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# The suitability of private equity as an asset class for South African pension funds

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# The suitability of private equity as an asset class for South African pension funds

**Kamal Mitha**

**A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration**

**Johannesburg, 2016**

# ABSTRACT

This study examined the suitability of Private Equity as an asset class for South African pension funds. The characteristics were explored as well as the historical performance of the asset class. Although the riskiness of the asset class as well as the liquidity constraints may act as a deterrent for many investors, the diversification benefits as well as the return potential may entice those with a riskier appetite.

Numerous studies have been published that have indicated the performance of Private Equity as an asset class. Amongst these studies, a South African study was conducted that used data for the period between January 1992 and December 2003. The study showed that Private Equity outperformed South African listed equities.

This current study extended the earlier study for the period between January 2002 and December 2015. This study compared the performance of Private Equity with other asset classes. This study involved a sample of 11 funds based in South Africa covering a 13-year period, ending on 31 December 2015. In comparison to South African listed equities, Private Equity was found to outperform by approximately 15% p.a. The study found Private Equity to have high risk-adjusted returns as well as low correlations with other asset classes, implying diversification benefits.

The inclusion of Private Equity into the asset allocation of pension funds was also explored by employing mean variance optimisation. This study found pension funds with the tolerance for risk and limited liquidity needs to add an allocation up to the Regulation 28 limit of 10% to their asset allocation.

# DECLARATION

I, Kamal Mitha, 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 Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

---

Kamal Mitha

Signed at ……

On the …….. day of …… 20…..

# DEDICATION

This research project is dedicated to my wife Trisha, my parents Sam and Jyoti, my siblings Nitasha and Trisha, and my extended family. Thank you for all the love and support you have given me. The completion of my MBA and my research would not have been possible without you.

# ACKNOWLEDGEMENTS

I would like to express my thanks and sincere gratitude to the following people and organisations who have made this research possible:

- To my precious wife, Trisha: You are my inspiration for everything I have accomplished so far. You have provided unwavering support and motivation throughout my MBA and in particular during my dissertation.
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# CHAPTER 1: INTRODUCTION

## 1.1 Purpose of the study

The purpose of this research study was to assess the suitability of South African Pension funds investing in private equity. Private equity characteristics were described and the performance of the asset class was examined. Mean Variance Optimisation (MVO) was conducted to determine whether private equity as an asset class can enhance pension funds' return, add diversification and introduce lower correlations.

## 1.2 Background of the study

Private Equity (PE) is considered an alternative asset class. The investment strategy is an ownership interest in a private company that is not listed on any stock exchange. The equity is raised through a private placement rather than through a public offering.

The particularity of PE investments implies that many pension funds do not have the required incentives or abilities to devote in this group of alternative assets. PE investments ought to be done by those with the required knowledge and skills to select fund managers that have sufficient negotiating power (Rigot & Tadjeddine, 2010).

A significant amount of literature has also developed with the goal of understanding the performance of firms and the performance of PE funds (Cochrane, 2005; Gompers & Lerner, 1997; Harris, Jenkinson, & Kaplan, 2014, 2015; Higson & Stucke, 2012; Jones & Rhodes-Kropf, 2003; Kaplan & Schoar, 2005; Ljungqvist & Richardson, 2003; Missankov, van Dyk, van Biljon, Hayes, & van der Veen, 2008; Phalippou & Gottschalg, 2009; Phalippou & Zollo, 2005; Robinson & Sensoy, 2013). However, these views have received mixed results.

In South Africa (SA), with Regulation 28, Pension Fund asset allocations to PE are limited to 10%.

Asset allocation is generally defined as the allocation among asset classes of an investor's portfolio (Sharpe, 1992). Investors need to understand the background of asset allocation as a concept for minimising risk and improving returns (Anson, 2004).

The board of trustees of a pension fund establish the Strategic Asset Allocation (SAA) among the major asset classes. SAA is a process whereby long-term assets are matched by long-term pension fund liabilities.

Allocations of pension funds towards PE have increased over the years. Ashiagbor, Satyamurthy, Casey, and Asare (2014) found the average pension fund allocation to alternative assets, including real estate and PE, to be 20% in the USA, 28% in Switzerland, and 25% in Australia. The three largest PE investors in the USA were the Washington State Investment Board, the California Public Employees' Retirement System and the California State Teachers Retirement System with target allocations to PE of 23%, 13% and 14% respectively.

However, the literature that specifically analyses pension funds allocation to PE funds is scarce mostly due to data limitations.

## 1.3 Problem statement

### 1.3.1 Main problem

The central problem that this research study proposed was to determine the suitability of private equity for South African pension funds.

### 1.3.2 Sub problems

The first sub-problem sought to determine the risk and return characteristics of private equity as well as the correlations and Sharpe ratios with other asset classes.

The second sub-problem determined if adding private equity to a pension fund portfolio is beneficial to asset allocation.

## 1.4 Significance of the study

The study may provide guidance to a better understanding of the PE asset class and the allocations of capital to the asset class. Literature that discusses the asset class in the context of pension funds is rather limited. Comparisons were drawn from international experiences where it was found to be appropriate.

The study may provide value to high net worth individuals, pension fund trustees and individuals who are involved in making asset allocation decisions. These individuals may benefit from an understanding of the asset class as a diversifier in an efficient portfolio of assets.

## 1.5 Delimitations of the study

The study investigated the returns of a number of independent PE funds in SA for the period beginning on 1 January 2002 and ending on 31 December 2015.

PE funds that are members of South African Venture Capital Association (SAVCA) are only included in this research study.

## 1.6 Definition of terms

Beta: A measure of risk of a security or portfolio relative to the market.

National Association of Securities Dealers Automated Quotations **(**NASDAQ): American Stock Exchange.

Net Asset Value (NAV): The book value of the business.

Sharpe Ratio: a ratio that measures excess return above a risk free rate per unit risk, where risk is measured by the standard deviation of returns (Sharpe, 1994).

South African Venture Capital Association (SAVCA): A private equity association from South Africa.

Standard & Poor's 500 (S&P 500): An American stock exchange that uses the largest 500 companies by market capitalisation within the index.

Strategic Asset Allocation (SAA): Strategic asset allocation creates an asset mix that will provide an optimal balance between expected risk and return for a long-term investment horizon (Eychenne, Martinetti, & Roncalli, 2011).

Thomson Venture Economics (TVE): A commercial database that sources data from both limited and general partners.

Vintage year: The year in which a fund has its first drawdown.

## 1.7 Assumptions

The researcher made the following assumptions, which could have influenced the outcomes of the research.

- Survivorship bias: Only concentrating on data which survived and overlooking the data which failed.
- Sample size bias: The assumption that the sample used is representative of the population.

# CHAPTER 2: LITERATURE REVIEW

## 2.1 Introduction

In the subsequent literature review, the researcher outlined PE and then explained the basic structure of PE funds. The different stages in PE investing as well as PE characteristics are described. The researcher briefly discusses PE fundraising from a global perspective, followed by more in-depth analysis from China, Africa and South Africa. The literature review emphasises the performance of the asset class. In addition, pension funds in South Africa and Regulation 28 are discussed. In concluding this literature review, strategic asset allocation is explored. The purpose of this literature review is to allow the reader to fully understand the empirical part of this research study.

## 2.2 Private Equity Background

### 2.2.1 Private Equity Defined

Several definitions of PE exist such as those by KPMG and SAVCA (2014), EVCA (2015) and BVCA (2014). This research study used the definition by British Venture Capital Association (BVCA).

According to BVCA (2014, p. 6) “Private equity is medium to long-term finance provided in return for an equity stake in potentially high growth unquoted companies.”

### 2.2.2 Private Equity Characteristics

PE investments are illiquid in nature. The investments require long-term commitment from investors and place restrictions on withdrawals to the fund. On average, the returns on PE investments show greater dispersion than public equities investments as the risk of complete loss of investment is higher. PE investors target higher rates of returns as compensation for the risk and illiquidity (Maginn, Tuttle, McLeavey, & Pinto, 2007).

Further to these characteristics, Huss and Zimmermann (2005) included that minimum capital commitments are required and while these amounts differ from fund to fund, they can easily reach a material fraction of an investor's wealth. The PE market is not transparent and there is limited public information as information is mainly shared between limited partners. There is no organised market to trade PE fund shares.

### 2.2.3 Private equity investments

Engaging in PE can be done either by a direct investment or by an investment through a fund.

Direct investing refers to investors who are responsible for the entire investment process by participating in privately placed offerings. This might not be very time consuming or costly, however it requires experience and intensive relationships in the PE market. Asymmetric relationships between investors and entrepreneurs and the knowledge about the actual conditions of their firms and the market can pose some difficulties (Huss & Zimmermann, 2005). PE investments through a fund are described in the next section and these investments are a core focus of this study.

### 2.2.4 Structure of Private Equity Firms

According to Kaplan and Strömberg (2008), PE firms are structured as limited partnerships and are governed by a limited partnership agreement between the fund manager (General Partner (GP)) and the fund's investors (Limited Partners (LP's)). PE firms raise capital through private equity funds. The PE fund structure is depicted in Figure 1. According to Fraser-Sampson (2011), a Limited Partnership can comprise of any number of LPs, who do not take part in the business and have limited liability, which is limited to the amount of their committed capital. At least one GP, who has unlimited liability and effectively makes the necessary decisions and takes actions is required to manage the business. It is important for the GP to invest at least 1% of the total capital required to the fund (Kaplan & Strömberg, 2008). Once investors commit funds to the private equity managers, these managers draw on investor's

commitments and deploy these funds into various portfolio companies. The PE firm generally takes five years to invest the capital committed by the LPs. Ljungqvist and Richardson (2003) stated that 90% of LP capital is normally invested in approximately the first six years. A PE fund is a closed-end fund with a term of between 10 and 12 years and generally, has the option of two annual extensions. It is vital for the GP to plan the exit route of these investments as the exit strategy provides the most critical mechanism to unlock value in PE.

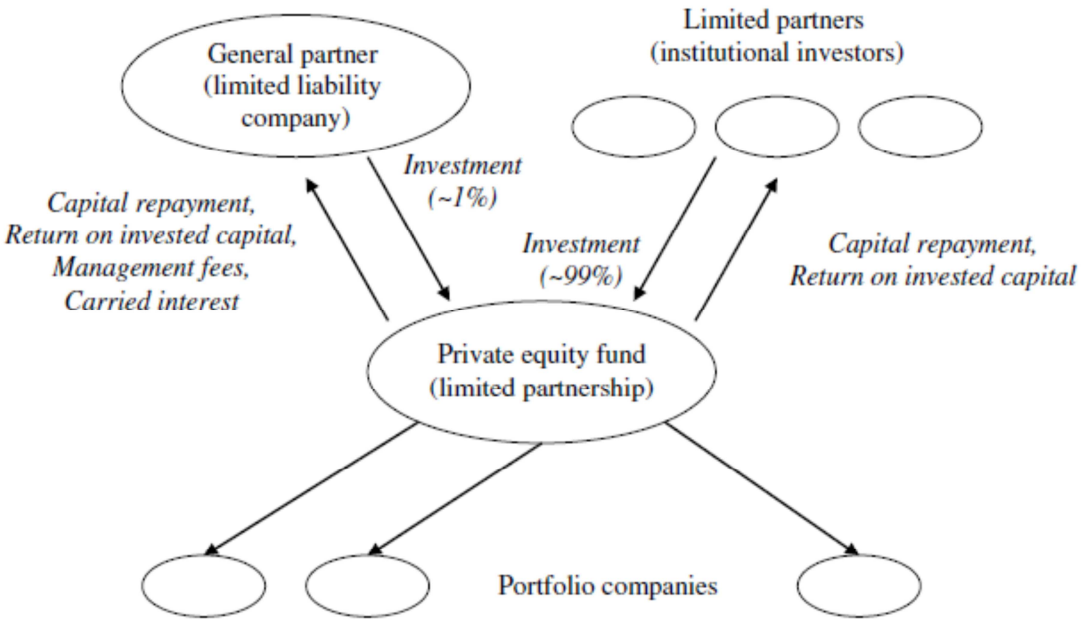


**Figure 1: PE Fund Structure (Mathonet & Meyer, 2008)**

GPs are compensated through management fees and carried interest. Management fees are based on a percentage of LP's committed funds and are a small portion of the GP's total compensation. The largest portions of the GP's compensation are linked to performance through carried interest. Carried interest refers to profits that are gained through a realisation of the fund. The PE fund follows a J-curve as shown in Figure 2. The returns in early years of the fund's life are negative as LP funds are drawn down for investment into portfolio companies and management fees. As the fund becomes fully invested and early investments mature and are realised, positive cash flows begin to dominate, shifting the curve upward (Murphy, 2006).

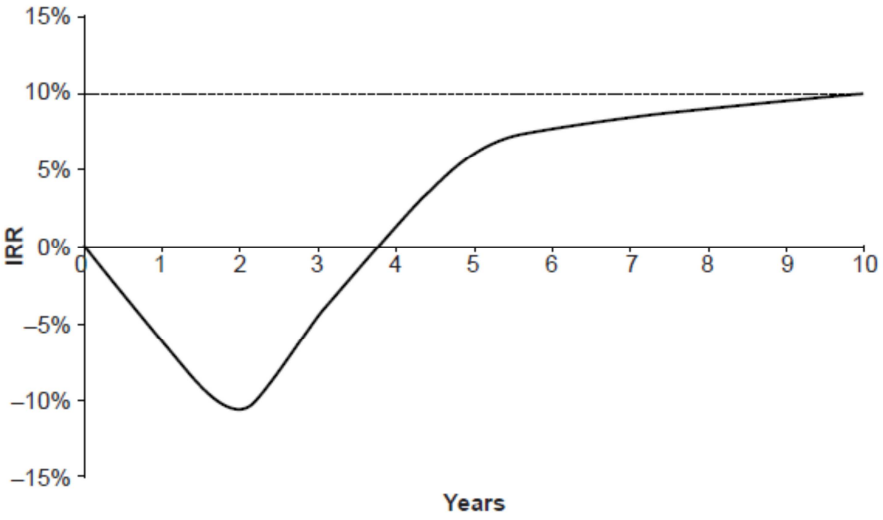


**Figure 2: J Curve (Mathonet & Meyer, 2008)**

### 2.2.5 Private Equity Investment Stages

The life cycle phase of the target company determines the category of the PE investment, as depicted in Figure 3 below.

| Private equity category | Stage of business development | Typical application |
|---|---|---|
| Venture capital | Seed capital | Funding for research, evaluation and development of a concept or business before the business starts trading. |
| | Start-up and early stage | Funding for new companies being set up or for the development of those which have been in business for a short time (one to three years). |
| Development capital | Expansion and development | Funding for growth and expansion of a company which is breaking even or trading profitably. |
| Buy-out | Leveraged buy-out or buy-in | Funding to enable a management team or empowerment partner, either existing or new, and their backers to acquire a business from the existing owners, whether a family, conglomerate or other. Unlike venture and development capital, the proceeds of a buy-out generally go to the previous owners of the entity. Buy-outs are often leveraged. |
| | Replacement capital | Funding for the purchase of existing shares in a company from other shareholders, whether individuals, other venture-backers or the public through the stock market. Unlike venture and development capital, the proceeds of replacement capital transactions are generally paid to the previous owners of the entity. |

**Figure 3: Investment stages in Private equity (KPMG & SAVCA, 2011)**

According to Anson, Chambers, Black, and Kazemi (2012), venture capital (VC) involves equity investments in start-up companies that are unable to attract capital from traditional sources, such as banks, as a result of the start-ups

having negative cash flows for the first few years. A leveraged buyout (LBO) is a way for an investor or group thereof to take a public company private by purchasing all of the outstanding shares. The research that follows focuses mainly on VC and buyout funds.

### 2.2.6 Global Private Equity Market

According to an industry report by Bain & Company (2015), exits from investments in 2014 have consecutively increased for the fourth year as represented in Figure 4. Distributions to LPs have been greater than capital draws from them. LPs are considering maintaining or increasing their coverage to their premier returning asset class. This has contributed to another strong year for fund-raising. Best performing fund managers have attracted new capital quickly, as significant sums of money pursued the same top performing managers. Towards the end of 2014, newly committed funds reached an international high of $1.2 trillion. In the Asia-Pacific region, exits increased by a phenomenal 120% to $105 billion. These increases continued in Europe where exits increased by 104% to $173 billion. In North America, buyouts rose 34% to $214 billion.

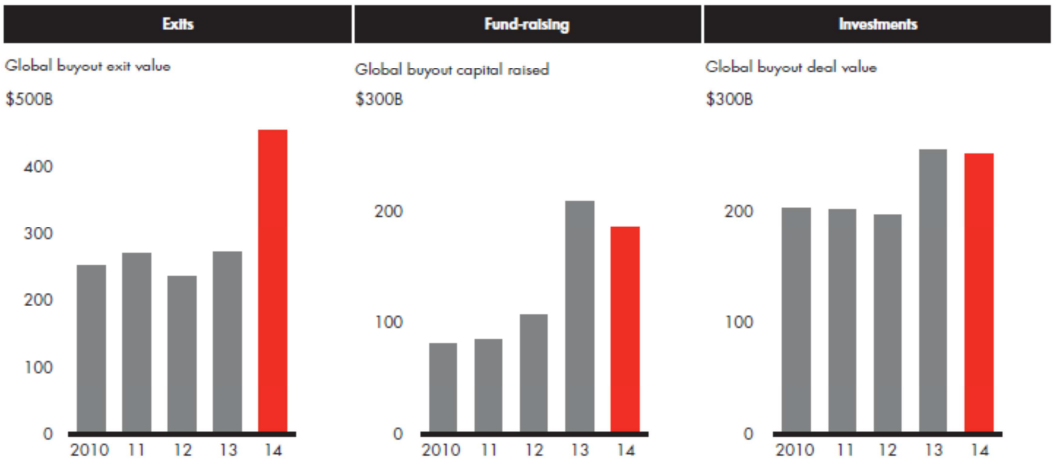


**Figure 4: 2014 Exits, Fundraising and Investments (Bain & Company, 2015)**

In 2014 global PE fundraising declined by 6% due to the characteristics of the funds in the market rather than as a symbol of weakness, this is apparent in

Figure 5. There was only one deal exceeding $10 billion that closed in 2014, compared to five in 2013. Distributions increased in 2014 and LPs were churning these distributions into newly raised funds (Bain & Company, 2015).

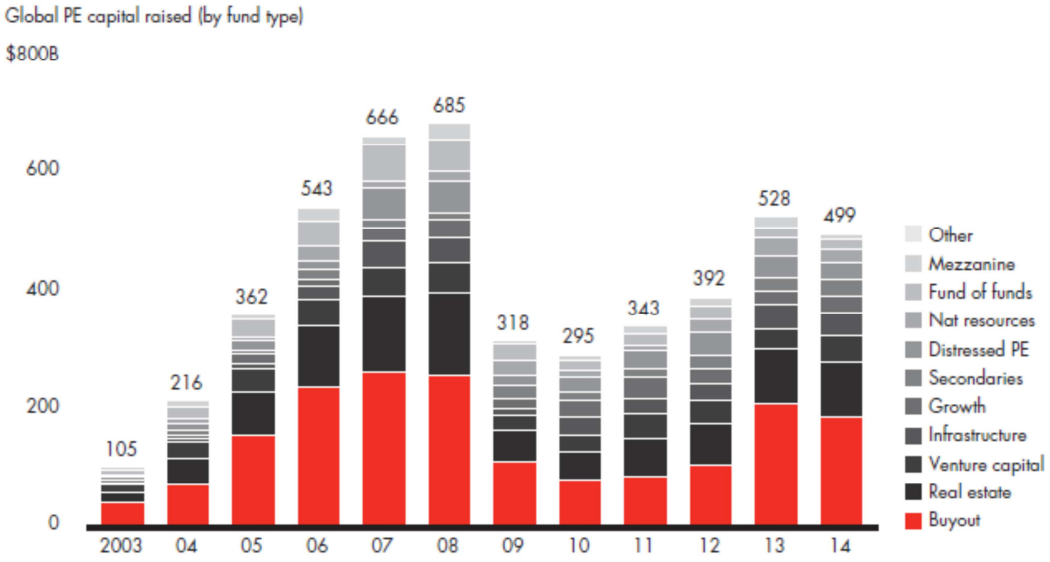


**Figure 5: 2014 Global Fundraising (Bain & Company, 2015)**

### 2.2.7 Private Equity Market in China

Fundraising increased during 2014, with $30.4 billion raised by funds focused on the country. This signified an increase of 15.7% from the $26.2 billion raised in 2013 (EY, 2014a).

### 2.2.8 Private Equity Market in Africa

According to EY (2014b), LPs looked to Africa for their vast opportunities. Fundraising within Africa was high in 2014, increasing by 24% to $4.1 billion from $3.3 billion the previous year. The increase in fundraising came at a time where many investors were shifting their focus back to developed markets. This confirmed that investors believed in the potential within Africa. Fundraising for African opportunities has increased for two consecutive years.

The drivers of the increase in fundraising were mainly attributable to “rising middle class, demographic growth and low PE penetration” (EY, 2014b, p. 9). As a result, investors have looked to Africa as a long-term investment destination as the PE industry continues to flourish and reach maturity.

According to an industry survey done by Deloitte (2015), respondents from East and West Africa said their first choice of fundraising would come from LPs in the UK, followed by the US. This could provide a great prospect for South African LPs.

### 2.2.9 Private Equity Market in South Africa

According to KPMG and SAVCA (2014), PE fund managers include independent as well as captive managers. The independent managers manage funds on behalf of third parties while the captives manage on balance sheet money that is generally funded by the parent company or a group.

Figure 6 illustrates the PE industry in South Africa. It has seen funds under management increase at a compound annual growth rate of 11.8% since 1999. As at 31 December 2013, the South African PE industry had R162.2 billion in funds under management, representing an increase of 16.9% from R138.8 billion (KPMG & SAVCA, 2014).

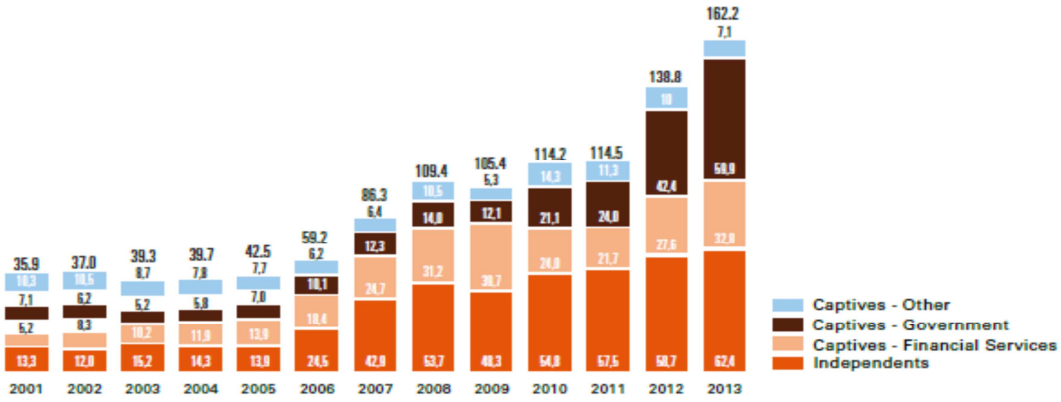


**Figure 6: Composition of total funds under management (KPMG & SAVCA, 2014)**

According to KPMG and SAVCA (2014), although being smaller in comparison to the US and UK, the South African PE industry is well established. South African investment activity as a percentage of GDP has increased from 0.11% in 2012 to 0.13% in 2013. As represented in Figure 7, South Africa ranks ahead of China and Russia, but remains behind Brazil and India. Israel currently leads followed by the US and then the UK.

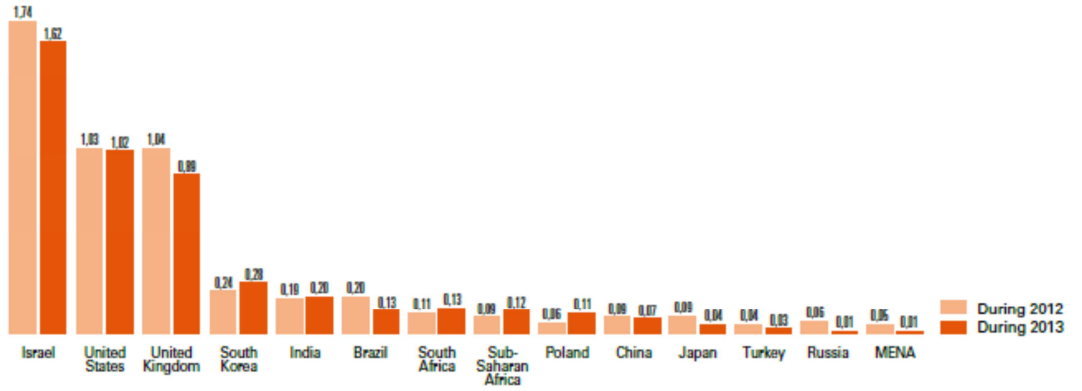


**Figure 7: Private equity annual investment by independents as a percentage of GDP (KPMG & SAVCA, 2014)**

Figure 8 shows that pension fund commitments in South Africa have increased from R8.6 billion in 2012 to R23.3 billion in 2013. This represents an increase of more than 150%.

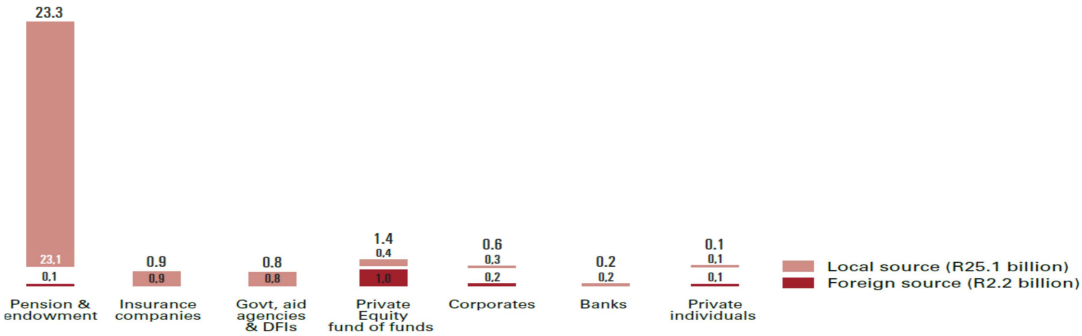


**Figure 8: Source of third party funds raised during 2013 (R billion) (KPMG & SAVCA, 2014)**

This is clear confirmation of the appetite for investments into PE by pension funds in SA.

## 2.3 Performance Measures in Literature Review

### 2.3.1 Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) also known as money-weighted rate of return is defined as the growth rate that links the ending value of the account to its beginning value plus all intermediate cash flows.

$$\sum_{i=0}^{n} \frac{CF_i}{(1+IRR)^i} + \frac{RV_n}{(1+IRR)^n} = 0$$

IRR : Internal Rate of Return

$CF_i$ : Net Cash Flow to the Fund

$RV_n$ : Residual Value

**Equation 1: IRR**

### 2.3.2 Total Value to Paid-in Capital (TVPI) multiple

Ang and Sorensen (2011) refer to TVPI being another performance measure, which is less prone to manipulation than the IRR. They further calculate TVPI as: “The total amount of capital returned to the LP investors (net of fees) divided by the total amount invested” (Ang & Sorensen, 2011, p. 16).

$$TVPI = \frac{\sum Dist(t)}{\sum Call(t)}$$

**Equation 2: TVPI**

### 2.3.3 Public Market Equivalent (PME)

Public Market Equivalent (PME) is an alternative measure to assess investment performance of PE relative to public benchmarks.

Ang and Sorensen (2011, p. 17) calculates PME as: “The ratio of the discounted value of the LPs’ inflows divided by the discounted value of outflows, with the discounting performed using realised market returns.”

$$PME_i = -\frac{\sum_{t-o}^{T}(CFO_{ti} * \prod_{n-o}^{t}(1 + r_{bn})^{-1}}{\sum_{t-o}^{T}(CFOI_{ti} * \prod_{n-o}^{t}(1 + r_{bn})^{-1}}$$

$CFO_{ti}$ : Cash Outflow of investment i in period t

$CFO_{ti}$ : Cash Inflow of investment i in period t

$r_{bn}$ : total return benchmark b in period n

**Equation 3: PME**

## 2.4 Performance of Private Equity

There have been many studies done on PE returns. From these studies, which are summarised below, there appears to be differing views on the asset class. Gompers and Lerner (1997) were the pioneers to analyse PE funds relative to public equity.

Fund level studies were conducted by Ennis and Sebastian (2005); Gompers and Lerner (1997); Harris et al. (2014, 2015); Higson and Stucke (2012); Jones and Rhodes-Kropf (2003); Kaplan and Schoar (2005); Ljungqvist and Richardson (2003); Missankov et al. (2008); Phalippou and Gottschalg (2009); Phalippou and Zollo (2005); Robinson and Sensoy (2013).

Studies which underperformed public markets were confirmed by research from Ennis and Sebastian (2005); Phalippou and Gottschalg (2009); Phalippou and Zollo (2005).

Studies where PE outperformed public markets included the works of Gompers and Lerner (1997); Harris et al. (2014, 2015); Higson and Stucke (2012); Jones and Rhodes-Kropf (2003); Ljungqvist and Richardson (2003); Missankov et al. (2008); Robinson and Sensoy (2013);.

Kaplan and Schoar (2005) found that there was no outperformance for investing in PE.

The details of the abovementioned studies are summarised below.

**Harris et al. (2015)** found that buyout funds outperformed public markets, particularly the S&P 500, net of fees and carried interest, in the 1980s, 1990s, and 2000s. The study comprised over 1,800 North American buyout and VC funds. This data is of high-quality fund level cash flows sourced by Burgiss from nearly 300 PE fund investors. The study revealed that the average buyout performance appears similar between Europe and North America and buyout funds have historically outperformed public markets. The dataset consisted of funds formed between 1984 and 2010. In total the data sourced for over 1,800 North American funds: 781 buyout funds and 1,085 VC funds. The information obtained from more than 300 European funds was analysed separately. It was found that VC funds performed better than public equities considerably until the vintages of the late 1990s, when a period of underperformance ensued. Only in the last few vintage years has VC performance appeared to rebound though not to the strong levels initially exhibited in the early 1990s.

**Harris et al. (2014)** found returns exceeding the S&P on average by 3% per year. Using Burgiss' new research quality cash flow data, the data confirmed that buyout funds in the US exceeded public markets since 1984. On average the outperformance over the S&P 500 was between 20% and 27%. The outperformance of buyout funds was comparable to the NASDAQ index. When compared to the small cap Russell 2000 index, it was slightly lower but still positive. The sample comprised of 1373 funds including buyout and VC funds, all focused on North America.

**Robinson and Sensoy (2013)** found buyouts to outperform the S&P 500 on a net of fee basis by 15%. They also found that returns on PE investments were correlated with changes in broad market conditions. They claim the individual LP invested similar to an index fund. The investor had a preference for buyout funds. During 1984 to 2010, there were a total of 837 VC and buyout funds in this specific sample. Their sample was 34.4% of the TVE universe of total capital committed to U.S. VC and buyout funds, and 55.7% of that committed to U.S. buyout funds, during the same time period. The authors calculated the PME.

**Higson and Stucke (2012)** found returns outperformed the S&P 500 with buyout funds since 1980. They also found that funds which were liquidated over performed by 4.5% per year. The returns were measured in money multiples as opposed to IRR.

**Stucke (2011)** compellingly demonstrated that TVE had not updated the cash flows as well as the NAVs for several funds. According to this study it appears that many funds stopped reporting data in 2001 but contrary to removing them from the database, their NAVs were always rolled to the next observation period. As a result, calculations done by **Phalippou and Gottschalg (2009)** understated the returns for numerous funds even when they used stated NAVs.

**Phalippou and Gottschalg (2009)** used a modernised version of the dataset used by **Kaplan and Schoar (2005)** which was comprised of 852 mature funds for which the cash-flows were available. They suggested previous research had overstated performance mainly due to inflated accounting valuation of investments and bias towards better performing funds. Once adjusted, they found that on average, the net of fees performance was 3% lower per year compared to S&P 500. The beta was found to be 1.3.

**Missankov et al. (2008)** completed a study of 11 funds in their study. They found that PE outperformed SA listed equities by 18% p.a. for the 13 year period ending on 31 March 2006. The study also found the volatility of returns to be 22.4%.

**Phalippou and Zollo (2005)** concluded an underperformance of 3.3% per annum in comparison to the S&P 500. They studied a sample of 2844 funds raised between 1980 and 1996. The sample studied generated an IRR of 12.44%. They concluded that investing in PE equally requires skill.

**Ennis and Sebastian (2005)** used VC and buyout data in their study and concluded the median returns underperformed listed US equities. They used the Wilshire 5000 index as a proxy for the US equities. A correlation of 0.9 was found with the index.

**Kaplan and Schoar (2005)** found the average fund returns after fees roughly equivalent to the S&P 500. They used the IRR and PME approach. They studied the returns of 746 funds from 1980 to 2001 using datasets of individual fund returns collected through TVE. They found large differences in fund returns. VC funds outperformed public equities on a capital-weighted basis, but marginally underperformed on an equal-weighted basis. They found that an increase in experience contributed to improving returns and that returns of reputable funds were less impacted by business cycles versus new entrants. Approximately 78% of the funds in the sample were VC funds while 22% were buyout funds. The data from the TVE service relied on self-reported statistics (which could possibly have led to selection bias) and also observed both realised and unrealised investments which could misrepresent the data set.

**Jones and Rhodes-Kropf (2003)** found excess gross returns for buyout and VC investments. The sample consisted of 1,245 VC and PE funds in the TVE database that were formed between 1980 and 1999. The following returns were achieved, annualised equal-weighted IRR of 16.38% across all funds, 19.25% for VC and 9.67% for buyout funds, annualised value-weighted IRR of 9.18% across all funds, 19.31% for VC and 4.57% for buyout funds.

**Ljungqvist and Richardson (2003)** found funds to outperform the equity market. The sample used included 19 VC funds and 54 buyout funds. The funds were raised between 1981 and 1993. They found excess returns of close to 6% per annum for the S&P 500 and 8% for the NASDAQ. They attributed these returns to the extreme illiquidity of PE which should compensate investors for taking risk. In the dataset, 28.9% of funds were first-time funds, 20.6% were second funds, 11.6% were third funds, and the remaining 39% were later funds. Of the funds that were based in the US, 91.1% were represented while the remainder were based in Europe and Latin America. All funds on average, experienced IRRs of 19.8%. IRR averages of 14.08% for VC funds and 21.83% for buyout funds. The equity beta for the average buyout fund in their sample was 1.08.

**Gompers and Lerner (1997)** found that PE outperformed public equities by 8% p.a. Their study focused on a single VC firms returns covering the 16-year

period, ending 1977. They found an average performance of 30.5% p.a. with a beta of 1.4 and standard deviation of 32%.

VC studies were done by Cochrane (2005) and Moskowitz and Vissing-Jorgensen (2002). Cochrane (2005) found outperformance while the study of Moskowitz and Vissing-Jorgensen (2002) found a flat performance.

**Cochrane (2005)** compared the VC returns to the S&P 500 and found it to outperform by 22% p.a. with a beta of 0.5. He compared the same returns with the NASDAQ to find outperformance of 45% p.a. with a beta of 1.5. He found later stage investments to be more stable than early stage investments.

**Moskowitz and Vissing-Jorgensen (2002)** studied the return of entrepreneurial investment in non-public companies. They found that PE funds performances were very close to public market returns, despite their lack of diversification.

Fees charged by a GP can have a significant impact on PE returns. A study done by Missankov et al. (2008) revealed that these returns can be impacted by up to 13.7% p.a. Phalippou (2007) and Swensen (2000) estimated the fees to have a negative return of between approximately 7% and 12% per annum respectively. Phalippou (2007) attributed the low performance to learning, mispricing, side benefits and conspiracy theory. These elements are briefly discussed below.

According to Phalippou (2007), managing PE investments requires skill as GPs are actively involved in making strategic decisions. Kaplan and Schoar (2005) found managers with experience offer their LPs higher performance. They also found that GPs who have been successful in the past, have their funds being quickly oversubscribed by prior investors who have preference. The differences in skill largely affect return performance. Froland (2005) found that selecting good managers enhances alpha for the investor. Froland (2008) found that investors need to target the top-performing managers to be effective as the difference in performance between top quartile managers and bottom quartile managers is significantly larger than in public equity markets.

According to Phalippou (2007), the side benefits refer to investors who may not be invested with the objective of maximising returns. They could be invested to stimulate the economy. Such investors include pension funds with a developmental objective in their mandate. Ljungqvist and Richardson (2003) found a similar view and found that some LPs may invest with the GP for the purpose of other business interests.

Phalippou (2007) also alluded to the fact that investors could have mispriced the asset class as a result of lack of skill. The investors generally analysed gross returns and do not consider the fees charged by GPs which could have a significant impact as mentioned above.

Finally Phalippou (2007), mentioned conspiracy theory, where stale residual values lead to reported figures which are overstated. Managers handling the PE portfolio of the LP are content to receive overstated performance figures from the GPs since their incentives and salaries are usually tied to the performance of the asset class under their management. The GPs are also happy with this arrangement since they can then charge higher fees, which are a concern for the industry and could pose a threat.

### 2.4.1 Correlations and asset allocation of Private Equity

Studies were done by Bekkers, Doeswijk, and Lam (2009), Idzorek (2007), Ennis and Sebastian (2005), and Missankov et al. (2008). These studies found correlations of PE to the public market to be 0.76, 0.7, 0.9 and 0.05 respectively. Froland (2005) also conducted a study and found a correlation of 0.91 to the S&P 500, and 0.84 to the NASDAQ indices. Anson et al. (2012) reported correlations of VC and buyouts to the S&P 500 of 0.39 and 0.79 respectively.

SAA creates an asset mix which provides an optimal balance between expected risk and return for a long-term investment horizon. Tactical asset allocation is the result of active management wherein managers deviate from the strategic asset allocation to take advantage of any perceived short-term opportunities in the market.

Chemla (2004) found pension funds slowly moving to PE as traditional assets were not providing returns. The study found US pension funds invest more in PE than Canadian pension funds. On average pension funds over $10 billion invested 6.6% of their portfolio in PE and under $10 billion invested 4.5% of their portfolio in PE. Canadian pensions found the asset class was complicated and difficult to evaluate. The study also found pooled vehicles such as fund of funds encouraging to smaller pension investors. Chemla (2004) also found the Canadian market to be underdeveloped. Further, Chemla (2004) also found that among the funds that invest in PE, the small funds invest more in VC.

Ibbotson and Kaplan (2000) and Brinson, Singer, and Beebower (1991), showed that SAA of pension funds accounted for over 90% in fund returns.

Ennis and Sebastian (2005) found that diversification benefits of PE occurred primarily in equity portfolios. They further found that PE received an allocation in efficient portfolios when the equity allocation was greater or equivalent to 60%. Portfolios with 100% equity assigned 5% to PE. Portfolio allocations up to 10% are only appropriate for equity-oriented funds that are moderately sized, with PE investment skills and staff resources, and with support from a knowledgeable board.

Regarding the distribution of asset allocation, pension funds that do not allocate to PE generally have a higher allocation to equities (López-Villavicencio & Rigot, 2013). Canadian pension funds do not succeed in selecting the best PE funds nor are they good in monitoring them. This does not seem to be the case for US pension funds, as these registered the highest return in PE allocation with the lowest cost. This was probably why they were encouraged to allocate more to PE. This means that larger and less concentrated funds have a higher probability of investing in PE. For pension funds, PE investments may enhance long-term asset-liability management, thereby providing a way to diversify portfolios and to reach higher performance. Moreover, they may have a more general benefit for the economy. They can be seen as long-term investment because they undertake investment in real companies, supplying equity at different stages of their evolution with different structures of funding.

According to Talmor and Vasvari (2014), pension fund allocations to PE has been steadily growing over the past eight years. Allocations to the asset class have almost doubled since 2005 to 8%. The study found a strong negative relationship between PE and listed equity and a strong positive relationship between real estate and PE. The study also found that smaller North American pension funds invest more in PE fund of funds.

Ashiagbor et al. (2014) found the average pension fund allocation to alternative assets, including real estate and PE, to be 20% in the USA, 28% in Switzerland, and 25% in Australia. The three largest PE investors in the USA were the Washington State Investment Board, the California Public Employees' Retirement System and the California State Teachers Retirement System with target allocation to PE of 23%, 13% and 14% respectively.

### 2.4.2 Pension Fund Regulation

Regulation 28 of the Pension Fund Act of 1956 sets the legal and regulatory framework for pension funds in South Africa. The regulation sets maximum asset limit exposure. These limits will assist trustees in portfolio diversification as well as safeguard them not to invest in single asset class. The revision of Regulation 28 in July 2011 allowed retirement funds to invest up to 10% of Assets under Management (AUM) in PE. The previous guideline allowed 5% for all alternative asset classes. The key limitations of Regulation 28 are as follows:

- Up to 15% may be invested in hedge funds and PE funds
- Up to 75% may be invested in equities
- Up to 25% may be invested in listed property
- Up to 25% may be invested in immovable property
- Up to 25% may be invested offshore
- Up to 10% may be invested commodities

According to Davis and Hu (2009), the quantitative limits are put in place to ensure that the less risky assets will better protect the pensions of participants. This is confirmed by Pfau (2011).

The positive to Regulation 28 is that they prevent investment in one asset class.

While the South African government has enforced these limits on certain asset classes to guard investors, they may also prevent the fund from trying to achieve its optimal asset allocation. Regulation 28 does not prevent investment into high risk investments.

### 2.4.3 South African Pension Funds overview

Section (36(1)(bB)) of the Pension Funds Act of 1956 sets prudential guidelines for pension fund investors. The act defines a pension fund as:

“Any business carried on under a scheme or arrangement established with the object of providing annuities or sum payments for persons who belong or belonged to the class of persons for whose benefit that scheme or arrangement has been established, when they reach their retirement dates or for dependants of such persons upon the death of those persons.”

The main objective of a pension fund is to provide retirement income security for the remaining life of the plan member. The board of trustees of a pension fund establishes the SAA among the major asset classes.

Pension funds are usually managed by a financial intermediary for the company and its employees, although some larger corporations and government institutions operate their pension funds in-house. Pension funds are the largest institutional investors in most countries and dominate stock markets where they invest. The largest pension fund in South Africa is the Government Employees’ Pension Fund (GEPF). It has more than R1 trillion in assets under management with a membership of more than 1.2 million (GEPF, 2015).

## 2.5 Conclusion of Literature Review

The extreme illiquidity of PE should compensate investors for taking risk. Buyout funds and VC funds have been shown to be riskier than public equity. As a result of this, LPs demand a return premium.

“Although many investors may feel confident that they understand the risks of traditional asset classes, it is important that they keep in mind the aspects of risk in private equity that are unique” (Phalippou, 2010, p. 50).

Over the past decade, the funds raised by PE funds have been increasing steadily. Fund managers continuously seek growth opportunities in the market. Studies done by researchers have provided mixed results when comparing the performance of PE to public equities. International research studies have been done and one study has been done in South Africa. The research in SA did not include performance post the credit crisis. This research attempts to fill this gap.

An increase in skill and experience directly contributes to improving returns. Returns of reputable funds are less impacted by business cycles versus new entrants. If a GP was successful in the past, they find their new funds raised being oversubscribed. Fees charged by the GP can have a huge impact on returns. Differences in returns can be up to 13.7%. Investors need to be cognisant of how fees impact returns.

The correlations of the asset class provide the benefit for diversification in an investor’s portfolio. Asset allocation to the asset class has been increasing over the years as LPs and GPs become more knowledgeable about the asset class.

Selecting the right fund manager is critical to success in PE markets and enhances alpha for the investor.

Institutional investors should invest large proportions to the asset class if they have access to the best GPs.

“Only moderate-size, equity-oriented funds with exceptional PE investment skill, strong board-level support, and adequate staff resources should consider allocations as large as 10%”(Ennis & Sebastian, 2005, p. 86).

Ibbotson (2007) and Ennis and Sebastian (2005) both found that PE should only receive an allocation to portfolios with high risk-bearing capabilities and strong emphasis on equity assets.

### 2.5.1 Research Question 1:

Would it be beneficial to invest in South African private equity from 1 January 2002 to 31 December 2015 in terms of risk, returns, correlations and Sharpe ratios?

### 2.5.2 Research Question 2:

Considering Regulation 28, would it be beneficial for pension funds to allocate funds to private equity in SA over the period 1 January 2002 to 31 December 2015?

# CHAPTER 3: RESEARCH METHODOLOGY

An outline of the research methodology is defined in this chapter. An in-depth review of the research design is explained, followed by the indices to be included in the population, and details of the sample characteristics are delineated. An overview of the research instrument is provided. Thereafter the detail of the procedure to obtain data and the analysis and interpretation of this data is described. This chapter is concluded by stating the limitations of the study and considering the validity and reliability of the analysis.

## 3.1 Research methodology/paradigm

A quantitative methodology was used to address both research questions. According to Albright, Winston, and Zappe (2010), in order to uncover large amounts of data, a more precise approach is required to uncover valuable information. The nature of this research and research problems necessitate the statistical measure of returns over time.

(Creswell, 2013) described the quantitative approach as the methodology that gathers data on predetermined instruments that yield statistical data. A quantitative approach is therefore considered the appropriate methodology for the proposed study.

## 3.2 Research Design

For both research questions, mathematical modelling using Microsoft Excel was used. With regard to the first research question posed, the question was answered by using an approach described by Missankov et al. (2008). An aggregate portfolio was created by PE fund data collected. It is appropriate as there is no PE index in SA. The index can be compared to the likes of TVE which is a database in which PE funds report.

With regard to the second research question, the researcher used Markowitz and Mean Variance Optimisation as discussed in Section 3.6. The methodologies are used by Ennis and Sebastian (2005); Ibbotson and Kaplan (2000); Missankov et al. (2008) and are consistent.

## 3.3 Population and sample

### 3.3.1 Population

The population for the research were all independent PE funds raised in South Africa from 1 January 2002 to 31 December 2015. The PE funds were affiliated with SAVCA.

The following indices data in Table 1 were also included in the population for the same period:

**Table 1: Index data**

| Index | Description of index |
|---|---|
| FTSE/JSE Africa All Share Index | South African listed equities |
| FTSE/JSE Mid Cap Share Index | South African listed mid cap equities |
| FTSE/JSE Africa Small Cap Equity Index | South African listed small cap equities |
| All Bond Index | South African bonds |
| FTSE/JSE Real Estate Index and Property Loan Stock Index | South African property |
| Alexander Forbes Short-Term Fixed-Interest Index (STeFI) | South African money market |
| MSCI World Index | Global equities |
| JP Morgan Global Government Bond Index | Global bonds |

### 3.3.2 Sample and Sampling Method

All indices data that was collected formed part of the sample for the period 1 January 2002 to 31 December 2015. The data was secondary data.

The researcher obtained 11 PE funds data for the same period. Only companies affiliated to the SAVCA were considered. The data was secondary data.

## 3.4 The research instrument

With regard to Research Question 1, data for PE funds was sourced through data collection. These were used with index data collected from I-NET Bridge and Bloomberg. PE Funds were used to create an aggregate portfolio.

With regard to Research Question 2, a Microsoft Excel-based mathematical model was used and thereafter the information was used to perform an analysis using the statistical methods. In particular this was used to determine the mean variance efficient frontier described by Markowitz (1952).

## 3.5 Procedure for Data Collection

PE Funds data were sourced directly from PE firms as well as third party providers such as Riscura.

The indices data were sourced from Bloomberg and I-NET Bridge.

## 3.6 Data Analysis and Interpretation

For Research Question 1, the absolute returns and annualised standard deviations were calculated for each PE fund to 31 December 2015. An aggregate portfolio of PE funds was created for the period 1 January 2002 to 31 December 2015 with the fund data received. Funds were analysed according to their vintage year. Funds were calculated gross of fees and net of fees. The Sharpe ratios as well as correlations with other indices were calculated.

Sharpe (1992) calculated the Sharpe ratio as

$$SR \equiv \frac{\mu - R_f}{\sigma}$$

**Equation 4: Sharpe Ratio**

The Sharpe Ratio is equivalent to excess expected return to the standard deviation of return where Rf is the risk free rate of interest.

The data collected from I-Net Bridge and Bloomberg was compared to the aggregate portfolio.

For Research Question 2, mean variance optimisation for the different asset classes in the portfolio was conducted. No short selling was allowed. Four optimisations were completed and all optimisations had the requirement for asset weights to be positive. The first optimisation had no limits and had no allocation to PE. The second optimisation also had no limits and had an unlimited allocation to PE. The third and fourth optimisations used constraints in their asset allocations as follows:

- SA Equity: 25% to 75%
- SA Bonds: 10% to 75%
- SA Property: 0% to 25%
- SA Cash: 0% to 10%
- Foreign Equity: 0% to 25%
- Foreign Bonds: 0% to 25%

The above constraints were adapted from (Alexander Forbes, 2013).

The third optimisation did not allow an allocation to PE and the fourth allowed an allocation to PE up to the Regulation 28 limit of 10%.

### 3.6.1 Markowitz and Mean Variance Optimisation

This section describes the researcher's approach for considering whether the pension funds in South Africa may benefit from including PE in their asset allocation.

Markowitz (1952) was instrumental in the development of Modern Portfolio theory. The theory assumes markets are efficient and agents in the market are risk averse. If presented with two identical portfolios with similar returns, agents will select the one with the least risk. The model aims to find the diverse

portfolio that minimises risk measured by standard deviation and maximises return.

Markowitz (1952) formed the basis for mean-variance optimisation. An investor can diversify and reduce risk of a portfolio by adding assets with correlations lower than 1. The main drawbacks within the assumptions are that investors are rational and risk averse meaning an investor will maximise return given the level of risk and choose the portfolio with less risk.

Figure 9 demonstrates the calculation of the expected return and portfolio variance.

- Expected return for a portfolio is defined as:

  $$\mathrm{E}(R_p) = \sum_i w_i \, \mathrm{E}(R_i)$$

  where $R_p$ is the return on the portfolio, $R_i$ is the return on asset $i$ and $w_i$ is the weighting of component asset $i$ (that is, the proportion of asset "i" in the portfolio).

The expected return for a portfolio is the sum of the product of each individual asset and their expected returns.

- Portfolio return variance:

  $$\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq i} w_i w_j \sigma_i \sigma_j \rho_{ij},$$

  where $\rho_{ij}$ is the correlation coefficient between the returns on assets $i$ and $j$. Alternatively the expression can be written as:

  $$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_i \sigma_j \rho_{ij}$$

  where $\rho_{ij} = 1$ for $i=j$.

- Portfolio return volatility (standard deviation):

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

**Figure 9: Calculation of Expected Return and Portfolio Variance**

According to Mangram (2013, p. 66), the efficient frontier “represents the best combination of asset classes within an investment portfolio. The portfolios that lie along the efficient frontier have the highest expected return for a given level of risk. “

Mangram (2013) further indicates that all investors are rational and would invest in portfolios that lie along the efficient frontier as depicted in Figure 10.

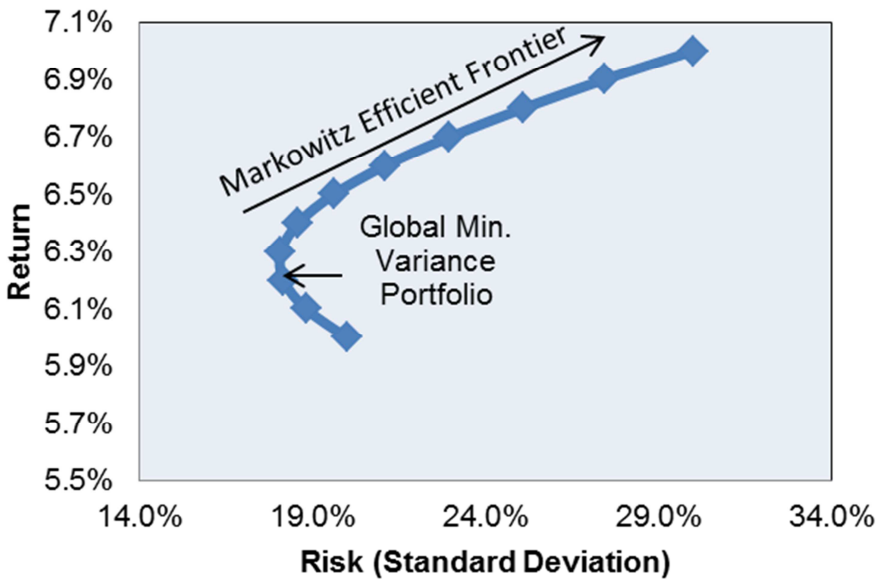


**Figure 10: Markowitz Efficient Frontier**

## 3.7 Limitations of the study

- Survivorship bias: Only funds which survive in the index were counted.
- Sample size bias: Inferring that the sample size is representative of the population.
- Assumes markets are efficient and investors are rational.
- Only investors in PE funds receive the performance data.
- The incomparability of listed asset classes versus PE owing to liquidity constraints of PE instruments.
- The optimisations were backward looking and assumed returns and risk were consistent into forward looking estimates.
- Valuations of PE investments are infrequent.

## 3.8 Validity and Reliability

Leedy and Ormrod (2001) described the validity of an instrument as the extent to which it measured was supposed to measure. Reliability is described as the accuracy and consistency with which the measuring instrument produced results.

### 3.8.1 External validity

According to Bryman (2012) external validity is defined as the extent that conclusions from specific study can be a representation from a study to a larger population. The techniques used included computing returns, standard deviations and correlations are well as established methods, hence external validity was apparent.

### 3.8.2 Internal validity

According to Bryman (2012) internal validity refers to extent that the finding between two or more variables is sound. If the availability of data is limited, internal validity is maintained by taking a sample representative of the population. The data is analysed and the conclusions drawn are extrapolated to the population under investigation.

### 3.8.3 Reliability

According to Bryman (2012), reliability is an indication of the stability of a measure of a concept. Numerous reliability checks on various data to be used were implemented.

# CHAPTER 4: PRESENTATION OF RESULTS

## 4.1 Introduction

This chapter presents the results obtained following the use of the research methodology and data analysis approaches as described Chapter 3.

## 4.2 Results pertaining to Research Question 1

**Table 2: Fund returns versus other asset classes**

| Fund Name | Vintage Year | No of Months | Fund Returns | SA Equity | SA Cash | Foreign Bonds | Foreign Equity | Mid Cap Equity | SA Bonds | SA Property | Small Cap Equity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fund 1 | 2007 | 91 | 17.75% | 8.02% | 7.20% | 9.71% | 0.91% | 10.55% | 0.93% | 17.11% | 7.99% |
| Fund 2 | 2011 | 55 | 13.36% | 10.37% | 5.75% | 7.46% | 4.44% | 10.03% | 0.31% | 19.97% | 8.09% |
| Fund 3 | 2013 | 31 | 20.12% | 11.75% | 5.91% | 15.17% | 5.48% | 6.50% | -5.07% | 12.24% | 11.42% |
| Fund 4 | 2006 | 103 | 15.53% | 7.55% | 6.39% | 6.99% | 1.46% | 9.49% | 0.41% | 15.39% | 7.13% |
| Fund 5 | 2012 | 43 | 37.19% | 11.99% | 5.76% | 5.35% | 7.81% | 8.25% | -1.53% | 20.24% | 14.28% |
| Fund 6 | 2005 | 121 | 21.80% | 12.02% | 7.31% | 5.61% | 3.34% | 12.78% | -1.01% | 19.13% | 12.62% |
| Fund 7 | 2004 | 121 | 37.42% | 12.18% | 7.31% | 5.61% | 3.53% | 12.78% | -1.01% | 19.13% | 12.75% |
| Fund 8 | 2013 | 22 | 3.23% | 7.59% | 6.19% | 4.08% | 3.23% | 7.33% | -0.86% | 27.84% | 10.15% |
| Fund 9 | 2002 | 159 | 34.03% | 13.74% | 7.01% | -4.81% | 5.91% | 16.09% | 0.16% | 24.16% | 18.64% |
| Fund 10 | 2005 | 112 | 20.19% | 10.84% | 7.73% | 7.70% | 2.77% | 11.26% | -1.41% | 19.78% | 11.73% |
| Fund 11 | 2007 | 100 | 15.37% | 8.00% | 7.23% | 7.75% | 0.75% | 8.53% | -0.41% | 16.68% | 6.87% |
| **Aggregate Portfolio** | **2002** | **159** | **28.81%** | **13.74%** | **7.01%** | **-4.81%** | **5.91%** | **16.09%** | **0.16%** | **24.16%** | **18.64%** |
| Minimum | | 22 | 3.23% | 7.55% | 5.75% | -4.81% | 0.75% | 6.50% | -5.07% | 12.24% | 6.87% |
| Maximum | | 159 | 37.42% | 13.74% | 7.73% | 15.17% | 7.81% | 16.09% | 0.93% | 27.84% | 18.64% |
| Average | | 87.09 | 21.45% | 10.37% | 6.71% | 6.42% | 3.60% | 10.33% | -0.86% | 19.24% | 11.06% |

Table 2 shows the returns for each fund versus that of other asset classes for the period from 1 January 2002 to 31 December 2015. The aggregate portfolio was also compared to other asset classes over the same time period. The minimum, maximum and average performances are also shown for each asset class.

**Table 3: Fund relative returns**

| Fund Name | Vintage Year | No of Months | SA Equity | SA Cash | Foreign Bonds | Foreign Equity | Mid Cap Equity | SA Bonds | SA Property | Small Cap Equity |
|---|---|---|---|---|---|---|---|---|---|---|
| Fund 1 | 2007 | 91 | 9.73% | 10.54% | 8.04% | 16.83% | 7.20% | 16.82% | 0.64% | 9.75% |
| Fund 2 | 2011 | 55 | 2.99% | 7.61% | 5.90% | 8.92% | 3.33% | 13.05% | -6.61% | 5.27% |
| Fund 3 | 2013 | 31 | 8.37% | 14.20% | 4.95% | 14.63% | 13.61% | 25.18% | 7.88% | 8.70% |
| Fund 4 | 2006 | 103 | 7.98% | 9.13% | 8.53% | 14.07% | 6.04% | 15.12% | 0.14% | 8.40% |
| Fund 5 | 2012 | 43 | 25.20% | 31.43% | 31.83% | 29.37% | 28.94% | 38.72% | 16.95% | 22.91% |
| Fund 6 | 2005 | 121 | 9.78% | 14.49% | 16.19% | 18.46% | 9.02% | 22.81% | 2.67% | 9.18% |
| Fund 7 | 2004 | 121 | 25.24% | 30.11% | 31.81% | 33.89% | 24.64% | 38.43% | 18.29% | 24.67% |
| Fund 8 | 2013 | 22 | -4.36% | -2.96% | -0.85% | 0.00% | -4.11% | 4.09% | -24.62% | -6.92% |
| Fund 9 | 2002 | 159 | 20.30% | 27.02% | 38.84% | 28.12% | 17.94% | 33.87% | 9.87% | 15.39% |
| Fund 10 | 2005 | 112 | 9.35% | 12.47% | 12.50% | 17.43% | 8.93% | 21.60% | 0.42% | 8.46% |
| Fund 11 | 2007 | 100 | 7.37% | 8.13% | 7.62% | 14.61% | 6.84% | 15.78% | -1.31% | 8.49% |
| **Aggregate Portfolio** | **2002** | **159** | **15.08%** | **21.80%** | **33.62%** | **22.90%** | **12.72%** | **28.65%** | **4.66%** | **10.17%** |
| Minimum | | 22 | -4.36% | -2.96% | -0.85% | 0.00% | -4.11% | 4.09% | -24.62% | -6.92% |
| Maximum | | 159 | 25.24% | 31.43% | 38.84% | 33.89% | 28.94% | 38.72% | 18.29% | 24.67% |
| Average | | 87.09 | 11.09% | 14.74% | 15.03% | 17.85% | 11.13% | 22.32% | 2.21% | 10.39% |

Table 3 shows the relative returns for each fund versus that of other asset classes for the period from 1 January 2002 to 31 December 2015. The aggregate portfolio was also compared to other asset classes over the same time period. The minimum, maximum and average relative performances are also shown for each asset class.

**Table 4: Fund volatilities versus other asset classes**

| Fund Name | Vintage Year | No of Months | Fund Volatility | SA Equity | SA Cash | Foreign Bonds | Foreign Equity | Mid Cap Equity | SA Bonds | SA Property | Small Cap Equity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fund 1 | 2007 | 91 | 17.78% | 16.34% | 0.64% | 42.80% | 17.90% | 13.92% | 7.58% | 16.20% | 12.92% |
| Fund 2 | 2011 | 55 | 7.19% | 11.37% | 0.15% | 33.45% | 13.17% | 9.60% | 7.01% | 13.31% | 7.48% |
| Fund 3 | 2013 | 31 | 3.97% | 11.82% | 0.17% | 29.12% | 11.26% | 11.31% | 7.85% | 14.51% | 8.25% |
| Fund 4 | 2006 | 103 | 18.85% | 15.83% | 0.61% | 41.94% | 17.36% | 13.83% | 7.37% | 15.63% | 12.49% |
| Fund 5 | 2012 | 43 | 18.02% | 10.94% | 0.17% | 30.20% | 11.53% | 10.24% | 7.47% | 14.74% | 7.80% |
| Fund 6 | 2005 | 121 | 9.71% | 15.52% | 0.57% | 40.26% | 16.30% | 14.44% | 7.07% | 16.95% | 13.38% |
| Fund 7 | 2004 | 121 | 18.77% | 15.52% | 0.57% | 40.26% | 16.30% | 14.44% | 7.07% | 16.95% | 13.38% |
| Fund 8 | 2013 | 22 | 3.74% | 10.57% | 0.13% | 26.62% | 11.33% | 11.96% | 7.08% | 10.04% | 8.25% |
| Fund 9 | 2002 | 159 | 14.59% | 16.09% | 0.55% | 37.43% | 15.20% | 14.34% | 6.73% | 16.20% | 13.70% |
| Fund 10 | 2005 | 112 | 13.86% | 15.34% | 0.57% | 40.56% | 16.42% | 14.06% | 7.13% | 16.81% | 13.14% |
| Fund 11 | 2007 | 100 | 12.41% | 16.06% | 0.61% | 41.35% | 17.58% | 13.91% | 7.38% | 15.68% | 0.61% |
| **Aggregate Portfolio** | **2002** | **159** | **10.52%** | **16.09%** | **0.55%** | **37.43%** | **15.20%** | **14.34%** | **6.73%** | **16.20%** | **13.70%** |
| minimum | | 22 | 3.74% | 10.57% | 0.13% | 26.62% | 11.26% | 9.60% | 6.73% | 10.04% | 0.61% |
| maximum | | 159 | 18.85% | 16.34% | 0.64% | 42.80% | 17.90% | 14.44% | 7.85% | 16.95% | 13.70% |
| average | | 87.09 | 12.63% | 14.13% | 0.43% | 36.73% | 14.94% | 12.91% | 7.25% | 15.18% | 10.13% |

Table 4 shows the volatility for each fund versus that of other asset classes for the period from 1 January 2002 to 31 December 2015. The aggregate portfolio was also compared to other asset classes over the same time period. The minimum, maximum and average volatilities are also shown for each asset class.

**Table 5: Sharpe ratios**

| Fund Name | Vintage Year | No of Months | Fund | SA Equity | SA Cash | Foreign Bonds | Foreign Equity | Mid Cap Equity | SA Property | Small Cap Equity |
|---|---|---|---|---|---|---|---|---|---|---|
| Fund 1 | 2007 | 91 | 0.95 | 0.49 | 9.18 | 0.07 | 0.07 | 0.71 | 1.00 | 0.58 |
| Fund 2 | 2011 | 55 | 1.81 | 0.94 | 11.15 | 0.38 | 0.41 | 1.07 | 1.46 | 1.79 |
| Fund 3 | 2013 | 31 | 5.90 | 1.41 | 11.42 | 0.79 | 0.96 | 1.05 | 1.21 | 1.95 |
| Fund 4 | 2006 | 103 | 1.18 | 0.57 | 12.86 | 0.46 | 0.18 | 0.62 | 1.03 | 0.63 |
| Fund 5 | 2012 | 43 | 1.93 | 1.21 | 11.97 | 0.36 | 0.82 | 0.95 | 1.42 | 1.92 |
| Fund 6 | 2005 | 121 | 2.18 | 0.86 | 13.86 | 0.34 | 0.34 | 0.96 | 1.17 | 1.03 |
| Fund 7 | 2004 | 121 | 3.20 | 0.86 | 13.86 | 0.34 | 0.34 | 0.96 | 1.17 | 1.03 |
| Fund 8 | 2013 | 22 | 0.70 | 0.68 | 12.06 | 0.25 | 0.28 | 0.60 | 2.46 | 1.14 |
| Fund 9 | 2002 | 159 | 2.06 | 0.85 | 11.54 | 0.03 | 0.43 | 1.08 | 1.39 | 1.29 |
| Fund 10 | 2005 | 112 | 1.41 | 0.79 | 14.27 | 0.38 | 0.31 | 0.87 | 1.13 | 0.95 |
| Fund 11 | 2007 | 100 | 1.23 | 0.53 | 11.72 | 0.37 | 0.15 | 0.64 | 1.06 | 0.60 |
| **Aggregate Portfolio** | **2002** | **159** | **2.43** | **0.85** | **11.54** | **0.03** | **0.43** | **1.08** | **1.39** | **1.29** |
| Minimum | | 22 | 0.70 | 0.49 | 9.18 | 0.03 | 0.07 | 0.60 | 1.00 | 0.58 |
| Maximum | | 159 | 5.90 | 1.41 | 14.27 | 0.79 | 0.96 | 1.08 | 2.46 | 1.95 |
| Average | | 87.09 | 2.05 | 0.84 | 12.17 | 0.34 | 0.39 | 0.87 | 1.32 | 1.17 |

Table 5 shows the Sharpe ratios for each asset class for the period from 1 January 2002 to 31 December 2015. The aggregate portfolio was also compared to other asset classes over the same time period. The minimum, maximum and average Sharpe ratios are also shown for each asset class.

**Table 6: Correlation matrix with other asset classes**

| Fund Name | Vintage Year | No of Months | SA Equity | SA Cash | Foreign Bonds | Foreign Equity | Mid Cap Equity | SA Bonds | SA Property | Small Cap Equity |
|---|---|---|---|---|---|---|---|---|---|---|
| Fund 1 | 2007 | 91 | 0.08 | 0.16 | (0.15) | 0.07 | 0.01 | (0.03) | (0.01) | (0.05) |
| Fund 2 | 2011 | 55 | 0.08 | (0.20) | (0.20) | 0.06 | (0.03) | (0.10) | 0.09 | (0.07) |
| Fund 3 | 2013 | 31 | 0.33 | (0.44) | 0.01 | 0.15 | 0.57 | 0.15 | 0.16 | 0.40 |
| Fund 4 | 2006 | 103 | (0.02) | 0.23 | 0.17 | (0.05) | (0.10) | (0.06) | (0.11) | (0.05) |
| Fund 5 | 2012 | 43 | 0.13 | (0.18) | (0.20) | 0.13 | 0.10 | 0.16 | 0.14 | 0.26 |
| Fund 6 | 2005 | 121 | 0.02 | 0.14 | 0.15 | (0.07) | 0.09 | 0.12 | 0.07 | 0.00 |
| Fund 7 | 2004 | 121 | 0.02 | (0.00) | (0.02) | 0.02 | (0.07) | (0.12) | (0.12) | (0.08) |
| Fund 8 | 2013 | 22 | (0.12) | 0.01 | 0.26 | (0.08) | 0.02 | 0.17 | (0.08) | 0.03 |
| Fund 9 | 2002 | 159 | 0.16 | 0.02 | (0.19) | 0.14 | 0.15 | 0.05 | 0.08 | 0.15 |
| Fund 10 | 2005 | 112 | 0.13 | (0.19) | (0.08) | 0.13 | 0.08 | (0.03) | 0.06 | 0.15 |
| Fund 11 | 2007 | 100 | 0.02 | 0.36 | 0.02 | (0.04) | (0.10) | (0.09) | (0.17) | (0.16) |
| Aggregate Portfolio | 2002 | 159 | 0.11 | 0.08 | (0.22) | 0.11 | 0.15 | 0.11 | 0.09 | 0.15 |
| Minimum | | 22 | (0.12) | (0.44) | (0.20) | (0.08) | (0.10) | (0.12) | (0.17) | (0.16) |
| Maximum | | 159 | 0.33 | 0.36 | 0.26 | 0.15 | 0.57 | 0.17 | 0.16 | 0.40 |
| Average | | 87.09 | 0.08 | (0.01) | (0.02) | 0.04 | 0.07 | 0.02 | 0.01 | 0.05 |

Table 6 shows the correlation matrix for each fund versus that of other asset classes for the period from 1 January 2002 to 31 December 2015. The aggregate portfolio was also compared to other asset classes over the same time period. The minimum, maximum and average correlations are also shown for each asset class.

**Table 7: Gross versus net returns per fund**

| Fund Name | Vintage Year | No of Months | Gross return | Net Return | Difference |
|---|---|---|---|---|---|
| Fund 1 | 2007 | 91 | 17.75% | 16.34% | 1.41% |
| Fund 2 | 2011 | 55 | 13.36% | 10.40% | 2.96% |
| Fund 3 | 2013 | 31 | 20.12% | 8.52% | 11.60% |
| Fund 4 | 2006 | 103 | 21.82% | 8.92% | 12.89% |
| Fund 5 | 2012 | 43 | 37.19% | 33.04% | 4.15% |
| Fund 6 | 2005 | 121 | 21.80% | 20.21% | 1.59% |
| Fund 7 | 2004 | 121 | 37.42% | 33.11% | 4.31% |
| Fund 8 | 2013 | 22 | 3.23% | 0.00% | 3.23% |
| Fund 9 | 2002 | 159 | 33.11% | 24.29% | 8.82% |
| Fund 10 | 2005 | 112 | 20.19% | 14.93% | 5.26% |
| Fund 11 | 2007 | 100 | 15.37% | 5.73% | 9.64% |
| **Aggregate Portfolio** | **2002** | **159** | **28.81%** | **23.42%** | **5.39%** |
| Minimum | | 22 | 3.23% | 0.00% | 1.41% |
| Maximum | | 159 | 37.42% | 33.11% | 12.89% |
| Average | | 87 | 21.94% | 15.95% | 5.99% |

Table 7 shows the gross and net returns for each fund used in the study period.

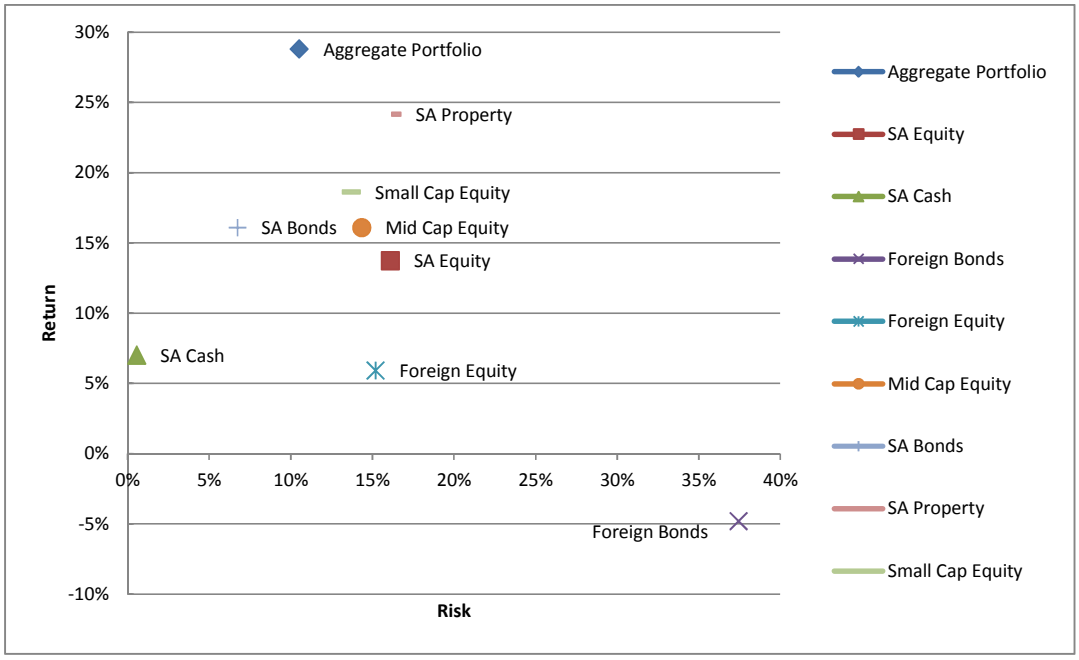


**Figure 11: Risk versus return graph**

Figure 11 plots the risk versus return on a graph with risk on the *x*-axis and return on the *y*-axis.

## 4.3 Results pertaining to Research Question 2

**Table 8: Optimisation 1 - Target return with no allocation to private equity allowed and no constraints applied**

| Target return | 2.50% | 5.00% | 7.50% | 10.00% | 12.50% | 15.00% | 20.00% |
|---|---|---|---|---|---|---|---|
| Private Equity | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| SA Cash | 28.71% | 63.95% | 98.44% | 81.68% | 62.83% | 44.23% | 7.03% |
| SA Bonds | 53.70% | 26.65% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| SA Property | 0.00% | 0.00% | 0.00% | 11.12% | 22.14% | 33.41% | 55.93% |
| SA Equity | 0.00% | 0.00% | 0.24% | 0.00% | 0.00% | 0.00% | 0.00% |
| Foreign Bonds | 7.32% | 3.72% | 0.22% | 0.90% | 2.01% | 3.07% | 5.17% |
| Foreign Equity | 10.28% | 5.68% | 0.89% | 0.00% | 0.00% | 0.00% | 0.00% |
| Small Cap Equity | 0.00% | 0.00% | 0.20% | 6.30% | 13.01% | 19.30% | 31.86% |
| Mid Cap Equity | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Std dev portfolio | 4.07% | 2.07% | 0.54% | 2.30% | 4.57% | 6.85% | 11.44% |

Table 8 shows the results of MVO when no allocation to PE is allowed. The results targeted returns of between 2.5% and 20% p.a.

**Table 9: Optimisation 2 - Target return with allocation to private equity allowed and no constraints applied**

| Target return | 2.50% | 5.00% | 7.50% | 10.00% | 12.50% | 15.00% | 20.00% |
|---|---|---|---|---|---|---|---|
| Private Equity | 0.00% | 0.00% | 0.00% | 9.23% | 18.71% | 28.27% | 47.31% |
| SA Cash | 28.71% | 63.95% | 98.44% | 87.39% | 75.06% | 62.76% | 38.13% |
| SA Bonds | 53.70% | 26.65% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| SA Property | 0.00% | 0.00% | 0.00% | 2.59% | 5.36% | 8.05% | 13.51% |
| SA Equity | 0.00% | 0.00% | 0.24% | 0.00% | 0.00% | 0.00% | 0.00% |
| Foreign Bonds | 7.32% | 3.72% | 0.22% | 0.00% | 0.00% | 0.00% | 0.00% |
| Foreign Equity | 10.28% | 5.68% | 0.89% | 0.00% | 0.00% | 0.00% | 0.00% |
| Small Cap Equity | 0.00% | 0.00% | 0.20% | 0.79% | 0.87% | 0.92% | 1.05% |
| Mid Cap Equity | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Std dev portfolio | 4.07% | 2.07% | 0.54% | 1.24% | 2.31% | 3.42% | 5.65% |

Table 9 shows the results of MVO when an unlimited allocation to PE is allowed. The results targeted returns of between 2.5% and 20% p.a.

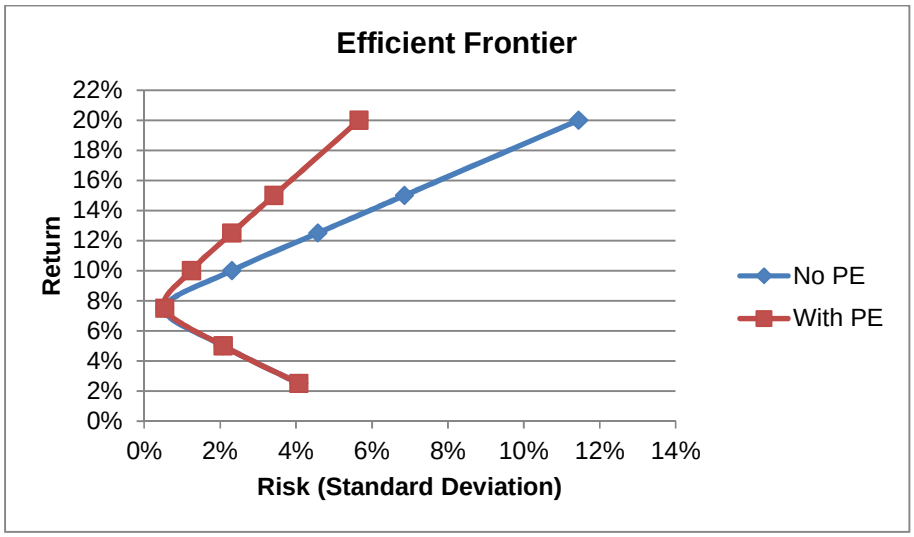


**Figure 12: Efficient Frontier with optimisation 1 and 2 applied**

Figure 12 shows the efficient frontier with and without an allocation to PE. The introduction of PE into the asset allocation improves the standard deviations at target returns of 10% and higher,

**Table 10: Optimisation 3 - Target return with no allocation to private equity allowed and balanced constraints applied**

| Target return | 2.50% | 5.00% | 7.50% | 10.00% | 12.50% | 15.00% |
|---|---|---|---|---|---|---|
| Private Equity | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| SA Cash | 0.00% | 10.00% | 10.00% | 10.00% | 10.00% | 2.98% |
| SA Bonds | 53.08% | 43.63% | 28.64% | 13.66% | 10.00% | 10.00% |
| SA Property | 0.00% | 3.19% | 13.07% | 22.95% | 25.00% | 25.00% |
| SA Equity | 25.00% | 25.00% | 25.00% | 25.00% | 44.09% | 62.02% |
| Foreign Bonds | 21.92% | 10.80% | 12.66% | 14.52% | 10.91% | 4.92% |
| Foreign Equity | 0.00% | 7.38% | 10.63% | 13.88% | 0.00% | 0.00% |
| Std dev portfolio | 7.48% | 5.26% | 5.72% | 6.37% | 7.80% | 11.90% |

Table 10 shows the results of MVO when no allocation to PE is allowed. The results targeted returns between 2.5% and 15% p.a.

**Table 11: Optimisation 4 - Target return with allocation to private equity allowed and balanced constraints applied**

| Target return | 2.50% | 5.00% | 7.50% | 10.00% | 12.50% | 15.00% |
|---|---|---|---|---|---|---|
| Private Equity | 0.00% | 0.00% | 0.00% | 0.00% | 10.00% | 10.00% |
| SA Cash | 0.00% | 10.00% | 10.00% | 10.00% | 10.00% | 10.00% |
| SA Bonds | 53.08% | 43.63% | 28.64% | 13.66% | 35.28% | 17.55% |
| SA Property | 0.00% | 3.19% | 13.07% | 22.95% | 24.44% | 25.00% |
| SA Equity | 25.00% | 25.00% | 25.00% | 25.00% | 20.28% | 37.45% |
| Foreign Bonds | 21.92% | 10.80% | 12.66% | 14.52% | 0.00% | 0.00% |
| Foreign Equity | 0.00% | 7.38% | 10.63% | 13.88% | 0.00% | 0.00% |
| Std dev portfolio | 7.48% | 5.26% | 5.72% | 6.37% | 7.43% | 8.80% |

Table 11 shows the results of MVO when the Regulation 28 limit allocation to PE was allowed. The results targeted returns of between 2.5% and 15% p.a.

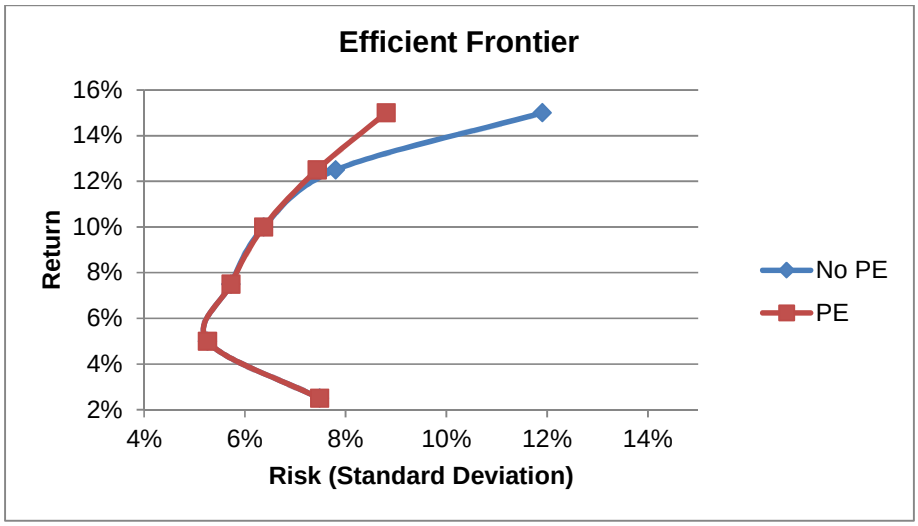


**Figure 13: Efficient Frontier with optimisation 3 and 4 applied**

Figure 13 shows the efficient frontier with and without an allocation to PE. The introduction of PE into the asset allocation improves the standard deviations at target returns of 12.5% and higher,

## 4.4 Summary of the results

The research methodology described in Chapter 3 was used to gather and analyse the data and the results were presented in this chapter.

For Research Question 1, the risk, returns, correlations, Sharpe ratios and gross versus net returns were presented for private equity. A risk versus return graph was also presented with the different asset classes plotted on them.

For Research Question 2, four optimisations were run using the mean variance methodology. These were presented in various figures and tables.

The significant findings are discussed and explained in the next chapter.

# CHAPTER 5: DISCUSSION OF THE RESULTS

## 5.1 Introduction

This chapter begins with an analysis of the results presented in Chapter 4. It addresses each item in turn, emphasising the major findings or outcomes. This is followed by conclusions relating to each research question.

## 5.2 Discussion pertaining to Research Question 1

Table 2 and 3 illustrated the PE returns compared to that of other asset classes. For the 11 funds used in the study, the returns ranged from 3.23% p.a. to 37.42% p.a. with an average return of 21.45% p.a. The aggregate portfolio return was 28.81% p.a.

PE returns were the best performing asset class over the period with SA Property being the next best performing asset class at an average performance of 19.24% p.a. and SA Bonds being the worst performing asset class with an average performance of -0.86%. SA Equity performed with an average of 10.37% p.a. for the period under investigation.

Table 3 indicated the relative returns with other asset classes. The PE performance was compared with SA Equity, Mid-Cap Equity, Small-Cap Equity, SA Bonds, SA Property, SA Cash, Foreign Bonds and Foreign Equity.

PE's one fund underperformed SA Equity by 4.36% p.a. but the maximum over performance of SA Equity was 25.24% p.a. The average outperformance was 11.09% p.a. while the aggregate portfolio outperformed SA Equity by 15.08% p.a.

PE's one fund underperformed SA Property by 24.62% p.a. but the maximum over performance of SA Property was 18.29% p.a. The outperformance on average was 2.21% p.a. while the aggregate portfolio outperformed SA Property by 4.66% p.a.

Maximum outperformance of 38.84% p.a. was observed in relation to Foreign Bonds, while the maximum underperformance of 24.62% p.a. was observed in comparison to SA Property.

As was evident, PE produced return premiums of 15.08% p.a. over SA Equity, 21.08% p.a. over SA Cash, 33.62% p.a. over Foreign Bonds, 22.9% p.a. over Foreign Equity, 12.72% p.a. over Mid-Cap Equity, 28.65% p.a. over SA Bonds, 4.66% p.a. over SA Property and 10.17% p.a. over Small-Cap Equity.

Most academics have presented mixed results with regard to the performance of PE versus listed equities. However, this current research study found that the outperformance of PE in comparison to listed equities was further confirmed in studies by Cochrane (2005); Harris et al. (2014, 2015); Higson and Stucke (2012); Jones and Rhodes-Kropf (2003); Ljungqvist and Richardson (2003); Missankov et al. (2008); Robinson and Sensoy (2013). The outperformance could be attributable to the illiquid nature of the asset class as investors demand a premium.

Table 4 indicated the fund volatilities versus other asset classes. PE observed a volatility of 10.52% for the aggregate portfolio with a minimum volatility of 3.74% and a maximum volatility of 18.85%. Foreign Bonds had the highest average volatility of 36.73%, while SA Cash had the lowest average volatility of 0.43%. SA Equity achieved an average volatility of 14.13%.

Studies by Cochrane (2005) affirmed conflicting views with regard to the volatility of the asset class. The one study demonstrated that it was more risky than public equities and the other study confirmed that it was less risky. A study by Phalippou and Gottschalg (2009) indicated that the volatility is higher than public equities. Maginn et al. (2007) also characterised PE as being more risky than public equities. This current research study proved that PE is less volatile than public market equities. A possible reason for this could be the time period studied or the sample of fund data collected.

Table 5 demonstrated the observed Sharpe ratios for each asset class. The highest average Sharpe ratios were observed by SA Cash, indicating higher

risk-adjusted returns and the lowest by Foreign Bonds. This was presented in Figure 11.

PE produced the second highest risk-adjusted returns on average of 2.05 with a minimum of 0.7 and a maximum of 5.90. The aggregate portfolio Sharpe ratio was 2.43. SA Equity, Mid-Cap Equity, SA Property and Small-Cap Equity produced lower risk-adjusted returns. In comparison to the aggregate portfolio, these produced ratios of 0.85, 1.08, 1.39 and 1.29 respectively.

Missankov et al. (2008) found similar results with SA Cash producing the best risk-adjusted returns followed by PE.

Table 6 included the various combinations of correlations between PE and the other asset classes. The highest correlations to PE were produced by Mid-Cap Equity with 0.57 and the lowest correlation is produced by SA Cash with -0.44. SA Equity produced a maximum correlation of 0.33 and a minimum of -0.12. The average correlation was 0.08. The aggregate portfolio produced a correlation of 0.11 to SA Equity. The aggregate portfolios' highest correlation was with Mid-Cap Equity and Small-Cap Equity with 0.15 and the lowest correlation was with Foreign Bonds, with -0.22.

Correlations studies with PE versus listed equities were conducted by Anson et al. (2012); Bekkers et al. (2009); Ennis and Sebastian (2005); Froland (2005); Idzorek (2007); Missankov et al. (2008). Some studies indicated a high positive correlation to listed equities of 0.76 and above. This current research study however found a low correlation to listed equities.

Investors can potentially increase returns while probably even decreasing risk through the selection of assets with low correlations.

Table 7 referred to gross returns versus net returns. The aggregate portfolio produced a gross return of 28.81% p.a. versus a net return of 23.42% p.a. The difference of 5.39% p.a. was observed. The maximum gross return was 37.42% p.a. with a net return of 33.04% p.a. The minimum gross return was 3.23% p.a. with a net return of 0% p.a. The maximum difference in returns was 12.89% p.a. and minimum was 1.41% p.a.

Fund 6 and 10 both had a 2005 vintage. Fund 6 showed a performance of 21.8% p.a. and Fund 10 had 20.19% p.a. These two funds had similar gross returns but vastly different net returns as a result of fees.

The fees charged by the GP are significant to returns of PE. This current research study found the impact to be as high as 12.89% p.a. Previous studies by Missankov et al. (2008); Phalippou (2007); Swensen (2000) revealed that fees contribute negatively to returns from 7% p.a. up to 13.7% p.a.

Even though the returns are impacted negatively by these fees, PE has still managed to outperform listed equities.

- **Conclusion to Research Question 1**

It would have been beneficial to invest in South African private equity from 1 January 2002 to 31 December 2015 as a result of the following:

- The returns for PE were the best performing asset class and outperformed SA Equity by 15.08% p.a.
- The risk of PE was found to be 10.52% and was lower than SA Equity.
- The correlation of PE to SA Equity was 0.11 and provided diversification benefits for adding the asset class to an investor's portfolio.
- On a risk-adjusted basis, PE reported the second highest Sharpe ratio.

## 5.3 Discussion pertaining to Research Question 2

The first optimisation results were depicted in Table 8. With a target return of 2.5%, the allocation to SA Cash was 28.71%, SA Bonds was 53.7%, Foreign Bonds was 7.32% and Foreign Equity was 10.28%. The standard deviation was 4.07%. The minimum variance portfolio is seen at a target return of 7.5% with a standard deviation of 0.54%. This was presented in Figure 12.

With a target return of 20%, the allocation to SA Cash was 7.03%, SA Property was 55.39%, Foreign Bonds was 5.17% and Small-Cap Equity was 31.86%. The standard deviation was 11.44%.

SA Cash and SA Bonds dominated the allocations at lower target returns. SA Cash produced the best risk adjusted returns, which is the reason for these results. As target returns move beyond 7.5%, the allocations to SA Cash decreased and were taken up by SA Property and Small-Cap Equity as these produced the next best risk adjusted returns after SA Cash.

The second optimization results were depicted in Table 9. With the target return of 2.5%, 5% and 7.5%, there were no changes in the asset allocations from optimisation one. This was evident as SA Cash produced the best risk-adjusted returns.

For target returns from 10% up to 20%, the majority of the allocation was taken up by Private Equity, then by SA Property and then by Small-Cap Equity. An interesting observation of the portfolio standard deviations was that these were significantly lower with the addition of PE for target returns of 10% and higher. This is evident in Figure 12.

The third optimisation was depicted in Table 10. A target return of 20% was not achievable with all the constraints used. The table used targeted returns from 2.5% up to 15%. With the constraints imposed, the standard deviations increased significantly as the allocation to SA Cash was capped at 10%.

With a target return of 2.5%, the allocation to SA Bonds was 53.08%, SA Equity was 25% and Foreign Bonds was 21.92%. The standard deviation was 7.48%.

With a target return of 15%, the allocation to SA Cash was 2.98%, SA Property was 25%, SA Equity was 62.02% and Foreign Bonds was 4.92%. The standard deviation was 11.9%.

The allocations to SA Bonds decreased from 53.08% to 10% as the target returns were increased. The opposite was evident with SA Property from a 0% allocation to the maximum of 25% as higher returns were required. At targeted returns of 12.5% and higher, SA Equity increased significantly from 25% to 62.02%.

The fourth optimisation was depicted in Table 11. With the target return of 2.5%, 5%, 7.5% and 10%, there were no changes in the asset allocations from optimisation three.

The allocation to PE was at its maximum from target returns of 12.5%. The 10% allocation was absorbed from SA Equity and SA Property. Another interesting point to note is that when PE was included from target returns of 12.5% onwards, the standard deviations were decreased. This is evident in Figure 13.

The literature regarding asset allocation for a pension fund is rather limited and this current research study attempted to fill this gap. This study found allocation of PE only being added at target returns of 10% and higher in optimisation 2 and at targeted returns of 12.5% and higher in optimisation 4. An important observation is that when adding PE to an asset allocation, the standard deviations of the portfolio also decreased at higher targeted returns.

Studies conducted by Ennis and Sebastian (2005); Ibbotson and Kaplan (2000) and Missankov et al. (2008) found that investments in PE should only be allocated to portfolios with high risk bearing capabilities. Only aggressive investors should add an allocation of over 10% to PE and these investors should be highly skilled and understand the asset class. Missankov et al. (2008) found that PE allocations up to 5% was the maximum regulated limit being used.

Investors would need to consider the unique risk of the asset class (Phalippou, 2010).

- **Conclusion to Research Question 2**

Considering Regulation 28, it would have been beneficial for pension funds to allocate funds to private equity in SA for the period from 1 January 2002 to 31 December 2015 if the following are considered:

- Even though standard deviations have decreased with the allocation of PE for return targets of 10% and above, Pension funds should allocate PE only if they fully understand the asset class.

- Access to the best GPs should be of particular importance.
- The tolerance for risk is high and the need for liquidity is low.

## 5.4 Conclusion

For Research Question 1, the findings proved that investing in South African PE would have been beneficial in terms of risk, returns, correlations and Sharpe ratios. The pertinent findings included the following:

- The returns for PE were the best performing asset class and outperformed SA Equity by 15.08% p.a.
- The risk of PE was found to be 10.52% and was lower than SA Equity.
- The correlation of PE to SA Equity was 0.11 and provided diversification benefits for adding the asset class to an investor's portfolio.
- On a risk-adjusted basis, PE reported the second highest Sharpe ratio.

For Research Question 2, considering Regulation 28, it would have been beneficial for pension funds to allocate funds to private equity in SA for the period from 1 January 2002 to 31 December 2015 if they considered the following:

- Even though standard deviations have decreased with the allocation of PE for return targets of 10% and above, Pension funds should allocate PE only if they fully understand the asset class.
- Access to the best GPs should be of particular importance.
- The tolerance for risk is high and the need for liquidity is low.

# CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Introduction

A summary of the findings of the research as presented in Chapter 5 is presented in this chapter. The next section provides recommendations to the stakeholders who may be interested in the findings of the study. The chapter is concluded by offering suggestions for future study.

## 6.2 Conclusions of the study

The objectives of this research were:

- To compare the performance of PE against the performance of listed equities and other asset classes for the period between 1 January 2002 and 31 December 2015. Some of the metrics used included risk, returns, correlations and Sharpe ratios; and
- To determine if it was beneficial for pension funds to allocate funds to private equity in SA for the period between 1 January 2002 and 31 December 2015, taking into account Regulation 28.

Investors in PE need to be knowledgeable of the asset class and understand the characteristics that pertain to these investments. The capital commitments required to invest in the asset class are limited to high net worth individuals or large institutions.

There have been numerous studies analysing the performance of the asset class in comparison to listed equities. However, these studies have mixed results. This study demonstrated that private equity has outperformed listed equities in South Africa by 15% p.a. over the 13-year period ending 31 December 2015.

The studies that examined the allocation of private equity to pension funds are rather limited due to data limitations. This study showed that when targeting returns of 10% and higher, an investor should allocate PE to their asset allocation as portfolio risk may be reduced because of lower correlations with other asset classes. It should also be noted that investors with the appetite for risk as well as low liquidity needs should consider adding the asset class to their portfolio.

## 6.3 Recommendations

It was hoped that this study would provide a better understanding of the asset class for all participants. The participants included high net worth individuals, pension fund trustees and individuals involved in making asset allocation decisions. The expectations were that the asset class would achieve more attention in the context of portfolio design and strategic asset allocation.

## 6.4 Suggestions for further research

More research needs to be done on PE and its role in strategic asset allocation as current research is limited. This research study could be expanded to include different time periods, as well as the effects that PE plays on the overall economy.

# REFERENCES


Albright, S., Winston, W., & Zappe, C. (2010). *Data analysis and decision making*. Boston: Cengage Learning.

Alexander Forbes. (2013). *Manager Watch Survey of Retirement Fund Investment Managers.* Retrieved 5 December 2015 from https://www.alexanderforbes.co.za/business/Publications-Info.aspx?survey=Manager%20Watch%20Series%20of%20Surveys

Ang, A., & Sorensen, M. (2011). Risk, Returns, and Optimal Holdings of Private Equity.

Anson, M. J. (2004). Business Development Companies: Cashing In on Private Equity? *The Journal of Private Equity, 7*(4), 10-16.

Anson, M. J., Chambers, D. R., Black, K. H., & Kazemi, H. (2012). *CAIA level I: an introduction to core topics in alternative investments* (Vol. 709). New York: John Wiley & Sons.

Ashiagbor, D., Satyamurthy, N., Casey, M., & Asare, J. (2014). *Pension Funds and Private Equity: Unlocking Africa's Potential.* (pp. 1-20). Retrieved 5 December 2015 from http://www.savca.co.za/wp-content/uploads/2014/07/Pension-Funds-and-Private-Equity-Unlocking-Africas-Potential-SAVCA-.pdf

Bain & Company. (2015). *Global Private Equity Report 2015.* Retrieved 5 December 2015 from http://www.bain.com/Images/BAIN_REPORT_Global_Private_Equity_Report_2015.pdf

Bekkers, N., Doeswijk, R. Q., & Lam, T. W. (2009). Strategic asset allocation: determining the optimal portfolio with ten asset classes. *Journal of Wealth Management, 12*(3), 61-77.

Brinson, G. P., Singer, B. D., & Beebower, G. L. (1991). Determinants of portfolio performance II: An update. *Financial Analysts Journal, 47*(3), 40-48.

Bryman, A. (2012). *Social research methods*. Oxford: Oxford university press.

BVCA. (2014). *A Guide to Private Equity* (pp. 1-56). Retrieved 5 December 2015 from http://www.bvca.co.uk/Portals/0/library/Files/Website%20files/2012_0001_guide_to_private_equity.pdf

Chemla, G. (2004). Pension fund investment in private equity and venture capital in the US and Canada. *The Journal of Private Equity, 7*(2), 64-71.

Cochrane, J. H. (2005). The risk and return of venture capital. *Journal of financial economics, 75*(1), 3-52.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage publications.

Davis, E. P., & Hu, Y. (2009). Should Pension Investing be Regulated? *Rotman International Journal of Pension Management, 2*(1), 34-42.

Deloitte. (2015). *Africa Private Equity Confidence Survey.* Retrieved 5 December 2015 from http://www2.deloitte.com/content/dam/Deloitte/na/Documents/finance/na_za_private_equity_confidence_survey_may2015.pdf

Ennis, R. M., & Sebastian, M. D. (2005). Asset allocation with private equity. *The Journal of Private Equity, 8*(3), 81-87.

EVCA. (2015). What is Private Equity? Retrieved 5 June, 2015, from http://www.evca.eu/about-private-equity/private-equity-explained/

EY. (2014a). *Private equity roundup China.* Retrieved 5 December 2015 from http://www.ey.com/GL/en/Industries/Private-Equity/ey-private-equity-roundup-china

EY. (2014b). *Private equity roundup Africa.* (pp. 1-18). Retrieved 5 December 2015 from http://www.ey.com/GL/en/Industries/Private-Equity/EY-private-equity-roundup-for-africa-2015

Eychenne, K., Martinetti, S., & Roncalli, T. (2011). *Strategic asset allocation.* Retrieved 5 December 2015 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.310.1027&rep=rep1&type=pdf

Fraser-Sampson, G. (2011). *Private equity as an asset class*. New York: John Wiley & Sons.

Froland, C. G. (2005). *Private Equity in a Low-Return World.* Paper presented at the CFA Institute Conference Proceedings, New York, CFA Institute.

Froland, C. G. (2008, 20 February). *The Fortunes of Private Equity: What Drives Success?* Paper presented at the Alternative Investments Conference, Stamford, Connecticut, CFA Institute.

GEPF. (2015). WHO IS GEPF? Retrieved 23 December 2015, from http://www.gepf.gov.za/

Gompers, P., & Lerner, J. (1997). Risk and reward in private equity investments: The challenge of performance assessment. *The Journal of Private Equity, 1*(2), 5-12.

Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2014). Private equity performance: What do we know? *The journal of finance, 69*(5), 1851-1882.

Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2015). *How Do Private Equity Investments Perform Compared to Public Equity?* Retrieved 5 December 2015 from http://areas.kenan-flagler.unc.edu/finance/PERC/HJK%20JOIM%20forthcoming.pdf

Higson, C., & Stucke, R. (2012). *The performance of private equity.* Retrieved 5 December 2015 from http://www.cfasociety.org/netherlands/Documents/Paper%20Chris%20Higson.pdf

Huss, M., & Zimmermann, H. (2005). Performance Characteristics of Private Equity. *Unpublished working paper, University of Basel*.

Ibbotson, R. G., & Kaplan, P. D. (2000). Does asset allocation policy explain 40, 90, or 100 percent of performance? *Financial Analysts Journal, 56*(1), 26-33.

Idzorek, T. (2007). *Private equity and strategic asset allocation*. Ibbotson Associates. Chicago, Illinois.

Jones, C. M., & Rhodes-Kropf, M. (2003). The price of diversifiable risk in venture capital and private equity. *Unpublished working paper, Columbia University*.

Kaplan, S. N., & Schoar, A. (2005). Private equity performance: Returns, persistence, and capital flows. *The journal of finance, 60*(4), 1791-1823.

Kaplan, S. N., & Strömberg, P. (2008). Leveraged buyouts and private equity. *Journal of Economic Perspectives, 23*(3), 121-146.

KPMG, & SAVCA. (2011). *Venture capital and private equity industry performance survey of South Africa covering the 2010 calendar year.* Retrieved 5 December 2015 from http://www.kpmg.com/zm/en/issuesandinsights/articlespublications/industries-publications/pages/south-africa-private-equity-survey-2010.aspx

KPMG, & SAVCA. (2014). *Venture capital and private equity industry performance survey of South Africa covering the 2013 calendar year.* Retrieved 5 December 2015 from http://www.savca.co.za/wp-content/uploads/2014/06/KPMG-SAVCA-Private-equity-survey-2014.pdf

Leedy, P. D., & Ormrod, J. (2001). Practical research and design: Upper Saddle River, New Jersey: Merryll Prentice Hall.

Ljungqvist, A., & Richardson, M. (2003). *The cash flow, return and risk characteristics of private equity.* New York University, Working Paper.

López-Villavicencio, A., & Rigot, S. (2013). *The Determinants of Pension funds' Allocation to Private Equity.* Retrieved 5 December 2015 from http://www.top1000funds.com/wp-content/uploads/2014/02/The-determinants-of-pension-funds-allocation-to-private-equity.pdf

Maginn, J. L., Tuttle, D. L., McLeavey, D. W., & Pinto, J. E. (2007). *Managing investment portfolios: a dynamic process* (Vol. 3). New York: John Wiley & Sons.

Mangram, M. E. (2013). A simplified perspective of the Markowitz Portfolio Theory. *Global Journal of Business Research, 7*(1), 59-70.

Markowitz, H. (1952). Portfolio selection. *The journal of finance, 7*(1), 77-91.

Mathonet, P. Y., & Meyer, T. (2008). *J-Curve exposure: Managing a portfolio of venture capital and private equity funds*. New York: John Wiley & Sons.

Missankov, I., van Dyk, R., van Biljon, A., Hayes, M., & van der Veen, W. (2008). Private Equity Returns in Emerging Markets: The South African Case. *The Journal of Private Equity, 11*(4), 42-52.

Moskowitz, T. J., & Vissing-Jorgensen, A. (2002). The returns to entrepreneurial investment: A private equity premium puzzle? *American Economic Review, 92*(3), 745-778.

Murphy, D. (2006). *Understanding the J-Curve: A Primer on Interim Performance of Private Equity Investments.* Retrieved 5 December 2015 from http://www.goldmansachs.com/gsam/pdfs/USTPD/education/understanding_J_Curve.pdf

Pfau, W. D. (2011). Emerging market pension funds and international diversification. *The Journal of Developing Areas, 45*(1), 1-17.

Phalippou, L. (2007). *Investing in private equity funds: A survey.* Retrieved 5 December 2015 from http://down.cenet.org.cn/upfile/36/2007122595923124.pdf

Phalippou, L. (2010, 23 March). *Private Equity: Performance, Risk, and Fund Selection.* Paper presented at the CFA Middle East Conference, Manama, Bahrain, CFA Institute.

Phalippou, L., & Gottschalg, O. (2009). The performance of private equity funds. *Review of Financial Studies, 22*(4), 1747-1776.

Phalippou, L., & Zollo, M. (2005). What drives private equity fund performance. *Unpublished working paper*.

Republic of South Africa. (1956). *Regulation 28 of the Pension Funds Act.* Pretoria: Government Printer.

Rigot, S., & Tadjeddine, Y. (2010). Emergence of a new regulation: informational disclosure modalities in the hedge fund opacity world. *International Economics, 123*, 161-195.

Robinson, D. T., & Sensoy, B. A. (2013). Do private equity fund managers earn their fees? Compensation, ownership, and cash flow performance. *Review of Financial Studies, 26*(11), 2760-2797.

Sharpe, W. F. (1992). Asset allocation: Management style and performance measurement. *The journal of portfolio management, 18*(2), 7-19.

Sharpe, W. F. (1994). The sharpe ratio. *The journal of portfolio management, 21*(1), 49-58.

Stucke, R. (2011). *Updating history.* Retrieved 5 December 2015 from http://ssrn.com/abstract=1967636

Swensen, D. F. (2000). Pioneering Portfolio Management: New York: The Free Press.

Talmor, E., & Vasvari, F. (2014). *The Adveq Applied Research Series: The extent and evolution of pension funds private equity allocations* (pp. 1-26). Retrieved 5 December 2015 from http://www.privateequity.london.edu/content/userdocuments/newsdocuments/44.pdf