different results. When using a distributional time series model they find that equity REIT returns appear to be much more like common stock returns and closed end funds than like returns on un-securitised real estate. However when they examine the returns intertemporally using vector autoregressive model and Granger causality tests, in which the returns of one asset are lagged on the returns of the other asset, they find that the equity REIT index returns were found to Granger cause un-securitised real estate returns for most of the real estate indices. They find a closer relationship between REIT returns and un-securitised real estate returns than between REIT returns and stock or closed end fund returns. However, the Granger causality relationship that Neil Myer and Webb (1993) find runs in the opposite direction to what we would expect. We would expect to find that un-securitised real estate returns Granger cause REIT returns, as real estate is the asset class that forms the basis for REITs and their pricing should therefore be based on the underlying asset. However, the results that Neil Myer and Webb find indicate that in fact un-securitised real estate pricing is based on REIT pricing, and that REIT pricing is a factor of market conditions rather

than of real estate prices. Neil Myer and Webb believe that this result could be present because appraisal or accounting based real estate prices are slow to incorporate new market information, whereas REITs incorporate information more quickly as they are market or transaction based.

The conflicting results that are found by these researchers when studying the relationship between REIT returns, securitised financial asset returns and private real estate returns could stem from problems such as the time the studies were conducted (data from pre or post the 1990 REIT boom), differences across countries, different econometrical methods and indices that have been used for measurement. Oikarinen et al. (2011) suggest that relationships found between REIT returns and other asset classes to be significant by researchers in the past may no longer hold, due to the REIT boom of the 1990s and major structural changes that have occurred in the REIT market since then. Therefore, researchers should exercise caution when carrying out past literature reviews. Clayton and McKinnon (2003) further investigate changes in the REIT market. They find that prior to the 1990s REIT boom, REIT returns were highly correlated with the general stock market (with large-cap stocks) rather than with real estate pricing and returns, but that post the REIT boom of the 1990s REIT returns are correlated with small-cap stocks and with un-securitised real estate returns. They believe that because of the REIT boom, a higher number of investors created a demand for information. This lead to more accurate information and REIT pricing that was more reflective of the underlying real estate as a result of a more efficient and transparent market. This is supported by Wang et al. (1995) who studied the REIT market prior to the REIT boom and found that at this stage the market did not provide the same level of information dissemination, monitoring activities and pricing mechanisms for REIT stocks as it did for other stocks in the market. They believe that the REIT market prior to the REIT boom was not benefiting from securitisation.

2.5 The Current Securitised Real Estate Market in South Africa

In South Africa property entities that are listed on the Johannesburg Stock Exchange (JSE) fall under the umbrella of 'Financials – Real Estate'. These entities take on a structure that varies slightly from international REIT structures. The JSE defines a property entity as any investment vehicle that gives investors the ability to invest in real estate through the purchase of securities. Investors make use of such investment vehicles to invest in either direct or indirect property investments. Whether direct or indirect, these entities must exclusively build their portfolios in the real estate market (JSE, 2012).

Before the new FTSE/JSE sectors came into play on the Johannesburg Stock Exchange property entities fell into three categories; Property, Property Loan Stocks or Variable Stock, and Property Unit Trusts. Since 2002 these sub-categories are no longer used and are only referred to as a means of differentiating between the different property investment trusts and companies. Currently there are four types of property entities listed on the Exchange; Property Unit Trusts (PUTs), Property Holding and Development Companies, Real Estate Investment Trusts (REITs) and Property Loan Stock Companies (PLSs). The JSE has about forty companies listed in their Real Estate Sector and five property unit trusts.

Although the JSE has REITs listed on the exchange, these REITs are for dual-listing purposes. There is currently no legislative framework for REITs in South Africa. In its Tax Amendment Bill, the National Treasury has proposed a South African REIT structure for financial regulation and tax purposes. The treasury is proposing that South Africa create a REIT tax dispensation. The new structure will encompass both the existing local structures for PLSs and PUTs (Property Loan Stock Association, 2012). However, use of REITs and conversion of existing property entities to REITs in South Africa is still under consideration by the National Treasury, but to date nothing has been formalised concerning a South African REIT

structure (Republic of South Africa, National Treasury, 2007). We expect the introduction of the first formal REITs in South Africa in 2013.

However, according to Ernst & Young we can study and compare South African properties entities to international REITs, as even though there is not a formal legislative structure for REITs in South Africa our property entities are close enough in structure to REITs for comparative purposes. REITs and PUTs are highly comparable due to their shared characteristics. Their similarities extend to the restrictions allowing these entities to invest in specific types of assets. Their methods of distributing income earned by the trust take on the form of net rental or interest distribution. Income is taxed in the hands of the investors rather than at a trust or company level and they have to follow strict guidelines about how much income gets distributed to their investors. They have to adhere to limitations concerning gearing and leverage (The Association of Property Unit Trusts, 2012). PUTs are the closest equivalent to international REITs, followed by PLSs (Stooker, 2012). It must further be noted that PUTs and PLSs are only comparable to equity REITs, not mortgage or hybrid REITs, due to the regulations that exist in South Africa that restrict these investment vehicles from investing in mortgage instruments. Therefore, I will discuss PUTs and PLSs in this study as a substitute for international equity REITs that have been the focus of many international studies on listed property funds.

2.5.1. Property Unit Trusts (PUTs)

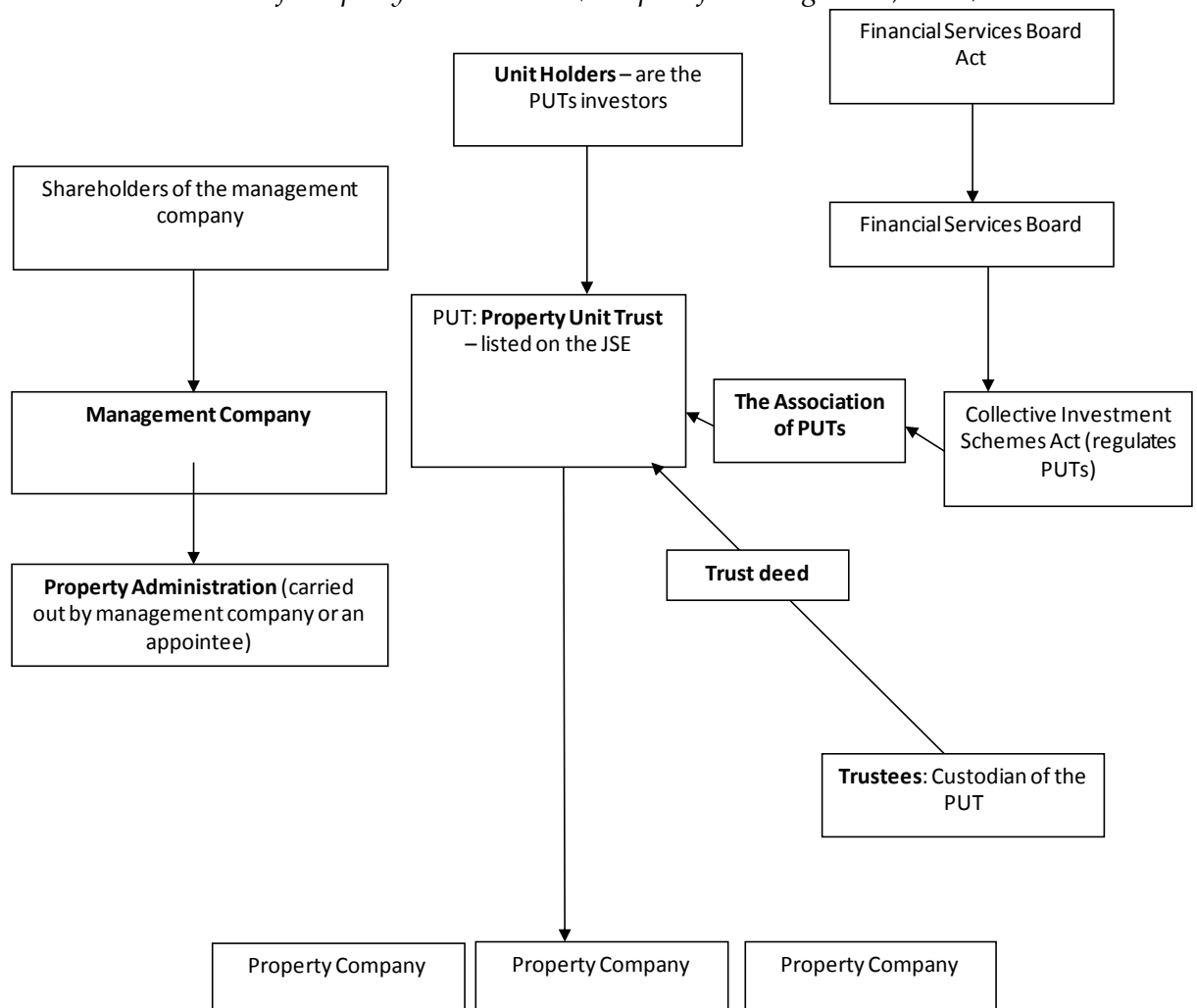
Property Unit Trusts (PUTs) were first established in 1968 when the Unit Trust Control Act was amended to permit the establishment of PUTs (this act was then rewritten in 1981 and further amended by the Collective Investments Schemes Act of 2002). The Collective Investment Schemes Control Act now governs PUTs and the Financial Services Board regulates them. The Financial Services Board Act governs The Financial Services Board. In 1969 the first two trusts were established and listed on the JSE Limited – a separate sector for PUTs was later established on

the JSE in 1976 (Fleming, 2002). The formation of the Association of Property Unit Trust Management Companies took place in South Africa in 1984 with the objective of protecting the security of PUTs, management companies, and shareholders or investors. This association functions to facilitate communication between PUTs and regulatory authorities (the Registrar of Collective Investment Schemes, the JSE), as well as to represent and lobby for the interests of PUTs and their investors.

A Property Unit Trust is a portfolio of investment grade properties that is technically a pooled equity fund that invests in real estate. PUTs usually specialise by geographic location, real estate type (such as office, retail, industrial, residential), or both. These funds derive value through rental income as well as the capital appreciation of the real estate in the portfolio. Property unit trusts are 'closed-end' funds, making them intrinsically different from mutual investment funds that are open-ended. PUTs are sold through IPOs and traded on the securities exchange like common stock, resulting in these trusts being fairly liquid. The objective of establishing these investment vehicles was to encourage the securitisation of real estate and property investments as a liquid asset class, in order to encourage small private investors and pension funds to invest in this asset class. However, in South Africa pension funds, provident funds and asset management funds purchase the majority of PUT shares, rather than directly by private investors.

The reclassification of PUTs as collective investment schemes resulted from the introduction of the Collective Investment Schemes Act in 2002. However, investors still refer to these investment vehicles as PUTs because the type of investment activities that they engage in has not changed. Currently the PUT sector in South Africa is made up of six trusts that have a combined market capitalisation of over R46 – billion (The Association of Property Unit Trusts, 2012).

Figure 2-3: The Structure of Property Unit Trusts (Adapted from Zagaretos, 2002)



The Collective Investment Schemes Act of 2002 largely determines the structure of PUTs. The introduction of this Act has had three major impacts on the way that PUTs are structured (Still, 2003):

1. Under the Unit Trust Act, property companies could only hold properties. The trust may now hold properties, as well as the property companies. This means that PUTs can now sell the properties that they hold without having to pay capital gains tax on their property sales, putting them on more of a par with other types of unit trusts.
2. PUTs may now repurchase their own stock. Such repurchases can benefit shareholders, especially if a PUT is in the position where their stock is trading at a large discount to the Net Asset Value.

3. Properties owned by the trust may now be bonded in order to generate higher leverage levels. A PUT may now have gearing levels of up to 30% of its Net Asset Value. This change to the structure of PUTs is an important consideration when studying the returns generated by PUTs, as returns (gains or losses) generated by PUTs post the 2002 gearing legislation will be amplified (Nsibande, 2006).

This Act places the restrictions on these trusts concerning their investments policies, the trust's management company, the rights of unit holders, the trustees and income distribution. PUTs use statutory control provisions that establish agency structure and process to prevent unsound investment practices. The Collective Investment Schemes Act of 2002 enforces these controls, the management company, the trust deed and trustees. For further information on PUTs, see APPENDIX 2: Further information on Property Unit Trusts (PUTs) (pg 97).

2.5.2. Property Loan Stocks (PLSs)

Like PUTs, Property Loan Stocks fall under the umbrella of 'Financial – Real Estate' on the Johannesburg Stock Exchange. The Companies Act 61 of 1973 governs these investment vehicles, by their own Articles and Memorandum of Association. Because PLSs are subject to a different Act and regulations to PUTs, their structures are inherently different.

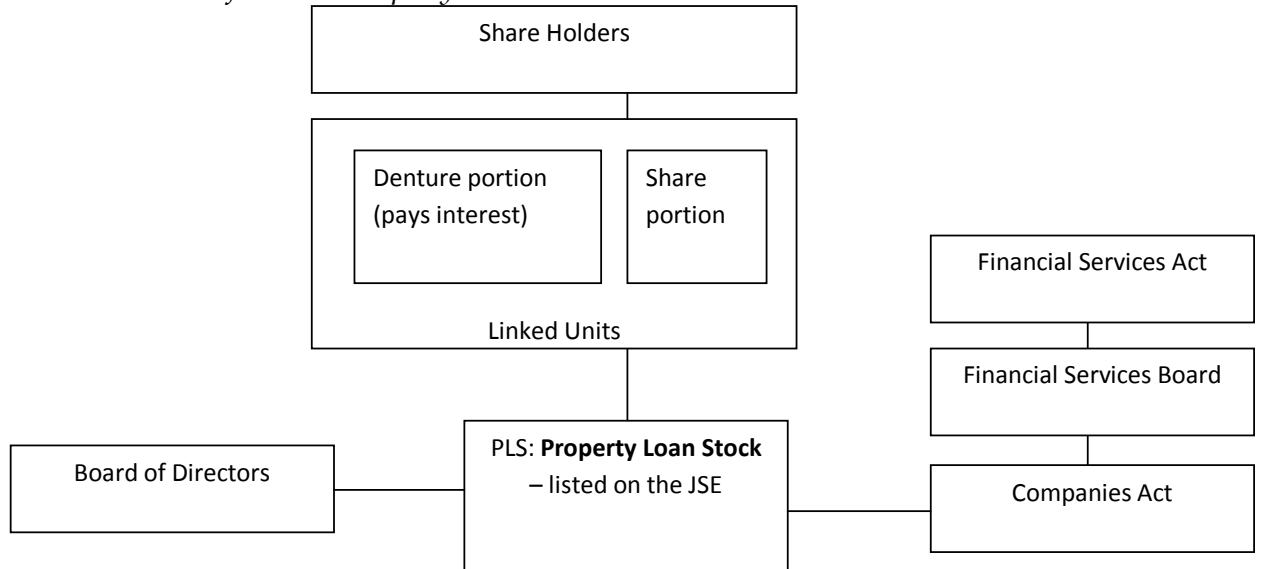
Property Loan Stock companies are funds whose underlying assets are real estate. A property loan stock company would hold direct investments in commercial, retail or industrial property, and manage these properties on behalf of shareholders. The main distinguishing aspect of these types of property funds is the method that the fund uses to raise capital. Capital is raised when the fund issues 'linked units' to capital investors, which are comprised of part share and part debenture or unsecured debt. The debenture portion of the linked unit earns interest at a variable rate. The Debenture Trust Deed governs the capital portion of the debenture and is usually repayable after twenty-five years. The main reason the

PLSs are structured in this way is to make their structure as similar as possible to PUTs, but without them being subject to the restrictions and regulations of the Collective Investments Schemes Act – giving them a more flexible structure. PLSs have managed to imitate PUTs in their income structures (that is tax-free at a company level) by using a variable loan structure. They have done this by creating a capital structure of a combination of interest-bearing debentures and share capital. Usually a PLS's debentures to equity ratio is 999:1 – for every R1 000 of capital invested by the investor, he holds R999 of debentures and R1 of stock. The company bases the interest paid on debentures on the net rentals or net income earned by the company, rather than on a fixed rate. Most of the return that the investor receives is therefore paid out as interest (interest incurred in the production of income is tax deductible in terms of Section 11(a) of the Income Tax Act). Therefore, most of the income paid out to the investor is tax free or tax deductible – provided that all net income is paid out to share holders rather than retained by the PLS. PLSs can elect to hold back income if they choose (but this income will then be subject to normal company tax rates). This option is not available to PUTs. PLSs pay tax at the rate applicable to companies which is currently 28%. The use of this capital structure means that they are then only liable for tax on a small portion of their earnings. Tax liabilities only come into existence at the investor level, so specific tax categories are the basis of unit holders' tax levels.

One of the major differences between PUTs and PLSs is their gearing structures. While PUTs are only allowed a leverage level of up to 30% of their Net Asset Value, there are no restrictions placed on PLSs with regards to gearing. PLSs do not have statutory gearing constraints. They may also pledge their assets as security for loans. PLSs are allowed any level of gearing that management deems acceptable. There are some PLSs that have leveraged their assets well over the 50% level, introducing an element of risk in a high interest rate environment (Nsibande, 2006).

PLSs do not have the same trust structure & trustees that PUTs have. The structure of these investment vehicles is more like normal companies and has to rely on the integrity of management, and they usually have a board of directors that replaces the trustees.

Figure 2-4: Structure of a PLS Company



Due to the differences that are evident in the structures of PUTs and PLSs we can hypothesize that the correlations between PUT Funds and PLS Funds ($\rho_{c,b}$) are significantly less than positive one (pg 40).

2.5.3. Other funds that invest in Property

PUTs and PLSs further need to be distinguished from open-end funds that hold securitised real estate in their portfolios. While open-end funds may also invest in the stocks of property companies, they cannot be compared directly with PUTs and PLSs due to their different structures. These types of open-end funds are not listed on the stock exchange and are generally managed by unit trust companies (such as mutual funds, for example; the Coronation Property fund, the Marriott Property income fund, the Liberty Property Income fund). One of the key differences between PUTs and open-end unit trusts is that open-end unit trusts are mandated to invest in

a far wider range of asset classes. These collective investment schemes usually invest in property shares (such as PUT shares) rather than in direct fixed property as well as other common stock securities, bonds, and cash instruments – in order to maximise the diversification of the portfolios that they manage (Still, 2003).

2.6 Hypotheses

In summary of the literature review, the hypotheses listed below will be examined in this study:

H₁: The variances of investment portfolios comprised of mixed-asset classes ($\sigma_{p_1}^2$) are lower than variances of investment portfolios comprised of single asset classes ($\sigma_{p_2}^2$).

H₂: The correlations between Property Unit Trust Funds and Property Loan Stock Funds ($\rho_{c,b}$) are significantly less than positive one.

H₃: The correlations between traditional asset classes (common stock, bonds and cash instruments) and property funds ($\rho_{a,t}$) are significantly less than positive one.

H₄: The variability in returns of the public equity (common stock), public debt (bonds) and cash markets explains the variability in returns of securitised property funds, where β is not equal to zero.

H₅: The correlations between the CPI index and the returns of securitised property funds ($\rho_{i,s}$) are significantly less than positive one.

H₆: The correlations between the variability in returns of securitised property funds and the variability ($\rho_{s,d}$) in returns of direct property investments are significantly less than positive one.

CHAPTER 3. MODEL DEVELOPMENT

Prior research on this topic has utilised variables either indirectly related to private real estate markets or based directly on private real estate returns (Anderson et al., 2005). This research is an empirical study that uses a combination of the two approaches.

Clayton and MacKinnon (2003) and Anderson et al. (2005) use a similar methodology to conduct their studies. Clayton and MacKinnon (2003) use the multiple regression model in equation (1) in their study 'The relative importance of stock, bond and real estate factors in explaining REIT returns'. The model describes the return on a REIT (REIT index, or portfolio of REITs, or individual REIT) as a linear function of stock, bond and real estate factors.

$$rPft = \beta_0 + \beta_1 r_{slt} + \beta_2 r_{sst} + \beta_3 r_{bt} + \beta_4 r_{et} + v_t \quad (1)$$

Where:

$rPft$	is the return on a securitised property fund/ REIT at period t (measured using the NAREIT index)
r_{slt}	is the return on large-cap stocks at period t (measured using the S&P500)
r_{sst}	is the return on small-cap stocks at period t (measured using the Russell 2000 index)
r_{bt}	is the return on the bond market at period t
r_{et}	is the return on real estate at period t (measured using an unsmoothed version of the NCREIF index)
β_0	measures the sensitivity of REIT returns to various other factors
v_t	represents the unexplained portion in REIT returns / error

I use an adapted version of Clayton and MacKinnon's (2003) model in conjunction with the single-index model to conduct this research.

3.1 Single-Index Model

The 'Single-Index Model' derived from the family of factor models is one of the most common models used in asset and portfolio management. Researchers developed this model for forecasting correlation structures between asset classes, as well as between individual securities as a basis for simplifying the portfolio selection process (Elton et al., 2009). This model is premised on the fact that when the average returns on the market either increase or decrease, the return on an individual asset will usually mimic the market. This indicates that the same factors that affect the market affect the return on an individual asset. The single-index model regresses the individual asset's returns against the market to determine how sensitive their returns are to changes in the market (comprised of both equity and debt assets). This regression model divides the return of an asset into two components – a component that the equity and debt markets explain and a component that is independent of equity and debt market factors.

The single-index model takes on the form of a regression model and forms the basis for the model employed by Clayton and MacKinnon (2003). Researchers use regression (an econometric model) to access the relationship between two or more variables. Multiple regression is used when we are trying to access many variables and the complex relationships between them (Koop, 2006). Elton et al. (2009) define the Single-Index Model as:

$$R_i = \alpha_i + \beta_i R_m + e_i \quad (2)$$

Where;

R_i is the return of an individual security

R_m is the rate of return on the market index – a random variable (in this study the JSE / FTSE All Share Index will be used as a proxy for the return on the market)

e_i represents the unexplained portion in returns (error – a random variable)

β_i measures the expected change in R_i relative to movement in R_m

α_i measures the component of return that is independent from the market

Here we need to assess the variable Beta (β), as this will determine an individual asset's sensitivity to the market and therefore diversification potential. Beta on the market is equal to one. The risk associated to an asset is determined based on whether the Beta of the asset is greater or smaller than the market's Beta (Elton et al., 2009).

Beta measures sensitivity to the market. Beta estimates measure how much Y changes when X changes by a marginal amount. Beta interprets the marginal effect of X on Y and is a measure of how much X influences Y. Assessing how sensitive an asset is to changes in the market will help to assess the diversification potential that an asset possess. For example if securitised property funds exhibit low sensitivity to the market, we would be able to infer that they would provide good diversification for common stocks when combined in a mixed-asset portfolio.

We can extend the single index model to measure the sensitivity of portfolios of stocks to the market:

$$R_p = \alpha_p + \beta_p R_m + e_i \quad (3)$$

Where R_p is now the return on a portfolio of stocks rather than a single instrument.

In this research, the single-index model will be adapted to measure the sensitivity of portfolios of listed real estate to the various asset classes that comprise the market. Here common stock (equity market), bonds (debt market), and cash equivalents (cash market) are said to comprise the market. The employed model takes on the form of a multiple regression model:

$$R_p = \alpha_p + \beta_1 R_s + \beta_2 R_b + \beta_3 R_c + e_i \quad (4)$$

Where:

R_s is the return on common stocks (measured by the All Share Index - ALSI)

R_b is the return on sovereign and non-sovereign bonds (measured by the All Bond Index - ALBI)

R_c is the return on cash instruments (measured by the STeFI Index)

I will conduct this research employing the multiple regression model seen in equation four.

CHAPTER 4. RESEARCH METHODOLOGY

The derived equation (4 – pg 43) forms the basis of the methodology employed in this research.

As data on income derived from direct real estate investments is only available in South Africa on an annual basis, and no proxy for the NCREIF index exists in South Africa, I have split this research into four sections.

Firstly, I will assess the portfolio diversification potential of listed real estate funds, by looking at how much unsystematic risk investors can reduce by combining instruments from different asset classes in a single investment portfolio. Secondly, this research will make use of the single-index model to assess how sensitive securitised property fund returns are to the market. Thirdly, this research will compare the returns derived from listed real estate investments and direct real estate investments to local inflation levels. Finally, this research will assess whether securitised real estate pricing is representative of the underlying asset.

4.1.1. Part 1

Here I will assess the potential reduction of unsystematic risk by combining property funds with different asset classes such as common stocks and bonds (sovereign and non-sovereign) into single investment portfolios. Firstly, I will create portfolios of each asset class, starting with one instrument and systematically increasing the number of instruments in the portfolio in order to measure the amount portfolio variance decreases by when the number of instruments in a portfolio is increased and at what point the reduction in portfolio variance tapers off. I will also compare the portfolio variance to the weighted average variance of the individual instruments, to measure empirically the effect of combining different assets in a portfolio. Secondly, I will create a portfolio of property funds, common stocks and bonds to determine if the portfolio variance of a portfolio of combined asset classes is lower than that of a portfolio of instruments from a single asset class.

I will then employ t-tests to determine significance of these results. Shares that comprise these portfolios will be selected based on two criteria; firstly data on all shares that underlie the PRUT, PULS, ALSI, and ALBI indices will be assembled. The data on these instruments will then be optimised to select the instruments that will be included in the study based on their individual Sharpe Ratios. The instruments included in each portfolio are equally weighted.

The methodology set out in part one will be used to assess hypothesis one (pg 40). H_1 : The variances of investment portfolios comprised of mixed-asset classes ($\sigma_{p_1}^2$) are lower than variances of investment portfolios comprised of single asset classes ($\sigma_{p_2}^2$).

4.1.2. Part 2

Here I will assess hypotheses two, three and four. I will carry out this section of the study in the following steps:

A. Step 1:

Here I will compare the PULS index (Property Loan Stock Index) to the PRUT index (Property Unit Trust Index). Here I will be look at correlation (measured as correlation coefficients), risk and return properties (measured using the Sharpe Ratio, a measure of excess return per unit of risk), and volatility (measured as variance or standard deviation). The Sharpe Ratio is calculated as:

$$\text{Shape Ratio} = \frac{R_i - R_f}{\beta_i}$$

Where; R_i is the average return on your asset, R_f is a risk free rate, and β_i is Beta of your asset. This analysis will indicate the similarities and differences in the behaviour exhibited by PUTs and PLSs exhibit in the equity and debt markets, in terms of volatility, risk and return characteristics, and correlation of returns. This will indicate if we should study these two types of property funds separately or if we can combine them in a single category. The analysis will determine the

benchmark for listed property funds in the study. I will use the methodology set out in part two, step one to assess hypothesis two (pg 40). H₂: The correlations between Property Unit Trust Funds and Property Loan Stock Funds ($\rho_{c,b}$) are significantly less than positive one.

B. Step 2:

Firstly, the relationship between common stocks (equity market), bonds (debt market), cash instruments (cash market) and listed property funds will be analysed through an assessment of correlation (measured as correlation coefficients), risk and return properties (measured using the Sharpe Ratio) and volatility (measured as variance or standard deviation). I will use this first step to evaluate hypothesis three (pg 40), H₃: The correlations between traditional asset classes (common stock, bonds and cash instruments) and property funds ($\rho_{a,t}$) are significantly less than positive one.

Secondly, I will employ model (4) (pg 43) where the returns on the equity market, the debt market and the cash market will be regressed against the property fund indices. In this regression the various markets will be used as explanatory variables (X) and the property fund indices as the dependent variable (Y). I will use this regression to determine to what extent the variability in the returns on the various markets explains the variability in returns on property funds and therefore to what extent property funds have the potential for providing diversification for instruments such as common stock and bonds. In this study, I have used inflation levels (measured using the CPI index), the REPO rate, and GDP (Gross Domestic Product) as control variables (pg 52) when carrying out these regression tests. This is because the equity and debt markets might not be the only factors influencing the variability in the returns on property funds. Other economic conditions might also influence the variability in the returns on property funds. These conditions need to be included in the study in order to ensure accuracy of the regression results.

Here I have employed a hierarchical regression. Firstly, I have regressed the control variables against the PRUT and PULS indices to determine their significance and inclusion in the study – see APPENDIX 3 for these results (pg 101). Although the control variables are not significant in explaining the returns on the independent variable (PULS and PRUT indices) I have decided to still include them in the regression as they could be catalysts (the other explanatory variables may not be significant without them). The second step of the regression is to regress the equity, debt, and cash market indices and the control variables against the PRUT and PULS indices. These results are shown in the empirical results (pg 68).

I will use the regression model set out above to evaluate hypotheses four (pg 40). H₄: The variability in returns of the public equity (common stock), public debt (bonds) and cash markets explains the variability in returns of securitised property funds, where β is not equal to zero.

Preceding steps one and two, I have tested the data for multicollinearity and serial dependency problems.

Multicollinearity problems arise when explanatory variables used in a regression are highly correlated with one another (Koop, 2006) causing problems in identifying which of the explanatory variables are providing explanatory power for the dependant variable. Initially the regression included the following market indices: All Share Index (ALSI), Mid-Cap Index (mid-cap stocks), Small-Cap Index (small-cap stocks), All Bond Index (ALBI), GOVI index (sovereign bonds), OTHI index (non-sovereign bonds), and STeFI index (cash instruments). High correlation scores between the ALSI, Mid-Cap and Small-Cap indices as well as high correlation scores between the ALBI, GOVI and OTHI indices results in multicollinearity problems in the regression – see Table 0-4 (APPENDIX 4 – pg 102). The Mid-Cap index is a sub-index of the ALSI; the GOVI and OTHI indices are sub-indices of the ALBI indices, therefore high correlation exists between these indices resulting in multicollinearity problems. The Small-Cap Index is also highly correlated with the

ALSI. Because of the multicollinearity problems that occur when using multiple market indices in the same regression, I have excluded the Mid-Cap, Small-Cap, GOVI and OTHI indices from this regression. In the regressions, I have therefore only regressed the PRUT and PULS indices against the ALSI, ALBI, STeFI indices and control variables (GDP, CPI index and REPO rate).

Serial dependency problems are the result of trends where each observation is dependent on the previous observation or highly correlated with the previous observation, a problem that usually arises in time-series regressions (Koop, 2006). The data is serially correlated or autocorrelated when we find high positive correlations across observations. The main problem caused by serial correlation in a linear regression is an incorrect estimate of the regression coefficient (DeFusco et al., 2001). I tested for this problem using the Durbin-Watson test. Durbin-Watson tests indicate that serial dependency problems are prevalent in this data. Therefore, I have employed data lagged one period in the regression, resulting in a decisively better fit and independent explanatory power of the individual observations.

I have further modified the data to exclude the observation of June 2008. This observation is a significant outlier that is the result of a possible data problem with the data at this time point and therefore I have omitted this observation from the study.

4.1.3. Part 3

Ziering and McIntosh (1997) discuss the importance of including real estate assets in mixed-asset portfolios, because of their ability to hedge inflation over long periods. In order to assess the inflation hedging potential of real estate investments, I will compare returns on listed property funds (measured by the PRUT and PULS indices) to the Consumer Price Index (CPI), and the South African REPO rate. I also compare the returns derived from direct real estate investments to the CPI index in order to assess whether Ziering and McIntosh's findings hold true in the South African context.

I will use this section of the methodology to evaluate hypothesis five (pg 40). H₅: The correlations between the CPI index and the returns of securitised property funds ($\rho_{i,s}$) are significantly less than positive one.

4.1.4. Part 4

In this section, I will compare the returns derived directly from property investments to the market pricing of securitised real estate assets. Returns on direct property investments will be measured using data on capital value and rental income. I will use the IPD (International Property Database) total return measure to evaluate performance of direct property investments. This will give an indication of the extent to which securitised real estate investments provide exposure to the underlying asset class. This will be analysed through an assessment of correlation (measured as correlation coefficients), risk and return properties (measured using the Sharpe Ratio) and volatility in returns (measured as variance / standard deviation). I will mainly make use of correlation tests in this part of the study, as the limited number of data points available for direct property returns make tests such as regression unfeasible.

This section of the study will span 2002 to 2010, and I will employ annual data intervals.

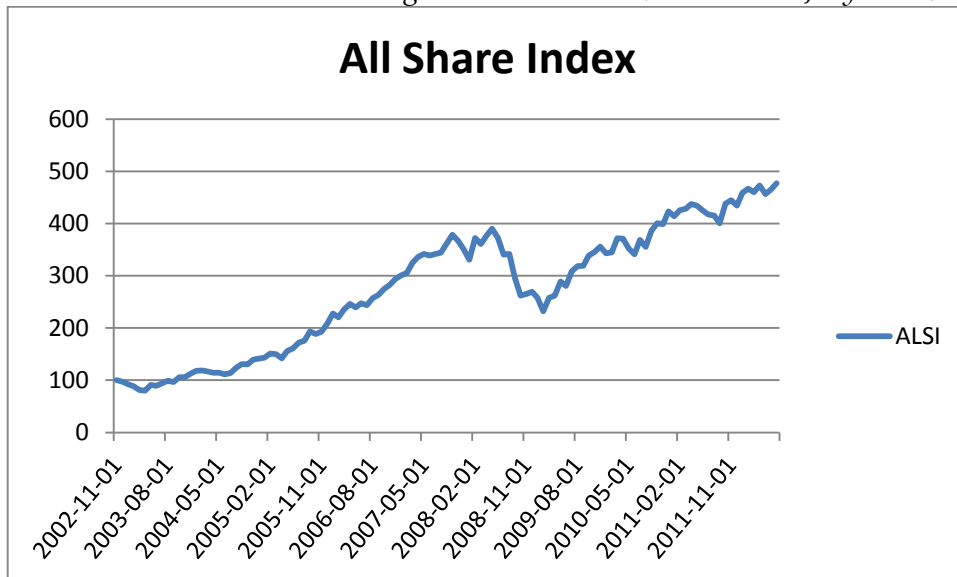
I will use this section of the methodology to evaluate hypothesis six (pg 40). H₆: The correlations between the variability in returns of securitised property funds and the variability ($\rho_{s,d}$) in returns of direct property investments are significantly less than positive one.

From the empirical data derived in parts one, two, three, and four I will look at what implications the results have for mixed-asset portfolio management and diversification potential across asset classes in South Africa over the period 2002 to 2012, and what implications this could have on the future inclusion of securitised real estate in mixed-asset portfolios.

4.2 Data & Benchmarks

The data used in this study will span November 2002 to July 2012. I have divided this analysis into three periods based on the general cycle of the economy as measured by the All Share index. I will use the analysis of the data in different periods to determine if we can observe different patterns during normal, boom and recessionary economic periods. In Niskanen and Falkenbach's (2010) study, they observe variations in correlations between asset classes across varying economic periods.

Figure 4-1: The All Share Index using normalised data (Nov 2002 - July 2012)



Periods for the data analysis:

- November 2002 – August 2008 (Normal period, going into a boom)
- September 2008 – December 2009 (economic recession)
- January 2010 – July 2012 (economic recovery from the recession)

Only when including data on direct real estate returns in the study will the period vary, as this data range spans 2002 to 2010 and is based on annual data intervals.

All other data intervals will be monthly. Although some daily data is available in the South African context, available monthly data is more consistent than daily

data, and therefore will provide results that are more accurate. Further, the period for the study is a sufficiently long enough period to use monthly data and still get significant results. The period covered in this study is November 2002 – July 2012 (117 months or 117 data points).

As I will conduct this research in the South African context using South African data, I will use the following data and indices as benchmarks:

Common Stocks (equity market). To measure common stock returns I will use the JSE / FTSE All Share Index (J203) to measure the returns on large-cap stocks, the JSE/ FTSE Small-Cap index (J202) to measure the returns on small-cap stocks, and the JSE/ FTSE Mid-Cap index (J201) to measure the returns on mid-cap stocks (JSE, 2012).

Bonds (debt market). To measure returns on long-term bonds I will use the ALBI (all bond index). The ALBI index is composed of the most liquid sovereign and non-sovereign (local government, public utilities and corporate) bonds (JSE, 2012).

Cash and cash equivalents (cash market). To measure returns on cash instruments I will use the Alexander Forbes STeFI index. This index is composed of money market instruments such as call deposits and negotiable certificates of deposit (Bloomberg, 2012).

Securitised Property Funds. To measure securitised real estate returns I will use the price data from the PULS (Property Loan Stock index) and PRUT (Property Unit Trust index). Here I will consider the returns on listed property funds a proxy for listed real estate returns (JSE, 2012). As mortgage property funds do not exist in South Africa, this study will focus only on equity property funds. Both PUTs and PLSs can be characterised as equity funds. See APPENDIX 1 (pg 94) for listed Property Loan Stock and Property Unit Trust funds that underlie the PULS and PRUT indices and that will be included in this study.

Control variables: Inflation, GDP and the REPO rate. The CPI index is a survey of monthly consumer retail prices that provides information on increases or decreases

in the overall price level of goods and services that an average South African household consumes – we refer to this as the inflation rate. I will use this measure to determine whether returns on the securitised real estate investment class exceed inflation levels (Statistics South Africa, 2012). The South African REPO rate (repurchase rate) is the benchmark interest rate in South Africa, the rate at which the South African Reserve Bank lends money to the commercial banks. The REPO rate affects the supply of money in the economy. Therefore, this rate affects the cost at which consumers can obtain credit and spend borrowed money, national debt levels, business growth and inflation (Firer et al., 2008). Gross Domestic Product (GDP) is a measure of total economic output produced within the boundaries of a specific region, and therefore is an indicator of the strength of the economy as well as of the economic cycle (Blanchard, 2010).

Risk Free Rate. As a proxy for the risk free rate in South Africa, I will use the three-month JIBAR (Johannesburg Interbank Agreed Rate). 3 month JIBAR at 19.10.2012 = 5.08% (McGregor, 2012).

Direct property investments. The primary measure of direct real estate performance in the US is the NCREIF property index (Feldman, 2003). As a result of the difficulties in obtaining information on the returns on privately owned property even in the US (with residential property being the one exception) this index is constructed using actual incomes from public real estate investments as a determinant of the value of the property that underlies securitised funds. As a comparative index does not exist for South Africa, I will obtain similar data on the South African context rather than using an index as a measure. I have accessed data on direct property returns in South Africa from the International Property Database (IPD). The data accessed via IPD represents 65% of the South African commercial property market and therefore provides an accurate account of market averages (IPD, 2012). Sectors represented in this data include; retail, office, industrial, residential and other.

The IPD (International Property Database) uses a measure of 'total return' to measure the income derived from direct property investments and total performance of these investments. The IPD calculates total return as the change in capital value, less any capital expenditure incurred plus net income, expressed as a percentage of capital employed over the period concerned. Total return is therefore the sum of capital growth and income return for a given period. The IPD only reports data on direct real estate on an annual basis for South Africa.

CHAPTER 5. EMPIRICAL RESULTS

As set out in the methodology (Chapter 4) the results of this research are set out in four distinct parts.

5.1 Part 1

In line with the objectives of this study, we start with examining the simple diversification potential of real estate based assets. Here we employ a diversification test where the reduction of unsystematic risk and volatility is determined by means of creating portfolios of common stock, bonds, and real estate assets with increasing numbers of instruments, in order to ascertain what portfolio size exhausts the diversification possibility of such a portfolio. The larger this size relative to other assets, the higher we can deem the diversification potential real-estate assets to be.

Table 5-1 below shows the portfolio variance of various portfolios comprised of Property Unit Trust Funds (PUTs) and Property Loan Stock Funds (PLSs) for the period January 2010 to July 2012.

Table 5-1: Portfolio Variance of Portfolios of listed Property Funds

Property Funds				
No. of Instruments	Portfolio VAR	Standard Error	Weighted Ave VAR of individual assets	Difference between Portfolio VAR & Weighted Ave VAR
1	2.85%	16.88%	2.85%	0%
2	.87%	6.61%	1.58%	81%
3	.37%	3.50%	1.15%	215%
4	.26%	2.55%	.93%	256%
5	.19%	1.97%	.79%	309%
6	.14%	1.52%	.70%	401%
7	.11%	1.26%	.61%	449%
8	.09%	1.08%	.55%	485%
9	.08%	0.96%	.50%	503%
10	.07%	.86%	.46%	522%
11	.07%	.78%	.43%	534%
12	.06%	.74%	.40%	515%
13	.06%	.70%	.38%	494%
14	.06%	.66%	.36%	477%
15	.06%	.64%	.34%	454%
16	.06%	.61%	.32%	438%
17	.06%	.58%	.31%	438%
18	.06%	.56%	.30%	432%
19	.05%	.53%	.28%	432%
20	.05%	.49%	.27%	460%

Notes. Based on monthly data intervals, Period = January 2010 to July 2012, N = 30 (PUT = 6, PLS = 14)

Table 5-2 below shows the portfolio variance of portfolios comprised of common stocks and portfolios comprised of sovereign and non-sovereign bonds for the period January 2010 to July 2012.

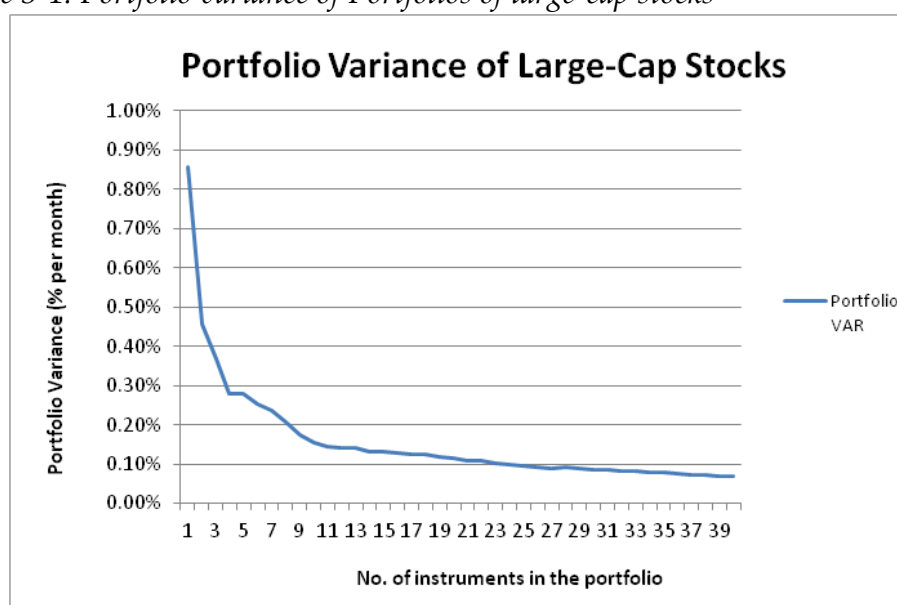
Table 5-2: Portfolio Variance of Portfolios of common stocks and bonds

Large-Cap stocks					Bonds - Sovereign & Non-Sovereign				
No. of Instruments	Portfolio VAR	Standard Error	Weighted Ave VAR of individual assets	Difference between Portfolio VAR & Weighted Ave VAR	No. of Instruments	Portfolio VAR	Standard Error	Weighted Ave VAR of individual assets	Difference between Portfolio VAR & Weighted Ave VAR
1	.86%	9.26%	.86%	0%	1	.00011%	.10%	.00011%	0%
2	.45%	4.77%	.84%	85%	2	.00010%	.07%	.00011%	2%
3	.37%	3.50%	.81%	121%	3	.00010%	.06%	.00010%	3%
4	.28%	2.65%	.78%	177%	4	.00009%	.05%	.00009%	5%
5	.28%	2.37%	.73%	162%	5	.00008%	.04%	.00009%	5%
6	.25%	2.05%	.70%	178%	6	.00008%	.04%	.00008%	5%
7	.24%	1.84%	.67%	185%	7	.00007%	.03%	.00008%	6%
8	.21%	1.61%	.65%	214%	8	.00007%	.03%	.00008%	6%
9	.17%	1.39%	.63%	260%	9	.00007%	.03%	.00007%	7%
10	.16%	1.25%	.61%	291%	10	.00007%	.03%	.00007%	7%
11	.14%	1.15%	.59%	309%	11	.00006%	.02%	.00007%	7%
12	.14%	1.08%	.58%	310%	12	.00006%	.02%	.00007%	8%
13	.14%	1.04%	.56%	297%	13	.00006%	.02%	.00006%	9%
14	.13%	.97%	.55%	314%	14	.00005%	.02%	.00006%	10%
15	.13%	.94%	.53%	302%	15	.00005%	.02%	.00006%	10%
16	.13%	.89%	.51%	303%	16	.00005%	.02%	.00006%	11%
17	.13%	.86%	.50%	298%	17	.00005%	.02%	.00005%	11%
18	.13%	.83%	.49%	289%	18	.00005%	.02%	.00005%	12%
19	.12%	.78%	.47%	306%	19	.00005%	.02%	.00005%	13%
20	.12%	.76%	.46%	299%	20	.00004%	.01%	.00005%	13%
21	.11%	.72%	.45%	320%	21	.00004%	.01%	.00005%	14%
22	.11%	.70%	.45%	315%	22	.00004%	.01%	.00005%	14%
23	.10%	.67%	.44%	331%	23	.00004%	.01%	.00005%	15%
24	.10%	.64%	.43%	337%	24	.00004%	.01%	.00004%	16%
25	.09%	.61%	.42%	347%	25	.00004%	.01%	.00004%	16%
26	.09%	.60%	.41%	345%	26	.00004%	.01%	.00004%	17%
27	.09%	.58%	.41%	355%	27	.00004%	.01%	.00004%	17%
28	.09%	.57%	.40%	339%	28	.00003%	.01%	.00004%	18%
29	.09%	.56%	.39%	334%	29	.00003%	.01%	.00004%	18%
30	.09%	.53%	.38%	350%	30	.00003%	.01%	.00004%	18%
31	.08%	.52%	.38%	344%	31	.00003%	.01%	.00004%	20%
32	.08%	.51%	.37%	341%	32	.00003%	.01%	.00004%	21%
33	.08%	.49%	.36%	348%	33	.00003%	.01%	.00004%	22%
34	.08%	.48%	.36%	347%	34	.00003%	.01%	.00004%	23%
35	.08%	.47%	.35%	343%	35	.00003%	.01%	.00003%	24%
36	.08%	.46%	.34%	356%	36	.00003%	.01%	.00003%	26%
37	.07%	.44%	.34%	360%	37	.00003%	.01%	.00003%	27%
38	.07%	.43%	.33%	360%	38	.00003%	.01%	.00003%	27%
39	.07%	.43%	.32%	360%	39	.00002%	.01%	.00003%	28%
40	.07%	.41%	.32%	371%	40	.00002%	.01%	.00003%	29%

Notes. Based on monthly data intervals, Period = January 2010 to July 2012, $N = 30$

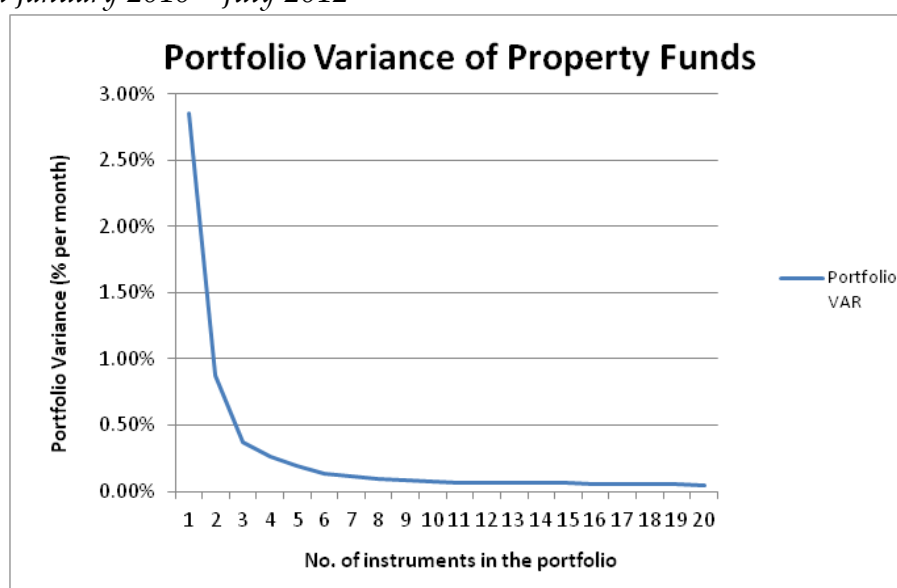
Figure 5-1 and Figure 5-2 below are graphical representations of the portfolio variance of portfolios of common stocks and portfolios of property funds. They indicate how combining more instruments in the portfolio initially reduces portfolio variance, but that this reduction in variance eventually tapers off.

Figure 5-1: Portfolio variance of Portfolios of large-cap stocks



Notes. Based on monthly data intervals, Period = January 2010 to July 2012, $N = 30$

Figure 5-2: Portfolio variance of listed Property Funds – based on monthly returns for the period January 2010 – July 2012



Notes. Based on monthly data intervals, Period = January 2010 to July 2012, $N = 30$ (PUT = 6, PLS = 14)

Table 5-1, Table 5-2, Figure 5-1 and Figure 5-2 indicate that both the portfolio variance of portfolios made up of property funds and portfolios made up of large-cap stocks tend to taper off once the number of instruments in the portfolio reaches about 12. The difference between the weighted average variance of the individual assets in the portfolio and the portfolio variance indicates how substantial the effect of combining individual instruments in a portfolio is in terms of lowering the investors overall risk exposure, when a portfolio of stock instruments is held.

However this reduction in portfolio variance is marginal when creating portfolios of bonds. This is due to the low volatility that bonds exhibit and their tendency to be highly correlated. Bond instruments are only effective in reducing portfolio variance when combined in portfolios with other asset classes.

Table 5-3 below shows the portfolio variance of instruments from mixed-asset classes (property funds, large-cap stocks, and bonds), for the period January 2010 to July 2012.

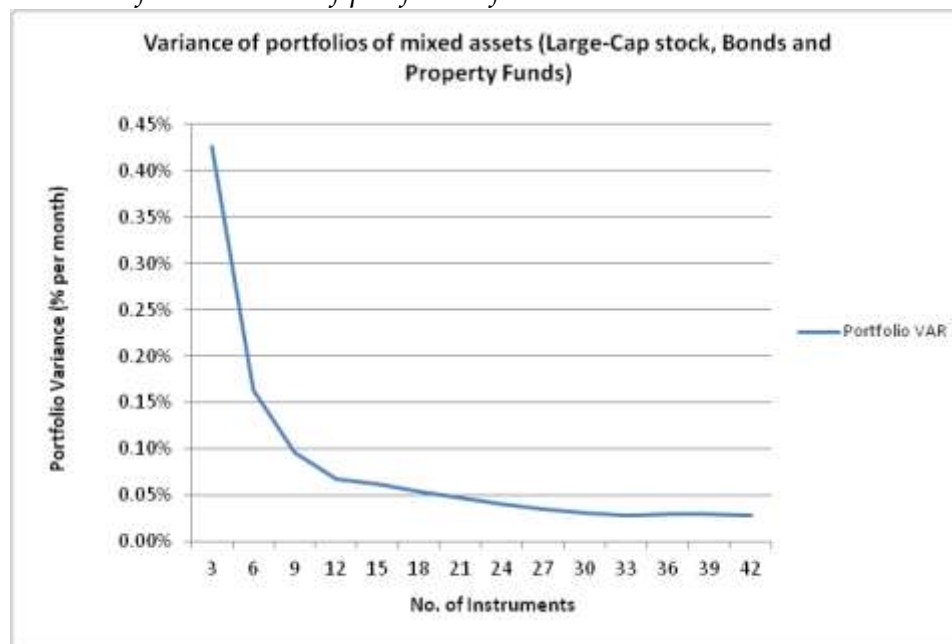
Table 5-3: Portfolio Variance of portfolios of large-cap stocks, property funds and bonds

<i>Mixed-asset class portfolios</i>				
No. of Instruments	Portfolio VAR	Standard Error	Weighted Ave VAR of individual assets	Difference between Portfolio VAR & Weighted Ave VAR
3	.43%	3.77%	1.24%	190%
6	.16%	1.65%	.81%	393%
9	.10%	1.03%	.66%	583%
12	.07%	.75%	.57%	741%
15	.06%	.65%	.51%	710%
18	.05%	.54%	.47%	771%
21	.05%	.48%	.43%	805%
24	.04%	.41%	.40%	877%
27	.04%	.36%	.38%	955%
30	.03%	.32%	.36%	1060%
33	.03%	.30%	.34%	1082%
36	.03%	.28%	.33%	1022%
39	.03%	.27%	.31%	967%
42	.03%	.26%	.30%	985%

Notes. Based on monthly data intervals, Period = January 2010 to July 2012, N = 30

Figure 5-3 below is a graphical representation of the portfolio variance of portfolios of mixed-asset classes.

Figure 5-3: Portfolio variance of portfolios of mixed-asset classes



Notes. Based on monthly data intervals, Period = January 2010 to July 2012, N = 30

When combining different instruments from different asset classes (large-cap stocks, property funds, sovereign and non-sovereign bonds) in a portfolio the portfolio variance does not tend to taper off sooner than when combining instruments from one asset class in a portfolio. However, there is a very clear advantage. Comparing Table 5-1 with Table 5-2 and Table 5-3 indicates that the difference between the portfolio variance and average weighted variance of the individual instruments is much larger in a mixed-asset portfolio than in a portfolio of instruments from a single asset class. For example, when combining 18 instruments of mixed-asset classes in a portfolio the weighted average of the individual instruments in the portfolio is 771% greater than the portfolio variance of the same instruments. However, the weighted average variance of a portfolio of 18 large-cap stocks is only 289% greater than the portfolio variance. The weighted average variance of a portfolio of 18 Property Funds is only 432% greater than the portfolio variance, and the weighted average variance of a portfolio of 18 Sovereign

and Non-Sovereign bonds is only 12% greater than the portfolio variance. I then tested the statistical significance of the difference between the portfolio variance and average weighted variance of the individual instruments across different portfolios using a t-test. This t-test was a two-sample test that assumed unequal variances. Table 5-4 below shows the results of this test.

Table 5-4: *t-Test: Two-Sample Assuming Unequal Variances*

	Mixed-asset portfolios & large-cap stock portfolios	Mixed-asset portfolios & property fund portfolios	Mixed-asset portfolios & bond portfolios
t Stat	7.05	5.08	11.20
t Critical two-tail	2.14***	2.11***	2.16***

Notes. Period = January 2010 to July 2012, *** $p < .01$, ** $p < .05$, * $p < .10$.

We can therefore determine that the difference in portfolio variance between mixed-asset portfolios variance and individual asset class portfolios (large-cap stocks, bonds, and property funds) is statistically significant at the 99% confidence level. Therefore, we reject the null hypothesis at the 99% confidence level in favour of the alternative hypothesis (H_1). We have therefore found that the variances of investment portfolios comprised of mixed-asset classes ($\sigma_{p_1}^2$) are in fact lower than variances of investment portfolios comprised of single asset classes ($\sigma_{p_2}^2$).

5.2 Part 2

In this section, we examine the relationship between the two property fund indices – the PRUT (Property Unit Trust index) and PULS (Property Loan Stock Index) indices, and then proceed to assess the relationship between the property fund indices and equity market, debt market, and cash market indices.

5.2.1. The PULS index and the PRUT index

I will start by examining the relationship between the PRUT and PULS indices. Table 5-5 below shows the descriptive statistics for these two indices over the three stipulated periods.

Table 5-5: PRUT & PULS indices - Descriptive Statistics

	Nov 2002 – Aug 2008		Sep 2008 – Dec 2009		Jan 2010 – July 2012	
	PULS	PRUT	PULS	PRUT	PULS	PRUT
Mean (ave monthly return %)	2.58%	2.04%	1.14%	1.46%	2.10%	1.73%
Standard Deviation	5.63%	5.97%	4.60%	3.97%	3.02%	2.60%
Sharpe Ratio	8.80%	4.63%	2.14%	3.18%	4.76%	3.52%

Notes. Based on monthly data intervals, PRUT = Property Unit Trust Index, PULS = Property Loan Stock Index, N = 68/16/31 (June 2008 observation deleted)

Average returns on the PULS index are higher than average returns on the PRUT index during November 2002 to August 2008 and January 2010 to July 2012 (normal and boom economic periods). However, during the period of economic recession (September 2008 to December 2009) the PRUT index outperforms the PULS index. During the November 2002 to August 2008 period the volatility of PULS returns is slightly lower than the volatility of PRUT returns in spite of the higher average returns attained by PULSs, resulting in the PULS index exhibiting higher excess returns per unit of risk. However, during the September 2008 to December 2009 the PRUT index exhibits much lower levels of volatility than the PULS index, resulting in the PRUT index exhibiting higher excess returns per unit of risk. This is a result of the higher leverage levels that Property Loan Stock funds exhibit, which magnifies both positive and negative returns. Therefore, during normal and boom economic periods PULS funds are more attractive as investments, while during periods of economic recession PRUT funds are more attractive as investments.

Table 5-6 below shows the results of correlation tests between the PRUT and PULS indices.

Table 5-6: PRUT & PULS indices – Correlation

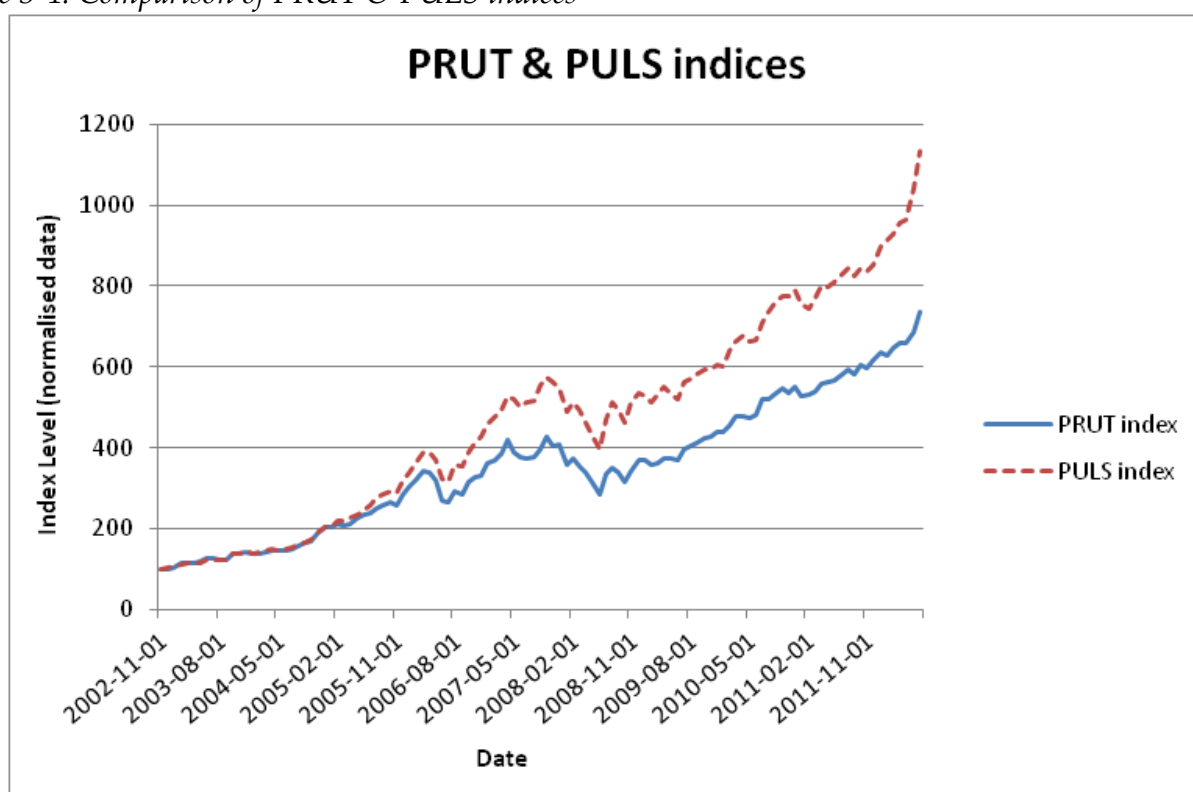
	Nov 2002 – Aug 2008		Sep 2008 – Dec 2009		Jan 2010 – July 2012	
	PRUT	PULS	PRUT	PULS	PRUT	PULS
PRUT	1.00	.93***	1.00	.94***	1.00	.84***

Notes. Based on monthly data intervals, PRUT = Property Unit Trust Index, PULS = Property Loan Stock Index, N = 68/16/31 (June 2008 observation deleted), *** $p < .01$, ** $p < .05$, * $p < .10$.

There is a high positive correlation between PRUT and PULS indices across all periods. Although the correlation coefficients for the PRUT and PULS indices indicates that these two indices are highly positively correlated, the PULS index outperforms the PRUT index over time as a result of the higher leverage levels that Property Loan Stock funds are allowed. The below normalised graph of these two indices shows that over the period November 2002 to August 2005 the returns on these two indices were very similar, however after this period their respective returns began to diverge. This is because there was a period of unusually high growth in the Property Loan Stock industry in the second half of 2005. When computing the Sharpe ratios for the 2005 period only we see that the PULS index provides a monthly excess return rate of 11.12% per unit of risk while the PRUT index exhibits a Sharpe Ratio that is less than half of the PULS Sharpe ratio. These high returns on Property Loan Stock funds were a result of certainty around interest rates and decreased debt costs, high dividend distributions and rental growth. During this period of high growth where returns on Property Loan Stocks outperformed the ALSI there was an increased interest in these funds by investors, which supported higher PLS growth over the long run (Property Loan Stock Association, 2006).

Figure 5-4 below shows a comparison of the performance of these two indices over the period November 2002 to July 2012.

Figure 5-4: Comparison of PRUT & PULS indices



Notes. Constructed using normalised data⁹, Based on monthly data intervals, Period = November 2002 to July 2012, N = 116

Table 5-7 below shows the Sharpe ratios (monthly) for the PRUT and PULS indices during 2005, the period in which the PULS index exhibited abnormal performance.

Table 5-7: Sharpe Ratios for 2005

2005	PRUT	PULS
Sharpe Ratio (Monthly)	5.23%	11.12%

Notes. Based on monthly data intervals, Using the ALSI as a proxy for the market, PRUT = Property Unit Trust Index, PULS = Property Loan Stock Index, N = 12

P-Values indicate that correlation results for all periods are significant at the 99% confidence level. Based on the correlation results we fail to reject the null hypothesis at the 99% confidence level in favour of the alternative hypothesis (H_2).

⁹ Normalised data is the standardisation of data for purposes of comparison, here the value of 100 points has been used as a basis for normalising the data

We have therefore found that the returns characteristics of Property Unit Trust Funds and Property Loan Stock Funds ($\rho_{c,b}$) are not significantly different.

Although the PRUT and PULS indices are highly correlated, they will be studied separately because of their different leverage levels and the different company structures that underpin these two fund types.

5.2.2. The equity, debt and cash markets and listed property indices

Here we examine the relationship between the property fund indices and equity market, debt market, and cash market indices.

A. Descriptive statistics and correlation amongst asset classes

Table 5-8 below shows the descriptive statistics for the ALSI, ALBI, STeFI, PRUT and PULS indices for the three periods.

Table 5-8: Asset Classes - Descriptive Statistics

	Nov 2002 - Aug 2008			Sep 2008 - Dec 2009			Jan 2010 - July 2012		
	Mean	Std Dev	Sharpe Ratio	Mean	Std Dev	Sharpe Ratio	Mean	Std Dev	Sharpe Ratio
ALSI	1.94%	4.88%	-	.52%	7.43%	-	1.03%	4.03%	-
ALBI	-.03%	1.77%	15.13%	.01%	2.43%	-8.42%	.42%	1.69%	.00%
STeFI	.75%	.25%	-31.62%	.80%	.16%	-38.49%	.50%	.08%	-102.59%
PULS	2.58%	5.63%	8.80%	1.14%	4.60%	2.14%	2.10%	3.02%	4.76%
PRUT	2.04%	5.97%	4.63%	1.46%	3.97%	3.18%	1.73%	2.60%	3.52%

Notes. Based on monthly data intervals, ALSI = All Share Index, ALBI = All Bond Index, STeFI = cash index, PRUT = Property Unit Trust Index, PULS = Property Loan Stock Index, N = 68/16/31 (June 2008 observation deleted)

All common stocks provide higher returns than bond and cash instruments. However, when looking at excess return per unit of risk the All Bond index provides the highest excess returns per unit of risk over the period November 2002 to August 2008.

When comparing the PULS and PRUT indices to the market, the descriptive statistics documented indicate that the average monthly returns on both property

indices are better than the ALSI returns in all periods (normal, boom, and recessionary economic periods).

Taking into account the risk and return properties of the various market indices (stock, bond, cash instruments and property funds), property loan stocks are the most attractive investment during normal and boom economic periods (November 2002 to August 2008 and January 2010 to July 2012) as indicated by Sharpe Ratio of 8.8% and 4.8% respectively – with the exception of the All Bond Index during the November 2002 to August 2008 period, while property unit trusts are the most attractive investment during recessionary economic periods (September 2008 to December 2009) indicated by a Sharpe Ratio of 3.2%.

Table 5-9 below shows the correlation amongst asset classes. See APPENDIX 5: Scatter plots of correlations amongst asset classes (pg 103) for scatterplots of the correlations amongst asset classes.

Table 5-9: Correlations amongst asset classes

	Nov 2002 – Aug 2008		Sep 2008 – Dec 2009		Jan 2010 – July 2012	
	PRUT	PULS	PRUT	PULS	PRUT	PULS
ALSI	.29**	.24**	.66***	.56**	.53**	.44**
ALBI	.60***	.59***	.63***	.56**	.84***	.81***
STeFI	-.11	-.05	-.09	.01	-.05	.03
PRUT	1.00	.93***	1.00	.94***	1.00	.84***
PULS	.93***	1.00	.94***	1.00	.84***	1.00

Notes. Based on monthly data intervals, ALSI = All Share Index, ALBI = All Bond Index, STeFI = cash index, PRUT = Property Unit Trust Index, PULS = Property Loan Stock Index, N = 68/16/31 (June 2008 observation deleted), *** $p < .01$, ** = $p < .05$, * = $p < .10$

Although almost all correlations between the property fund indices and the other asset classes provide significant positive results, here we are interested in relationships between asset classes where the correlations are not significantly positive. The only correlations found to be consistently negative or very weakly positive are between the PRUT and STeFI indices and PULS and STeFI indices.

Although correlations between the property indices and ALBI and property indices and ALSI are significantly positive, the R scores are not positive one –

indicating that they are not perfectly positively correlated. Therefore, Property Unit Trusts and Property Loan Stocks can be said to hold some diversification potential for common stocks and bonds when combined in a portfolio. This is especially true when correlating the All Share index with the PULS and PRUT indices for the period November 2002 to August 2008 where we attain R scores of 0.24 and 0.29 respectively. Deriving R squared scores indicates that during this period the variance in the ALSI only tends to account for 5.76% of the variance in Property Loan Stock returns and 8.41% of the variance in Property Unit Trust returns. While the returns on common stock are positively correlated with the returns on both property fund indices during this period, this correlation is weak and explains a minimal percentage of property fund return variance.

Over the September 2008 to December 2009 period, the returns on the PULS and PRUT indices become more positively correlated with returns on the ALSI. Over this period, the variance in the ALSI tends to account for 31.36% of the variance in returns on the PULS index and 43.56% of the variance in returns on the PRUT index.

Over the January 2010 to July 2012 period the returns on the PULS and PRUT indices are still positively correlated with returns on the ALSI, but less so than during the September 2008 to December 2009 period. During this period, the variance in returns on the ALSI tends to account for 19.36% of the variance of returns in the PULS index and 28.09% of the variance of returns in the PRUT index.

P-Values indicate that correlation results for all periods are significant at the 95% and 99% confidence levels (excluding the STeFI index). Based on the correlation results we fail to reject the null hypothesis at the 95% confidence level in favour of the alternative hypothesis (H_3). We have therefore found that the return characteristics of traditional asset classes (common stocks and bonds) and property funds ($\rho_{a,t}$) are not significantly different. Therefore, the alternative asset class of securitised real estate does provide a significant amount of diversification potential for traditional asset classes, especially in periods of economic recession.

B. Regression results

Table 5-10 below shows the results of the of the ALBI, ALSI, STeFI, REPO rate and GDP on the PULS index for all three periods combined – November 2002 to July 2012.

Table 5-10: Regression of the ALBI, ALSI, STeFI, CPI, REPO rate & GDP on the PULS index for all economic periods

	Param.	Std.Err	T-Stat	P-value	Beta (β)	St.Err.β	-95.00% Cnf.Lmt	+95.00% Cnf.Lmt
Intercept	-4.30	67.47	-.06	.95				
ALSI	.70	.16	4.52	.00	.32***	.07	.18	.47
ALBI	56.50	6.98	8.10	.00	.60***	.07	.45	.75
STEFI	64.80	50.11	1.29	.20	.09	.07	-.05	.24
CPI	82999.70	41071.93	2.02	.05	.16**	.08	.00	.31
REPO RATE	-	65242.42	-.41	.68	-.03	.07	-.18	.12
	26792.40							
GDP	15088.00	22683.27	.67	.51	.05	.07	-.09	.19
Multiple R	.72***							
Multiple R ²	.51***							
Adjusted R ²	.49***							
Durbin-Watson	1.66							
Serial								
Corr.	.15							

Notes. Based on monthly data intervals, ALSI = All Share Index, ALBI = All Bond Index, STeFI = cash index, PULS = Property Loan Stock Index, N = 115 (June 2008 observation deleted), *** $p < .01$, ** = $p < .05$, * = $p < .10$

Regressing returns of the equity market, debt market, cash market and control variables (REPO rate, CPI index and GDP) on the PULS index using the modified single-index model (4) (pg 43) it is possible to ascertain what portion of Property Loan Stock returns are dependent on the various markets. In the above regression the PULS index is the dependant variable, while the ALSI, ALBI, and STeFI indices are the explanatory variables that represent the various markets, and the REPO rate, CPI index and GDP are control variables.

Indicated by adjusted R squared the variance in the returns on the equity, debt and cash markets tend to account for 49% of the variability in the returns on Property

Loan Stock funds (measured using the PULS index) over the period November 2002 to July 2012.

The Beta estimates measure the marginal effect of X on Y. The Beta estimate of 0.32 on the ALSI indicates that when returns on the All Share index increase by 1%, returns on the PULS index tend to increase by 0.32% holding all other explanatory variables constant. While the Beta estimate of 0.60 on the ALBI indicates that when returns on the ALBI increase by 1%, returns on the PULS index tend to increase by 0.60% holding all other explanatory variables constant.

P-Values indicate that both the ALSI (equity market) and ALBI (debt market) indices are significant in explaining the returns on the PULS index at the 99% confidence level. P-Values also indicate that the CPI index (used to measure inflation) is significant in explaining returns on the PULS index at the 95% confidence level. Based on these regression results we reject the null hypothesis in favour of the alternative hypothesis (H_4) for the ALSI and ALBI indices. We have therefore found that the variability in returns of the public equity (common stocks) and public debt (bonds) markets is significant in explaining the variability in returns of securitised property funds.

However we fail to reject the null hypothesis in favour of the alternative hypothesis (H_4) for the STeFI index, indicating that the variability in returns on the cash market are not significant in explaining variability in returns on the PULS index.

Table 5-11 below shows the results of the ALBI, ALSI, STeFI, REPO rate and GDP on the PULS index for the separate economic periods.

Table 5-11: Regression of the ALBI, ALSI, STeFI, CPI, REPO rate & GDP on the PULS index for separate economic periods

	Period=Nov 02 - Aug 08, N = 67				Period=Sept 08 - Dec 09, N = 16				Period=Jan 10 - July 12, N = 31			
	Beta (β)	St.Err. β	T-Stat	P-value	Beta (β)	St.Err. β	T-Stat	P-value	Beta (β)	St.Err. β	T-Stat	P-value
Intercept			-0.06	.95			-1.23	0.25			-0.10	.92
ALSI	.45***	.10	4.61	.00	.58**	.21	2.74	.02	-.03	.13	-.24	.81
ALBI	.49***	.11	4.52	.00	.67**	0.23	2.91	.02	.82***	.12	6.72	.00
STeFI	.05	.10	.46	.65	.38	.24	1.60	.14	.07	.13	.50	.62
CPI	.03	.11	.27	.79	.38	.23	1.62	.14	.10	.12	.87	.39
REPO RATE	-.02	.11	-.18	.86	.07	.21	.34	.74	-.24	.12	-	.05
GDP	.04	.10	.40	.69	.19	.23	.82	.44	-.02	.13	2.06	.86
Multiple R	.67***				.85**				.86***			
Multiple R²	.45***				.73**				.74***			
Adjusted R²	.39***				.55**				.68***			
Durbin-Watson	1.73				1.86				1.68			
Serial Corr.	.10				.04				.15			

Notes. Based on monthly data intervals, ALSI = All Share Index, ALBI = All Bond Index, STeFI = cash index, PULS = Property Loan Stock Index, N = 67/16/31 (June 2008 observation deleted), *** $p < .01$, ** $p < .05$, * $p < .10$

Carrying out this regression using data split into different economic periods provides us with a very similar result to the results we find in Table 5-11 where the data from all three economic periods are combined. The only change is that during the January 2010 to July 2012 period the variability in returns on the ALSI become insignificant in explaining the variability in returns on the PULS index. Excluding this exception, we have therefore found little difference in our results across different economic periods.

Table 5-12 below shows the results of the of the ALBI, ALSI, STeFI, REPO rate and GDP on the PRUT index for all three periods combined – November 2002 to July 2012.

Table 5-12: Regression of the ALBI, ALSI, STeFI, REPO rate, CPI index and GDP on the PRUT index for all economic periods

	Param.	Std.Err	T-Stat	P-value	Beta (β)	St.Err. β	-95.00% Cnf.Lmt	+95.00% Cnf.Lmt
Intercept	14.21	51.31	.28	.78				
ALSI	.62	.12	5.04	.00	.36***	.07	.22	.50
ALBI	41.75	5.31	7.87	.00	.58***	.07	.43	.72
STeFI	24.69	38.11	.65	.52	.05	.07	-.09	.19
CPI	25705.18	31233.86	.82	.41	.06	.08	-.09	.22
REPO RATE	5396.09	49614.72	.11	.91	.01	.07	-.14	.15
GDP	17690.50	17249.89	1.03	.31	.07	.07	-.07	.21
Multiple R²	.72***							
Adjusted R²	.52***							
Durbin-Watson Serial Corr.	2.16							
	-.09							

Notes. Based on monthly data intervals, ALSI = All Share Index, ALBI = All Bond Index, STeFI = cash index, PRUT = Property Unit Trust Index, N = 115 (June 2008 observation deleted), *** $p < .01$, ** = $p < .05$, * = $p < .10$

In this regression the PRUT index is the dependant variable, while the ALSI, ALBI, and STeFI indices are the explanatory variables that represent the equity, debt and cash markets respectively and the REPO rate, CPI index and GDP are control variables.

Adjusted R squared shows that 50% of the variability in the returns on Property Unit Trust funds (measured using the PRUT index) tends to be accounted for by the variance in the returns on the equity, debt and cash markets, over the period November 2002 to July 2012.

The Beta estimate of 0.36 on the ALSI indicates that when returns on the All Share index increase by 1%, returns on the PULS index tend to increase by 0.36% holding all other explanatory variables constant. While the Beta estimate of 0.58 on the ALBI indicates that when returns on the ALBI increase by 1%, returns on the PULS index tend to increase by 0.58% holding all other explanatory variables constant.

P-Values indicate that both the ALSI (equity market) and ALBI (debt market) indices are significant in explaining the returns on the PULS index at the 99% confidence level. Based on these regression results we reject the null hypothesis in favour of the alternative hypothesis (H_4) for the ALSI and ALBI indices. We have therefore found that the variability in returns of the public equity (common stocks) and public debt (bonds) markets is significant in explaining the variability in returns of securitised property funds.

However we fail to reject the null hypothesis in favour of the alternative hypothesis (H_4) for the STeFI index, indicating that the variability in returns on the cash market are not significant in explaining variability in returns on the PULS index.

Table 5-13 below shows the results of the ALBI, ALSI, STeFI, REPO rate and GDP on the PRUT index for the separate economic periods.

Table 5-13: Regression of the ALBI, ALSI, STeFI, REPO rate, CPI index and GDP on the PRUT index for separate economic periods

	Period=Nov 02 - Aug 08, N = 67				Period=Sept 08 - Dec 09, N = 16				Period=Jan 10 - July 12, N = 31			
	Beta (β)	St.Err. β	T- Stat	P- value	Beta (β)	St.Err. β	T- Stat	P- value	Beta (β)	St.Err. β	T- Stat	P- value
Intercept			.12	.90			-1.15	.28			.10	.92
ALSI	.46***	.09	4.92	.00	.68***	.16	4.27	.00	.08	.13	.67	.51
ALBI	.52***	.10	5.01	.00	.63***	.17	3.61	.01	.78***	.12	6.65	.00
STeFI	.00	.10	.01	.99	.29	.18	1.62	.14	.04	.13	.31	.76
CPI	.00	.11	-.01	.99	.11	.18	.65	.53	.10	.11	.88	.39
REPO RATE	.05	.11	.45	.65	.09	.16	.56	.59	-.15	.11	-1.29	.21
GDP	.00	.09	-.04	.97	.29	.17	1.67	.13	.06	.13	.50	.62
Multiple R	.70***				.92***				.87***			
Multiple R²	.50***				.84***				.76***			
Adjusted R²	.45***				.74***				.70***			
Durbin- Watson	2.24				2.01				2.68			
Serial Corr.	-.13				-.02				-.35			

Notes. Based on monthly data intervals, ALSI = All Share Index, ALBI = All Bond Index, STeFI = cash index, PRUT = Property Unit Trust Index, N = 67/16/31 (June 2008 observation deleted), *** $p < .01$, ** $p < .05$, * $p < .10$

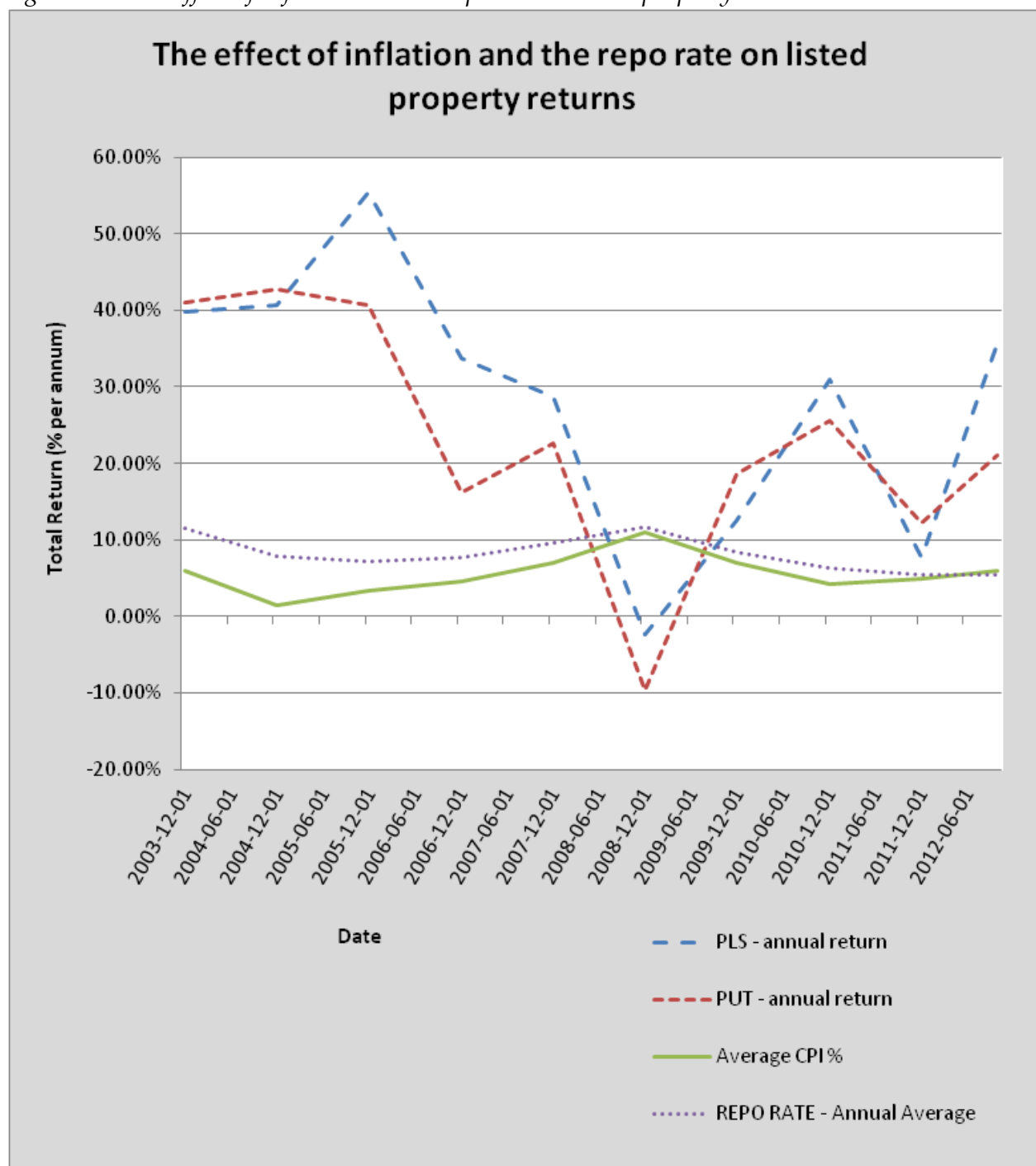
As with the regression on PULS index, this regression of the various market indices on the PRUT index using data split into different economic periods provides us with a very similar result to the results we find in Table 5-12 where the data from all three economic periods are combined. As with the regression on PULS index, the only change is that during the January 2010 to July 2012 period the variability in returns on the ALSI becomes insignificant in explaining the variability in returns on the PRUT index. Excluding this exception, we have therefore found little difference in our results across different economic periods.

5.3 Part 3

In this section, I will present the results on the relationship between securitised property funds and inflation.

Figure 5-5 below is a graphical representation of the effect of inflation and the repo rate on listed property returns over the period November 2002 to July 2012.

Figure 5-5: The effect of inflation and the repo rate on listed property returns



Notes. Based on monthly data intervals, Period = November 2002 to July 2012, N = 116

When comparing the performance of property funds to the CPI index (Consumer Price Index) it is evident that these funds tend to outperform the CPI

index and therefore hedge inflation over most periods. However during the period of the global credit crunch (September 2008 to December 2009) these funds provided returns that were below the annual inflation level. As a result, we cannot say that listed property investments are consistently a good hedge for inflation.

Table 5-14 below shows correlation between the listed property funds (measured by the PULS and PRUT indices), CPI index, and REPO rate.

Table 5-14: Correlations – PULS, PRUT & CPI index, and REPO rate

	Nov 2002 - Aug 2008		Sep 2008 - Dec 2009		Jan 2010 - July 2012	
	PULS	PRUT	PULS	PRUT	PULS	PRUT
CPI	-.10	-.10	-.12	-.24	.22**	.17*
REPO RATE	-.14	-.08	-.07	-.16	.03	.05

Notes. Based on monthly data intervals, PRUT = Property Unit Trust Index, PULS = Property Loan Stock Index, N = 68/16/31 (June 2008 observation deleted), *** $p < .01$, ** = $p < .05$, * = $p < .10$

Assets that exhibit positive R scores when correlated with the CPI index preserve purchasing power during high inflationary periods and hedge inflation. During November 2002 to August 2008 and September 2008 to December 2009 periods both the PULS and PRUT indices exhibit negative R scores when correlated with the CPI index indicating that they are not a good investment hedge for inflation. However, during the January 2010 to July 2012 period both the PULS and PRUT indices exhibit positive R scores (significant at the 95% and 90% confidence levels respectively) when correlated with the CPI index, indicating that during this period property funds exhibited inflation hedging potential.

Table 5-15 below shows correlation between direct property returns and the CPI index.

Table 5-15: Correlations – direct property & CPI index

	Direct Property	CPI
Direct Property	1.00	
CPI	-.48	1.00

Notes. Based on annual data intervals, Period = 2002 to 2010, N = 10, *** $p < .01$, ** = $p < .05$, * = $p < .10$

Although previous studies have shown direct property investments to be a good hedge for inflation (Barry et al., 1996; Barry and Rodriguez, 2004; Hudson-Wilson et al., 2005; Park and Bang, 2012; and Lee 2010), here correlations between direct property returns and the CPI index over the period 2002 to 2012 produce an R score of -0.48 indicating a negative correlation. This indicates that direct property investments are not a good hedge for inflation. In Figure 5-6 below we can see that although direct property returns are higher than inflation levels in absolute terms, returns on these investments peak when inflation levels decrease and decrease when inflation levels increase.

Figure 5-6: The effect of inflation on direct property investments



Based on the above results we can reject the null hypothesis in favour of the alternative hypothesis (H_5). With the exception of one period (January 2010 to July 2012) we have therefore found that correlations between the inflation and the returns of securitised property funds ($\rho_{i,s}$) are significantly less than positive one, indicating that inflation and the returns of securitised property funds do not exhibit a strong positive relationship.

5.4 Part 4

In the last section of the empirical results, I will compare the returns derived directly from property investments to the market pricing of securitised real estate assets.

5.4.1. Listed Property and Direct Property investments

Table 5-16 below shows correlations between direct property returns and securitised property funds (measured by the PRUT and PULS indices). See APPENDIX 6: Scatter plots of correlations between direct property returns and PULS & PRUT indices (pg 112) for scatterplots of these correlations.

Table 5-16: Correlations – Direct property returns and PRUT & PULS indices

	<i>PULS</i>	<i>PRUT</i>
All		
Property	.79**	.87***
Retail	.77**	.90***
Office	.81**	.86***
Industrial	.74**	.77**
Other	.44	.46

Notes. Based on annual data intervals, PRUT = Property Unit Trust Index, PULS = Property Loan Stock Index, Period = 2002 to 2010, N = 10, *** $p < .01$, ** $p < .05$, * $p < .10$

P-values indicate that correlations between the PULS index and direct property returns of various property sectors (retail, office, industrial) as well as an average of all direct property returns (all property) are significantly positive. We have found the same significant positive correlations between the PRUT index and direct property returns of various property sectors (all property, retail, office, industrial).

When looking at the correlation between the average of all direct property returns and property funds the variance in returns on direct property tends to account for 62.41% of the variance in returns on the PULS index and 75.67% of the variance in returns on the PRUT index.

Based on the correlation results in Table 5-16 we fail to reject the null hypothesis in favour of the alternative hypothesis (H_6). We have therefore found that

the correlations between the variability in returns of securitised property funds and the variability ($\rho_{s,d}$) in returns of direct property investments are significantly positively related. This indicates that the market prices of property funds are representative of the underlying asset class (the fixed properties that these funds invest in).

A graphic representation (Figure 5-7) of the annual returns on direct property investments, securitised property funds and the ALSI shows that although the returns on direct property investment are significantly positively correlated with securitised property funds, the returns on securitised property funds tend to be far more volatile than the returns on direct property investments. We have found that securitised property prices tend to be influenced by both the value of the underlying assets as well as the conditions of the equity and debt markets, making their returns more volatile than direct property returns. Total returns derived from direct property investments tend to be far more stable and predictable. Their respective variance scores further indicate this (Table 5-17). PULS and PRUT indices exhibit annual variances of 3.81% and 3.06% respectively while direct property investments exhibit an annual variance of 0.67%.

Figure 5-7: Line Graph showing the total returns of PULS and PRUT indices, direct property, and the ALSI – based on annual return data

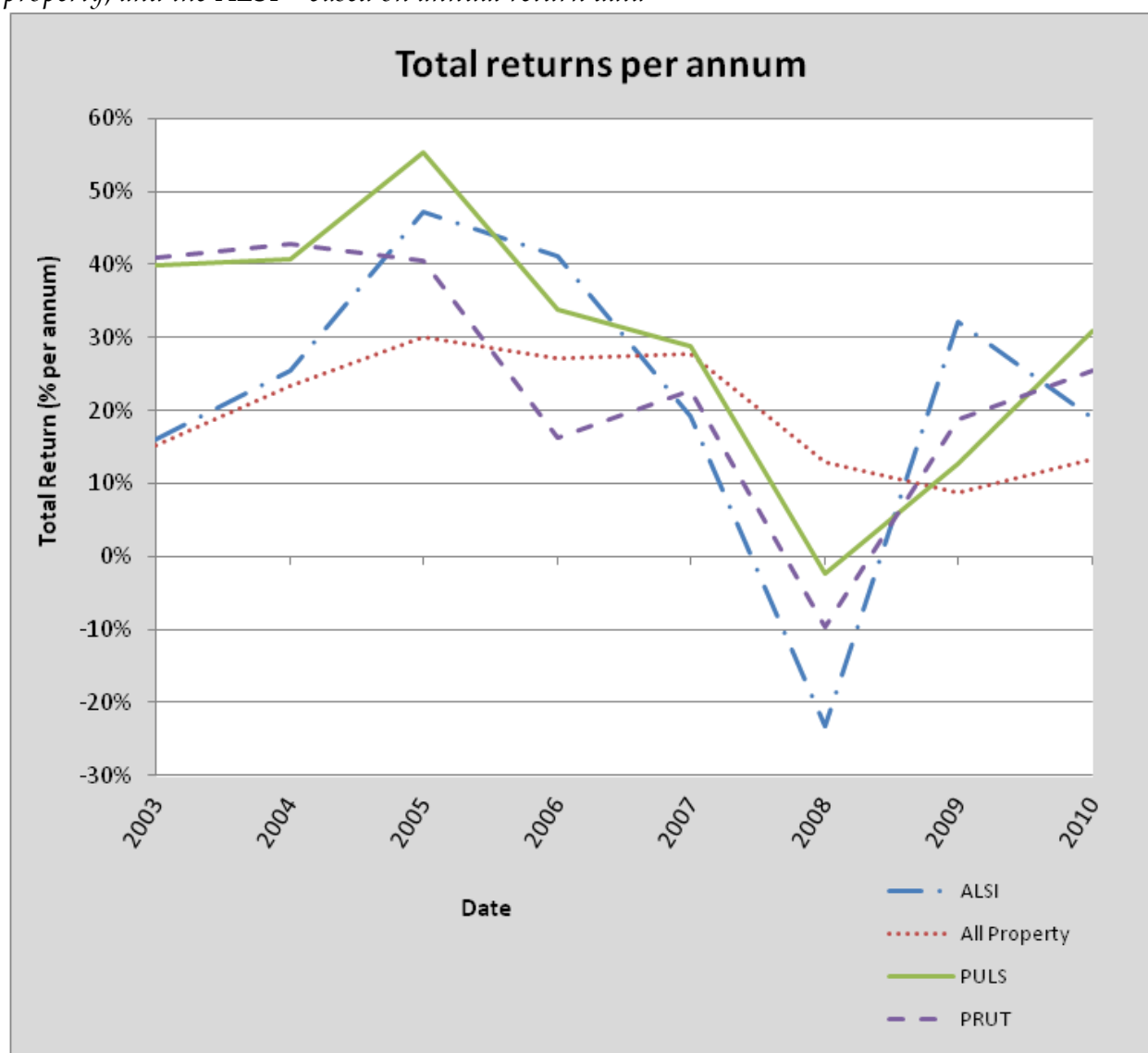


Table 5-17 below shows variance of the returns on direct property investments and securitised property funds. This data indicates that securitised property funds tend to exhibit far higher levels of variance.

Table 5-17: Variance – based on annual returns

	<i>Variance</i>
<i>All Property</i>	.007
<i>Retail</i>	.008
<i>Office</i>	.007
<i>Industrial</i>	.010
<i>Other</i>	.003
<i>PULS</i>	.032
<i>PRUT</i>	.031

Notes. Based on annual data intervals, Period = 2002 to 2010, N = 10

CHAPTER 6. DISCUSSION & CONCLUSION

In the subsequent paragraphs, I will discuss and answer the research problems and hypotheses, based on the empirical results set out in Chapter 5.

In Chapter 5 we failed to reject the null hypothesis in favour of the alternative hypothesis (H_2). We found that the returns characteristics of Property Unit Trust Funds and Property Loan Stock Funds ($\rho_{c,b}$) are not significantly different. Therefore, the diversification potentials that these two funds possess are similar. Although different company structures underpin PUTs and PLSs, they still exhibit similar return characteristics. This is probably because the real estate assets that underlie these funds are similar. PLSs exhibit higher returns than PUTs because of the higher leverage levels that these vehicles tend to contain, however this difference between the two fund types does not lead to PUTs and PLSs providing different diversification potentials for mixed asset portfolios.

When using the empirical results to evaluate hypothesis one, we rejected the null hypothesis in favour of the alternative hypothesis (H_1). We found that the variances of investment portfolios comprised of mixed-asset classes ($\sigma_{p_1}^2$) are in fact lower than variances of investment portfolios comprised of single asset classes ($\sigma_{p_2}^2$). Therefore, combining common stocks, bonds, and securitised real estate assets in a portfolio results in a significant reduction in the portfolio's overall level of unsystematic risk. This indicates that asset allocation (passive portfolio management) is significant in determining the risk levels of a portfolio of mixed assets. This finding is consistent with Brinson et al. (1986), Vardharaj and Fabozzi (2007), and Bekkers et al. (2009), who found that asset allocation strategies are significant in reducing the overall variance of a portfolio.

However, when looking at the correlation between securitised real estate assets and other asset classes we failed to reject the null hypothesis in favour of the alternative hypothesis (H_3). We found that the return characteristics of traditional

asset classes (common stocks and bonds) and securitised property funds ($\rho_{a,t}$) are not significantly different. There is therefore a link between the variance in securitised property fund returns and the variance in the returns of traditional asset classes. We only observed negative correlation scores between securitised real estate and cash instruments. Further, positive correlations between securitised property funds and traditional asset classes (common stocks and bonds) are the strongest during periods of economic recession. This result is consistent with Hung et al (2008) who found that securitised property funds provide the best diversification during boom markets when it is least needed.

Creating portfolios of mixed-assets showed a significant reduction in the portfolios overall level of unsystematic risk, but the correlations between these asset classes are significantly positive. This suggests that there need not be a negative correlation or even a very low positive correlation between asset classes for diversification potential to exist, and for a significant reduction in overall level of unsystematic risk to arise from combining these assets in a mixed-asset portfolio. In fact, portfolio managers can achieve a significant reduction in unsystematic risk by combining asset classes whose correlations are not equal to positive one, but are still strongly positive. The benefit of investing in securitised real estate assets for portfolio managers is that when combined with traditional asset classes the result is a significant reduction in the overall unsystematic risk level of the portfolio. This result contradicts Ziering and McIntosh (1997), who found that the benefit of including core real estate in a mixed-asset portfolio resulted from a negative correlation between real estate assets and other financial assets.

Our evaluation of hypothesis four in Chapter 5 indicated that both the variability in the ALSI and ALBI indices are significant in explaining the variability of returns on the PULS index as well as the variability in returns on the PRUT index. However, the variability in the STeFI index (cash market) was not significant in explaining the variability in returns on the PULS and PRUT indices. We therefore

reject the null hypothesis in favour of the alternative hypothesis (H_4) for the ALSI and ALBI indices. We found that the variability in returns in both the equity and debt markets influences the variability in returns on both Property Unit Stock funds and Property Unit Trust funds. This result is consistent with Peterson and Hsieh (1997), Ziering and McIntosh (1997), Barry and Rodriguez (2004), Anderson et al. (2005), and Pavlov and Wachter (2008).

We have already established that securitised real estate assets are able to provide diversification potential for mixed-asset portfolios and reduce the level of unsystematic risk in a portfolio mainly comprised of traditional asset classes. However, we have also found that the variability in returns of securitised real estate assets is also a factor of the variability in both the debt and equity markets, meaning that this diversification potential is significant but not perfect.

When assessing the relationship between inflation and securitised real estate assets in Chapter 5 we reject the null hypothesis in favour of the alternative hypothesis (H_5). The variability in the returns of securitised real estate assets are not strongly positively related to inflation and therefore do not provide good hedging potential for inflation. This contradicts the results found by Barry et al. (1996), Barry and Rodriguez (2004), Hudson-Wilson et al. (2005), Park and Bang (2012), and Lee (2010).

Using empirical results to evaluate hypothesis 6, we fail to reject the null hypothesis in favour of the alternative hypothesis (H_6). We found that there is a significant positive relationship between the variability in returns on direct real estate investments and the variability in returns on securitised real estate investments. This indicates that securitised real estate funds are representative of the underlying asset class, and that there is a real estate factor in securitised real estate pricing. This result is consistent with Giliberto (1990), Gyourko and Keim (1992), Barkham and Geltner (1995), Barry et al. (1996), Quan and Titman (1997), Oikarinen

et al. (2011), who find that REIT returns are positively correlated with un-securitised private real estate returns.

Although we observed significant positive correlations between the variability in returns on direct property investment and securitised property funds, we also found that returns on securitised property funds tend to be far more volatile than the returns on direct property investments. This is because there is a link between the variability in returns on securitised property funds and the variability in the South African public equity and debt markets. We have therefore found that variability in PUT and PLS returns can be explained by both the variability in the equity and debt markets (measured by the ALSI and ALBI), and the variability in direct property returns.

In summary of the above, we have found the following results:

- Securitised property funds reduce unsystematic risk in a portfolio by a significant amount, when these assets are combined in portfolios with assets from traditional asset classes (namely common stocks and bonds).
- The variability in PUT and PLS returns can be explained by both the variability in the equity and debt markets (measured by the ALSI and ALBI), as well as the variability in direct property returns.
- Correlations between asset classes do not need to be negative for significant diversification potential to occur. Diversification and the reduction of unsystematic risk occur as long as assets are not perfectly positively correlated.
- PUT and PLS market pricing is representative of the underlying asset class pricing (direct real estate prices).
- Securitised property funds are not a good tool for inflation hedging.

These findings have two main implications for South African portfolio managers. Firstly, portfolio managers can use securitised property funds (both

PUTs and PLSs) to reduce unsystematic risk in their portfolios. Secondly, portfolio managers should not use securitised real estate as a tool for inflation hedging.

We have not covered the areas of research listed below in this study and these are potential areas for future study. We conducted this research in only one emerging market (South Africa), and therefore the results are only relevant in the South African context. Research would be more informative to a wider audience if conducted across various emerging markets as well as developed markets. There is also further room to study the impact of including securitised real estate from an emerging market in a portfolio with international equities and debt instruments – in this study we have only looked at creating portfolios of domestic equities, domestic bonds, domestic cash instruments, and domestic securitised property funds.

In this study, the data employed only covered the period 2002 to 2012. It would be more informative to use a longer time series, including data over the period of the REIT boom. More extensive data on direct property prices (more data points) would also have been more informative and would have allowed us to carry out regression tests and determine if differences exist across economic periods.

There is potential for further research on the inflation hedging potential of real estate, as this was only briefly examined in this study. This research only looks at the diversification potential that securitised property funds provide for mixed asset portfolios. There is a need for further research on the differences between PUT and PLS funds (such as their different structures), and what implications and advantages these differences might have for investors and portfolios managers.

When PUT and PLS funds are converted to REIT structures in South Africa there will be a need to test if the results found here are still relevant for portfolio

managers or if the new REIT structure will have an impact on the diversification potential of securitised property funds.

In this research, we have only examined the diversification potential of one alternative asset class (securitised real estate) relative to traditional asset class investments. There is potential for more research on the effect of other alternative asset classes (such as hedge funds, private equity, and commodities) in mixed asset portfolios in the emerging market context. There is also potential to research what weighting of each of these asset classes are ideal for a mixed asset portfolio.

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APPENDICES

APPENDIX 1: PULS and PRUT index constituent data

Table 0-1 below shows the various PLS and PUT funds that underlie the PULS and PRUT indices respectively, between 2002 and July 2012.

Table 0-1: PLS funds and PUT funds that underlie the PULS and PRUT indices

PULS INDEX		
Instrument Name	Symbol	Period included in PULS index
Acucap Properties Limited	ACP	31/07/2003
Acucap Properties Limited	ACP	31/08/2012
Alpina Property Holdings	ALA	30/09/2003
Alpina Investments	ALA	31/10/2003
Alpina Investments	ALA	28/02/2006
Ambit Properties	ABT	31/03/2004
Ambit Properties	ABT	30/06/2009
Annuity Properties	ANP	29/06/2012
Annuity Properties	ANP	31/08/2012
Apexhi Properties -A-	APA	30/04/2002
Apexhi Properties -A-	APA	31/07/2009
Apexhi Properties -B-	APB	30/04/2002
Apexhi Properties -B-	APB	31/07/2009
Apexhi Properties -C-	AXC	29/12/2006
Apexhi Properties -C-	AXC	31/07/2009
Arnold Property Fund	ARP	30/04/2002
Arnold Property Fund	ARP	30/11/2004
Arrowhead Properties (A)	AWA	30/12/2011
Arrowhead Properties (A)	AWA	31/08/2012
Arrowhead Properties (B)	AWB	30/12/2011
Arrowhead Properties (B)	AWB	31/08/2012
Atlas Properties Ltd	ATS	30/04/2002
Atlas Properties Ltd	ATS	31/07/2007
Calulo Property Fund	CLO	29/09/2006
Calulo Property Fund	CLO	30/04/2007
CBS Property Portfolio	CBS	30/12/2005
CBS Property Portfolio	CBS	31/07/2007
Dipula Income Fund (A)	DIA	30/12/2011
Dipula Income Fund (A)	DIA	31/08/2012
Dipula Income Fund (B)	DIB	30/12/2011
Dipula Income Fund (B)	DIB	31/08/2012
Diversified Property Fund	DIV	30/12/2005
Diversified Property Fund	DIV	30/05/2008
Fairvest Property Hldgs	FVT	30/04/2002
Fairvest Property Hldgs	FVT	31/05/2012
Fortress Income Fund Ltd. (A)	FFA	31/12/2009
Fortress Income Fund Ltd. (A)	FFA	31/08/2012
Fortress Income Fund Ltd. (B)	FFB	30/03/2012
Fortress Income Fund Ltd. (B)	FFB	31/08/2012
Freestone Property Holdings	FSP	31/12/2004

Freestone Property Holdings	FSP	30/03/2007
Growthpoint Prop Ltd	GRT	30/04/2002
Growthpoint Prop Ltd	GRT	31/08/2012
Hospitality Property A	HPA	31/03/2006
Hospitality Property A	HPA	31/08/2012
Hospitality Property B	HPB	31/03/2006
Hospitality Property B	HPB	31/08/2012
Hyprop Investments Ltd	HYP	30/04/2002
Hyprop Investments Ltd	HYP	31/08/2012
iFour Properties	IFR	30/09/2002
iFour Properties	IFR	30/05/2008
Investec Property Fund Ltd	IPF	30/06/2011
Investec Property Fund Ltd	IPF	31/08/2012
iProp Holdings	IPR	31/12/2002
iProp Holdings	IPR	30/06/2003
Madison Property Fund Managers	MDN	29/09/2006
Madison Property Fund Managers	MDN	31/07/2009
Metboard Properties	MPL	30/04/2002
Metboard Properties	MPL	31/07/2006
MICC Property Income	MCP	31/12/2003
MICC Property Income	MCP	31/12/2004
Monyetla Property Fund	MYT	31/05/2007
Monyetla Property Fund	MYT	31/12/2008
Octodec Investments	OCT	30/04/2002
Octodec Investments	OCT	31/08/2012
Orion Real Estate Ltd.	ORE	31/03/2006
Orion Real Estate Ltd.	ORE	31/08/2011
Pangbourne Prop Ltd	PAP	30/04/2002
Pangbourne Prop Ltd	PAP	28/02/2011
Paramount Property Fund	PRA	30/04/2002
Paramount Property Fund	PRA	28/02/2007
Premium Properties	PMM	30/04/2002
Premium Properties	PMM	31/08/2012
Primegro Properties Ltd	PMG	30/04/2002
Primegro Properties Ltd	PMG	31/07/2003
Rand Leases Properties	RPR	30/04/2002
Rand Leases Properties	RPR	31/12/2003
Rebosis Property Fund	REB	30/09/2011
Rebosis Property Fund	REB	31/08/2012
Redefine Income Find	RDF	30/04/2002
Redefine Income Find	RDF	26/02/2010
Redefine Properties	RDF	31/03/2010
Redefine Properties	RDF	31/08/2012
Resilient Prop Inc Fd	RES	30/06/2003
Resilient Prop Inc Fd	RES	31/08/2012
Sa Retail Properties	SRL	30/04/2002
Sa Retail Properties	SRL	30/11/2006
Shops for Africa	SFA	30/04/2002
Shops for Africa	SFA	30/06/2004
Siyathenga Property Fund Ltd	SYA	30/09/2005
Siyathenga Property Fund Ltd	SYA	30/05/2008
Spearhead Property Holdings	SPE	30/04/2002

Spearhead Property Holdings	SPE	30/11/2006
Synergy Income Fund A	SGA	30/03/2012
Synergy Income Fund A	SGA	31/08/2012
Synergy Income Fund B	SGB	30/03/2012
Synergy Income Fund B	SGB	31/08/2012
Vividend Income Fund Ltd	VIF	31/03/2011
Vividend Income Fund Ltd	VIF	31/08/2012
Vukile Property Fund	VKE	30/09/2004
Vukile Property Fund	VKE	31/08/2012
Vunani Property Investment Fund	VPF	30/12/2011
Vunani Property Investment Fund	VPF	31/08/2012
PRUT INDEX		
Instrument Name	Symbol	Period included in PRUT
Allan Gray Property Trust	GRY	30/04/2002
Allan Gray Property Trust	GRY	31/05/2007
Capital Property Fund	CPL	30/04/2002
Capital Property Fund	CPL	31/08/2012
Centrecity Property Fund	CEN	30/04/2002
Centrecity Property Fund	CEN	31/03/2003
Emira Property Fund	EMI	31/03/2004
Emira Property Fund	EMI	31/08/2012
Fountainhead Property Trust	FPT	29/06/2007
Fountainhead Property Trust	FPT	31/08/2012
Martprop Property Fund	MTP	30/04/2002
Martprop Property Fund	MTP	30/11/2006
Prima Property Trust	PRM	30/04/2002
Prima Property Trust	PRM	31/01/2006
SA Corporate Real Estate Fund	SAC	29/12/2006
SA Corporate Real Estate Fund	SAC	31/08/2012
Sycom Property Fund	SYC	30/04/2002
Sycom Property Fund	SYC	31/08/2012

APPENDIX 2: Further information on Property Unit Trusts (PUTs)

A. Investors / Unit holders

An investor who holds shares in one of the PUTs is referred to as a unit holder. A unit holder's investment in a PUT entitles him to an undivided share of the trust's portfolio (Fleming, 2002), as well as a share of the trust's net income proportionate to the holder's investment in the trust. By investing in a PUT the unit holder is effectively buying a share in an array of real estate owned by the trust.

A major advantage of PUTs is the diversification of risk through pooling of investors' funds to invest in a wide range of properties. Therefore investors can invest in low denominations of units, but still have exposure to a large spread of property investments.

B. Investment policy

The Collective Investments Act sets out various restrictions that PUTs need to adhere to with regard to the assets that they are mandated to invest in. Their investment activities are restricted to property shares, immovable property and a limited amount of other assets (such as common stocks that should only be held by the trust until suitable property investments can be made). A trust that takes on the legal form of a PUT has to restrict its activities to investing in individual properties that are held either in the trust or in separate property investment companies. The objective of the investments that they make is to acquire ownership in fixed property, to gain an income from the property and at the same time maintain the security of the capital investment and accrue returns from long term capital growth gains. All investing activities that the trust's property companies engage in must be focused on generating income and capital gain for the unit holders. PUTs are also entitled to hold temporary liquid assets (such as stocks in other firms), while they are looking for suitable properties to invest the unit holders' capital in (Republic of South Africa, 2002).

As PUTs are closed-end funds further stock issues are strictly controlled. Additional funds raised by the trust are generally restricted to rights issues which are first offered to existing investors. After the first issue of units the management may offer a SEO (seasoned equity offering) only as a rights offering, or split the shares (e.g. a 2 for 1 split).

C. The property company

The property company is mandated to purchase and hold investments in fixed real estate in their portfolio.

The property company must be entirely owned by the trust. These companies are not allowed to hold assets or liabilities on their books that are not aligned to the trusts objectives. A PUT may not invest in a fixed property that has been used to guarantee the liabilities of another person. Therefore unlike REITs PUTs may not invest in mortgage bonds (Zagaretos, 2002).

D. The trust's management company

PUTs are managed by a management company. According to the Collective Investment Schemes Act only a company that is legally registered as a manager of a collective investment scheme in property under the Companies Act of 1973 and holds the required capital reserves, or its authorised agent, may administer a PUT (Republic of South Africa, 2002). The management company can either manage the properties itself, or appoint an external company to do this. This management company is allowed to manage either one or multiple property unit trusts. However each of the property unit trusts that are established must be established as a separate entity. By establishing a separate entity for each trust the management company is able to create different profiles and investment focuses for each trust. These management companies have responsibility for both the daily running of the trusts properties as well as the trust's long term investment strategy. Management companies acquire various properties, manage the properties and are mandated to

develop various parts of the property if the need for this arises. The management company may direct property companies owned by the trust, develop properties subject to the approval of the trustees, and acquire existing property companies. The management company may not develop properties in its own name or for its own account – only on behalf of the trust.

According to the Collective Investment Schemes Act the management company has to adhere to the following; the management company must maintain a minimum of R1 million of paid up share capital and reserves employed available for employment through its unit trust business. The management is required to invest a minimum of R200 000 in each of the PUTs under its control.

The management company's remuneration structure is as follows; an initial charge on the sales prices of the units of 5% or less, thereafter a service charge of 0.5% per annum of the total market value of the trusts units. The company who manages the property (the management company or any other appointed company), is entitled to a further charge of 5% or less of the gross income that is derived from the fixed properties (Fleming, 2002; and Nsibandé 2006).

A major advantage of PUTs is their management structure resulting in protection for their investors because of very tight management controls. A further advantage of their management structure is that the portfolio is actively managed, resulting in the highest possible returns for investors.

E. The trustees

In order for a PUT to be established, a trust deed must be drawn up that stipulates the agreement between the management company and the trustee constituting the trust for the purposes of the scheme. This deed needs approval from the registrar (Financial services board) – based on the requirements in the Unit Trust Control Act and The Collective Investments Control Act.

Trustees are responsible for ensuring that provisions of the trust deed are implemented, holding underlying securities and relevant titled deeds in trust and

cash resources, ensuring that the management company does not mortgage the securities or fixed properties of the trust. Trustees function to protect unit holders, as well as to determine if the acquired fixed property is fair value and if it conforms to the trusts policy.

Trustees may purchase, hold and dispose of units for their own accounts.

The trustees will be remunerated by the management company, based on the work and size of portfolio that each trustee is responsible for. Generally the trustee's remuneration is about 0.05% of the number of units in issue.

F. Income distribution & Taxation of PUTs

All net income generated by the trust, after costs have been deducted, has to be distributed to unit holders. This means that PUTs have a very high dividend payout ratio.

PUTs are entitled to a special tax status: neither the listed PUT nor its associated property companies pay normal company tax on their earnings as long as all net income is distributed to the unit holders. As dividends paid to unit holders are free of tax, individual investors or unit holders are liable for tax on the dividends they receive (unit holders are taxed according to their own tax category). Due to the tax free nature of their dividends, the dividends are usually treated as interest (as interest is tax deductible). Property trusts therefore have an advantage over normal property companies who are liable for normal company tax on their income before dividends are distributed (Nsibande, 2006).

G. Accounting Policy

Objects in the buildings that the trust owns need to be depreciated (such as lifts, air conditioners and any objects that may need replacing in the future). Since 1984 the actual property is not to be depreciated.

APPENDIX 3: Regression control variables on the PULS & PRUT indices

Table 0-2 and Table 0-3 below show the results of regressions of the control variables against the PRUT and PULS indices to determine their significance and inclusion in the study.

Table 0-2: Regression of the CPI, REPO rate & GDP (control variables) on the PULS index

	Param.	Std.Err	T-Stat	P-value	Beta (β)	St.Err.β	-95.00% Cnf.Lmt	+95.00% Cnf.Lmt
Intercept	98.20	26.09	3.76	.00				
CPI	29813.10	54164.36	.55	.58	.06	.10	-.15	.26
REPO RATE	-93011.60	90752.73	-1.02	.31	-.11	.10	-.31	.10
GDP	5696.70	30624.56	.19	.85	.02	.10	-.17	.21

Notes. Based on monthly data intervals, PULS = Property Loan Stock Index, N = 115 (June 2008 observation deleted), *** $p < .01$, ** $p < .05$, * $p < .10$

Table 0-3: Regression of the CPI, REPO rate & GDP (control variables) on the PRUT index

	Param.	Std.Err	T-Stat	P-value	Beta (β)	St.Err.β	-95.00% Cnf.Lmt	+95.00% Cnf.Lmt
Intercept	62.50	20.06	3.12	.00				
CPI	-7566.40	41646.65	-.18	.86	-.02	.10	-.22	.10
REPO RATE	-48762.80	69779.22	-.70	.49	-.07	.10	-.28	.10
GDP	14436.80	23547.04	.61	.54	.06	.10	-.13	.20

Notes. Based on monthly data intervals, PRUT = Property Unit Trust Index, N = 115 (June 2008 observation deleted), *** $p < .01$, ** $p < .05$, * $p < .10$

APPENDIX 4: Correlation between market indices

Table 0-4 shows the results of a correlation between various market indices. This was used to determine possible multicollinearity problems.

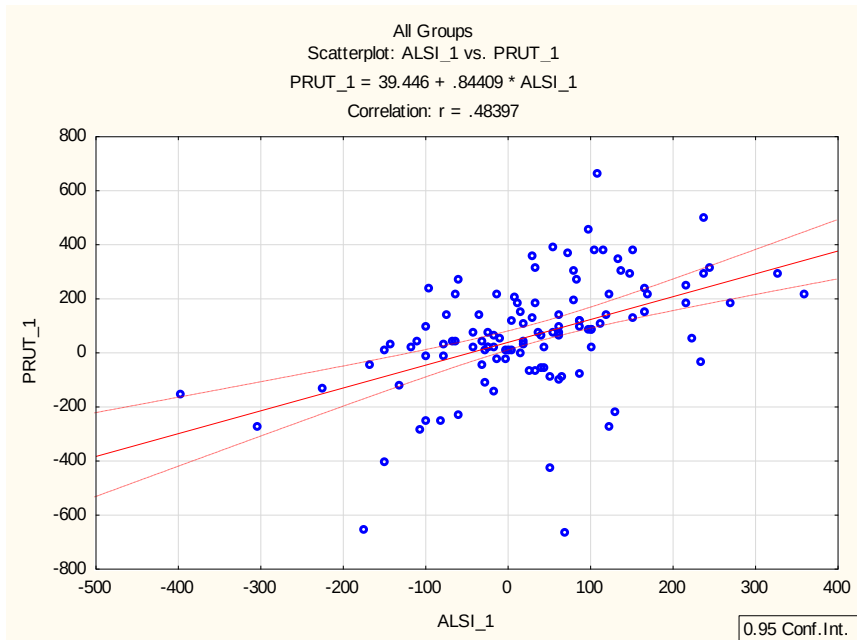
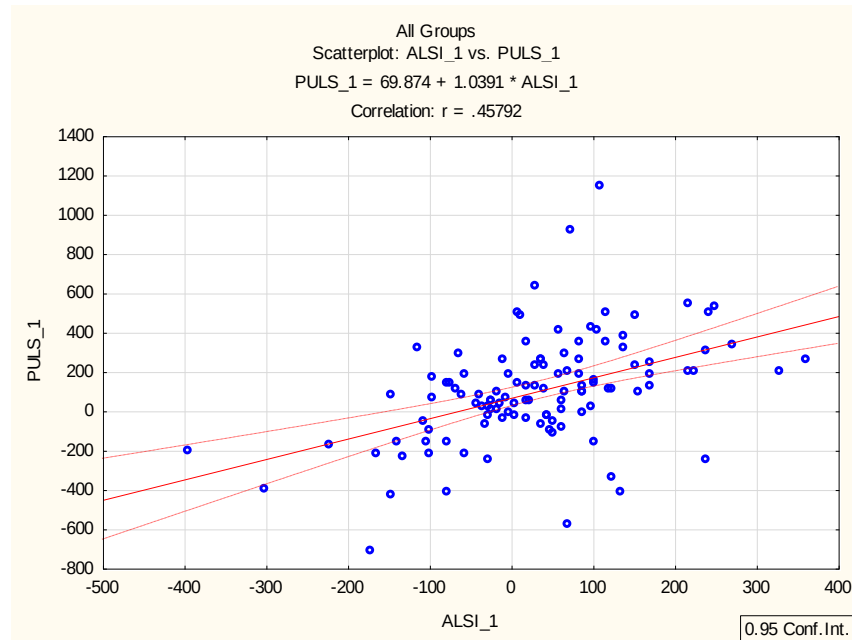
Table 0-4: *Correlation between various market indices*

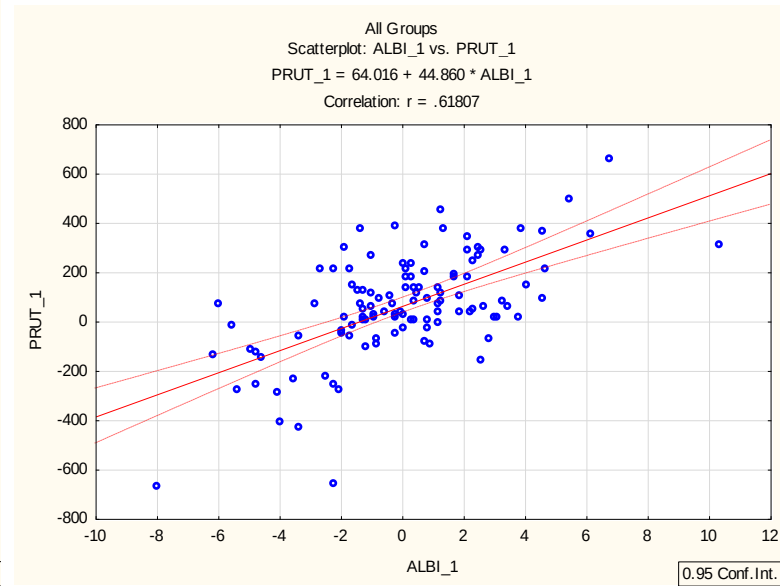
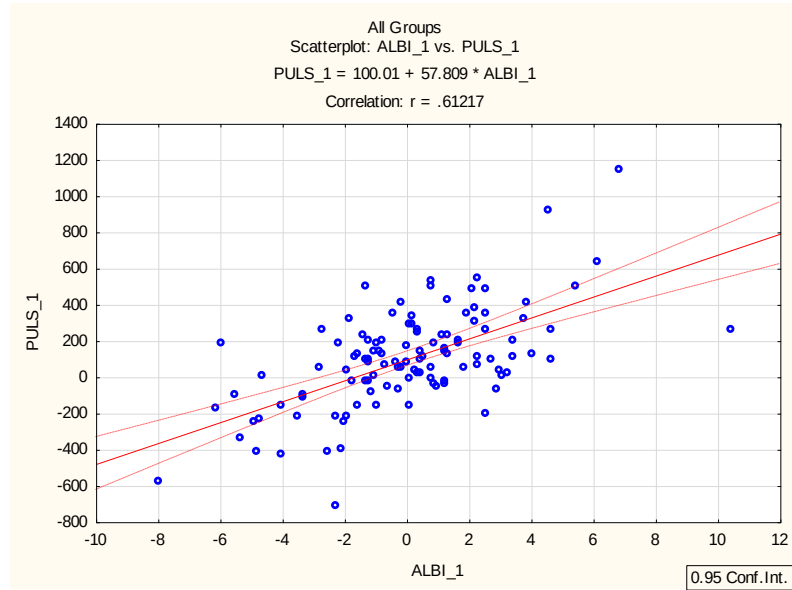
	ALSI	Mid-Cap	Small-Cap	ALBI	GOVI	OTHI	STeFI
ALSI	1.00						
Mid-Cap	.73	1.00					
Small-Cap	.72	.91	1.00				
ALBI	.09	.45	.34	1.00			
GOVI	.09	.45	.34	1.00	1.00		
OTHI	.10	.46	.34	.99	.98	1.00	
STeFI	-.18	-.16	-.22	-.03	.00	-.03	1.00

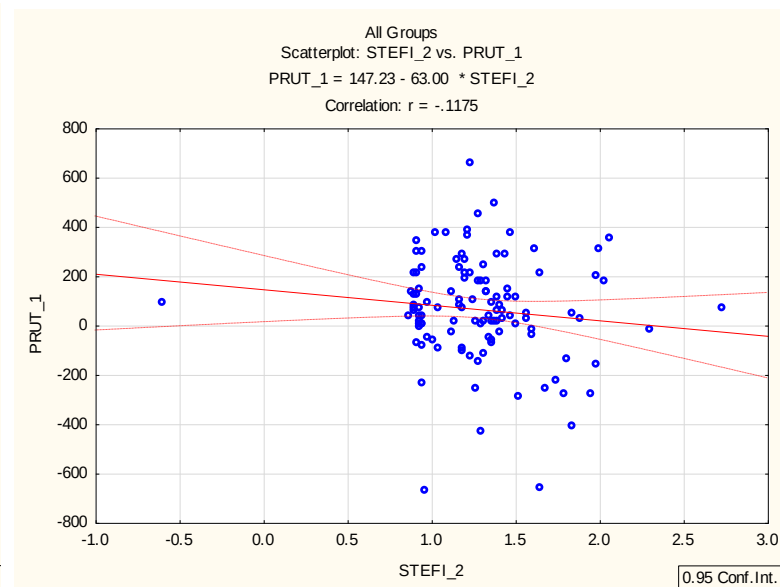
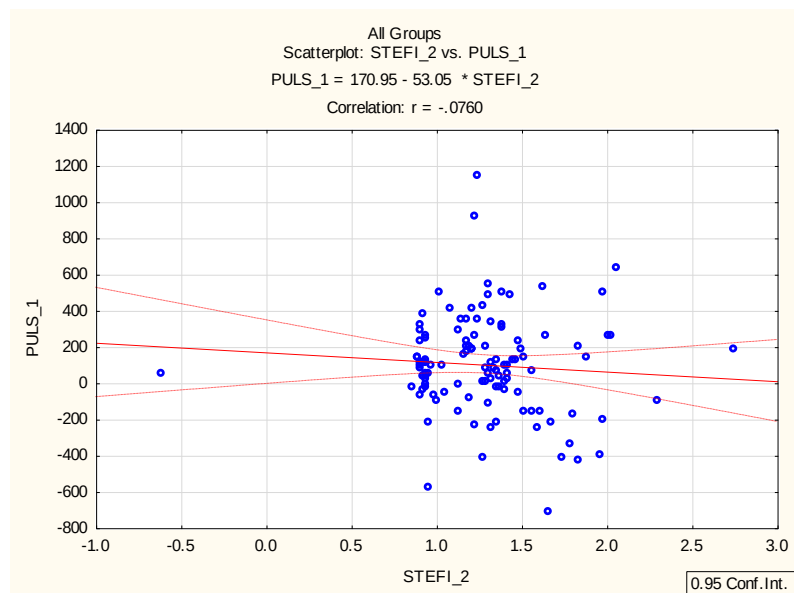
Notes. Based on monthly data intervals, Period = February 2005 to July 2012, N = 90

APPENDIX 5: Scatter plots of correlations amongst asset classes

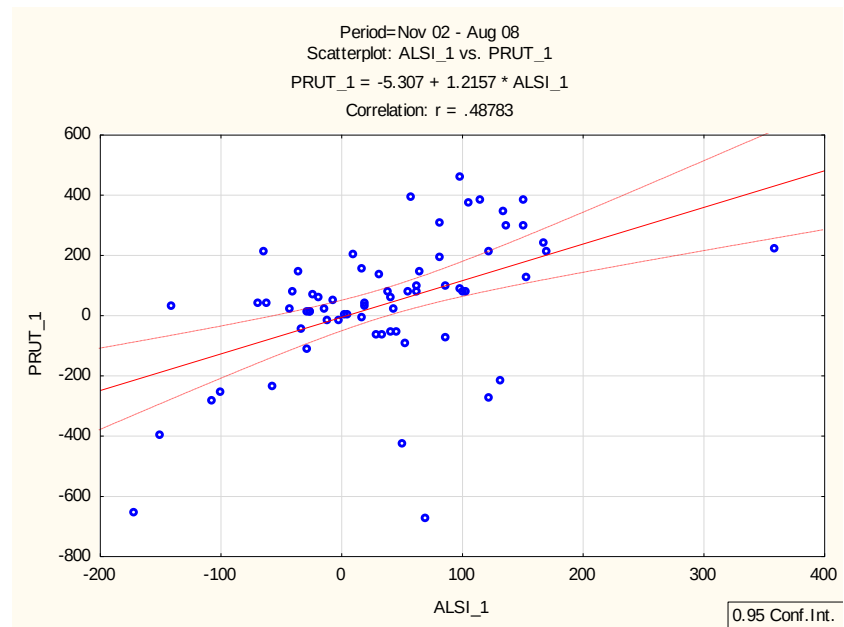
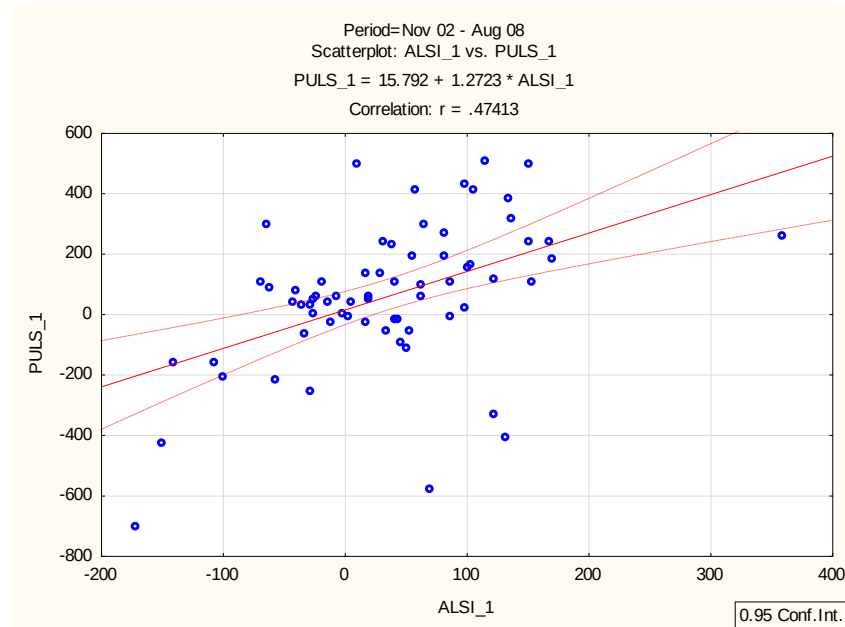
Scatter plots of correlations amongst asset classes for all three periods combined – November 2002 to July 2012.



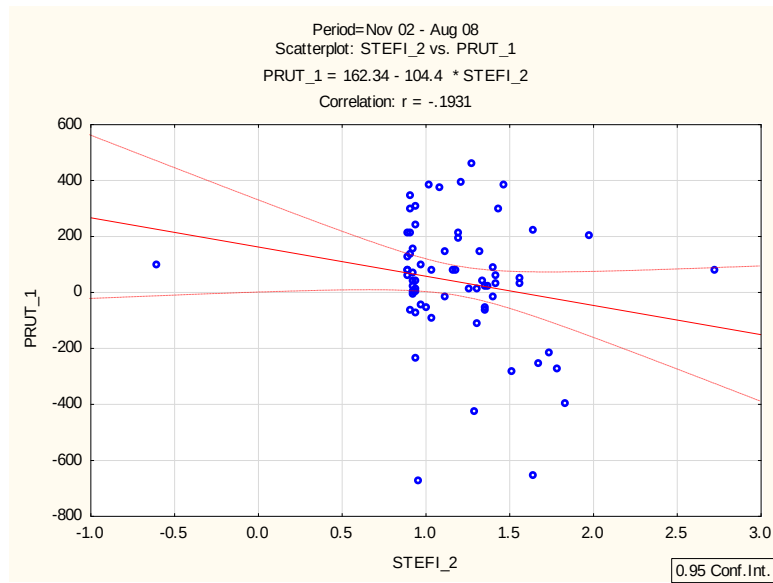
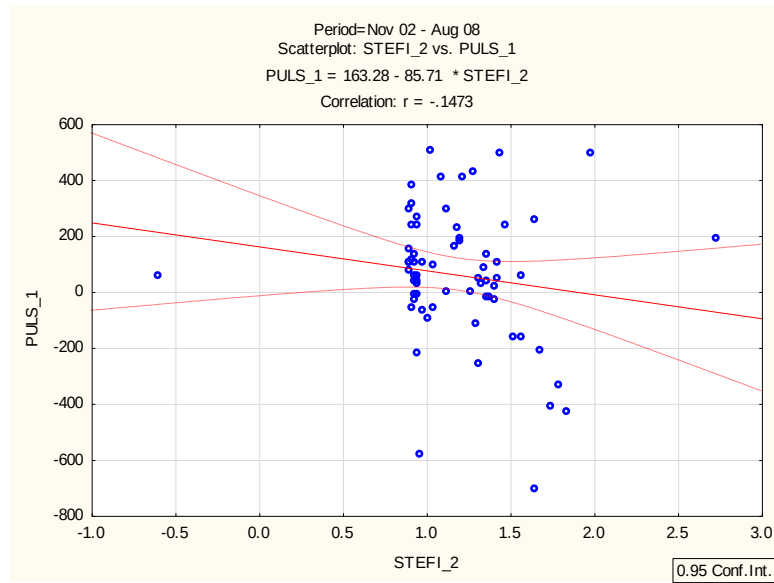
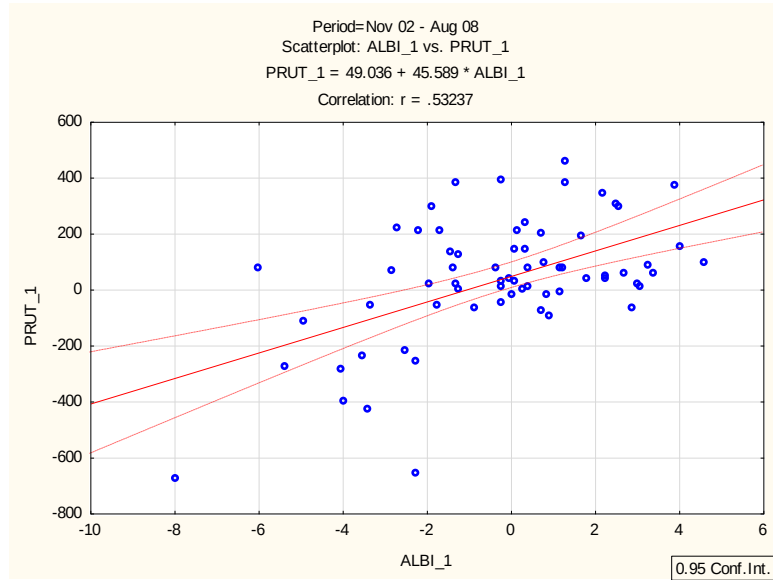
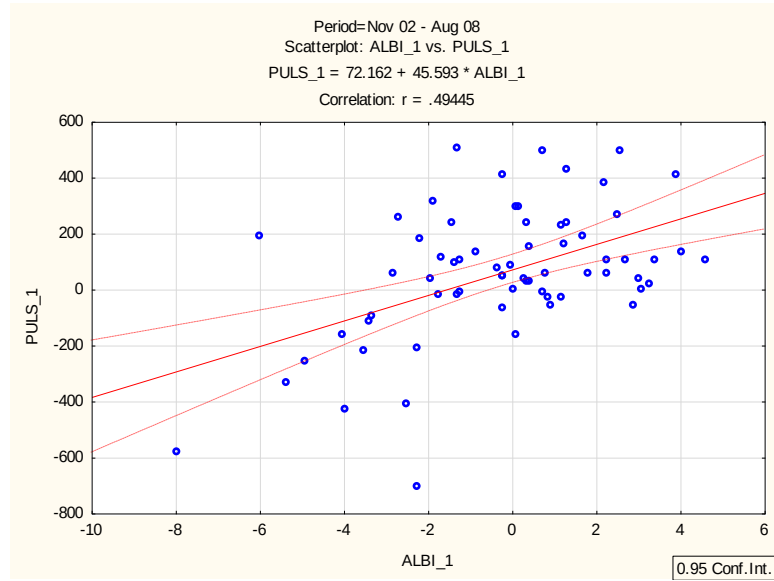




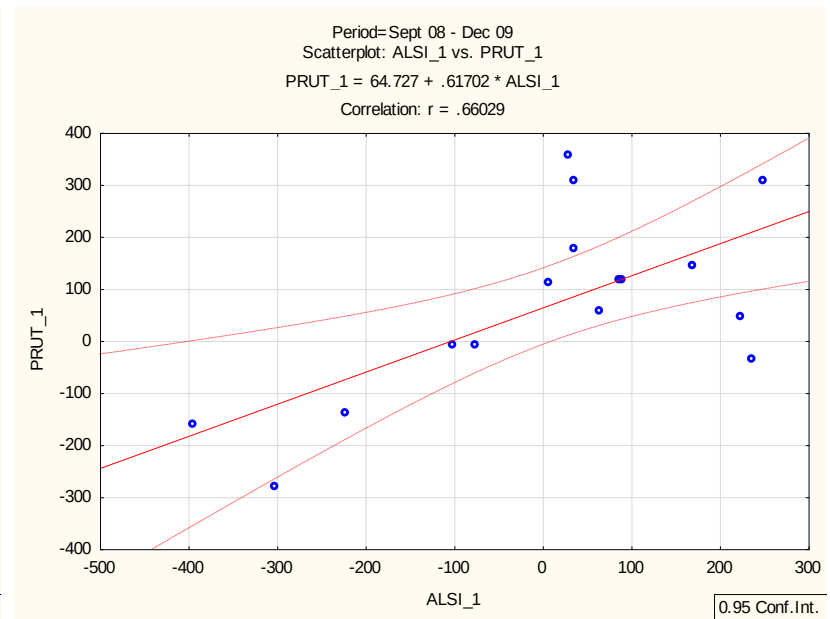
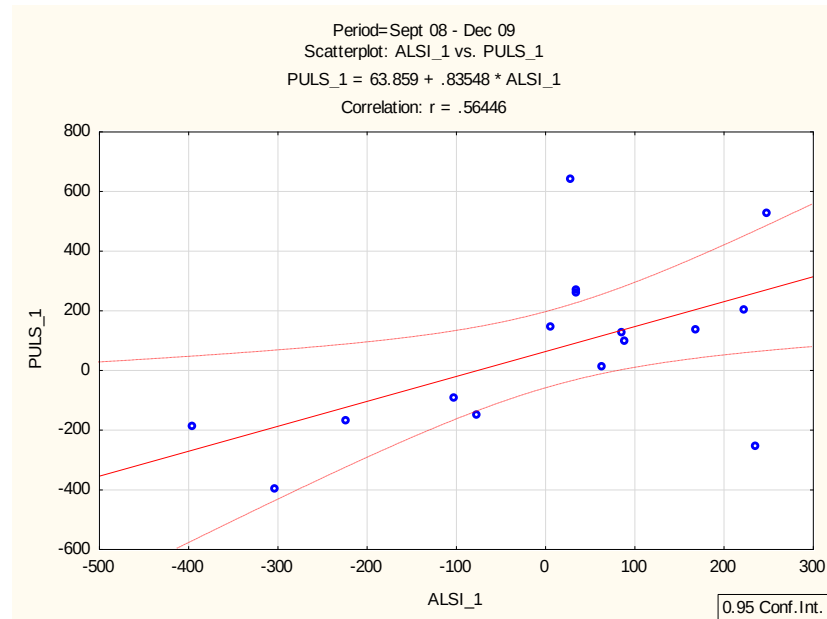
Scatter plots of correlations amongst asset classes – November 2002 – August 2008



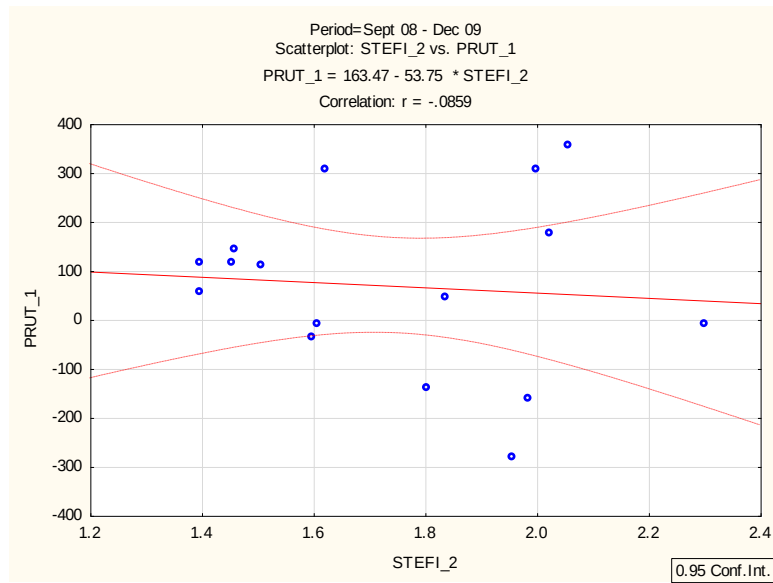
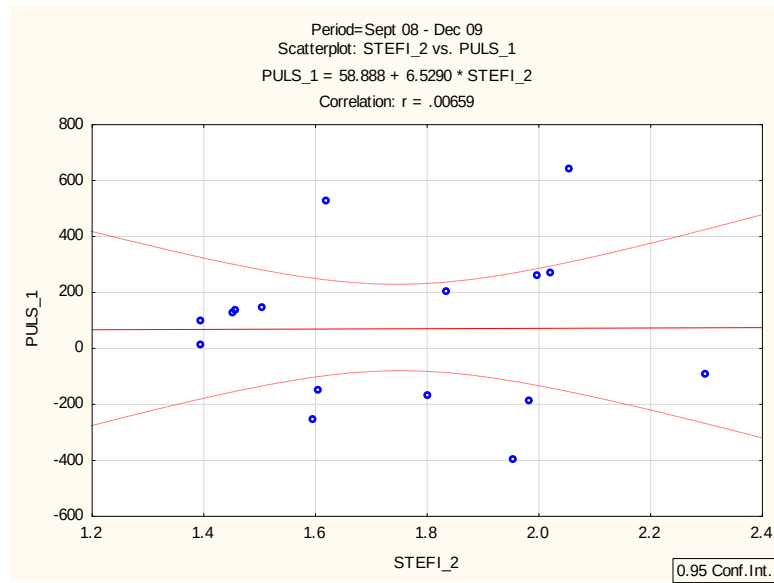
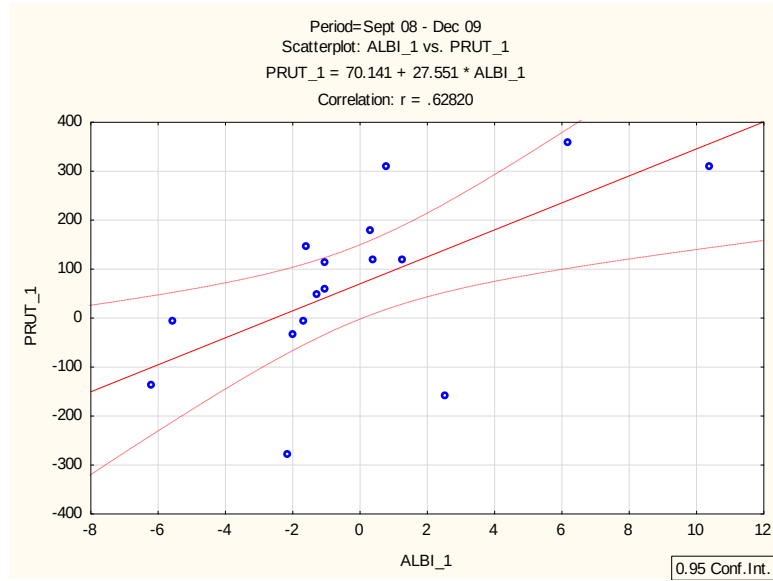
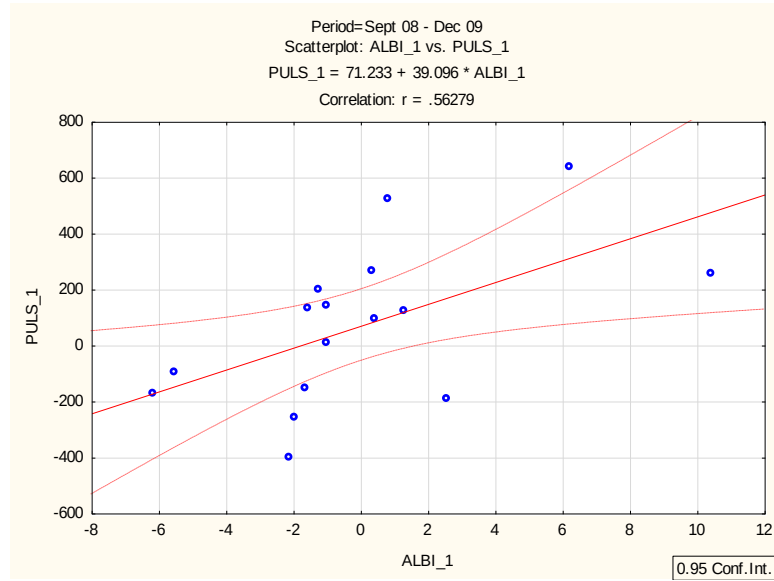
APPENDICES



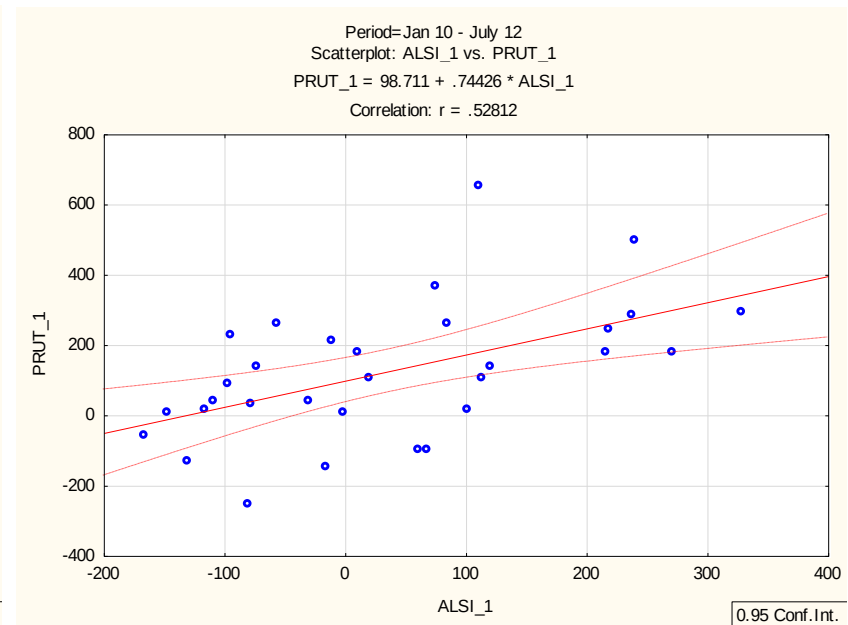
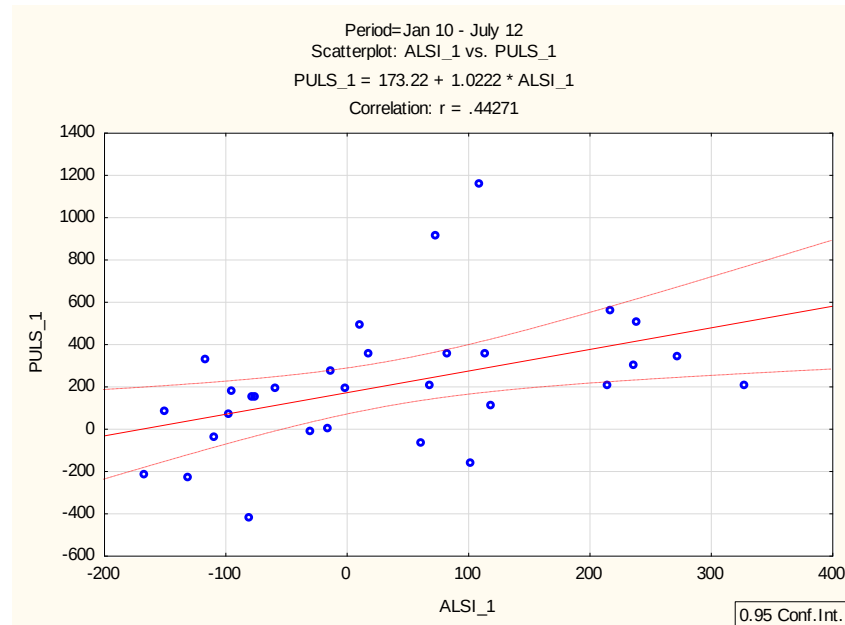
Scatter plots of correlations amongst asset classes – September 2008 to December 2009



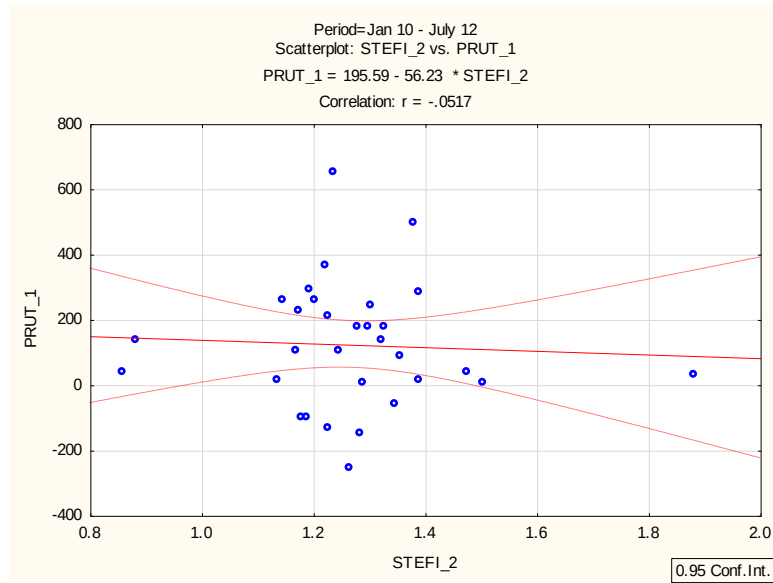
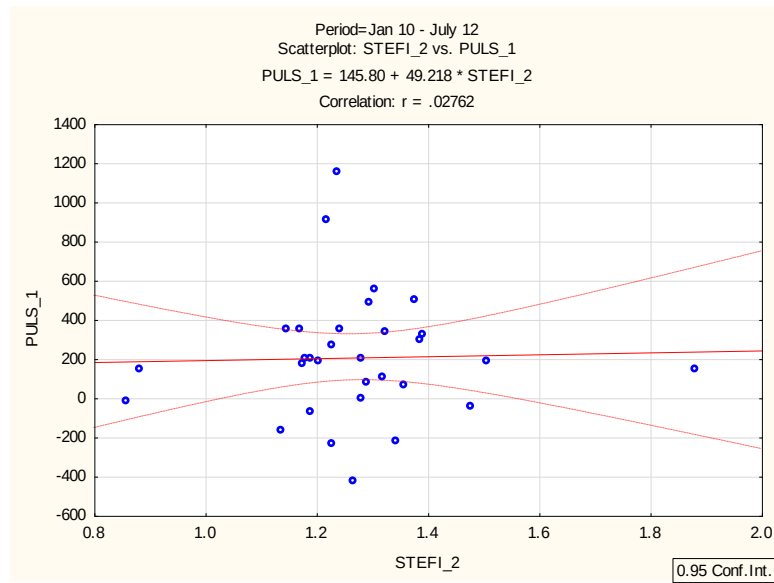
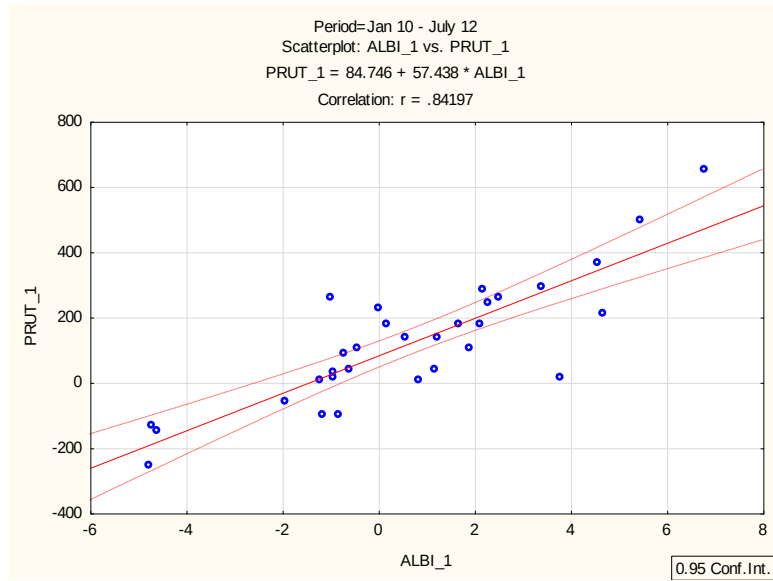
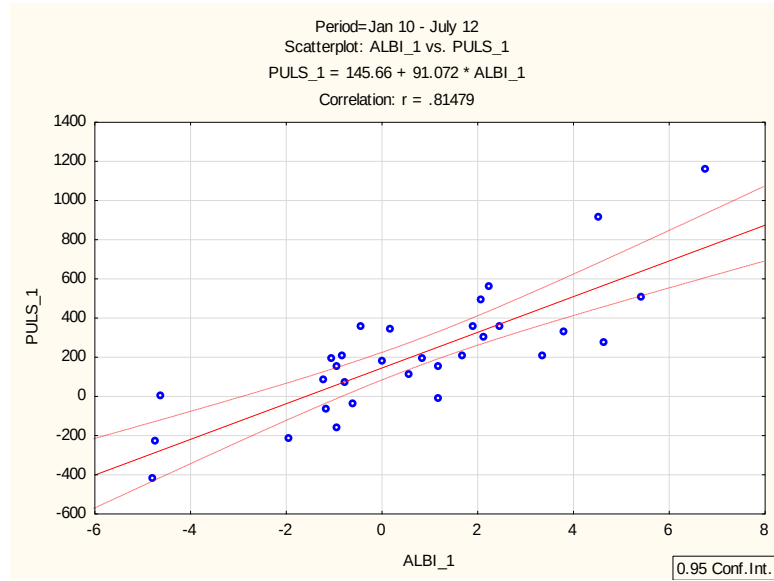
APPENDICES



Scatter plots of correlations amongst asset classes – January 2010 to July 2012



APPENDICES



APPENDIX 6: Scatter plots of correlations between direct property returns and PULS & PRUT indices

