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Marginal diversification benefits of private equity fund of funds in South African pension funds

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ABSTRACT

The revised Regulation 28 of section 36 of the South African Pension Fund Act (no 24 of 1956) explicitly allowed and increased the maximum allowed private equity for a South African pension funds from 2.5% to 10%, effective 1 July 2011 (National Treasury, 2011). Four years later, there has not been a meaningful increase of private equity exposure in the South African (SA) pension funds (KPMG & SAVCA, 2015). In contrast, when Regulation 28 was revised in 2011 to increase the maximum allowed allocation to global assets in SA pension funds from 15% to 25%, most pension fund key decision makers were quick to increase and maximise their strategic and tactical allocations to global assets, respectively. Bradfield and Munro (2011) also quantitatively confirmed that global equities and bonds introduced significant diversification benefits to SA pension funds.

The main objective of this study was to quantitatively determine whether SA private equity fund of funds introduces significant diversification benefits to SA pension funds. Diversification was broken into upside potential, downside risk, downside-risk adjusted and pairwise returns association. The secondary objective was to qualitatively assess whether SA pension fund managers were objectively assessing private equity. These included illiquidity risk, minimum investments and depth of private equity research.

The quantitative research methodology used quarterly asset allocation and returns data from nine asset classes. A control strategic portfolio and ten other strategic portfolios with increasing levels of private equity exposure were constructed. These portfolios were then tested for statistical evidence of improved diversification. A qualitative approach in form of exploratory, 15 semi-structured interviews was used to contextualise the quantitative results.

The quantitative results showed statistical evidence that SA private equity has better pair-wise diversification properties than SA listed equities and SA property relative to the asset classes in a typical SA pension fund. However, there was no statistical evidence suggesting that 10% allocation to SA private equity fund of funds results in increased diversification for a SA pension fund. The qualitative findings showed that lack of investment into private equity by SA pension fund managers has not been based on objective assessments of private equity.

Key words: Private equity fund of funds, strategic asset allocation, diversification, illiquidity risk, behavioural bias.

DECLARATIONS

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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Date: 9 November 2015

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QUOTATION

Wisdom is of utmost importance, therefore get wisdom, and with all your effort work to acquire understanding.

Solomon, former king of Israel

1 INTRODUCTION TO RESEARCH PROBLEM

1.1 Introduction

Chapter 1 introduces the reader to the topic and background of the research. It articulates the research problem, objectives, main, hypotheses, propositions, motivation and scope of the research. It is the bedrock for the whole research and sets the scene for the key ideas and concepts to be discussed.

1.2 Research title

Marginal diversification benefits of private equity fund of funds in South African pension funds.

1.3 Background to the research problem

The revised Regulation 28 of section 36 of the South African Pension Fund Act (no 24 of 1956), in short Regulation 28, published in March 2011 explicitly allowed and increased the maximum allowed private equity allocation for South African (SA) pension funds from 2.5% to 10%, effective 1 July 2011. In this piece of legislation, the National Treasury also ruled that up to 5% could be allocated per private equity fund of funds, whilst only 2.5% could be allocated per direct private equity fund. The intention for the difference in allocations was to ensure diversification by limiting allocations made to individual private equity funds on a look-through basis (National Treasury, 2011b).

The explanatory note from the (National Treasury, 2011a) contains a debate championed by the key pension fund decision makers. It captures the unresolved misalignment of views between two broad groups: the pro-private equity group (National Treasury and private equity fund managers) and anti-private equity group (SA pension fund decision makers). Some pension fund managers attribute the low allocations to the short-termism behaviour of trustees and asset consultants who want to see immediate returns and to be re-elected. As a result, pension fund managers fear that if they underperform because of private equity capital allocations, it might damage their relationships with trustees and asset consultants leading to termination of their mandates (Manson, 2014).

The explanatory note from the National Treasury (2011a) makes it plain that the regulator only applied qualitative perspectives. These perspectives included the need to ensure that retirement savings are prudently invested not only in ways that protects

the retirement fund members, but that also promote economic development, jobs creation and growth. In contrast, a recent study done in the US showed that buyouts resulted in moderate net job losses, but significant increases in gross job formation and losses (Davis et al., 2014). A counter argument to these findings is that it only included one aspect of private equity and did not assess the net impact of private equity after taking into account venture and development capital.

The private equity investment professionals were excited about the supportive regulatory provisions made by the National Treasury because they anticipated meaningful support in form of funding from SA pension fund managers. However, four years later there has not been a meaningful positive response by the SA pension funds community in support of the regulator's initiatives (KPMG & SAVCA, 2015).

In contrast, when Regulation 28 was revised in 2011 to increase the maximum allowed allocation to global assets in SA pension funds from 15% to 25%, most pension fund key decision makers were quick to increase and maximise their strategic and tactical allocations to global assets, respectively, especially global equities in South African multi-asset high equity funds (SA MA high equity). This was supported by the quantitative work done by Bradfield & Munro (2011) who concluded that global equities and bonds introduced significant marginal diversification benefits to SA pension funds. It made logical sense for the researcher to attempt to explain the gap between the new Regulation 28 and decisions made by pension fund managers. The starting point would be to quantify the diversification effect that private equity would potentially bring to SA pension funds.

The (National Treasury, 2011b) claims that revised Regulation 28 empowers decision makers of pension funds to do due diligence and assess the pension funds suitable for a particular liquidity and liability profile. What was clear throughout this debate was that the National Treasury did not provide quantitative evidence about the marginal diversification benefits of including private equity into the strategic asset allocation of South African funds. It also did not provide an objective framework for assessing a SA pension fund's liquidity and downside risk when exposed to private equity. The researcher argues that the regulation puts an enormous responsibility on inadequately informed trustees and asset consultants to quantitatively assess the marginal diversification benefits of private equity before making decisions on behalf of retirement members.

1.4 Problem statement and research objectives

Main objective: To answer the question, “Does private equity fund of funds generate statistically significant marginal diversification benefits in South African pension funds?”

Secondary objective: To answer the question, “Do SA pension fund managers objectively assess the diversification benefits of private equity in a SA pension fund?”

The quantitative perspectives of private equity fund of funds’ marginal benefits in SA pension funds will potentially provide the key decision makers with a more scientific and objective framework that can empower them to fully exercise their fiduciary duty by making more informed, less biased and prudent decisions on behalf of their clients.

1.5 Research motivation and business rationale

Humphery-Jenner (2013), National Treasury (2011a) and National Treasury (2011b) agree that private equity fund of funds introduce better downside protection relative individual direct private equity. Gresch & Von Wyss (2011) also qualitatively argue that the access to private equity via the fund of funds structure significantly reduces the liquidity constraint. However, the reviewed literature does not quantify the impact of moving from a direct to a fund of funds structure. The findings by Bradfield & Munro (2011) enabled the trustees, pension fund consultants and pension fund managers to quantitatively appreciate the need for taking advantage of the change in Regulation 28 to allow for off-shore asset classes allocations. Similarly, the researcher saw the need to quantitatively assess the marginal diversification benefits of private equity fund of funds in SA pension funds.

In the past two decades of academic research on private equity, there has been a reasonable amount of research done to qualitatively assess the unique risks of private equity, particularly illiquidity risk of private equity in the US. However, there has been a lack of in-depth and comprehensive research that quantified and integrated the multiple dimensions of diversification of private equity within a context of fund of funds structures, SA pension funds and non-Gaussian statistical measures. The lack of such research had partly to do with some of the following reasons:

- Low frequency private equity returns data
- Lack of transparency in disclosure of performance and holdings on the portfolios and investments in private equity funds

- Smaller private equity market
- Not yet established private equity fund of funds market
- Overdependence on Gaussian frameworks to understand risks
- Good returns from SA listed equity, hence less need to invest in alternative asset classes

The outcomes from this study is aimed at reducing the information gap that undermine the fiduciary efforts of pension fund decision makers. It achieved this by constructing an objective marginal portfolio diversification framework to enable the SA pension fund decision makers to make more prudent decisions on behalf of their retirement fund members. As a secondary motivation, the study also sought to identify and surface the behavioural biases of the key SA pension funds' decision makers that could be potentially influencing strategic allocations into private equity.

Furthermore, understanding why there has not been a positive response from the pension fund key decision makers could potentially help the regulators to come up with better and well-informed frameworks of engaging and incentivising these stakeholders appropriately, in order to get the desired outcomes.

1.6 Research scope and limitations

The research will be limited to SA private equity fund of funds and SA pensions funds. The Association for Savings and Investment South Africa (ASISA) categorises Regulation 28 funds into three main categories; SA MA low equity, SA MA medium equity and SA MA high equity.

The research only included SA MA high equity funds. This decision was motivated by the fact that SA MA low equity and SA MA medium equity funds are less likely to include private equity due to their shorter investment horizons and lower liquidity risk appetite for pension fund members close to or in retirement.

2 LITERATURE REVIEW

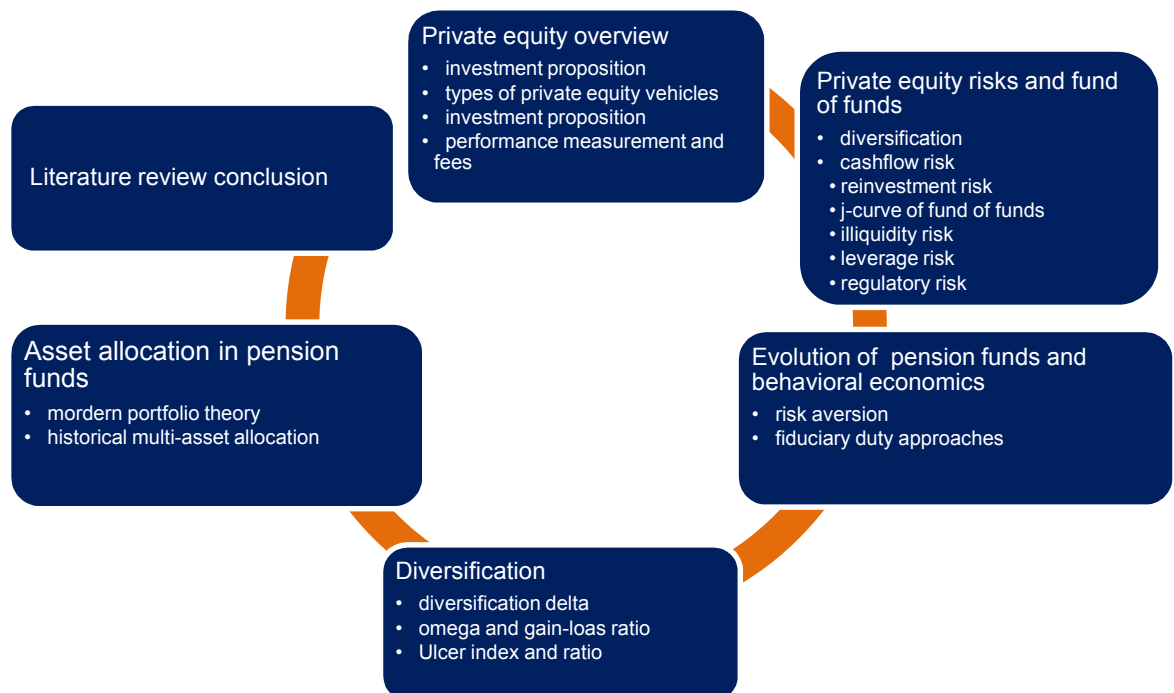
2.1 Introduction

The researcher's thought process on the literature review can be summarised with the following key questions:

- What assumptions, opinions and facts can be gleaned from the literature on the subject matter?
- What are the results, conclusions and recommendations from research papers on the topics of interest?
- Where is the literature search steering the direction for both the quantitative and qualitative aspects of the research?

The diagram in Figure 1 provides the chronological structure of the literature review. The subtopics were carefully chosen to establish a foundation of understanding around the scope of the study. The research used both quantitative and qualitative approaches as the main and overlay approaches, respectively.

Figure 1: Literature review structure



Source: Own

The chapter reviews literature on some key issues that pension fund fiduciaries are battling with. It begins with a review of the private equity industry, investment proposition, and performance measurement and fees by focusing on the recent academic research. Furthermore, the chapter discusses cashflow risks, illiquidity risk,

j-curve risk and leverage risk. It then reviews behavioural biases of investors, diversification and its measures, and asset allocation methodologies. Chapter 2 concludes with a summary of the principal ideas. It also draws up the strands together and demonstrates the need for the research and its potential value add.

2.2 Private equity overview

In certain instances, academic authors and professional bodies from different countries differ on their use of terminology when it comes to the terms private equity and venture capital. The South African (SA) and European professional bodies for private equity management broadly agree on the definition of private equity as the co-investment and ownership in unlisted or privately held companies of all magnitudes and at any of the three broad stages of development. SA private equity started in the mid-1980s when a number of foreign companies were disinvesting from SA and creating private equity deals for the banks. After 1994, the democratic SA supported the disinvestments of big companies from non-core assets and offshore expansion, and generated significant opportunities for private equity growth. The legislation of Black Economic Empowerment (BEE) also contributed to its growth (SAVCA, 2015).

Table 1: Private equity categories and stages

Category of Capital	Stage of business development	Typical application
Venture	Seed	Funding for market research, evaluation and development of a concept, product or business before the business starts trading.
	Start-up and early stage	Funding for new companies set up or for the development of those that have been in business for a short time (one to three years), marketing and selling of products.
Development	Expansion and development	Funding for growth of a company that is breaking even, full scale production, additional working capital, new product lines 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 their existing owners, whether a family, conglomerate or other. Unlike venture capital and developmental capital, the proceeds of a buy-out generally go to the previous owners of the entity. Buy-outs are usually leveraged.
	Replacement capital	Funding of purchase of existing shares in a company from other shareholders, which can be individuals, other venture-backers or public through the stock market. Unlike venture capital development, the proceeds of replacement capital transactions are generally paid to previous owners of the entity

Source: (SAVCA, 2015)

Table 1 shows the different stages of capital investment and management which are divided into venture capital (seed, start-up and early stage), development capital

(expansion or growth and development), and buy-out funding (leveraged buy-out or buy-in and replacement capital). In essence, EVCA (2014) and KPMG & SAVCA (2015) define venture capital as part of private equity, a funding for a business in its early stages of development. Jones & Mlambo (2013) also refer to venture capital as the early stage for financing and private equity as the later stage financing through which acquisitions and growth take place. The main intention is to exit the investment at a higher valuation than it was bought for through initial public offerings (IPOs) or private placement sales (Goktan & Ucar, 2012).

Tudor (2013) agrees with the definition of Goktan & Ucar (2012). However, he adds a critical aspect to the definitions by saying that the involvement of venture capitalists is mainly in consulting and their owned share capital is usually below 50%. On the other hand buyout investors normally own the majority shareholding and their role involves restructuring the company. Another critical difference is that early stages of private equity are less likely to involve high levels of debt due to the levels of risks associated in start-ups (KPMG & SAVCA, 2014). In South Africa, most of the third-party investments are done through leveraged buy-outs (LBOs) and management buyouts (MBOs) (EVCA, 2014; KPMG & SAVCA, 2015). Based on this literature review, the researcher settled on the all-encompassing and broader definition of private equity throughout the report. As at 31 December 2014, 88% of the undrawn commitments were in late stage private equity. A key observation from this is that the size and number of deal informs the attractiveness of investment stage (SAVCA, 2015). This means that most private equity vehicles in SA contain late stage private equity investments.

Table 1 also category definitions exclude mezzanine capital, a form of capital invested as either preference shares or subordinated debt of the company. This form of funding possesses both debt and equity like characteristics. Interestingly, for the first time in six years, mezzanine capital no longer exist in the composition of assets under management for SA private equity. Essentially the mezzanine capital can be used for any of the three stages mentioned above (EVCA, 2014; KPMG & SAVCA, 2014).

2.2.1 Types of private equity vehicles

The private equity historical model of investing in non-listed companies only is slowly changing as some private equity funds are now making investments into publicly listed companies as well (Cumming, 2012). Both Brown & Kräussl (2010) and Phalippou (2010) agree that unlisted and listed private equity companies have similar business models and similar return and risk characteristics. A common element about the two

private equity approaches is that both investors aim to create long-term value over a number of years before they can realise it by selling it to another buyer. In general, the two differ on governance and disclosure, as listed private equity has to comply with the regulatory requirements of the stock exchange. Furthermore, limited partners (LPs) in unlisted private equity investments can privately negotiate some aspects of the investment strategy and restrictive terms at the onset of the investment (Brown & Kräussl, 2010; Phalippou, 2010).

2.2.2 Listed and unlisted private equity

Brown & Kräussl (2010) and Phalippou (2010) further makes a distinction between listed direct and listed indirect funds. The listed direct vehicles are listed on the stock exchange and invested in unlisted firms and listed indirect are unitised funds which commit and invest capital in other underlying private equity funds. The later are also known as private equity fund of funds. Brown & Kräussl (2010) argued that the listed direct private equity gives more liquidity, lower fees, ease of monitoring and an opportunity to invest in unlisted companies at a discount with smaller capital. Their analysis is summarised in the Table 2 (Brown & Kräussl, 2010; Phalippou, 2010).

Table 2: SA listed vs SA unlisted private equity

Attribute	Listed private equity	Unlisted private equity
Lifetime	Unlimited	Normally fixed for 7-10 years
Fees	Normally low	Typically around 2% of the commitments + 20% carry
Liquidity	Possible to sell shares in the secondary market	Can be hard to resell
Investments	Diversified	Focused
Possibility of co-investments	Limited opportunities for shareholders	Sometime opportunities arise
Disclosure	Produce reports and accounts	Detailed information on investments are available to investors
Shareholder influence	Limited influence possible	High influence possible
Power	Shareholder democracy	Investors can change management
Realisation proceeds	Unusually reinvested	Returned to investors
Minimum investments	Very small minimum size	High minimum size

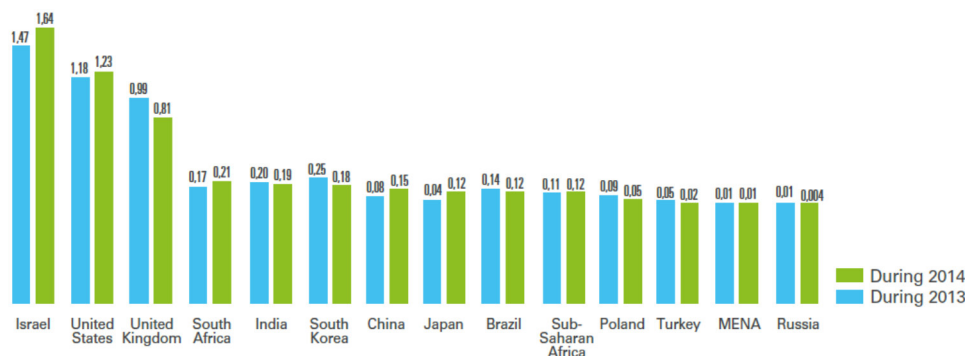
Source: (Brown & Kräussl, 2010; Goktan & Ucar, 2012)

Bergmann, Christophers, Huss, & Zimmermann (2009) also found evidence that IPO firms that are backed by listed private equity firms report higher quality earnings than IPO firms that are backed by unlisted private equity firms. Goktan & Ucar (2012) concluded that listed private equity is a growing market for investors who want private equity exposure in their portfolios. They discovered that listed private equity firms were on average older and had investment horizons in underlying unlisted investments longer than unlisted private equity firms.

There are 8 and 39 investable listed direct and unlisted direct private equity vehicles in South Africa (KPMG & SAVCA, 2015). The listed companies are PSG, Remgro, Reinert, Purple Capital, Brait, Brimstone, Bidvest and RECM & Calibre. Purists argue that gaining access to unlisted private equity through listed direct securities is not an entry to private equity in the accurate sense of the term. Cumming (2012) are of the view that there must be a certain end point in the private equity investment model and investment cycle. The implication of this distribution is that unlisted private equity plays a more significant role in the overall portfolios of private equity investors than listed private equity. Private equity investors should be expected to require a higher risk premium on unlisted private equity than listed equity.

2.2.3 SA versus the rest of the world

Table 3: Annual independent investments as % of GDP



Source: (SAVCA, 2015)

SAVCA (2015) argued and gave evidence that the South African private equity industry was broadly well established and locally significant. Jones & Mlambo (2013) agreed with their view and added that development capital and buy-out capital stages markets are well developed. However, they also concluded that, unlike the NASDAQ in the US and AIM in the UK, the JSE Alt-X equity market, which is an equivalent market established to draw early stage companies is still not deep enough to allow viable IPO exiting opportunities.

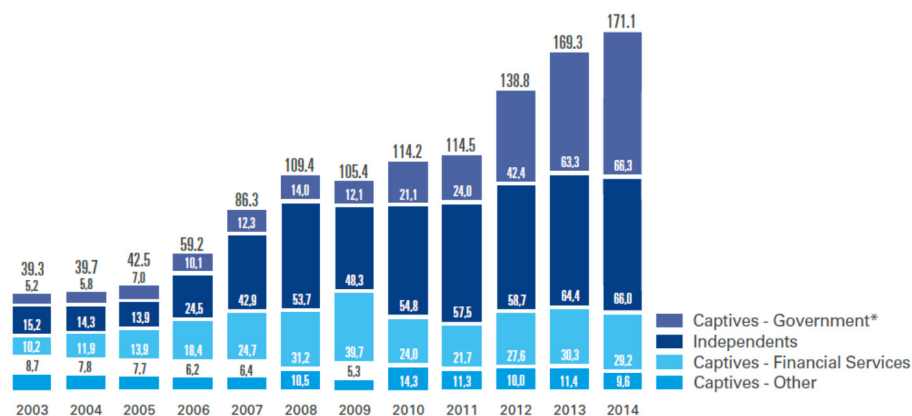
As at December 2015, SAVCA (2015) stated that South Africa’s independent private equity investments as a percentage of GDP was 0.21% and greater than that of any of the BRIC group countries: Russia (0.01%), Brazil (0.12%), China (0.15%) and India (0.19%). However, it is still significantly lower than that of the UK (0.81%), US (1.23%) and Israel (1.64%).

2.2.4 Regulatory implications

The SA Financial Services Board (FSB) added disclosure requirements for SA private equity funds that want to qualify for investment by SA pension funds. The investee private equity funds are now required to report quarterly, detailing their performance and relevant investment activities. Another requirement is that their financial statements and assets must be verified by auditors annually and half-yearly, respectively (Registrar of Pension Funds, 2012).

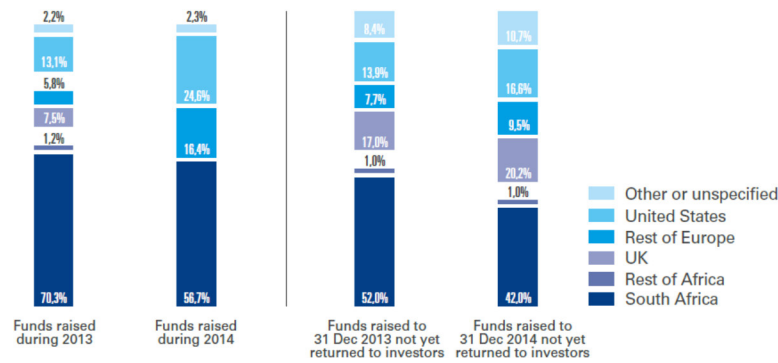
One would hope that these minimum disclosures would go a long way to addressing some of the concerns that key pension fund decision makers have when it comes to transparency, liability and corporate governance in private equity. Seretakis (2012) argued that the change in regulation on the disclosure of unlisted private equity which began post the 2007-8 global financial crisis in the US and EU with Dodd-Frank Act and Alternative Investment Fund Managers Directive (AIFMD) of 2010, respectively is unlikely to close the significant differences in public disclose and governance between unlisted and listed private equity companies.

Figure 2: Composition of total private equity funds under management



Source: (SAVCA, 2015)

Figure 3: Geographical sources of third party funds



Source: (SAVCA, 2015)

Fig 2 shows that as at the end of 2014, only R66 billion (39% of the R171 billion total commitment) private equity assets under management were managed by independent private equity managers, the rest belongs to on-balance sheet captive funds. Of the R171 billion commitment, only 68% was invested. The R66 billion was divided among 39 independent private equity managers. The government sponsored funds also had a similar amount of exposure to captive private equity. A linked observation is that a substantial portion of the third-party private equity funds are sourced from outside of South Africa, mainly Europe, the US and the UK as shown in Fig 3. Out of the R7 billion raised in 2014, only R 1 billion came from pension funds. Out the R1 billion, only R560 million came from SA pension funds. This means SA pension funds' capital invested in private equity continues to be a small percentage of total pension funds' assets, given that SA pension fund managers oversee R2.5 trillion. The researcher also deduced that foreign investors find SA private equity more attractive than SA resident investors (SAVCA, 2015).

The researcher puts forward a proposition that the quantum of SA private equity investments has a direct relationship to the risk perception of SA pension funds' key decision makers. This proposition was then tested qualitatively with key decision makers in SA private equity and pension funds industry.

2.2.5 Private equity investment propositions

Heed (2010) argued that private equity general partners (GP's) establish accountability that could be absent in a listed equity's board of directors whose members may not have meaningful active shareholding. Van Niekerk & Krige (2009) agree along similar lines and add that it creates sturdy alignment of interests between investors (LPs and GPs) and management. Some industry experts argue that the

superior outperformance in private equity is a function of the lead time invested into analysing the target company and its sector before make advances on the deal.

Others are of the view that the unlisted space has significant opportunities to buy businesses at very low multiples due to a large number of market inefficiencies (Sharma & Prashar, 2013). Private equity GP's also claim to benefit from the information asymmetry (legal form of insider information) on exit. Knauer, Lahmann, Pflücke, & Schwetzler (2014) also argued that financial engineering in form of leverage is another important factor that also contributes to the higher than listed equity returns through the tax-deductible interest on debt. Axelson, Jenkinson, Stromberg, & Weisbach, (2013) counter this school of thought by arguing that investors must not build investment cases on the grounds of applying leverage as the credit and economic environment may not be conducive. The researcher's view is that leverage should be optimised to economics of the business, sector and prevailing environment.

2.2.6 Private equity performance measurement and fees

SA, EU and US private equity GPs charge between 1-3% of committed capital. However, when it comes to carried interest performance fee for returns above the benchmark, EU and US private equity GPs charge between 15-20%, whilst SA GPs typically charge between 10-15% (Cumming & Johan, 2009).

Globally, private equity fund managers earn fixed fees, performance fees and sometimes give clawbacks when realised performance is below benchmark. Empirical studies show that the legal framework and conditions of a country are by far the biggest the most statistically and economically significant impact on private equity management fees (Cumming & Johan, 2009). This evidence is well in line with the theoretical deductions of Acemoglu & Zilibotti (1999). The empirical evidence and theory both concluded that risk averse private equity fund managers were expected to trade-off performance fees for fixed fees in economies where the regulatory environment is weak. On the other hand, risk averse institutional investors such as pension fund managers are more inclined towards negotiating clawbacks of the fees paid.

Malamud, Rossi & Martelanc (2013) argued that the private equity fee structure can be unfair and not aligned to the ultimate clients. They also contended that management fees are applied on the committed capital irrespective of how much was

invested into the target companies. In contrast, Cumming & Johan (2009) opposed this view by highlighting that it is essential to establishing an appropriate incentive structure, so that managers are not lured into rushed deals. The researcher's view is that both authors are correct and it depends with the context.

2.3 Mitigation of private equity risks through fund of funds

Under the Pension Funds Act, 1956, trustees, pension fund managers and advisors have a fiduciary duty to act in the best interest of the pension fund members at all times. These key decision makers are expected to perform deep dive due diligences in order to identify and mitigate risks which include but not limited to liquidity, credit and market risks (National Treasury, 2011a; National Treasury, 2011b).

The researcher structured the questions for the interviews with the aim of understanding how the key decision makers perceive these risks. Most of the interviewees admitted that these risks were the key reasons for excluding private equity in the strategic asset allocation of retirement funds. The picture of these risks becomes clearer when compared to listed equity. In the context of pension funds, Szigety (2013) and Inderst (2010) argued that the following risks top the list in the asset allocation decision making process:

2.3.1 Cashflow risk

Cashflows and dividend policies from private equity investments are less predictive and dependent are opportunity driven compared to listed equities. For example, the exact time of cashflow investments is usually unknown at the time of the initial private equity investment. This makes it difficult for key decision makers to allocate capital required to support clients who need more predictive income than capital growth (National Treasury, 2011a; National Treasury, 2011b).

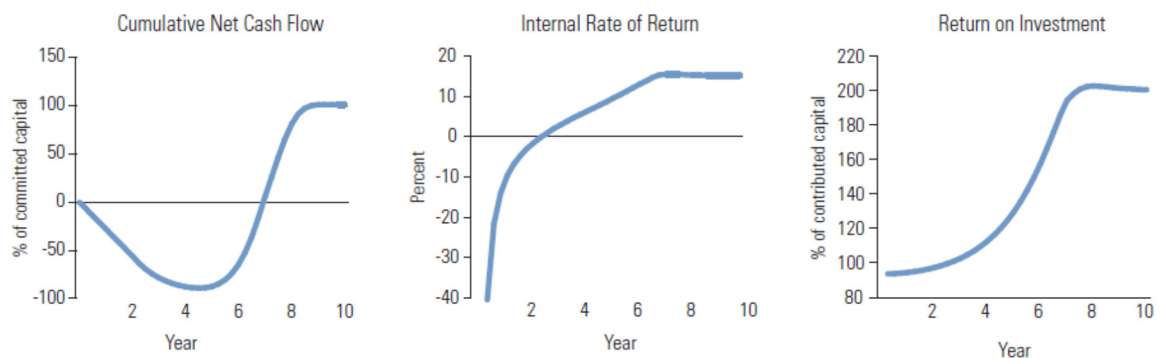
Cumming & Johan (2009) showed that weaker regulatory environments have higher chances of paying cash distributions than stronger ones. They also showed that SA private equity funds have higher probabilities of paying cash distributions to SA pension funds than developed countries' private equity funds to their respective pension funds. Another important argument is that cash distributions are a good litmus test for the operational health status of the investee company, enabling the SA pension funds to make informed decisions about whether or not to inject more capital into the projects of the investee (EVCA, 2014; Groh & Liechtenstein, 2011).

2.3.2 Reinvestment risk

It typically takes up to 5-10 years to liquidate the initial and subsequent investments. This can also be referred to as duration risk. On the other hand, listed equity can easily be sold in the secondary market for an opportunity with better expected return profile. The pension fund manager will have very limited opportunities to tactically reduce exposures to the private equity in favour of higher yielding asset classes, without attracting severe penalties (Andreu, Ortiz, & Sarto, 2013; Fat & Dezsi, 2012).

Murphy (2006) argued that reinvestment risk is usually countered by the J-curve effect. Figure 4 illustrates the J-curve effect which refers to the low and or negative cashflows and poor performance during the early years after the initial commitments are made. The performance and cashflows of the private equity will typically significantly increase in the mature stages of the fund.

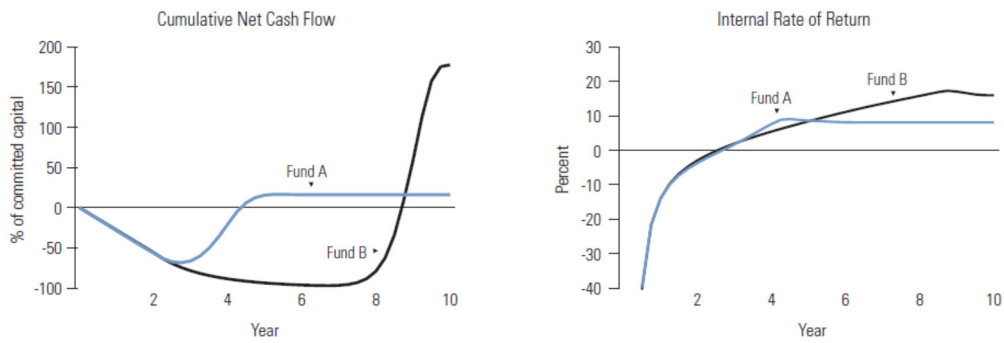
Figure 4: J-curve effect for private equity



Source: (Murphy, 2006)

Ji-Woong Chung, Sensoy, Stern, & Weisbach (2012) supported De Zwart, Frieser, & van Dijk (2012) by arguing that the J-curve effect should not be treated as an indicator of the overall returns of a private equity investment, but rather an attribute of the investment at a certain point in its life cycle. They also concluded that the longer the duration, the flatter the internal rate of return (IRR).

Figure 5: Impact of duration and ROI on IRR



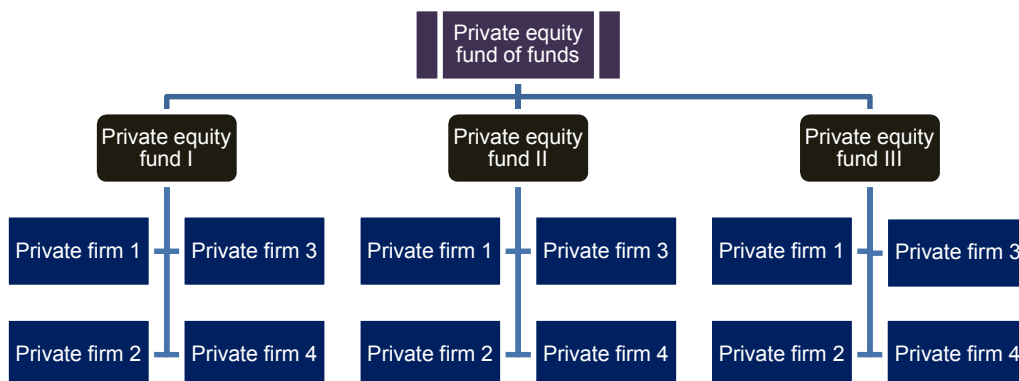
Source: (Murphy, 2006)

Murphy (2006) concluded that IRR combines both return on investments (ROI) and duration. A private equity fund that is exited early can be wrongly identified as a better performer than an investment with a longer exit. From their argument the researcher is of the view that, understanding the dynamics behind the J-curve allows investors to better manage reinvestment and cashflow risks, and their expectations regarding private equity investments. Murphy (2006) also concluded that one of the strategies to mitigate the risks is for pension funds to invest through fund of funds structures.

2.3.3 J-curve of fund of funds

Ewens, Jones, & Rhodes-Kropf (2013) also supported Murphy (2006) with an additional perspective that fund of funds significantly deal with the concentration risk and improve the overall diversification of private equity by improving of the J-curve profile.

Figure 6: Private equity fund of funds structure

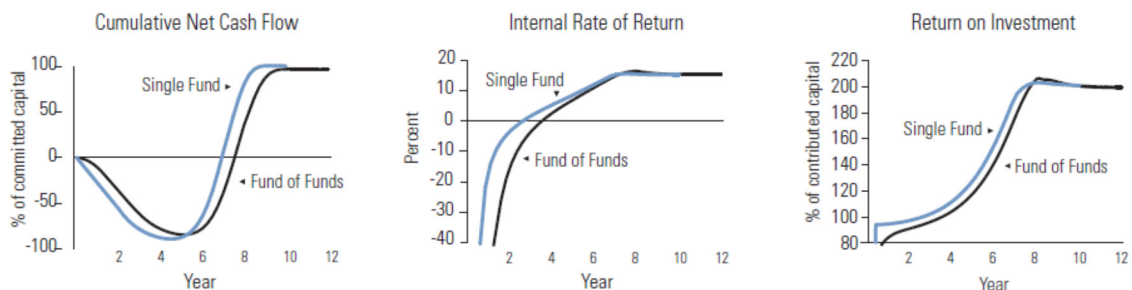


Source: own

Figure 6 shows a typical private equity fund of funds structure. At the beginning of the investment cycle, GP's raise capital from LP's in form of cash commitments. Once target firms are identified, the GP will then draw on the commitment line. GP's of private equity fund of funds choose and invest in a number of private equity funds over a different periods of time, known as vintage years. The overall fund of funds will typically have a better and J-curve profile than the underlying funds as illustrated in Figure 7.

As a trade-off for overall diversification, fund of funds typically have longer investment horizons than direct private equity funds. This is because the fund of funds structure has to remain active until the last vintage and underlying fund is exited. However, they would also typically have a stable and more predictable J-curve than a direct private equity investments due to averaging of vintage years, cashflows and valuation growths (Murphy, 2006). Studies of Murphy (2006) also indicated that pension fund managers can also mitigate the negative impact of the overall J-curve by using predetermined asset allocation strategies that emphasize vintage year diversification, such as implementing a gradual annual commitment to private equity fund of funds until the desired strategic allocation is reached.

Figure 7: J-curves of private equity fund of funds



Source: (Murphy, 2006)

Private equity fund of funds add a very important piece of the puzzle to the private equity debate. Old Mutual Multi-Manager Private Equity (2015) is a clear illustration of how fund of funds lower the barrier to entry with a minimum investment ranging of R100,000. Retail investors can now also invest with two of the four fund of funds firms in South Africa. In contrast, most direct private equity minimum investments are usually set at R100 million. If retail pension funds in the SA MA high equity were to take full advantage of the 10% maximum allocation limit to private equity, only 32 out of 152 (21%) would have been able to do so due to the pension fund size constraint.

By going the indirect fund of funds route, 100% of the retail pension funds would be able to take advantage of the 10% maximum allocation limit (Murphy, 2006).

As at 31 December 2014, there were only four fund of funds firms in South Africa, with the first fund having been incepted in 2004. These four are Vunani Private Equity, Sanlam Private Equity, Old Mutual Private Equity and Momentum. Vunani Private Equity, Sanlam are open only to institutional investors. An argument could be made that it is currently not practically plausible for most pension funds to gain access to fund of funds even if they wanted to. The main reason is that private equity fund of funds' capabilities have to take root first and increase before pension fund decision makers can consider them for a serious due diligence and as potential investment vehicles (SAVCA, 2015).

2.3.4 Illiquidity risk

Numerous empirical studies over the past three decades show evidence that illiquid assets usually offer a premium return over equivalent liquid assets (Hibbert, Kirchner, Kretzschmar, Li, & McNeil, 2009). Two main types of illiquidity risks are trading illiquidity and funding illiquidity. In our context, trading illiquidity is the ease with which the unlisted investment can be exited or liquidated and funding illiquidity refers to the ease with which private equity funds can access funds for unlisted deals or activities. The study focuses on trading illiquidity risk as key decision makers of pension funds that were interviewed by the researcher confirmed that their concern was on the trading illiquidity risk as opposed to funding illiquidity risk.

Ang & Kjaer (2012) argued that illiquid assets can only be realised by investors that have longer investment periods than the payoff period of the illiquid assets. They were also of the view that having a long investment period does not mean that the long-term investor should blindly invest in illiquid vehicles like private equity. Instead, long-term investors should demand an appropriate illiquidity premium as compensation to invest in illiquid vehicles like private equity. They also concluded that calculating illiquidity risk premium requires an asset allocation model through which the investor can quantify the opportunity cost of holding illiquid assets such as private equity.

Franzoni, Nowak, & Phalippou (2012) showed in their research the observed relationship between private equity returns and its corresponding illiquidity risk. They concluded that private equity funds have an illiquidity risk premium of around 3% per annum. However, they also argued that the good returns of private equity funds can

be attributed as reward for many other risks factors to which the business is exposed, and illiquidity risk is also one of the crucial sources of the risk premium. They also argued that pension fund investors in high equity funds were better suited to hold illiquid assets such as private equity. Their argument then suggests that pension fund decision makers should be more concerned with the question of downside risk than illiquidity risk because the funds generally have a longer investment horizon of 5-7 years.

De Zwart, Frieser, & Dijk (2012) recognised the potential impact of illiquidity risk of private equity in pension funds. They improved the risk-adjusted returns profile by developing a dynamic commitment strategy that preserves strategic asset allocation to private equity. Basically, for each period it determined the level of new commitments by applying techniques that take into account the characteristics of the existing private equity fund, distributions received, uncalled capital from previous commitments as well as the latest allocation relative to the target.

Missankov, Dyk, Biljon, Hayes, & Veen (2006) supported De Zwart et al. (2012) from a different angle with a view that private equity funds illiquidity should not be of serious concern even for pension funds with negative cashflows which can be paid from the remaining liquid asset classes such as listed equity, cash and bonds. They also countered the liquidity risk concerns with their research which showed that some successful private equity investments usually pay an ongoing payment of capital, interest and dividends to the private equity fund during the investment lock-in period. They also say that the liquidity constraint could be reduced with an increase in the number of underlying private companies and that a fund of funds structure might be the optimal way to implement it.

Private equity funds typically apply a liquidation penalty if exit is sought before the expiry of the mandated investment horizon. Franzoni, Nowak, & Phalippou (2012) argued that the only way to liquidate such a position is to sell it to a third party at a discount. The secondary market for these transactions is underdeveloped in South Africa. South African private equity fund of funds charge from 5% to 7.5% of the quarterly withdrawals, which is quite a steep discount (Old Mutual Multi-Manager Private Equity, 2015). Some of the private equity managers interviewed by the researcher argued that the liquidity option provides investors with a great peace of mind and that a very tiny number of investors have ever used this option.

An important take away from this literature review was to solicit responses from the interviewees on whether they were satisfied with a 3% liquidity risk premium from private equity above listed equity. For the interviewees (pension fund managers) who allocated to private equity, the researcher wanted to understand asset allocation modelling techniques that were employed to deal with the private equity risks.

2.3.5 Conflict of interest

Heed (2010) argued that despite some incentives and requirements such as the interest carry and personal capital commitment on the part of GP's and their staff, private equity managers are still susceptible to conflict of interest. There is risk of cherry picking certain underlying investments for certain funds in cases where the GP's are able to over or under commit to a specific fund. Such actions will enable them to take on more lucrative deals into certain funds with the agenda of benefiting their own personal portfolios at the potential expense of their clients and limited partners. The researcher has the view that this type of conflict of interest can be significantly mitigated by a fund of funds structure.

2.3.6 Leverage risk

Heed (2010) also concluded from two schools of thought, the positive and negative. On the negative, he suggested that when credit cycles deteriorate, interest rate hedging become undermined and capital structures that were once balanced become unsustainable. A good example is when Bain Capital bought EDCON just before the 2007-8 global financial crisis through a LBO and subsequently loaded Euro denominated debt on its capital structure. The result was EDCON struggling to sustainably repay its interest on debt and forced to restructure its debt in 2015 (Lowman, 2015).

On the positive side Heed (2010) argues that most firms' levels leverage are on the low side and considered to be tax and returns inefficient. He further justified it by arguing that generally large firms tend to do well with high leverage as they are generally more stable and in a position to survive financial downturns. The researcher's view is that leverage should be taken on a case by case basis and excessive use of debt makes most companies vulnerable when unforeseen economic and business environments play out.

2.3.7 Regulatory risk

Cumming, Schmidt, & Walz (2010) debate that the regulatory landscape has the potential to negatively influence private equity fund returns. They then suggest international diversification might enable regulatory arbitrage. The researcher's view is that a private equity fund of funds might be more effective in internationalising the private equity exposure due to the relatively higher number of underlying firms than direct private equity fund.

2.4 Behavioural biases

2.4.1 Introduction

The researcher did not find relevant research that discussed the impact of behavioural economics on the decisions made on private equity by the pension fund decision makers. Therefore, literature on behavioural finance was reviewed in order to appropriately position the interviews with key decision makers as well as to inform the reader on the development of the key and relevant concepts on the subject. The researcher was of the persuasion that the evolution of the pension fund industry's legal and regulatory framework in South Africa and globally had a huge negative impact on the behaviour of decision makers that are entrusted with the fiduciary duties designed to benefit the retirement fund clients.

2.4.2 Illiquidity risk aversion

Andrew, Papanikolaou, & Westerfield (2011) had intriguing findings on asset allocation. They discovered that illiquidity results in investment professionals behaving in a more risk averse fashion in relation to both liquid and illiquid investment choices, and that this risk aversion is also time dependent. They argued that the intuition and psychology behind it is that wealthy investors who have all their wealth in illiquid assets will not be able to consume out of their assets. Illiquid assets take away the investor's ability to rebalance and access to "dry powder" that enables them to acquire distressed assets during bad times. They cite a case of Harvard University endowment during the 2007-8, when it had serious need for cash to meet its liabilities. Its endowment held large amounts of illiquid assets which could not be readily liquidated to fund the imminent liabilities. They then concluded that investors should care about the ratio of their illiquid to liquid assets and this should be informed by asset allocation and expected liabilities.

Ang et al. (2011) also discovered that if the liquid asset classes in a portfolio are expected to generate reasonable returns, the case for an illiquid asset becomes less

compelling. They calculated and suggested that the optimal allocation to an illiquid asset such as single private equity fund which can only be rebalanced once in 10 years, 5 years and 1 year is 5%, 11% and 37%, respectively. Given that most private equity fund of funds have a 7-10 year horizon, these findings are in line with the 10% maximum limit to private equity which is prescribed by Regulation 28 (Andrew et al., 2011; National Treasury, 2011b). Ang et al. (2011) also suggested that a direct single private equity fund that can only be rebalanced once every 10 years, 5 years and 1 year, on average, should require an illiquidity risk premium of 6%, 4.3% and 0.9%, respectively.

2.4.3 Short-termism and herding behaviour

Hawley, Johnson, & Waitzer (2011) argued that fiduciaries ought to be examining the tightly held practices which have been considered as 'best' practice over the last century, given the structural shift in financial markets, economic dynamics and investments industry. They added that key decision makers have not fully adjusted their practices in order to reflect all the significant risks that potentially undermine the sustainability of the promises and expectations of pension funds.

Some of the key misalignments that exist between fiduciaries and the long-term expectations and liabilities of the pension fund members are as follows:

- Short-termism: Drexler & Greenhill (2012) argued that the average holding period for listed shares has reduced from above 5 years to less than one year. They also warned that some of the short-termism is orchestrated by regulatory frameworks that undermine the ability of fiduciaries to use long-term investment strategies. The researcher concurred with Krehmeyer, Orsagh, & Schacht (2006) that having a short-term outlook is not wrong, however what is important is an established balance on the long-term value creation and risks, short-term risks and opportunity costs.
- Herding behaviour: Sector and industry benchmarking has potentially resulted in key decision makers not wanting to significantly underweight or overweight certain risks or asset classes relative to their peers (Drexler & Greenhill, 2012).
- Modern Portfolio Theory (MPT) assumptions: The flawed assumptions of MPT are widely documented, particularly the "efficiency" of listed markets and "rationality" of investors (Drexler & Greenhill, 2012).
- Increasing complexity of the role of trustees: In the past trustees had a few managerial responsibilities or powers. Their role has significantly evolved over the past three decades. Most trustees are not adequately equipped to deal with the

complexities of the new investment world of ever evolving regulation, risks and expected returns. (Drexler & Greenhill, 2012).

The researcher concluded that sources of behavioural bias in the context of SA pension funds' asset allocation problem could be divided into three subcomponents namely, lack of objectivity in making decisions, shallow understanding of the illiquidity risk and lack of research (Drexler & Greenhill, (2012); Krehmeyer, Orsagh, & Schacht, (2006); Hawley, Johnson, & Waitzer, (2011). The researcher tested these behavioural biases with the relevant interviewees and the impact they could have on their ability to allocate pension funds' capital to private equity.

2.5 Diversification

A ground breaking research by Markowitz (1952) established the fundamentals for a more objective framework for asset allocation of money to a basket of investment vehicles. The study led to the mean-variance framework and showed that risk mitigation can be attained via either maximisation of expected return for a given predetermined standard deviation or minimisation of standard deviation for a predetermined expected return. The optimal set of funds generated by this methodology were dubbed an efficient frontier. Amenc, Goltz, & Stoyanov (2011) took it further by arguing that well-diversified portfolios or sensible diversification is more about efficient extraction of risk premia than about mere risk minimisation.

One of the key elements in portfolio construction and optimisations is the marginal diversification. In our context, marginal diversification refers to the change in measures of return or risk for a pension fund per unit percentage increase to the strategic allocation to private equity. Asness, Israelov, & Liew (2011) concluded that diversification should be measurable and result in better overall portfolio risk-adjusted returns relative any one investment held in isolation.

Humphery-Jenner (2013) discovered that risk-reduction within private equity could increase returns. However, he argued that it does not explain the association between returns and geographic/ industry risk mitigation. Instead, adding the number of companies in a portfolio lessens the fund's idiosyncratic risk. He also found that returns grow with an increase in underlying companies. Humphery-Jenner (2013) also balanced his argument with an opposing view that diversification might also detract value if skills are spread too thinly. For example, it might reduce the staff-to-region or

staff-to-industry ratios leading to reduced productivity and value creation per underlying company.

The researcher could not find comprehensive quantitative studies on the diversification impact of private equity funds of funds on pension funds. This further justifies the need for this study. The researcher reviewed the literature on diversification in order to identify the appropriate measures of diversification to use for the research. Christoffersen, Errunza, Jacobs, & Langlois (2012) concluded that the merits of international diversification across all broad markets decreased because of a gradual increase in the average correlation of these markets. In other words, if international markets are well interconnected, there is no marginal value in diversifying across them.

The view of Asness et al. (2011) added to the same argument by concluding that, over the short term, diversification can disappoints when needed the most as market tend to crash together and correlations converge. However, they also take an opposite view and argue that critiques who claim that diversification offers insignificant protection miss a very critical point about the long-term. They concluded that despite market panics being important factors for short performance, economic performance dominates over the long-term. The researcher also concurs with their view in that diversification hedges investors against the severe impact of having concentrated investments with poor long-term economic performance. In other words, over extended periods, underlying economic and fundamental drivers of earnings matters more than brief panics with respect to returns, and sensible diversification plays a tremendous role of shielding investors and creating marginal value.

The literature review supports the concerns that pension fund managers have about private equity risks. Humphery-Jenner (2013) demonstrated that there is a positive association between spreading of capital to many companies and returns, but did not investigate the fundamental factor of this relationship. Humphery-Jenner (2013) suggested that diversification might increase returns by enabling knowledge sharing among portfolio managers and senior managers. This is potentially because prior diversification may generate skills that the current funds can utilise to boost returns.

The work conducted by Christoffersen, Errunza, Jacobs, & Langlois (2012), Humphery-Jenner (2013), Amenc, Goltz, & Stoyanov (2011) and Asness, Israelov, &

Liew (2011) led the researcher to four important dimensions of sensible diversification namely, upside potential, downside risk, pairwise association and downside risk potential.

2.5.1 Omega and Gain & Loss ratios

The researcher agreed with Xiong, Idzorek, & Ibboston (2014) that, metrics such as volatility and beta are inappropriate risk measures and largely irrelevant. They penalise upside performance the same way they do losses. They also do not account for non-Gaussian/ Normality return attributes. Rutkowska-Ziarko & Garszka (2014) proposed the semi-variance as a more appropriate measure of downside risk than standard deviation. Bernardo & Ledoit (2000) introduced the Loss ratio (LR) as a better downside risk measure than standard deviation and semi-variance as it does not employ normality assumptions. It is defined as the probability weighted returns below a pre-defined threshold.

The researcher concurred with Arias Fogliano de & Samanez (2013) in that Omega and Gain-Loss ratios are credible measures for sensible diversification and downside-risk adjusted performance measures. Omega is computed by dividing the historical probability of obtaining a return superior to a return threshold by the historical probability of obtaining a return lower than it, as shown in Equation 1.

Equation 1: Omega ratio

$$\Omega (R_T) = \frac{\int_{R_T}^b (1 - F(x))dx}{\int_a^{R_T} F(x)dx}$$

$$\Omega (R_T) = \frac{\textit{Upside potential}}{\textit{Downside potential}}$$

Where a , b and R_T are minimum, maximum and threshold returns for the distribution, respectively. $F(x)$ is the non-parametric cumulative returns distribution.

Bernardo & Ledoit (2000) further developed a special case of the Omega known as Gain-Loss ratio which is also known as Omega-Sharpe, where the return threshold is 0%. Gain ratio and Loss ratio are the numerator and denominator of the Gain-Loss ratio, respectively as shown in Equation 2:

Equation 2: Gain-Loss ratio

$$\Omega (R_T) = \frac{\int_{R_T}^b (1 - F(x)) dx}{\int_a^{R_T} F(x) dx}$$

$$\Omega (0\%) = \frac{\text{Gain ratio}}{\text{Loss ratio}}$$

Where a , b and R_T are minimum, maximum and threshold returns for the distribution, respectively. R_T is equal to 0%. $F(x)$ is the non-parametric cumulative returns distribution.

Keating & Shadwick (2002) introduced the Omega function as a non-parametric alternative framework to the Mean-Variance Optimisation (MVO) by Markowitz (1952). Treynor, Sortino, Information and Sharpe ratios are widely documented risk-adjusted return measures under the MVO framework. These measures require strict assumptions about the investor's quadratic utility function or about the Gaussian distribution of the portfolio returns (Sharpe, 1966; Sortino & Price, 1994; Treynor, 1965). Unlike the Treynor, Sortino, Information and Sharpe ratios which use standard deviation as the denominator, the Omega function defines upside potential and downside risk differently, thus taking care of the extensively documented theoretical flaws of MVO.

To fully assess diversification, the researcher chose the Gain ratio and Loss ratio separately as measures of upside potential and downside risk, respectively.

2.5.2 Ulcer index and ratio

The researcher also chose the Ulcer (or Martin) index and Ulcer (or Martin) ratio as reliable non-parametric measures of downside risk and downside risk-adjusted performance, respectively (Martin & McCann, 1989). Kumaran (2013) agrees with Martin & McCann (1989) in that the maximum drawdown does not accurately capture the fear that investors encounter when investment values are continuously as falling. Maximum drawdown only describes a single event of the entire drawdown time series. Simply put, the Ulcer index measures the human stress of holding an investment since its value reached its high watermark. The higher the index, the more the stress. Similar to the Omega ratio, the Ulcer ratio is the risk-adjusted performance measure calculated by dividing the excess return on an investment by the ulcer index. It is mathematically expressed in Equation 3:

Equation 3: Martin or Ulcer ratio

$$\text{Martin ratio (MR) or Ulcer ratio (UR)} = \frac{r - r_f}{\sqrt{\sum_{i=1}^{i=n} \frac{D_i^2}{n}}}$$

$$\text{Martin Index (MI) or Ulcer Index (UI)} = \sqrt{\sum_{i=1}^{i=n} \frac{D_i^2}{n}}$$

Where D_i is drawdown since previous peak in period i and n is the interval period.

2.5.1 Pearson Correlation Coefficient

A number of empirical studies have used PCC to establish implied linear association between asset classes and as a measure of diversification. The argument against using PCC is that it should be used only as a short measure of linear relationships between asset classes. The Johansen's cointegration (JC) measures long-run relationships between variables. However, in constructing portfolios, correlation-based portfolios generated better risk-adjusted returns than JC-based portfolios (Aroskar & Ogden, 2011). Other parametric measure that were proposed as a potential replacement for PCC and JC include the Portfolio Diversification Index (PDI) and Returns Gaps (RG) by Lhabitant & Vicin, Michelle Learned De Piante (2004) and Statman & Scheid (2007), respectively. The researcher chose the PCC for its practical merits.

2.6 Asset allocation for pension funds

2.6.1 Morden Portfolio Theory

Morden Portfolio Theory (MPT) by Markowitz (1952) has been historically an important foundational and scientific framework of how pension funds determined their strategic asset allocation and are managed globally. The framework is based on the concept of optimising risk and expected returns. It advocates for diversification risk and marginal diversification benefits. The framework also employs mean-variance optimisation, correlation coefficients and the efficient frontier as the basis of assessing marginal diversification and identifying the optimal portfolio. The returns adjusted by standard deviation are the objective function.

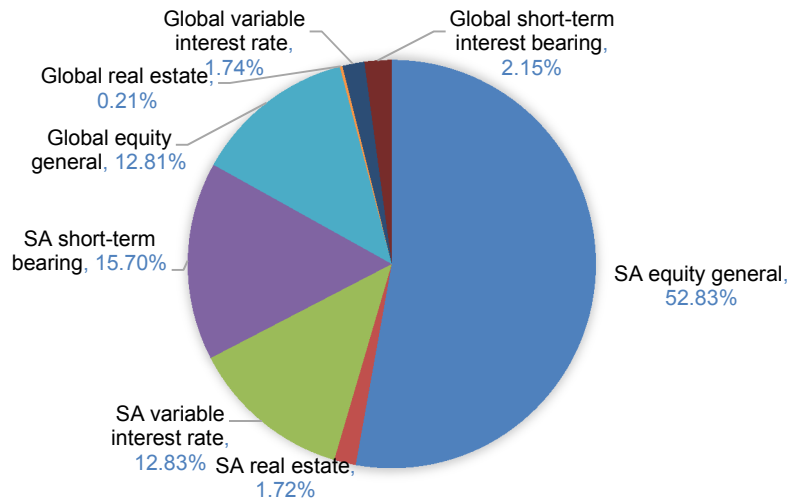
Recent work on asset allocation by Ballentine (2013), criticised various MPT assumptions used by various investment professionals. A relevant and important take

away from his work is that non-parameterised objective functions in asset allocation optimisations generally produce better results to parameterised objectives. The aim of this research was not to find the best optimisation technique for asset allocation. Instead, it was to assess the marginal diversification benefits of private equity on the average asset allocation of a SA MA high equity pension fund. Ibbotson (2010) also confirmed the findings by Brinson, Hood, & Beebower (1986) that about 90% of the absolute level of performance of the balanced and pension funds was accounted for by the strategic asset allocation.

2.6.2 Historical multi-asset portfolio

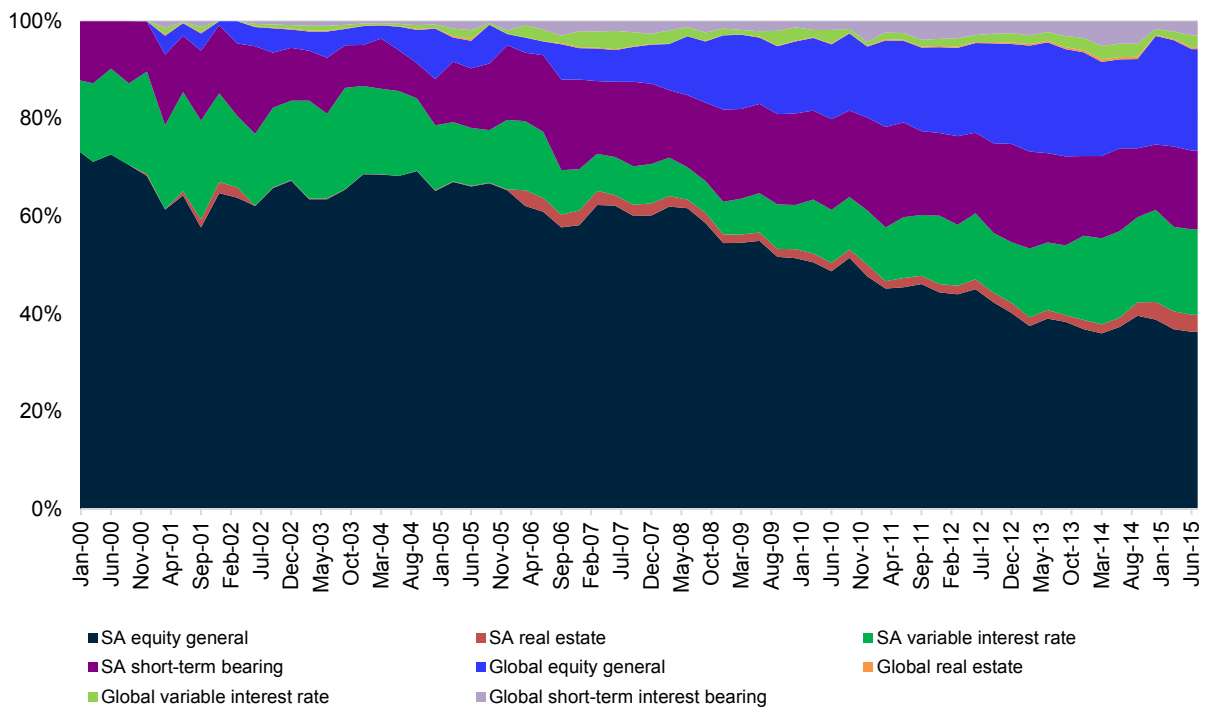
The researcher argues that the historical SA MA equity portfolio should be used to estimate strategic asset allocation portfolio. The asset allocation of Black & Litterman (1992) required a global multi-asset market portfolio in order to derive generate expected returns. Doeswijk, Lam, & Swinkels (2014) also supported this view when they concluded that this portfolio is essentially the aggregate portfolio that all SA MA equity sector pension fund managers are invested in, with average weights applied to each underlying asset class. In essence, the portfolio is an equally weighted portfolio. Deoswijk et al. (2014) added that the portfolio contains very important information, as it contains all the views of the SA MA equity sector universe, with respect to the long-term return and risk expectation of each underlying asset class. They later concluded that the portfolio can be used as a benchmark for the investors' strategic asset allocation. Sharpe (2010) also supported the researcher's view and advocated that the market portfolio can also be used as an initial point for portfolio construction.

Figure 8: Historical market portfolio, SA multi-asset high equity



Source: Moneymate and own

Figure 9: Time series of historical asset allocation, SA multi-asset high equity



Source: Moneymate and own

2.7 Literature review conclusions

In summary, the literature review began by reviewing the different types of private equity and investment vehicles focusing on the key differences, merits and demerits.

It also discussed the investment proposition for an investor who typically invests in a private equity vehicle.

It then proceeded to discuss private equity risks and why illiquidity risk is the biggest concern and stumbling block for most pension fund fiduciaries, including trustees and asset consultants. The researcher further reviewed a framework that could to understand and incorporate illiquidity risk premium in the asset allocation of pension funds. Later on, fund of funds are discussed as potential vehicle to mitigate the various risks that faced by private equity investors.

Apart from illiquidity risk, the researcher also reviewed the key risks that pension fund managers would be typically more concerned about in the context of a pension fund. These included reinvestment risk, cashflow risk, leverage risk, illiquidity risk, conflict of interest and regulatory risk. The Chapter also further reviewed the role of SA private equity fund of funds in mitigating vintage risk and other asynchronous risks which embedded in private equity.

The literature reviewed the four dimensions of diversification namely, upside potential, downside risk, downside risk-adjusted and pairwise association of returns. It also reviewed the appropriate measures for quantifying these dimensions. These measures are gain ratio and mean return for upside potential, loss ratio and ulcer index for downside risk, Pearson correlation coefficient for pairwise linear association or asset classes returns, and omega and ulcer ratios for downside risk-adjusted potential.

The researcher also discussed the literature on behavioural biases and complexities faced by pension fund managers, asset consultants and trustees in order to assess the potential flaws in their decision making processes. These biases include short-termism, herding behaviour, flawed modern portfolio theory assumptions and conflict of interest.

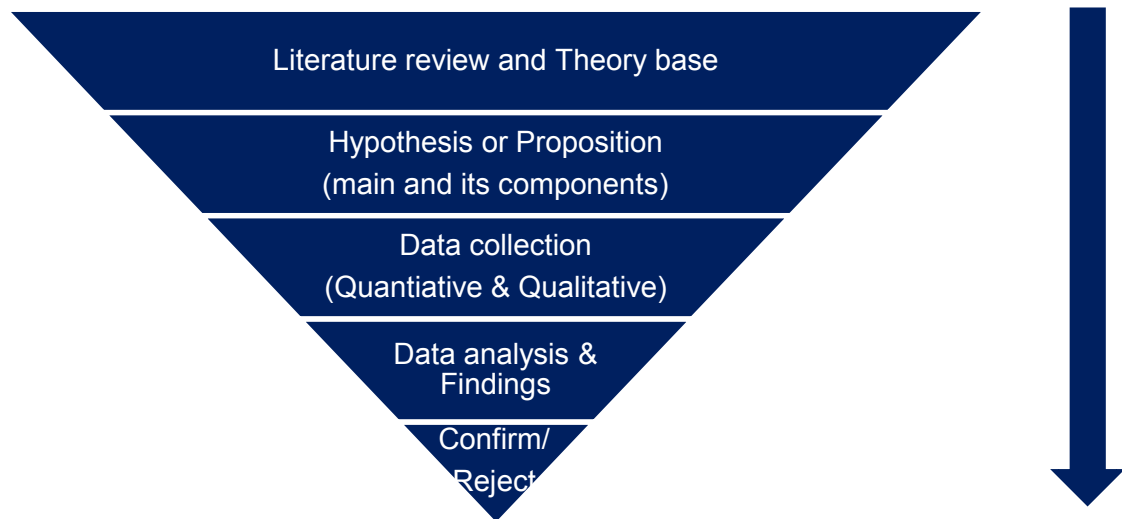
Finally, Chapter 2 concludes by reviewing methodologies of computing strategic asset allocation for pension funds in order to find the appropriate way of building strategic asset allocation portfolios.

3 RESEARCH HYPOTHESES AND PROPOSITIONS

3.1 Introduction

A deductive approach displayed in Fig 10 was followed in order to answer both the main and secondary research questions. The hypothesis and proposition were deduced from the relevant literature review and theory bases on Regulation 28, private equity risks, private equity fund of funds, risk diversification, behavioural biases and asset allocation methodologies. Relevant quantitative and qualitative data were collected in order to test the hypothesis and proposition, respectively.

Figure 10: Deductive approach



Source: (Creswell, 2012) and own

Based on the literature review, sensible diversification was subdivided into four main dimensions, downside protection, upside participation, downside risk-adjusted performance and pairwise returns association with other asset classes (Christoffersen, Errunza, Jacobs, & Langlois (2012); Humphery-Jenner (2013); Amenc, Goltz, & Stoyanov, (2011); Asness, Israelov, & Liew; (2011)).

Sources of behavioural bias in the context of SA pension funds' asset allocation problem were also divided into three subcomponents namely, lack of objectivity in making decisions, shallow understanding of the illiquidity risk and lack of research (Drexler & Greenhill, (2012); Krehmeyer, Orsagh, & Schacht, (2006); Hawley, Johnson, & Waitzer, (2011)).

To test the null hypothesis and proposition, the researcher split the null hypothesis and proposition further into four sub-hypotheses and three sub-propositions,

respectively. The four sub-hypotheses and sub-propositions were in line with diversification and behavioural biases elements expounded on in the literature review.

3.2 Objectives

As discussed in Chapter 1, there was a main and secondary objective and they were assessed quantitatively and qualitatively, respectively.

3.2.1 Main objective: Quantitative

Main objective: To answer the question, “Are the marginal diversification benefits of a SA private equity fund of funds in a South African pension fund significant?”

- **Null Hypothesis:** Marginal diversification benefits of a SA private equity fund of funds in a South African pension fund are not significant.
- **Alternative Hypothesis:** Marginal diversification benefits of a SA private equity fund of funds in a South African pension fund are significant.

3.2.1 Secondary objective: Qualitative

Secondary objective: To answer the question, “Are SA pension fund managers objective when assessing the diversification benefits of private equity in a SA pension fund?”

- **Proposition:** SA pension fund managers are not objective when assessing the diversification benefits of SA private equity in a SA pension fund.

Seven corresponding semi-structured questions were designed to solicit answers for the three sub-objectives and sub-propositions. These questions were asked five private equity managers during preliminary interviews and ten pension fund managers during the final in-depth interviews.

3.3 Quantitative based hypotheses

The following sub-hypotheses were derived from the objectives and questions discussed in section 3.2.1. All statistical inferences were tested at a 95% confidence level.

3.3.1 Hypothesis 1A

Objective 1A: To quantify and confirm or reject that strategic allocation to SA private equity fund of funds can meaningfully enhance the upside potential of SA pension funds.

Question 1A: 'Is there a significant change in the upside potential of a SA pension fund when the strategic asset allocation to private equity fund of funds is increased from 0% to 10%?'

Null hypothesis 1A: There is a negative or insignificant change in the upside potential of a SA pension fund when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1A: There is a positive marginal change in the potential upside of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Mathematically expressed as:

$H_1O: \mu_0 \geq \mu_1 \text{ or } \mu_0 \geq \mu_i \text{ or } \dots \mu_0 \geq \mu_{10}$

$H_1A: \mu_0 < \mu_1 \text{ or } \mu_0 < \mu_i \text{ or } \mu_0 < \mu_i \text{ or } \dots \text{ or } \mu_0 < \mu_{10}$

Where μ_i is the upside potential for a SA pension fund with a strategic allocation to SA private equity of 1% x i

Where i = 1 to 10

Where upside performance is measured by two different measures: Mean return and Gain ratio at a 0% threshold. The greater the value, the greater the upside potential, the better the diversification effect.

3.3.2 Hypothesis 1B

Objective 1B: To quantify and confirm or reject that strategic allocation to SA private equity fund of funds can meaningfully enhance the downside protection of SA pension funds.

Question 1B: 'Is there a meaningful marginal change in downside risk of SA pension funds when the strategic asset allocation to private equity fund of funds is increased from 0% to 10%?'

Null hypothesis 1B: There is a negative or no marginal change in downside risk of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1B: There is a positive marginal change in downside risk of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Mathematically expressed as:

$$H_1O: \pi_0 \leq \pi_1 \text{ OR } \pi_0 \leq \pi_i \text{ OR } \dots \text{ OR } \pi_0 \leq \pi_{10}$$

$$H_1A: \pi_0 > \pi_1 \text{ OR } \pi_0 > \pi_2 \text{ OR } \pi_0 > \pi_i \text{ OR } \dots \text{ OR } \pi_0 > \pi_{10}$$

Where π_i is annual downside risk for a SA pension fund with a strategic asset allocation to private equity of 1% x i

Where i = 1 to 10

Where downside risk is measured by two different measures: Loss ratio at 0% threshold and Ulcer index. The greater the value, the greater the downside risk, the poorer the diversification effect.

3.3.3 Hypothesis 1C

Objective 1C: To quantify and confirm or reject that strategic allocation to SA private equity fund of funds can meaningfully enhance the downside-risk adjusted potential of SA pension funds.

Question 1C: 'Is there a meaningful marginal change in downside risk-adjusted potential of SA pension funds when the strategic asset allocation to private equity fund of funds is increased from 0% to 10%?'

Null hypothesis 1C: There is a negative or no marginal change in downside risk-adjusted potential of SA pension funds when the strategic allocation of SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1C: There is a positive marginal change in downside risk-adjusted potential of SA pension funds when the strategic allocation of SA private equity is increased from 0% to 10%, in increments of 1%.

Mathematically expressed as:

$H_1O: \Omega_0 \geq \Omega_1$ or $\Omega_0 \geq \Omega_i$ or ... or $\Omega_0 \geq \Omega_{10}$

$H_1A: \Omega_0 < \Omega_1$ or $\Omega_0 < \Omega_2$ or $\Omega_0 < \Omega_i$ or ... or $\Omega_0 < \Omega_{10}$

Where Ω_i is downside risk-adjusted potential for a SA pension fund with a strategic asset allocation to private equity of 1% x i.

Where i = 1 to 10

Where downside risk-adjusted performance is measured by two different measures: Omega ratio at a 0% threshold and Ulcer ratio. The greater the ratio, the greater the downside risk-adjusted performance or diversification effect.

3.3.4 Hypothesis 1D

Objective 1D: To quantify and confirm or reject that SA private equity fund of funds returns have better pairwise, counter cyclical properties relative to each asset class found in a typical SA pension fund than SA listed equity.

Question 1D: 'Are the pairwise, counter cyclical properties of SA private equity fund of funds relative to each asset class found in a typical SA pension fund better than SA listed equity?'

Null hypothesis 1D: The pairwise, counter cyclical properties of SA private equity fund of funds relative to each asset class found in a typical SA pension fund are not better than SA listed equity.

Alternative hypothesis 1D: The pairwise, counter cyclical properties of SA private equity fund of funds relative to each asset class found in a typical SA pension fund are better than SA listed equity.

Mathematically expressed as:

$$H_{10}: PPC_{PE,X} > 0.5$$

$$H_{1A}: PPC_{PE,X} \leq 0.5$$

Where $PPC_{PE,X}$ is the diversification effect as measured by Pearson correlation coefficient (PCC) for SA private equity relative to an asset class x.

3.4 Qualitative based propositions

The following propositions were derived from the objectives and questions discussed in section 3.2.2.

3.4.1 Proposition 1A

Objective 1A: To assess whether or not SA pension fund managers' decision criteria for including private equity are not biased

Question 1A: What is or would potentially be your decision criteria for private equity or private equity fund of funds strategic allocation, in the context of the new Regulation 28 of the Pension Funds Act?

Question 2A: In your own opinion, do you think the extra return from direct private equity or private equity fund of funds fully compensates for the illiquidity and reinvestment risk? What do you think should be the minimum illiquidity risk premium per annum?

Proposition 1A: SA pension fund managers' decision criteria for including private equity are biased.

3.4.2 Proposition 1B

Objective 1B: To assess whether or not illiquidity and reinvestment risk of private equity is understood by SA pension fund managers.

Proposition 1B: The illiquidity and reinvestment risk of private equity is not understood by SA pension fund managers.

Question 1B: How would you mitigate the illiquidity and reinvestment risk of SA private equity or private equity fund of funds if it was part of the strategic allocation for your SA MA high equity pension fund?

Question 2B: Do you think private equity fund of funds significantly mitigate the vintage concentration, duration and illiquidity risk inherent in direct private equity? Why?

3.4.3 Proposition 1C

Objective 1C: To assess whether or not SA pension fund managers have made efforts to understand private equity through in-depth research.

Proposition 1C: Pension fund managers have not made efforts to understand private equity through in-depth research.

Question 1C: What research have you done or intend to do on SA private equity or private equity fund of funds, given that it is in your universe of investable asset classes?

Question 2C: What needs to change in SA private equity or private equity fund of funds before you can practically consider investing into the asset class?

Question 3C: In your own opinion, why do you think a significant number US and EU pension fund managers are willing to strategically allocate to private equity and private equity fund of funds? What needs to change before the SA pension fund managers' behaviour changes?

4 RESEARCH METHODOLOGY

4.1 Introduction

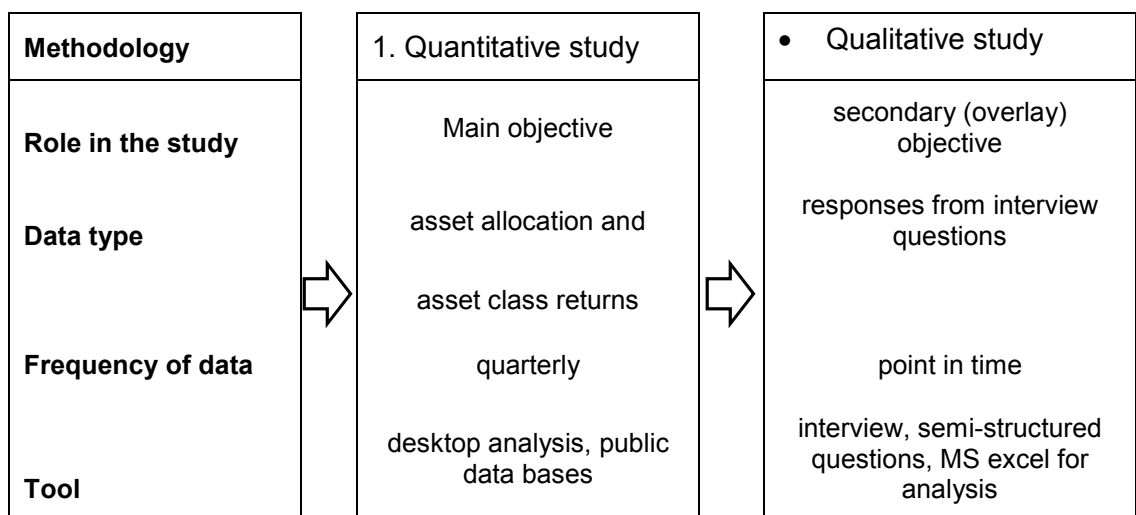
The main objective for this study was to assess the significance of the diversification benefits of SA private equity funds of funds on South African pension funds. The second objective complements the first and was aimed at understanding why pension fund managers were not utilising private equity, which is provided for in Regulations 28 (National Treasury, 2011b).

4.2 Overall Research Design

Figure 11 shows the research design and design in a flow chart diagram. The study and data gathering for the research used a combination of two methodologies. The main and first stage of the study used a quantitative methodology. This part of the study used public quarterly asset allocation and returns data.

The preliminary results of the first stage were used as a base for constructing a qualitative investigation. The qualitative investigation also contextualised the quantitative results and helped the researcher to gain insights into the behavioural biases of pension fund decision makers regarding private equity. The qualitative part was exploratory and used interviews based on semi-structured questions provided in Figure 14.

Figure 11: Research design and approach



Source: (Saunders, Lewis, & Thornhill, 2012)

Quantitative methodology

4.2.1 Unit of analysis

A unit of analysis is a pre-determined piece of data (Saunders et al., 2012). More clearly, it is defined as member or element of population (Welman, Kruger, & Mitchell, 2005). The unit of analysis in our case was quarterly returns generated by the 11 portfolios and by each of the 9 asset classes combined to create the portfolios for the period June 2006 to June 2015. There are 37 data points (quarterly returns) for portfolio and asset class. In total, there were (36 quarterly returns multiplied by a combination of 20 portfolios and asset classes) 740 quarterly returns or data points.

The quarterly returns of the strategic portfolios were used as inputs to calculating diversification dimensions and metrics in Table 4 below:

Table 4: Diversification dimensions and metrics

Dimension #	Diversification dimension	Metric 1	Metric 2
1	Upside potential	mean Return	Gain ratio
2	Downside risk	Loss ratio	Ulcer index
3	Downside risk-adjusted potential	Omega ratio	Ulcer ratio
4	Pair-wise association	Pearson correlation coefficient (PCC)	Diversification delta (DD)

Source: Own

4.2.2 Population

A population is a full set of group constituents or elements (Saunders et al., 2012). The population considered includes all SA pension funds that were active at any point in the history of South Africa. This number exceeds 500. This included Regulation 28 compliant funds in SA MA low equity, SA MA medium equity and SA MA high equity sectors. All South African pension funds are governed by the Regulation 28 of the Pension Funds Act.

4.2.3 Sampling method and size

Purposive sampling was used to select funds that were included to generate the strategic asset allocation of portfolio SP₀. Saunders et al. (2012) argue that purposive sampling is a type of non-probability sampling in which the researcher's judgement is executed in order to select the sample members on the basis of a set of reasons and principles.

Only SA pension funds in the SA MA high equity sector and are Regulation 28 complaint that were active at any point in the period 30 June 2006 to 30 June 2015. Only funds in the SA MA high equity sector were included as SA MA medium and low equity sector typically mandated to target returns over shorter investment horizons of between 3 to 5 years. Such funds conflict with the general liquidity constraint in private equity with typically locks in initial capital and capital gains for 5 to 10 years. On the other hand most SA MA high equity funds typically have minimum recommended investment horizons of between 5 to 7 years (Glacier Research, 2015).

The SA private equity data solicited only started on 30 June 2006, hence truncating the sample size. As at 30 June 2015, the SA MA high equity sector 127 pension funds. Therefore the sample consisted of a total of 127 pension funds in the SA MA high equity sector. Only retail SA pension funds were included. Institutional funds' data is usually not publicly available in Morningstar Direct and Money Mate databases.

4.2.4 Survivorship bias

Some of the funds that were active between 30 June 2006 and 30 June 2015 were closed or merged with others for various reasons. This potentially introduced survivorship bias, thus over or understated the returns and asset allocation values for the SA MA high equity sector. This bias was mitigated by including all the non-active funds.

4.2.5 Data collection

The study used multiple-source returns and asset allocation data by combining three different sets of data before the total data can be accessed for research (Saunders et al., 2012).

Data set 1, from Moneymate database:

Moneymate database provided quarterly asset allocation data for each of the 127 fund for the period 30 June 2006 to 30 June 2015.

Data set 2, from Morningstar direct database:

Morningstar direct database provided quarterly median returns were retrieved each of the 8 underlying asset classes in the SA MA high equity for the period 30 June 2006 to 30 June 2015.

Data set 3, from Thomson's Reuters One database:

Thomson's Reuters One database provided quarterly returns for private equity for the period 30 June 2006 to 30 June 2015.

Moneymate, Morningstar and Thompson Reuters databases are leading providers for asset allocation, traditional asset class returns and private equity returns for the South African market, respectively. Combining data from different sources also enabled the researcher to collect the longest data histories available.

4.2.6 Process of data analysis

The research included time series of asset allocation and asset class returns, and had a cross sectional time horizon. The research used an experimental design to test the hypotheses. The experiment was designed to compare a control group and an augmented or manipulated group. In our case, both groups came from the same population. The control group is the portfolio SP_0 and the manipulated portfolios are portfolios SP_1, \dots, SP_{10} . The following steps were followed:

Step 1: Estimating strategic asset allocation for SP_0

Initially, the strategic asset allocation of a typical South African pension fund had to be determined. The idea here was not to run any optimisation techniques in order to create an efficient frontier that includes private equity fund of funds. Instead, the study's intention was to determine the long-run historical asset allocation (strategic asset allocation) of the SA MA high equity first before determining the level of diversification benefit introduced by increments of private equity fund of funds into the strategic allocation or control pension fund.

The strategic asset allocation for the control portfolio SP_0 was computed using quarterly data from 30 June 2006 - 30 June 2015. It was estimated by computing the average allocation to the 8 main asset classes in the Table 5 below:

Table 5: Underlying asset classes for a SA pension fund

No.	Asset class	No.	Asset class
1	SA General equity	5	Global General equity
2	SA General estate	6	Global General estate
3	SA Variable interest	7	Global Variable interest
4	SA short-term interest bearing	8	Global Short-term interest bearing

Source: Own

Asset allocation for portfolios SP_1, \dots, SP_{10} were generated by adding private equity fund of funds in increments of 1% and corresponding proportional decrements in other asset classes. The 10 generated portfolios had strategic asset allocation which included private equity in Table 5 as follows:

Table 6: Strategic asset allocation portfolios

Portfolio name	Short name	% of private equity fund of funds in SP
Strategic Portfolio 0	SP 0	0%
Strategic Portfolio 1	SP 1	1%
Strategic Portfolio 2	SP 2	2%
Strategic Portfolio 3	SP 3	3%
Strategic Portfolio 4	SP 4	4%
Strategic Portfolio 5	SP 5	5%
Strategic Portfolio 6	SP 6	6%
Strategic Portfolio 7	SP 7	7%
Strategic Portfolio 8	SP 8	8%
Strategic Portfolio 9	SP 9	9%
Strategic Portfolio 10	SP 10	10%

Source: Own

Step 2: Generating quarterly returns

Simulating time series of quarterly returns for the control portfolio SP_0 and the manipulated portfolios SP_1, \dots, SP_{10} over the period 30 June 2006 to 30 June 2015.

Step 3: Generating descriptive statistics

Descriptive statistics were generated for the 11 strategic portfolios for the period 30 June 2006 to 30 June 2015. These descriptive statistics includes the mean and median returns, standard deviations, minimum and maximums. The returns distributions are also tested for normality assumptions.

Step 4: Computing statistical measures that represent diversification dimensions

Time series of three statistical measures in the Table 7 were computed for both the control portfolio SP_0 and the manipulated portfolios SP_1, \dots, SP_{10} over the period 30 June 2006 to 30 June 2015.

Table 7: Statistical measures

No.	Statistical measure	Abbreviation	Dimension of measure	Objective tested
1	Mean return	GM	upside potential	Outperformance
2	Gain ratio	GR	upside potential	Outperformance
3	Loss ratio	LR	downside risk	capital protection
4	Ulcer index	UI	downside risk	capital protection
5	Omega ratio	OR	downside risk-adjusted potential	effective diversification
6	Ulcer ratio	UR	downside risk-adjusted potential	effective diversification
7	Pearson correlation coefficient (PCC)	PCC	pair-wise association	downside counter-effect
8	Diversification delta	DD	pair-wise association	downside counter-effect

Source: Own

Step 5: Generating inference statistics

Inference statistics were generated at a 95% confidence level for all the statistical measures generated in step 4. Independent t-test was used to test for significance of the difference between SP_{10} and SP_0 for each statistical measure. Independent t-test assumes equality of variances and hence the validity of this assumption was also tested.

F-tests are used to assess the variance of two groups, but the using F-tests for differences in variance strictly requires that the distributions are normal. Instead, Levene's test was used due to its robustness in dealing with non-normal distributions (Allingham & Rayner, 2011).

4.2.7 Potential research limitations

The researcher identified potential limitations to the scope of the research and hence the study can only be indicative and not conclusive. Where possible, factors that minimise the impact of the limitations were also identified and outlined below.

1. The quantitative simulations and findings were based on quantitative and backward-looking returns and asset allocation. Past returns are not an true estimate of expected returns. In practice SA pension fund decision makers

generate their own qualitative and forward-looking risk and return estimates so as to satisfy their internal asset class views.

2. Efficient asset allocation methodologies were not used by the researcher to determine asset allocation. However, the study was designed to assess how private equity could have added value to the aggregate asset allocation frameworks currently used by pension fund managers.
3. There are only two active private equity multi-managers domiciled in South Africa and whose funds are eligible for South African pension fund investments. In total, only five funds were used in the SA private equity fund of funds composite. As the number of companies increase, pooled IRR becomes a good estimate for the private equity fund of funds (Gresch & Von Wyss, 2011).
4. The statistical tests could have resulted in a false positive, also known as a Type 1 error. In our context, Type 1 error is the seeing a difference in risk adjusted returns when there is none.
5. The private equity IRR are US dollars based and had to be converted into South Africa rands. The data sources for private equity and the rest of the asset classes for SA MA high equity are different. The rand/ dollar exchange valuation for the other asset classes could have happened at a different time. However, the researcher expected the deviations due to valuation timing to be netted off over longer time periods.

4.3 Qualitative methodology

A qualitative approach in form of exploratory, semi-structured interviews was used as an overlay. The objective was to investigate behavioural biases in the allocation of capital to private equity as well as to generate a context with qualitative perspectives of pension fund managers before triangulating with the quantitative findings (Denscombe, 2012; Saunders et al., 2012). Saunders et al. (2012) defined an exploratory study as an important way through which to uncover what is happening; to seek fresh insights, to make enquiry into and to assess a phenomena in a new light.

The preliminary results of the quantitative techniques were used as an introduction to the conversations with interviewees. Semi-structured and one-on-one interviews were

used as opposed to questionnaires, focus group discussions and participant observation. The semi structured interview guideline is in Appendix 3 in section 9.3.

Interviews are a very effective technique for gathering multi-dimensional data on behavioural finance and human phenomena. One-on-one conversations enable rapport to be established between the interviewer and interviewee. Given that these interviews are dialogues as opposed to interrogations, they usually generate richer data from the empathy, mutual respect and understanding. They also enable the interviewees to express themselves in their choice of words and language. Furthermore, when more clarity is needed, more probing can be done on site. Creswell (2012) argued that the technique gives informants an opportunity to unreservedly express their experiences, challenges, complexities and anxieties. To top it all, the interviewer can integrate observations such as emotional responses into the data gathering exercise (Creswell, 2012).

Though interviews have distinct advantages, they are not without short-comings. One of the arguments is that it places excessive control into the hands of the interviewee or research. Other scholars argue that the interviewees are treated as objects for data gathering and removed from the process of knowledge and wisdom generation. Another argument is that there are many opportunities for the researcher to be subjective, due to the influence of their personality (Saunders et al., 2012).

The qualitative research is for the purposes of providing an in-depth understanding of a problem rather than to quantify a known phenomenon. Also the qualitative techniques were simply used to add a “softer” dimension which cannot be explained by quantitative analysis (Saunders et al., 2012).

The qualitative unit of analysis was the transcribed interview conducted with ten SA MA high equity pension fund managers and five private equity fund managers. The data collection stages were planned and conducted as displayed in Table 7.

Table 8: Qualitative research approach

Research Phase	Key objective	Data collection method	Sampling technique	Sample size
Stage 1	Exploratory: Establish frame of reference and literature review of main ideas	Semi-structured interviews	Purposive	3
Stage 2	Pilot interviews: test draft questionnaire and enhance approach	Semi-structured, narrative enquiry interviews	Purposive	3
Stage 3	Final in-depth interviews with key decision makers of pension funds and private equity funds	Semi-structured, narrative enquiry interviews	Snowball	10

Source: (Saunders et al., 2012)

The in-depth interview approach was a necessary step for the study, as it provided a deeper level of understanding into the proposition and its four sub-propositions. The responses from the pension fund managers were used to test the sub-propositions. The responses from private equity managers were used to help bolster the conversations with pension fund managers. The order of the interviews was crucial, therefore interviews with private equity managers were held first. The interview questions asked are in Appendix 3 and Section 3.4.

4.3.1 Relevant population, unit of analysis and sampling

The total potential universe population for SA MA high equity pension fund managers and private equity fund managers was 127 and 14, respectively. The sample consisted of a total of 10 pension fund managers and 5 private equity managers.

All ten interviewees were key decision makers and had the same interview schedule and guideline. The letters of request and consent, and interview schedule are in Appendices 1, 2 and 3, respectively. The interviews were requested via emails with telephonic follow-ups. Snowball sampling approach was used for the exploratory and final stages of the qualitative process. Targeted interviewees referred their colleagues in managing pension and private equity funds at different companies.

The researcher used an interview schedule and guide with semi-structured questions to drive general direction of the conversation, while allowing for a reasonably naturally flowing conversation and questions. The interviewees were guaranteed anonymity to encourage complete openness.

4.3.2 Design of interview and initial testing

The aims for the exploratory and initial interview stages were as follows:

1. To ensure that crafted questions would generate answers to the research questions, taking into account the context of each decision maker;
2. To understand the environment and context in which the pension and private equity managers operate in. These initial insights became an important input for adjusting the literature review;
3. To assess the appropriateness of the interview time and the number of questions;
4. To assess the content and natural flow of questions in the questionnaire.

A number of modifications were made to the interview guideline through the exploratory and pilot interview stages in order to produce the final one.

4.3.3 Data collection

The data collection and analysis framework was outlined in the book called “The Long Interview” (McCracken, 1988). It is as follows:

An in-depth and thorough literature review. The argument is that this enables the researcher to clearly define their research problems and interview questions.

Self-introspection: McCracken (1988) provided a psychological perspective that helped the researcher to be mentally prepared and examine their biases, and knowledge of the subject.

Constructing questionnaire: McCracken (1988) also advocated that the questionnaire should contain a set of grand-tour questions with floating prompts, including “category,” “contrast,” “auto-driving,” and “special incident” questions. This generates a high level and flexible itinerary. Guion, Diehl, & McDonald (2011) provided supportive and more practical perspectives to (McCracken, 1988). His suggestions are as follows:

The interview conversation should be semi-structured and open ended. This mitigates the risk of the interviewee simply answering yes or no. This type of approach also allows a natural flow of ideas and conversation. Guion, Diehl, & McDonald (2011) also stresses the importance of recording responses on paper and electronic recording

devices. These responses must include observations of non-verbal actions and personal feelings immediately after the meeting. The researcher also applied the following principles in order to enrich the quality of the interview:

1. Researched the background information of the interviewee, funds and company so that more time is spent on discussing value adding insights;
2. Threw humour where appropriate in order to put the interviewee at ease;
3. Being punctual and requesting to record.

4.3.4 Data analysis approach

An interpretative phenomenological analysis (IPA) was used. The approach involves taking note of the main observations, insights and interpretations (Medico, 2005). The electronic device recordings were transcribed and text content was assigned to the relevant question. The common and shared, unique and relevant responses were summarised and prepared as findings.

4.3.5 Potential research limitations

The researcher identified potential limitations to the scope of the research and hence the study can only be indicative and not conclusive. Where possible, factors that minimise the impact of the limitations were also identified and outlined below:

1. **Information asymmetry:** Pension fund managers and private equity fund managers with relatively smaller funds and history generally had a limited information and input into the private equity discussion than private equity managers and pension fund managers with larger funds, and longer histories.

This is because were still attempting to establish the basics of their investment capabilities and proposition. The minimum limits on private equity investments meant that they had to exclude the asset class from their universe of potential investments;

To deal with the information asymmetry, the interviews were also deliberately designed include private equity funds which are held by pension funds. Likewise, the sample included pension funds which are relatively larger, have longer histories and already investing into private equity;

2. **Response bias:** The qualitative study was only conducted on private equity companies that agreed to give the researcher an interview. Convenience sampling may have introduced response bias. Two fund managers interviewed came from the same asset management firm. Companies that did not positively respond to the interview request could have introduced non-response bias;

3. **Research activity:** The South African private equity industry is underresearched. It was challenging to gather the appropriate and adequate material from South African journal depositories..

5 RESULTS

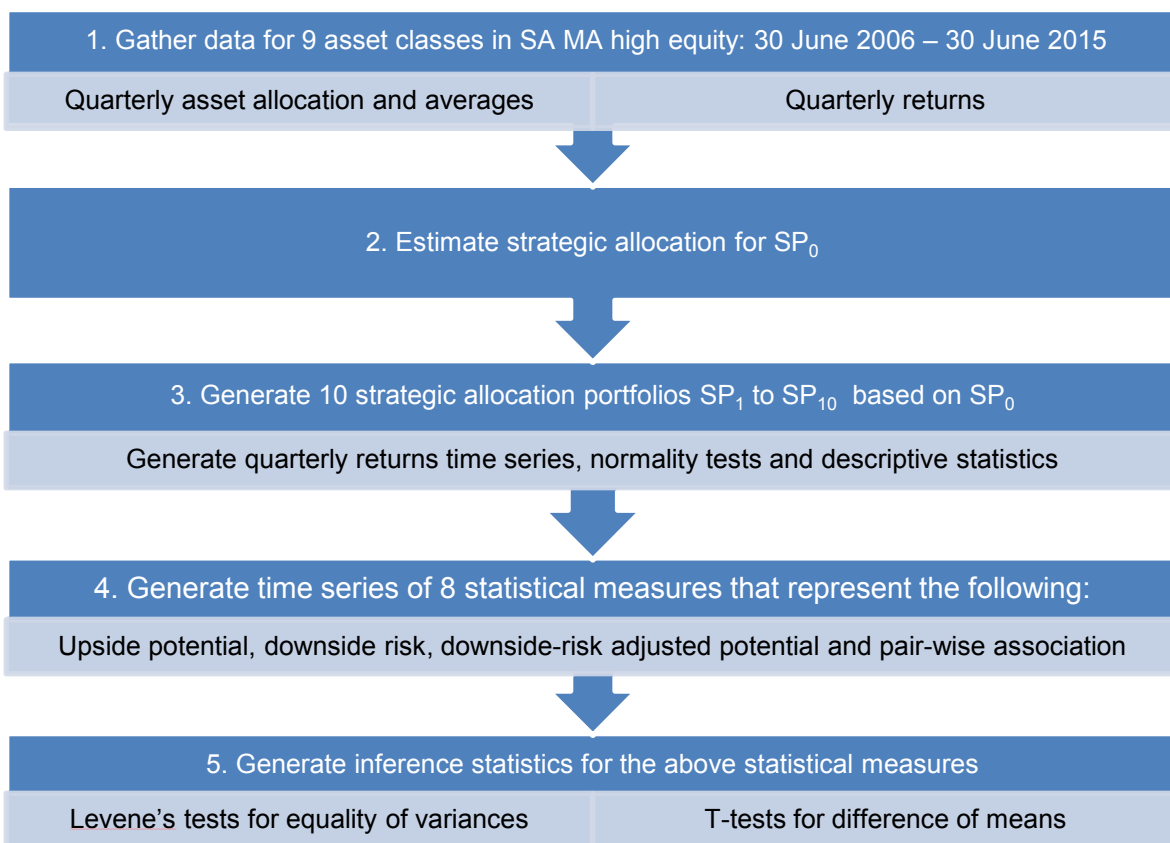
Chapter 5 gives the results of the tests on the hypotheses and propositions outlined in Chapter 3. It also concludes whether or not the null hypotheses and propositions were accepted. Chapter 6 then discusses the results followed by recommendations in Chapter 7.

The results in Chapter 5 were generated from a two pronged research methodology described in Chapter 4. The main approach was quantitative and it was supplemented by a qualitative overlay. For the quantitative approach, the period of analysis was 30 June 2006 – 30 June 2015, which is equivalent to nine years. The unit interval period was 3 months.

5.1 Quantitative approach

The process chart flow below graphically shows the quantitative approach giving detail of how data samples were collected, processed and statistically tested.

Figure 12: process chart flow for quantitative results



Source: Own

All statistical tests were run in XLSTAT at a 95% confidence level. Homogeneity of variance is important for the t-tests. As a result, Levene's tests of the equality of variances are required before testing for equality of means of independent samples.

The Levene’s test is a two-tailed test. The t-test instead of the z-test was used for comparing means of two samples. T-test is ideal for sample sizes that are less than 30. Also standard deviations for the population must be known for z-tests to be used. In our case, the sample sizes were less than 30 and the population variances are unknown (Allingham & Rayner, 2011).

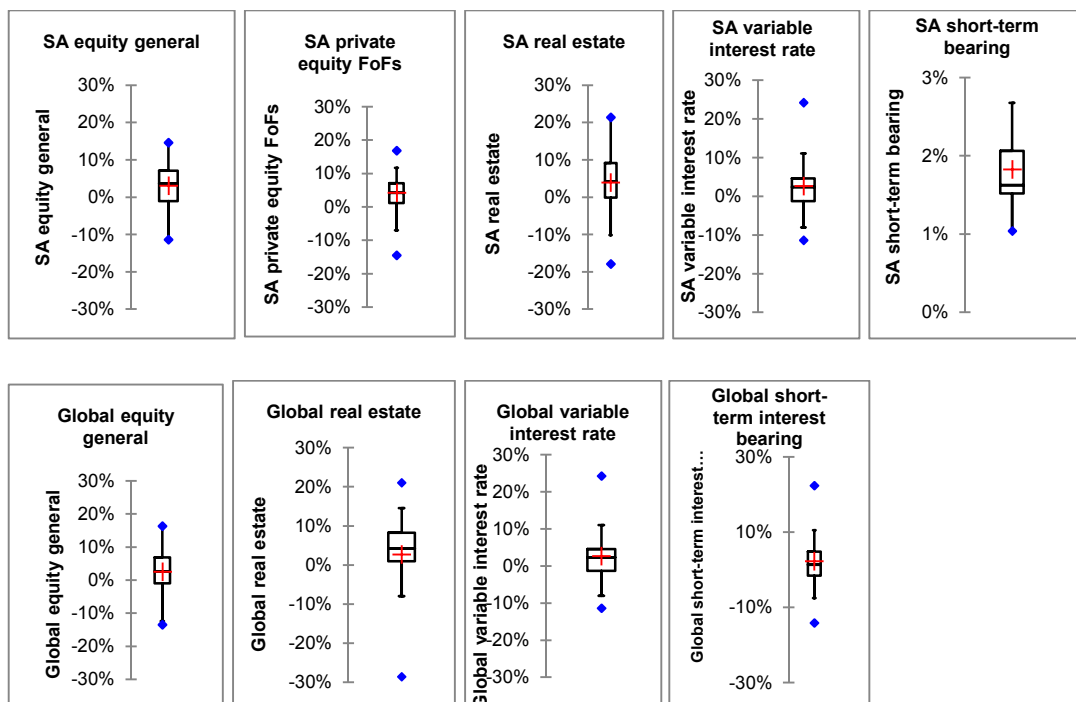
5.2 Descriptive statistics for quarterly returns

5.2.1 Underlying asset classes

Figure 13: Descriptive statistics for underlying asset classes

Statistic	SA equity general	SA real estate	SA variable interest rate	SA short-term bearing	Global equity general	Global real estate	Global variable interest rate	Global short-term interest bearing	SA private equity fund of funds
Nbr. of observations	37	37	37	37	37	37	37	37	37
Minimum	-11.3%	-17.9%	-11.4%	1.0%	-13.4%	-28.6%	-11.4%	-14.1%	-14.5%
Maximum	14.7%	21.4%	24.2%	3.6%	16.3%	21.0%	24.2%	22.4%	16.9%
1st Quartile	-1.1%	-0.1%	-1.3%	1.5%	-0.9%	1.0%	-1.3%	-1.6%	1.2%
Median	3.6%	4.2%	2.4%	1.6%	2.6%	4.3%	2.4%	1.4%	4.2%
3rd Quartile	7.1%	9.1%	4.6%	2.1%	6.9%	8.2%	4.6%	4.9%	7.1%
Mean	3.0%	3.9%	2.7%	1.8%	2.6%	2.7%	2.7%	2.3%	4.2%
Variance (n-1)	0.4%	0.7%	0.5%	0.0%	0.5%	1.1%	0.5%	0.5%	0.4%
Standard deviation (n-1)	6.2%	8.2%	6.9%	0.5%	6.9%	10.3%	6.9%	6.9%	5.9%

Figure 14: Asset class returns quartiles



5.2.2 Strategic allocation portfolios

Table 9: Descriptive statistics for strategic portfolios

Statistic	SP0	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8	SP9	SP10
Nbr. of observations	37	37	37	37	37	37	37	37	37	37	37
Minimum	-6.65%	-6.52%	-6.38%	-6.24%	-6.10%	-5.96%	-5.83%	-5.69%	-5.55%	-5.41%	-5.49%
Maximum	10.27%	10.26%	10.25%	10.24%	10.24%	10.23%	10.22%	10.21%	10.21%	10.20%	10.19%
1st Quartile	0.78%	0.81%	0.84%	0.86%	0.89%	0.92%	0.95%	0.97%	1.00%	1.03%	1.05%
Median	2.91%	2.99%	3.07%	3.14%	3.22%	3.29%	3.37%	3.45%	3.40%	3.34%	3.29%
3rd Quartile	5.23%	5.26%	5.26%	5.25%	5.25%	5.24%	5.23%	5.21%	5.20%	5.19%	5.18%
Mean	2.75%	2.76%	2.78%	2.79%	2.81%	2.82%	2.83%	2.85%	2.86%	2.88%	2.89%
Variance (n-1)	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%	0.13%
Standard deviation (n-1)	3.66%	3.66%	3.65%	3.65%	3.64%	3.64%	3.64%	3.64%	3.64%	3.64%	3.64%

5.3 Normality tests

5.3.1 Underlying asset classes and strategic portfolio

Table 10: Normality tests for underlying asset classes and strategic portfolio

Variable\Test	Shapiro-Wilk	Anderson-Darling	Lilliefors	Jarque-Bera
SA equity general	0.914	0.916	0.890	0.731
SA real estate	0.093	0.115	0.071	0.122
SA variable interest rate	0.013	0.006	0.002	0.007
SA short-term bearing	0.000	0.000	0.015	< 0.0001
Global equity general	0.640	0.578	0.643	0.649
Global real estate	0.006	0.002	0.000	0.004
Global variable interest rate	0.013	0.006	0.002	0.007
Global short-term interest bearing	0.048	0.026	0.215	0.035
SA private equity FoFs	0.178	0.287	0.522	0.068
SP0	0.422	0.302	0.281	0.386
SP1	0.396	0.285	0.310	0.390
SP2	0.369	0.268	0.366	0.393
SP3	0.348	0.253	0.427	0.396
SP4	0.324	0.235	0.491	0.398
SP5	0.303	0.222	0.469	0.400
SP6	0.281	0.209	0.422	0.401
SP7	0.255	0.192	0.377	0.402
SP8	0.236	0.184	0.334	0.402
SP9	0.214	0.172	0.294	0.403
SP10	0.217	0.163	0.257	0.402

Tests interpretation

H_0 : The variable from which the sample was extracted follows a Normal distribution.

H_a : The variable from which the sample was extracted does not follow a Normal distribution.

Accepted:

As the computed p-values are greater than the significance level $\alpha = 5\%$. We cannot reject the null hypothesis H_0 and therefore conclude that the quarterly returns for the following underlying asset classes and strategic portfolio are Normally distributed at a 95% confidence level:

1. SA equity general
2. SA real estate
3. Global equity general
4. SA private equity FoFs
5. SP_i , Where $i = 1$ to 10.

Rejected:

As the computed p-value is lower than the significance level $\alpha = 5\%$. We reject the null hypothesis H_0 , accept the alternative hypothesis H_a and conclude that the quarterly returns for the following underlying asset classes are not Normally distributed:

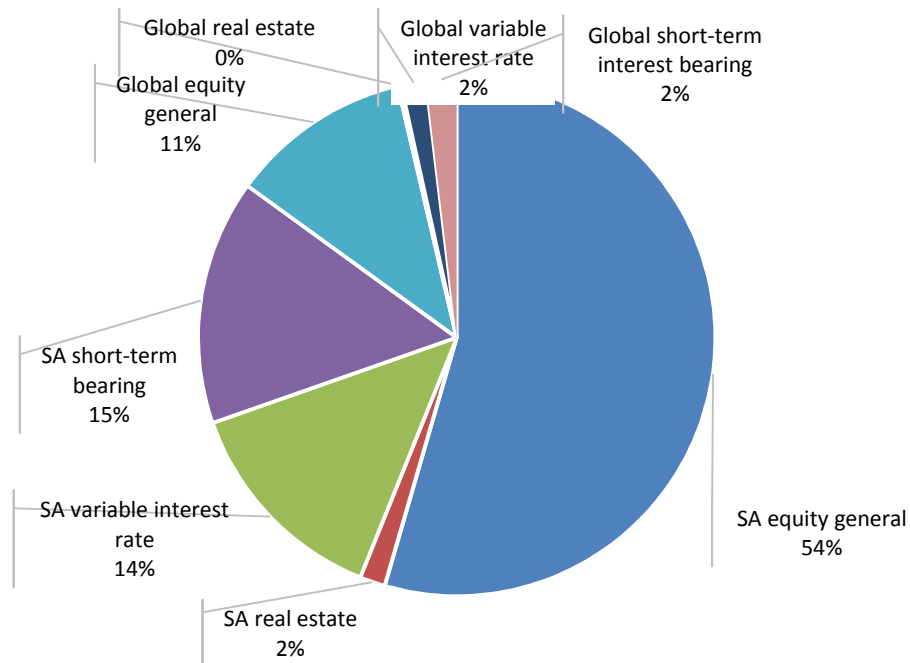
1. SA variable interest rate
2. SA short-term bearing
3. Global real estate
4. Global variable interest rate
5. Global short-term interest bearing

Appendix 4 in section 9.4 depicts the same Normality tests, however in graphical form.

5.4 Strategic asset allocation of a typical SA pension fund

Period: 30 June 2006 – 30 June 2015

Figure 15: Strategic asset allocation for SP₀



Data source: (Moneymate & Morningstar, 2015)

5.5 Hypothesis 1A

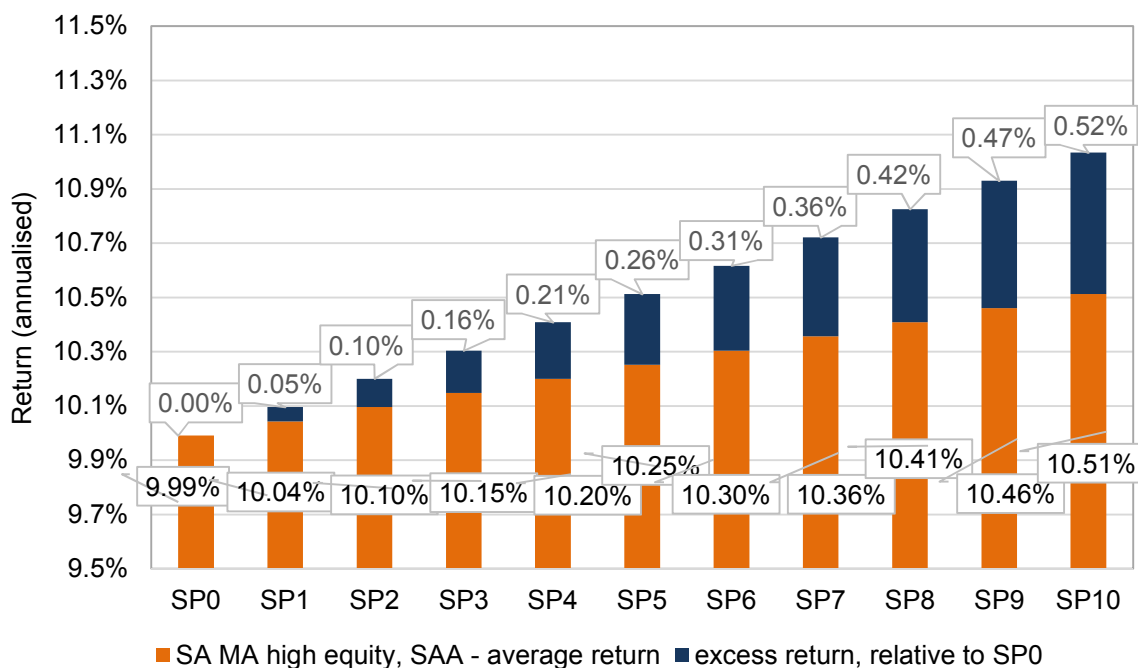
Null hypothesis 1A: There is a negative or insignificant change in the upside potential of a SA pension fund when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1A: There is a positive marginal change in the potential upside of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

5.5.1 Mean and Excess returns

Period: 31 June 2006 – 30 June 2015

Figure 16: Mean and Excess returns



Data source: (Moneymate & Morningstar, 2015)

SA general equity versus SA private equity

Levene's test:

F (Observed value)	0.684
F (Critical value)	3.974
DF1	1
DF2	72
p-value (one-tailed)	0.411
alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is greater than the significance level $\alpha=0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 41.10%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] -0.035 , +Inf [

Difference	-0.012
t (Observed value)	-0.816
t (Critical value)	1.666
DF	72
p-value (one-tailed)	0.791
Alpha	0.05

Test interpretation:

H_0 : The difference between the means is equal to 0.

H_a : The difference between the means is greater than 0.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 79.14%.

SP₀ versus SP₁₀

Levene's test:

F (Observed value)	0.011
F (Critical value)	3.974
DF1	1
DF2	72
p-value (one-tailed)	0.916
Alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 91.58%

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

$$]-0.016, +\text{Inf}[$$

Difference	-0.001
t (Observed value)	-0.172
t (Critical value)	1.666
DF	72
p-value (one-tailed)	0.568
Alpha	0.05

Test interpretation:

H₀: The difference between the means is equal to 0.

H_a: The difference between the means is greater than 0.

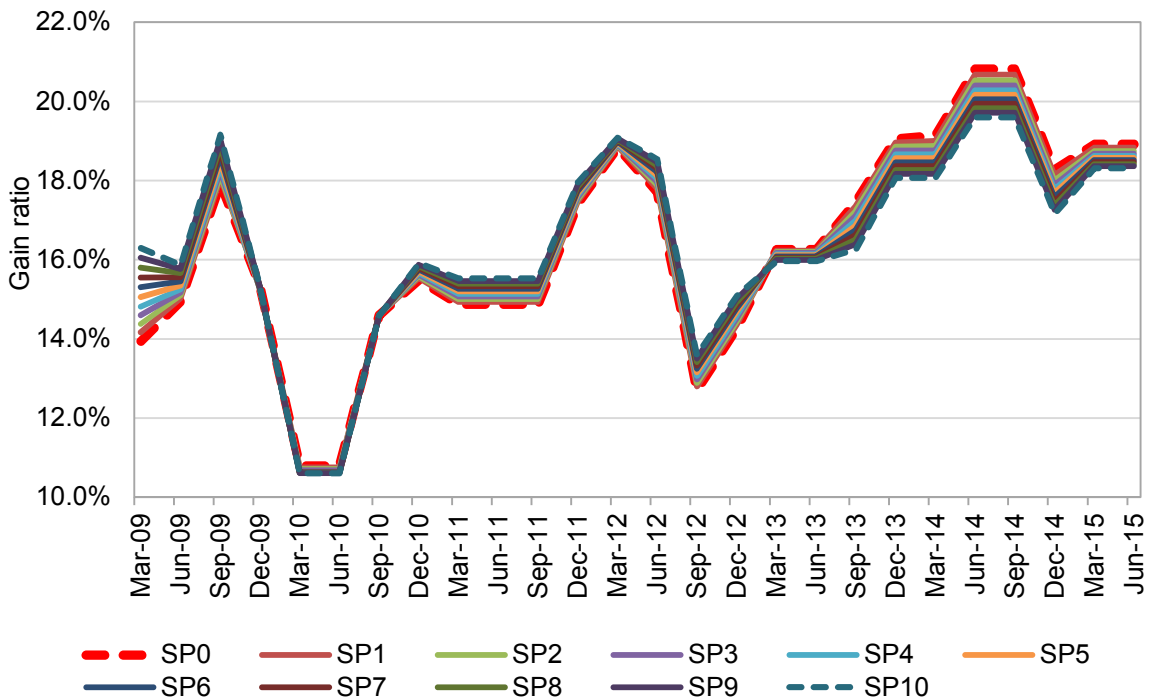
As the computed p-value is greater than the significance level alpha = 0.05, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 56.78%.

5.5.2 Gain ratio

Period: 31 December 2006 – 30 June 2015

Figure 17: Gain ratio



SA general equity vs SA private equity

Levene's test:

F (Observed value)	7.844
F (Critical value)	4.034
DF1	1
DF2	50
p-value (one-tailed)	0.007
alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is lower than the significance level $\alpha = 0.05$, one should reject the null hypothesis H_0 , and accept the alternative hypothesis H_a .

The risk to reject the null hypothesis H_0 while it is true is lower than 0.72%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] 0.006, +Inf [

Difference	0.047
t (Observed value)	1.949
t (Critical value)	1.684
DF	40
p-value (one-tailed)	0.029
alpha	0.05

The number of degrees of freedom is approximated by the Welch-Satterthwaite formula

Test interpretation:

H_0 : The difference between the means is equal to 0.

H_a : The difference between the means is greater than 0.

As the computed p-value is lower than the significance level $\alpha = 0.05$, one should reject the null hypothesis H_0 , and accept the alternative hypothesis H_a .

The risk to reject the null hypothesis H_0 while it is true is lower than 2.91%.

SP₀ versus SP₁₀

Levene's test

F (Observed value)	1.099
F (Critical value)	4.034
DF1	1
DF2	50
p-value (one-tailed)	0.300
Alpha	0.05

Test interpretation:

H₀: The variances are identical.

H_a: At least one of the variances is different from another.

As the computed p-value is greater than the significance level alpha = 0.05, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 29.96%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] -0.012 , +Inf [

Difference	0.000
t (Observed value)	-0.064
t (Critical value)	1.676
DF	50
p-value (one-tailed)	0.525
Alpha	0.05

Test interpretation:

H₀: The difference between the means is equal to 0.

H_a: The difference between the means is greater than 0.

As the computed p-value is greater than the significance level alpha = 0.05, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 52.53%.

5.6 Hypothesis 1B

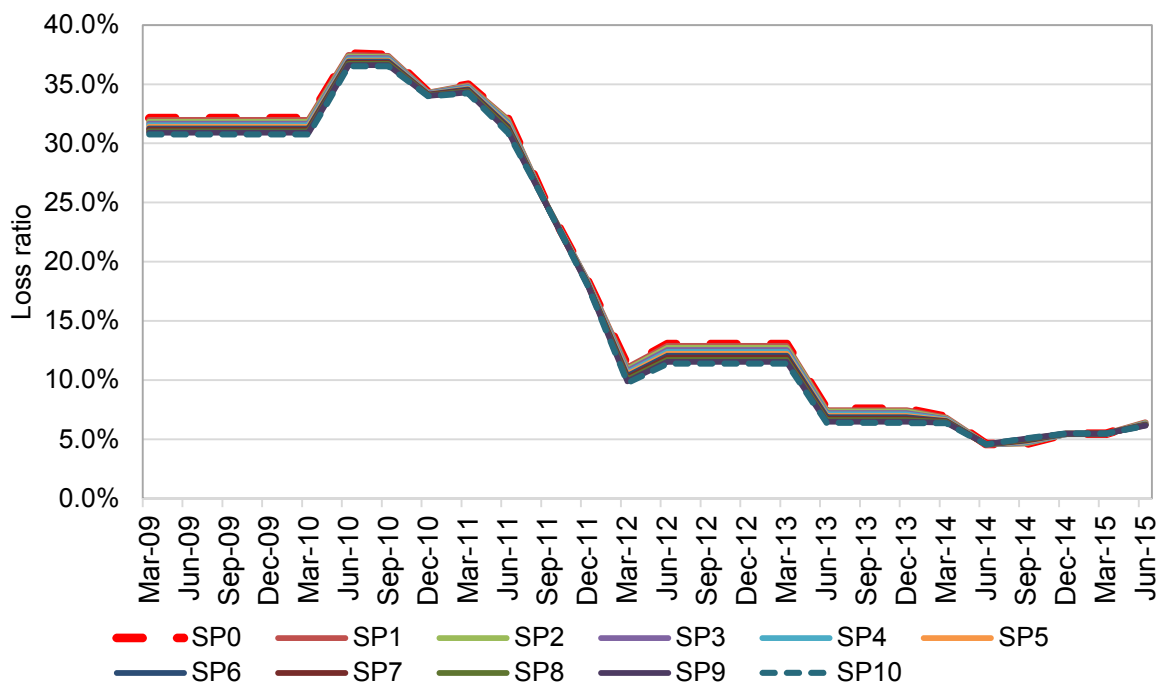
Null hypothesis 1B: There is a negative or no marginal change in downside risk of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1B: There is a positive marginal change in downside risk of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

5.6.1 Loss ratio

Period: 31 March 2006 – 30 June 2015

Figure 18: Loss ratio



Data source: (Morningstar, Reuters Thomson One & Moneymate, 2015)

SA general equity versus SA private equity

Levene's test:

F (Observed value)	0.248
F (Critical value)	4.034
DF1	1
DF2	50
p-value (one-tailed)	0.621
Alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 62.07%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] 0.022, +Inf [

Difference	0.097
t (Observed value)	2.183
t (Critical value)	1.676
DF	50
p-value (one-tailed)	0.017
Alpha	0.05

Test interpretation:

H_0 : The difference between the means is equal to 0.

H_a : The difference between the means is greater than 0.

As the computed p-value is lower than the significance level $\alpha = 0.05$, one should reject the null hypothesis H_0 , and accept the alternative hypothesis H_a .

The risk to reject the null hypothesis H_0 while it is true is lower than 1.69%.

SP₀ versus SP₁₀

Levene's test

	0.0
F (Observed value)	06
	4.0
F (Critical value)	34
DF1	1
DF2	50
	0.9
p-value (one-tailed)	36
	0.0
Alpha	5

Test interpretation:

H₀: The variances are identical.

H_a: At least one of the variances is different from another.

As the computed p-value is greater than the significance level alpha = 0.05, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 93.61%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] -0.049 , +Inf [

Difference	0.009
t (Observed value)	0.267
t (Critical value)	1.676
DF	50
p-value (one-tailed)	0.395
alpha	0.05

Test interpretation:

H₀: The difference between the means is equal to 0.

H_a: The difference between the means is greater than 0.

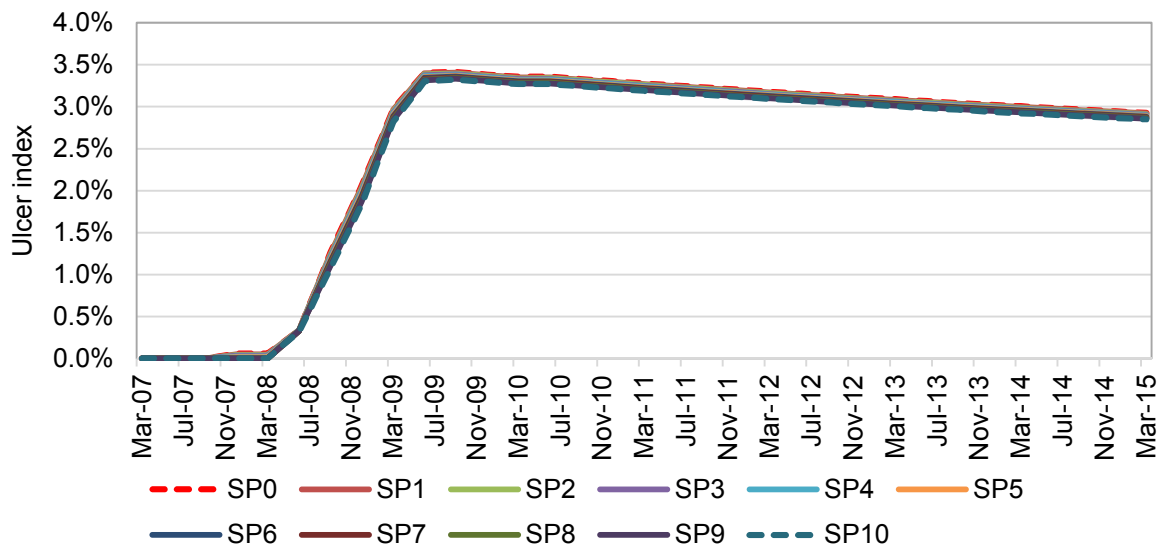
As the computed p-value is greater than the significance level alpha = 0.05, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 39.53%.

5.6.2 Ulcer index

Period: 31 March 2006 – 30 June 2015

Figure 19: Ulcer index



Data source: (Morningstar, Reuters Thomson One & Moneymate, 2015)

SA general equity versus SA private equity

Levene's test:

F (Observed value)	0.727
F (Critical value)	3.978
DF1	1
DF2	70
p-value (one-tailed)	0.397
alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is greater than the significance level $\alpha=0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 39.67%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] 0.002, +Inf [

Difference	0.011
t (Observed value)	2.152
t (Critical value)	1.667
DF	70
p-value (one-tailed)	0.017
alpha	0.05

Test interpretation:

H_0 : The difference between the means is equal to 0.

H_a : The difference between the means is greater than 0.

As the computed p-value is lower than the significance level $\alpha = 0.05$, one should reject the null hypothesis H_0 , and accept the alternative hypothesis H_a .

The risk to reject the null hypothesis H_0 while it is true is lower than 1.74%.

SP₀ versus SP₁₀

Levene's test:

F (Observed value)	0.002
F (Critical value)	3.991
DF1	1
DF2	64
p-value (one-tailed)	0.964
alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 96.41%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] -0.004 , +Inf [

Difference	0.001
t (Observed value)	0.277
t (Critical value)	1.669
DF	64
p-value (one-tailed)	0.391
Alpha	0.05

Test interpretation:

H_0 : The difference between the means is equal to 0.

H_a : The difference between the means is greater than 0.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 39.12%.

5.7 Hypothesis 1C

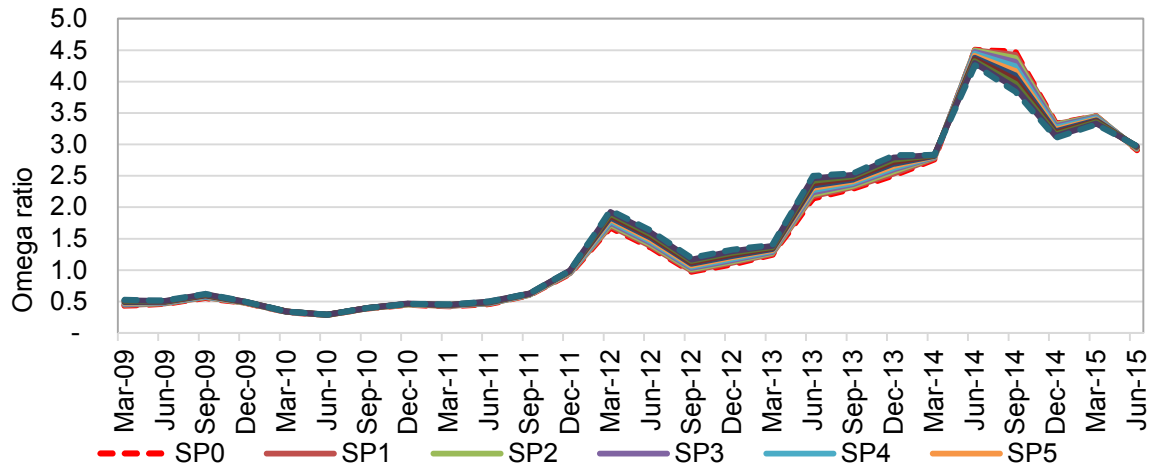
Null hypothesis 1C: There is a negative or no marginal change in downside risk-adjusted potential of SA pension funds when the strategic allocation of SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1C: There is a positive marginal change in downside risk-adjusted potential of SA pension funds when the strategic allocation of SA private equity is increased from 0% to 10%, in increments of 1%.

5.7.1 Omega ratio

Period: 31 June 2006 – 30 June 2015

Figure 20: Omega ratio



Data source: (Morningstar, Reuters Thomson One & Moneymate, 2015)

SA general equity vs SA private equity

Levene's test:

F (Observed value)	10.622
F (Critical value)	4.034
DF1	1
DF2	50
p-value (one-tailed)	0.002
alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is lower than the significance level $\alpha = 0.05$, one should reject the null hypothesis H_0 , and accept the alternative hypothesis H_a .

The risk to reject the null hypothesis H_0 while it is true is lower than 0.20%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

$$] -1.210 , +\text{Inf} [$$

Difference	-0.637
t (Observed value)	-1.874
t (Critical value)	1.688
DF	36
p-value (one-tailed)	0.966
alpha	0.05

The number of degrees of freedom is approximated by the Welch-Satterthwaite formula

Test interpretation:

H_0 : The difference between the means is equal to 0.

H_a : The difference between the means is greater than 0.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 96.55%.

SP₀ versus SP₁₀

Levene's test:

F (Observed value)	0.035
F (Critical value)	4.034
DF1	1
DF2	50
p-value (one-tailed)	0.853
Alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 85.31%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

$$] -0.651 , +\text{Inf} [$$

Difference	-0.054
t (Observed value)	-0.152
t (Critical value)	1.676
DF	50
p-value (one-tailed)	0.560
Alpha	0.05

Test interpretation:

H₀: The difference between the means is equal to 0.

H_a: The difference between the means is greater than 0.

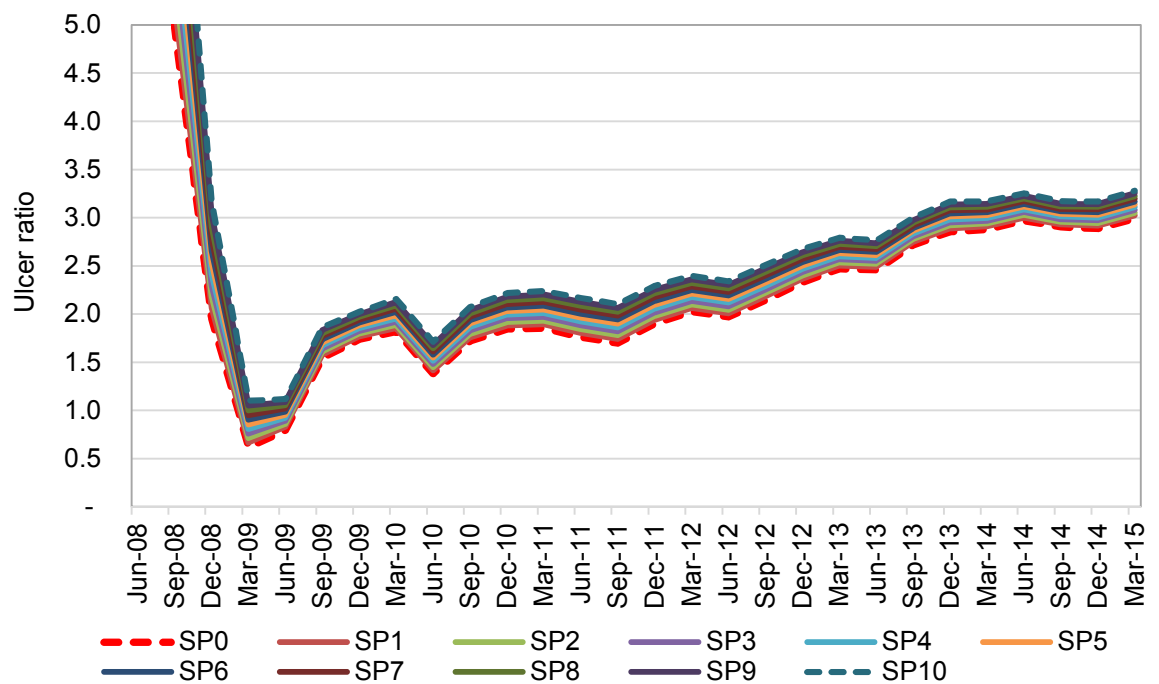
As the computed p-value is greater than the significance level alpha = 0.05, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 56.00%.

5.7.2 Ulcer ratio

Period: 31 March 2006 – 30 June 2015

Figure 21: Ulcer ratio



Data source: (Morningstar, Reuters Thomson One & Moneymate, 2015)

SA general equity versus SA private equity

Levene's test:

F (Observed value)	9.863
F (Critical value)	4.013
DF1	1
DF2	56
p-value (one-tailed)	0.003
Alpha	0.05

Test interpretation:

H_0 : The variances are identical.

H_a : At least one of the variances is different from another.

As the computed p-value is lower than the significance level $\alpha = 0.05$, one should reject the null hypothesis H_0 , and accept the alternative hypothesis H_a .

The risk to reject the null hypothesis H_0 while it is true is lower than 0.27%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

]-18.976 , +Inf [

Difference	-10.046
t (Observed value)	-1.913
t (Critical value)	1.701
DF	28
p-value (one-tailed)	0.967
Alpha	0.05

The number of degrees of freedom is approximated by the Welch-Satterthwaite formula

Test interpretation:

H_0 : The difference between the means is equal to 0.

H_a : The difference between the means is greater than 0.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H_0 .

The risk to reject the null hypothesis H_0 while it is true is 96.70%.

SP₀ versus SP₁₀

Levene's test:

F (Observed value)	0.146
F (Critical value)	4.013
DF1	1
DF2	56
p-value (one-tailed)	0.704
alpha	0.05

Test interpretation:

H₀: The variances are identical.

H_a: At least one of the variances is different from another.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 70.42%.

T-test for two independent samples / Upper-tailed test:

95% confidence interval on the difference between the means:

] -3.403 , +Inf [

Difference	-0.677
t (Observed value)	-0.415
t (Critical value)	1.673
DF	56
p-value (one-tailed)	0.660
alpha	0.05

Test interpretation:

H₀: The difference between the means is equal to 0.

H_a: The difference between the means is greater than 0.

As the computed p-value is greater than the significance level $\alpha = 0.05$, one cannot reject the null hypothesis H₀.

The risk to reject the null hypothesis H₀ while it is true is 66.02%.

5.8 Hypothesis 1D

Null hypothesis 1D: The pairwise, counter cyclical properties of SA private equity fund of funds relative to each asset class found in a typical SA pension fund are not better than SA listed equity.

Alternative hypothesis 1D: The pairwise, counter cyclical properties of SA private equity fund of funds relative to each asset class found in a typical SA pension fund are better than SA listed equity.

5.8.1 Pearson Correlation Coefficients (PCC)

Period: 31 March 2006 – 30 June 2015

Table 11: Pearson correlation coefficients

Asset classes	SA equity general	SA real estate	SA variable interest rate	SA short-term bearing	Global equity general	Global real estate	Global variable interest rate	Global short-term interest bearing	SA private equity FoFs
SA equity general	1	0.296	-0.406	-0.374	0.519	0.546	-0.406	-0.515	0.473
SA real estate	0.296	1	-0.229	0.182	-0.038	0.170	-0.229	-0.272	0.337
SA variable interest rate	-0.406	-0.229	1	-0.085	0.316	0.220	1.000	0.962	-0.037
SA short-term bearing	-0.374	0.182	-0.085	1	-0.691	-0.563	-0.085	-0.092	-0.182
Global equity general	0.519	-0.038	0.316	-0.691	1	0.766	0.316	0.257	0.356
Global real estate	0.546	0.170	0.220	-0.563	0.766	1	0.220	0.115	0.426
Global variable interest rate	-0.406	-0.229	1.000	-0.085	0.316	0.220	1	0.962	-0.037
Global short-term interest bearing	-0.515	-0.272	0.962	-0.092	0.257	0.115	0.962	1	-0.044
SA private equity FoFs	0.473	0.337	-0.037	-0.182	0.356	0.426	-0.037	-0.044	1

Values in bold and larger font size are different from 0 at a significance level alpha of 5%, or put differently 95% confidence level.

Table 12: p-values for Pearson Correlation Coefficients

Asset classes	SA equity general	SA real estate	SA variable interest rate	SA short-term bearing	Global equity general	Global real estate	Global variable interest rate	Global short-term interest bearing	SA private equity FoFs
SA equity general	0	0.075	0.013	0.023	0.001	0.000	0.013	0.001	0.003
SA real estate	0.075	0	0.172	0.280	0.824	0.314	0.172	0.103	0.042
SA variable interest rate	0.013	0.172	0	0.619	0.056	0.191	0.0001	< 0.0001	0.827
SA short-term bearing	0.023	0.280	0.619	0	< 0.0001	0.000	0.619	0.588	0.281
Global equity general	0.001	0.824	0.056	< 0.0001	0	0.0001	0.056	0.125	0.030
Global real estate	0.000	0.314	0.191	0.000	< 0.0001	0	0.191	0.497	0.009
Global variable interest rate	0.013	0.172	< 0.0001	0.619	0.056	0.191	0	< 0.0001	0.827
Global short-term interest bearing	0.001	0.103	< 0.0001	0.588	0.125	0.497	0.0001	0	0.795
SA private equity FoFs	0.003	0.042	0.827	0.281	0.030	0.009	0.827	0.795	0

Values in bold and larger font size are different from 0 at a significance level alpha of 5%, or put differently 95% confidence level.

5.9 Qualitative approach

The qualitative approach collected primary data through semi-structured interviews and was focused on testing the proposition as outlined in Chapter 4. The qualitative research is for the purposes of providing an in-depth understanding of a problem rather than to quantify a known phenomenon. Also the qualitative techniques were simply used to add a “softer” dimension and contextual backdrop which cannot be explained by quantitative analysis (Saunders et al., 2012).

The qualitative unit of analysis was the transcribed interview conducted with ten SA MA high equity pension fund managers and five private equity fund managers.

5.9.1 Research process

Each interviewee was requested for 30 minutes sessions with the researcher. The interviews are conducted at their work offices or telephonically.

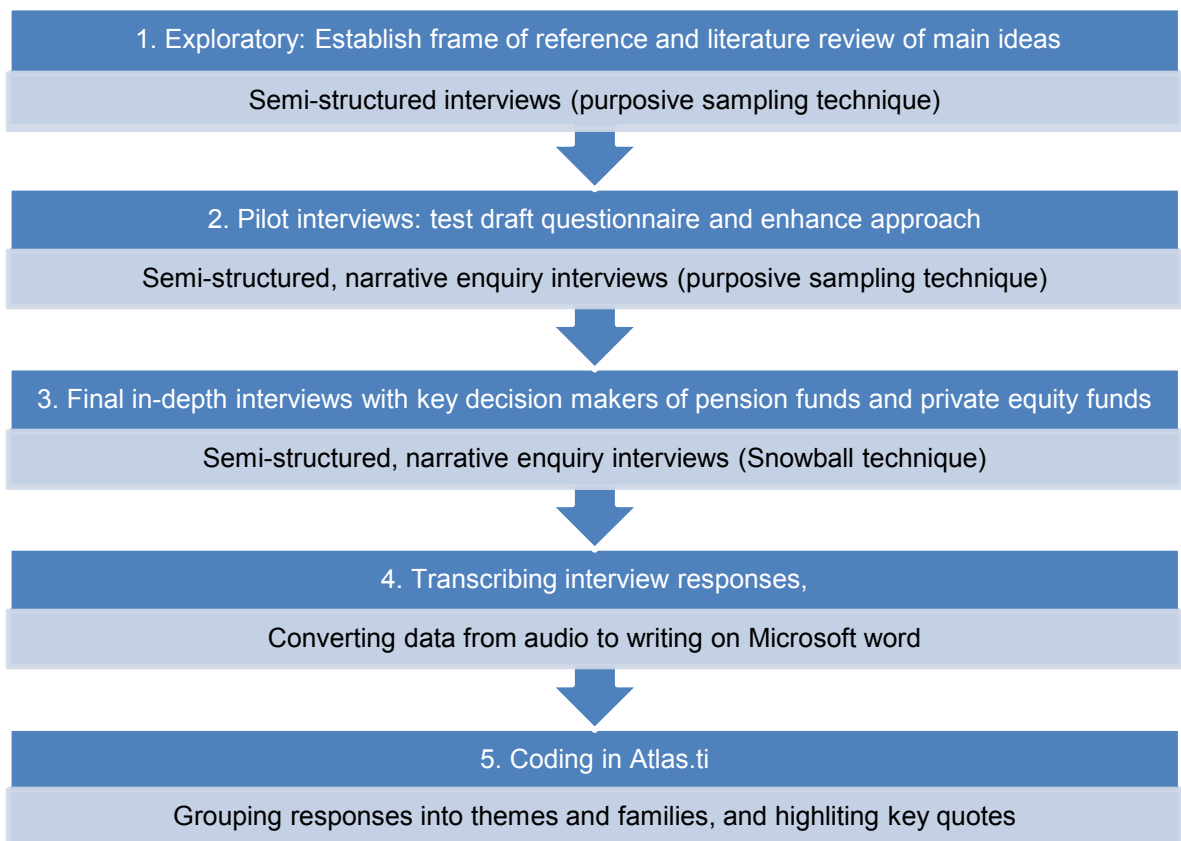
Before each scheduled interview, the interviewee was asked to sign letter of consent that granted the researcher permission to record the conversation. To preserve the anonymity of the interviewees, the researcher gave each of them a code names and a numeric number as displayed in Table 13. PFM and PEM stand for pension fund manager and private equity manager, respectively. These codes were used as identifiers for the quotes in Chapter 5 and 6.

The conversations were kept semi-structured whilst the researcher focused on making sure that insights and answers to the research questions were provided.

When the interview process was completed, the recordings were transcribed. Key themes were identified and MS excel was manually used to code the results into these themes. The reports from the code were then used to find the key quotes that demonstrate key insights.

The data collection stages were planned, conducted and analysed as depicted in Figure 22.

Figure 22: Qualitative research approach



Source: (Saunders et al., 2012) and Own

The in-depth interview approach was a necessary step for the study, as it provided a deeper level of understanding of the key themes, potential biases, behaviour and perspectives of the pension fund and private equity managers. The questions also captured some key themes and potential behavioural biases in the literature review.

Table 13 displays the 15 interviewees, their roles in their investment companies and the assets under management. The researcher quoted directly the interviewees, however their anonymity was protected.

Table 13: List of interviewees

Interviewee	Role	Type of Organisation	Assets under management (in R millions)
1	PFM 1	Single Manager - Asset management	+/- 750
2	PFM 2	Single Manager - Asset management	+/- 900
3	PFM 3	Multi-manager - Asset management	+/- 1,200
4	PFM 4	Single Manager - Asset management	+/- 3,000
5	PFM 5	Multi-manager - Asset management	+/- 7,000
6	PFM 6	Single Manager - Asset management	+/- 10,000
7	PFM 7	Single Manager - Asset management	+/- 12,000
8	PFM 8	Single Manager - Asset management	+/- 15,000
9	PFM 9	Single Manager - Asset management	+/- 20,000
10	PFM 10	Single Manager - Asset management	+/- 21,000
11	PEM 1	Single Manager - Private equity	+/- 500
12	PEM 2	Single Manager - Private equity	+/- 900
13	PEM 3	Single Manager - Private equity	+/- 1,300
14	PEM 4	Single Manager - Private equity	+/- 4,500
15	PEM 5	Multi-manager - Private equity	+/- 7,000

Source: Own

5.10 Secondary objective

Secondary objective: To answer the question, 'Are SA pension fund managers objective when assessing the diversification benefits of private equity in a SA pension fund?'

Proposition: SA pension fund managers have not objectively assessed the diversification benefits of private equity in a SA pension fund

The proposition was broken down into four sub-propositions. The responses from the seven semi-structured questions were designed to test these four sub-propositions.

5.11 Proposition 1A

Objective 1A: To assess whether or not SA pension fund managers' decision criteria for including private equity are not biased

Proposition 1A: SA pension fund managers' decision criteria for including private equity are biased.

Below are key themes and direct quotes from SA pension fund and private equity fund managers regarding proposition 1A

Over half of the pension fund managers expressed the view point that market size and minimum investment are the key practical requirements that they would consider before investing into any asset class. They excluded SA private equity on these two requirements. Some of the quoted responses that highlight the summarised views are as follows:

“My fund size (R800m) is too small and this is the case for most SA pension fund managers. A R10m minimum investment required by most PE funds is 12.5% of my fund making it practically impossible to even consider it as an investable asset class.”
(PFM 1)

“...apart from the expected returns, I consider the illiquidity risk as it introduces a key risk, reinvestment risk. Relative to other asset classes, my view is that the risk for private equity seems too high for the premium earned” (PFM 3)

“The asset class has lower correlations to SA listed equity, making it a good candidate for diversification, a fundamental requirement for pension funds.” (PFM 5)

“...we private equity managers think differently and think that the long-term investment horizons of 7-10 years is very suitable for pension funds as the retirement horizons are typically longer than that for the average retirement fund investor.” (PEM)

5.11.1 Summary of proposition 1A

The findings suggested that minimum investments and liquidity are by far some of the most critical considerations in the asset allocation of SA pension fund managers.

70% of the respondents include minimum investment as part of their decision criteria for asset allocation. However, when enlightened that private equity fund of funds had minimum investment of R100,000, they did not logically review their decision criteria.

Every respondent mentioned illiquidity risk but none of them gave an objective reason as to why a 7 year lock in period was not acceptable. No one talked about the minimum premium they would require for the lock-in.

Based on the information above, sub-proposition 1A 'SA pension fund managers have not objectively assessed the diversification benefits of private equity in a SA pension fund' should be accepted and is also in-line with proposition 1.

5.12 Proposition 1B

Objective 1B: To assess whether or not illiquidity and reinvestment risk of private equity is understood by SA pension fund manager

Proposition 1B: The Illiquidity and reinvestment risk of private equity is not understood by SA pension fund managers.

Below are key themes and direct quotes from SA pension fund and private equity fund managers regarding proposition 1B.

"On average less than 1% of SA pension funds is private equity and it is mainly driven by the larger pension funds such as Public Investment Corporation (PIC). They are not worried of illiquidity because of the size of the funds and withdrawals rates. In our case we are concerned" (PFM 4)

"... we understand it very well, but our hands are tied. Your typical pension fund trustee is very risk averse. They prefer the usual, put capital in tried and tested listed equity or in government bonds." (PFM 6)

"Trustees and asset consultants are generally affected by short-termism due to need for re-elections. This impacts their ability to objectively assess the merits of alternative asset classes like private equity." (PFM 7)

“... and we are currently taking illiquidity risk by investing in unlisted credit. However, it is different with private equity as trustees and asset consultants tend to be shy of anything they don’t understand.” (PFM 9)

5.12.1 Summary of proposition 1B

The findings suggested that Illiquidity risk is also a key consideration in the asset allocation of SA pension fund managers. 80% of the respondents made claims that they fully understand illiquidity risk and its implications to their portfolios. However, none of them could rationally articulate their minimum required risk premium for taking on the illiquidity. The same argued that trustees and asset consultants have veto on the types of risks taken and illiquidity risk from private equity would not be acceptable. 40% of the respondents even argued that they are already taking illiquidity risk through unlisted credit and their risk appetite would not allow them to take on more. Only 20% of the respondents gave a well-thought through process on how they would quantify the minimum premium they would require for the lock-in and the maximum private equity exposure they would fit their portfolio construction process.

Based on the information above, sub-proposition 1B ‘Illiquidity and reinvestment risk of private equity is not understood by SA pension fund managers’ should be accepted and is also in-line with proposition 1.

5.13 Proposition 1C

Objective 1C: To assess whether or not SA pension fund managers have made efforts to understand private equity through in-depth research.

Proposition 1C: Pension fund managers have not made efforts to understand private equity through in-depth research.

Below are key themes and direct quotes from SA pension fund and private equity fund managers regarding proposition 1C.

“We have not done research on the asset class. The benchmarking process and relative comparisons for pension funds foster herding behaviour as managers are not brave to take significant off-benchmark asset allocation calls. Moreover listed equity

continues to give good returns reducing the need to seek for extra returns from alternatives, despite the claim for diversification.” (PFM 2)

“We have not done an in-depth research because we would need a great deal of resources to put together data, let alone the research. It is a very secretive industry and that does not encourage most investors in our space as it introduces extra reporting burdens” (PFM 4)

“I have not done much research on the SA private equity fund of funds. Will it not be a layering of fees with little extra benefit?” (PFM 5)

“I think SA private equity fund of funds will go a long way to address the vintage concentration and significantly reduce the idiosyncratic risks. We still need to test what happens to the other characteristics such as the correlation, illiquidity risk ...” (PFM 8)

“We use third party research. We access private equity via fund of funds structures. That way we mitigate vintage concentration risk and are able to diversify the idiosyncratic risk. One fund of funds vehicle can give you up to access to about 40 underlying companies which is pretty good for us.” (PFM 10)

5.13.1 Summary of proposition 1C

The findings suggested that pension fund managers will only consider investment into asset classes that they have conducted research on. If a pension fund manager has not done research on an asset class, then they cannot claim to be objective regarding its decision on the asset class.

80% of the respondents made it plain that they had not done any meaningful and relevant research on the private equity asset class, including outsourcing third party research. The 20% that claimed doing research used third party research. They argued that it would have required them to operate with a disproportionately larger team of analysts focusing only on such research had they done it on by themselves. The 20% also used fund of funds vehicles to access private equity.

Based on the information above, sub-proposition 1C 'Pension fund managers have not made efforts to understand private equity through in-depth research' should be accepted and is also in-line with proposition 1.

5.14 Other findings

South Africa's more punitive regulatory environment relative to the developed world came out as a critical theme for influencing the behaviour of pension funds.

Below are some direct quotes from SA pension fund and private equity fund managers expressing the role of South Africa's regulation to the current behaviour by pension fund managers.

"The significant growth in the U.S pension and private equity funds has been due to relaxation of regulation that started decades ago. Moreover the search for yield in a low growth environment forced them to try private equity." (PFM 3)

"... and the redemptive laws on bankruptcy in the U.S. for example allows investors to be more adventurous with risk and opportunities. In our economy you cannot afford failing as a business as you are blacklisted for the next five years. You are more likely to bend the behaviour of U.S. pension fund managers than SA fund managers." (PFM 5)

"... also trustees and asset consultants cannot be expected to evolve beyond our less supportive regulatory environment. They make one mistake by taking a big knock in private equity and they are out of business for life. We can only advise our trustees, but they write the policy statement and boundaries between acceptable and unacceptable risk..." (PFM 8)

In Chapter 6, these results and findings will be assessed in relation to the literature review in Chapter 2.

6 DISCUSSION OF RESULTS

6.1 Introduction

Chapter 6 discusses, analyses and interprets a selection of results gathered from the two pronged research approach described in Chapter 5. The main approach was quantitative and it was supplemented by a qualitative overlay. Chapter 5 presented the quantitative results and results of the interview in relation to the hypotheses and propositions, respectively. In contrast, Chapter 6 analyses, discusses and links objectives in Chapter 1 and findings in relation to the literature review in Chapter 2. It discusses the results and findings that agree with, disagree with, or support the former research referenced in the literature review in a similar fashion and format to that established in Chapter 3.

6.2 Quantitative approach

Humphery-Jenner (2013), National Treasury (2011a) and National Treasury (2011b) agree that private equity fund of funds introduce better downside protection relative individual direct private equity. Gresch & Von Wyss (2011) also qualitatively argues that the access to private equity via the fund of funds structure significantly reduces the liquidity constraint. However, the reviewed literature does not quantify the impact of moving from a direct to a fund of funds structure. The findings by Bradfield & Munro (2011) enabled the trustees, pension fund consultants and pension fund managers to quantitatively appreciate the need for taking advantage of the change in Regulation 28 to allow for off-shore asset classes allocations. Likewise, the researcher saw the need to quantitatively assess the marginal diversification benefits of taking advantage of the change in Regulation 28 to allow for private equity fund of funds in SA pension funds.

Each sub-hypothesis addressed one of the four dimensions of diversification namely, downside protection, upside participation, downside risk-adjusted potential and pair-wise association of returns relative to other asset classes.

Under the upside participation category, two measures were used. The first one was Mean return and the second one was Gain ratio. Unlike Mean return, the Gain ratio is a more effective measure as it does not employ any pre-defined distributions and uses all statistical moments. It is defined as the historical probability of obtaining a return

superior to a return threshold. Unlike the Mean return, it is also less susceptible to outlier influences. However, the Mean return is more practically accessible and intuitive than Gain ratio.

Under the downside risk category, two measures were also used. The first one was Ulcer index and the second one was Loss ratio. Simply put, Ulcer index measures the human stress of holding an investment since its value reached its high watermark. Unlike the maximum drawdown, it takes into account the full time series of the asset price series (Kumaran, 2013). Bernardo & Ledoit (2000) introduced the Loss ratio (LR) as a better downside risk measure than standard deviation and semi-variance as it does not employ normality assumptions.

Under the Downside risk-adjusted potential category, two measures were also used. The first one was ulcer ratio and the second one was Omega ratio. Omega is computed by dividing the historical probability of obtaining a return superior to a return threshold by the historical probability of obtaining a return lower than it. Similar to the Omega ratio, the Ulcer ratio is the risk-adjusted performance measure calculated by dividing the excess return on an investment by the corresponding ulcer index.

Under the pair-wise association category, the Pearson correlation coefficient (PCC) measure was used. PCC is the most widely used measure of pair-wise association of returns and also more practically accessible.

The first three dimensions involved testing the effect of SA private equity fund of funds both in the strategic SA pension fund and as a standalone asset class. The tests and comparisons for the strategic SA pension funds were focused on a strategic allocation SA pension fund with 10% private equity, SP_{10} and strategic allocation SA pension fund with 0% private equity, SP_0 . Similarly, the tests and comparisons for a standalone SA private equity fund of funds were done relative to SA listed equity.

6.3 Illiquidity risk premium compensation

Allocating 10% to SA private equity fund of funds to the control portfolio SP_0 , generated an excess return 0.5% per annum. This is equivalent to cumulative excess returns of 5%, 2.5% and 0.5 % over investment horizons of 10 years, 5 years and 1 year. These numbers fall short of those suggested by Ang et al. (2011) when he concluded that a direct single private equity exposure that is rebalanced only once

every 10 years, 5 years and 1 year, on average, should require an illiquidity risk premium of 6%, 4.3% and 0.9%, respectively.

6.4 Strategic asset allocation for SP₀

Over the past 9 years, the average SA pension fund had 54%, 11%, 2% and 0% in SA equity general, Global equity general, SA real estate and Global real estate general, respectively. In the experiment, increasing SA private equity fund of funds proportionally resulted in a corresponding reduction in SA equity general by 5.4% to 48.6%. Essentially, SA equity general has dominated SA pension funds and very little emphasis and reliance has been placed on the other growth asset classes such as SA & Global real estate general and SA private equity fund of funds.

6.5 Quantitative approach

Primary objective: To answer the question, 'Are there is marginal diversification introduced by SA private equity fund of funds into SA pension funds?'

Null Hypothesis: Marginal diversification benefits of a SA private equity fund of funds in a South African pension fund are not significant.

Alternative Hypothesis: Marginal diversification benefits of a SA private equity fund of funds in a South African pension fund are significant.

When Regulation 28 was revised the maximum allowed allocation to global assets for SA pension funds, decision makers (pension fund managers, pension fund consultants, financial advisors and trustees) were quick to maximise their strategic and tactical allocation to global assets, especially global equities in SA MA high equity funds. This was supported by the quantitative work done by Bradfield & Munro (2011) who concluded that global equities and bonds introduced significant marginal diversification benefits to SA pension funds. Therefore, it made logical sense for the researcher to attempt to reconcile the gap between the regulator and decision makers by quantifying the value that private equity would potentially bring to SA pension funds.

The null hypothesis was broken down into four sub-hypotheses. The hypotheses were then tested at a 95% confidence level.

6.5.1 Hypothesis 1A

Null hypothesis 1A: There is a negative or insignificant change in the upside potential of a SA pension fund when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1A: There is a positive marginal change in the potential upside of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Upside performance is measured by two different measures: mean Return and Gain ratio at a 0% threshold. The greater the value, the greater the upside potential, the better the diversification effect.

Xiong, Idzorek, & Ibboston (2014) argued that metrics such as volatility and beta are inappropriate risk measures and largely irrelevant. They penalise upside performance the same way they do losses. They also do not account for non-Gaussian/ Normality return attributes. Rutkowska-Ziarko & Garsztka (2014) proposed the semi-variance as a more appropriate measure of downside risk than standard deviation. Bernardo & Ledoit (2000) introduced the Loss ratio (LR) as a better downside risk measure than standard deviation and semi-variance as it does not employ normality assumptions.

Franzoni, Nowak, & Phalippou (2012) showed in their research the observed relationship between US private equity performance and its corresponding illiquidity risk. They concluded that private equity funds have a illiquidity risk premium of around 3% per annum above private equity. They also argued that the great returns of private equity funds can be attributed as reward for many other risks factors to which the business is exposed, and illiquidity risk is also one of the crucial sources of the risk premium. Markowitz (1952) established the fundamentals for a more objective framework for asset allocation of money to a basket of investment vehicles. The study led to the mean-variance framework and showed that risk mitigation can be attained via either maximisation of expected return for a given predetermined standard deviation or minimisation of standard deviation for a predetermined expected return.

Even though null hypothesis 1A is solely focused on the strategic SA pension fund, similar extra tests for mean Return and Gain ratio were also run on SA private equity fund of funds relative to SA listed equity.

In conclusion, the findings in section 5.5 showed that adding the maximum allowed SA private equity to a SA pension fund does not statistically increase the potential upside.

Therefore null hypothesis 1A 'There is a negative or no marginal change in upside potential of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.' should be accepted. The finding was not in line with literature review in section 2.5.

However, SA private equity has statistically significant upside than SA listed equity, this finding complements the literature reviewed in section 2.4.4.

6.5.2 Hypothesis 1B

Null hypothesis 1B: There is a negative or no marginal change in downside risk of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1B: There is a positive marginal change in downside risk of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.

Downside risk was measured by two different measures: Loss ratio at 0% threshold, Pain index and Ulcer index. The greater the value, the greater the downside risk, the poorer the diversification effect.

The researcher also chose the Ulcer (or Martin) index and Ulcer (or Martin) ratio as reliable non-parametric measures of downside risk and downside risk-adjusted performance, respectively (Martin & McCann, 1989). Kumaran (2013) agrees with Martin & McCann (1989) in that the maximum drawdown does not accurately capture the fear that investors encounter when investment values are continuously as falling. Maximum drawdown only describes a single event of the entire drawdown time series.

Even though hypothesis 1A is solely focused on the strategic SA pension fund, similar extra tests for Loss ratio and Ulcer index were also run on SA private equity fund of funds relative to SA listed equity.

In conclusion, the findings in section 5.6 showed that adding the maximum allowed SA private equity to a SA pension fund does not statistically reduce the potential downside. Therefore null hypothesis 1B 'There is a negative or no marginal change in downside risk of SA pension funds when the strategic allocation to SA private equity is increased from 0% to 10%, in increments of 1%.' should be accepted. The finding was not in line with literature review in section 2.5.

However, there is statistical evidence that SA private equity has less downside than SA listed equity, this finding complements the literature reviewed in section 2.5.

6.5.1 Hypothesis 1C

Null hypothesis 1C: There is a negative or no marginal change in downside risk-adjusted potential of SA pension funds when the strategic allocation of SA private equity is increased from 0% to 10%, in increments of 1%.

Alternative hypothesis 1C: There is a positive marginal change in downside risk-adjusted potential of SA pension funds when the strategic allocation of SA private equity is increased from 0% to 10%, in increments of 1%.

Downside risk-adjusted performance is measured by two different measures: Omega ratio at a 0% threshold, Pain ratio and Ulcer ratio. The greater the ratio, the greater the downside risk-adjusted potential or diversification effect.

The researcher concurred with Arias Fogliano de & Samanez (2013) in that Omega and Gain-Loss ratios are credible measures for sensible diversification and downside-risk-adjusted potential measures. Unlike the Treynor, Sortino, Information and Sharpe ratios which use standard deviation as the denominator, the Omega function defines upside potential and downside risk differently, thus taking care of the extensively documented theoretical flaws of MVO.

Humphery-Jenner (2013) discovered that risk-reduction within private equity may increase returns. He also demonstrated that there is a positive association between diversification and returns, but did not assess the cause of this relationship. He suggested that diversification might increase returns by enabling knowledge sharing among portfolio managers and senior managers.

Even though hypothesis 1C is solely focused on the strategic SA pension fund, similar extra tests for Omega ratio and Ulcer ratio were also run on SA private equity fund of funds relative to SA listed equity. The mean Omega ratio and mean Ulcer ratio were significant at a 95% confidence level.

In conclusion, the findings in section 5.7 showed that there was no statistical evidence at a 95% confidence level that adding the maximum allowed SA private equity to a SA pension fund does not increase the downside-risk adjusted potential. Therefore null hypothesis 1C 'There is a negative or no marginal change in downside risk-adjusted performance of SA pension funds when the strategic allocation of SA private equity is increased from 0% to 10%, in increments of 1%' should be accepted. The finding was not in line with literature review in section 2.5.

Also there was no statistical evidence that SA private equity has more downside-risk adjusted potential than SA listed equity, this contradicted the literature reviewed in section 2.6.

6.5.1 Hypothesis 1D

Null hypothesis 1D: The pairwise, counter cyclical properties of SA private equity fund of funds relative to each asset class found in a typical SA pension fund are not better than SA listed equity.

Alternative hypothesis 1D: The pairwise, counter cyclical properties of SA private equity fund of funds relative to each asset class found in a typical SA pension fund are better than SA listed equity.

Pairwise association is measured by Person Correlation Coefficient (PCC). The PCC were measured and tested for SA private equity and SA listed equity relative to each

asset classes included in the strategic asset allocation. The lower the PCC, the greater the counter cyclical or diversification effect.

Christoffersen, Errunza, Jacobs, & Langlois (2012) concluded that the merits of international diversification across all broad markets have decreased because of a gradual increase in the average correlation of these markets. In other words, if international markets are well interconnected, there is no marginal value in diversifying across them.

Asness et al. (2011) added to the same argument by concluding that, over the short term, diversification can disappoints when needed the most as market tend to crash together and correlations converge. However, they also take an opposite view and argue that critiques who claim that diversification offers insignificant protection miss a very critical point about the long-term. They concluded that despite market panics being important factors for short performance, economic performance dominates over the long-term.

SA private equity fund of funds displayed good and statistically significant diversifying properties, as measured by PCC relative to all growth assets: SA equity general, SA real estate, Global equity general and Global general real estate.

In contrast, SA equity generally did not display statistically significant diversifying properties relative to SA general real estate. Interestingly, SA real estate did not display statistically significant diversification relative to both SA equity general and Global equity general, as measured by PCC.

In conclusion, the findings in section 5.8 showed statistical evidence at a 95% confidence level that SA private equity has better pair-wise diversification properties than SA listed equities and SA property. Therefore null hypothesis 1D 'SA private equity does not have better pair-wise diversifying properties than SA listed equity relative to the asset classes in a typical SA pension fund' should be rejected in favour of the alternative hypothesis.

6.6 Qualitative approach

Secondary objective: To answer the question, ‘Are SA pension fund managers objective when assessing the diversification benefits of private equity in a SA pension fund?’

Proposition: SA pension fund managers have not objectively assessed the diversification benefits of private equity in a SA pension fund.

The explanatory note from the (National Treasury, 2011a) contains a debate championed by the key pension fund decision makers. It captures the unresolved misalignment of views between two broad groups: the pro-private equity group (National Treasury and private equity fund managers) and anti-private equity group (SA pension fund decision makers). Some pension fund managers attribute the low allocations to the short-termism behaviour of trustees who want to see immediate returns and to be re-elected. As a result, pension fund managers fear that if they underperform it might damage their relationships with trustees leading to termination of their mandates (Manson, 2014).

6.6.1 Proposition 1A

Proposition 1A: SA pension fund managers’ decision criteria for including private equity are biased.

The findings suggested that minimum investments and liquidity are by far some of the most critical consideration in the asset allocation of SA pension fund managers. Private equity fund of funds add a very important piece of the puzzle to the private equity debate. Old Mutual Multi-Manager Private Equity (2015) is a clear illustration of how fund of funds lower the barrier to entry with a minimum investment ranging of R100,000, to the extent that retail investors can now also invest with two of the four fund of funds firms in South Africa.

In contrast, most direct private equity minimum investments are usually set at R100 million. If retail pension funds in the SA MA high equity were to take full advantage of the 10% maximum allocation limit to private equity, only 32 out of 152 (21%) would have been able to do so due to the pension fund size constraint. By going the indirect

fund of funds route, 100% of the retail pension funds would be able to take advantage of the 10% maximum allocation limit.

Over 50% of the pension fund managers expressed the view point that market size and minimum investment are the key practical requirements that they would consider before investing into any asset class. They excluded SA private equity on these two requirements. Their argument would be correct if direct private equity was the only way to access the asset class. As a result their argument is not in line with literature review in section 2.3.4.

Franzoni, Nowak, & Phalippou (2012) showed in their research the observed relationship between private equity performance and its corresponding illiquidity risk. They concluded that private equity funds have a liquidity risk premium of around 3% per annum. Every respondent mentioned illiquidity risk but none of them gave an objective reason as to why a 7 year lock in period was not acceptable. No one talked about the minimum premium they would require for the lock-in.

In conclusion, the findings in section 5.11 showed that pension fund managers, trustees and asset consultants, was in line with the literature review. Therefore sub-proposition 1A 'SA pension fund managers' decision criteria to for including private equity are biased' should be accepted and is in-line with the proposition.

6.6.2 Proposition 1B

Proposition 1B: The Illiquidity and reinvestment risk of private equity is not understood by SA pension fund managers.

The findings suggested that Illiquidity risk is also a key consideration in the asset allocation of SA pension fund managers. Numerous empirical studies over the past three decades displayed evidence that illiquid assets usually offer a premium return over equivalent liquid assets (Hibbert et al., 2009).

Ang & Kjaer (2012) later argued that illiquid assets can only be realised by investors that have longer investment periods than the payoff period of the illiquid assets. They also are of the view that having a long investment period does not mean that the long-

term investor should blindly invest in illiquid investment vehicles like private equity. Instead, long-term investors should demand an appropriate illiquidity premium as compensation to invest in illiquid investments like private equity. 60% of the respondents explicitly agreed that the average investment period or their investors was in line with the 7-10 year horizon for private equity. 80% of the respondents made claims that they fully understand illiquidity risk and its implications to their portfolios. However, none of them could rationally articulate their minimum required risk premium for taking on the illiquidity. Their decision to not invest was not an objective one.

The same argued that trustees and asset consultants have veto on the types of risks taken and illiquidity risk from private equity would not be acceptable. 40% of the respondents even argued that they are already taking illiquidity risk through unlisted credit and their risk appetite would not allow them to take on more. Only 20% of the respondents gave a well-thought through process on how they would quantify the minimum premium they would require for the lock-in and the maximum private equity exposure they would fit their portfolio construction process.

In conclusion, the findings in section 5.12 showed that pension fund managers, trustees and asset consultants did not understand illiquidity risk in the same way articulated in the literature review in section 2.4.4. Therefore sub-proposition 1B 'Illiquidity and reinvestment risk of private equity are not understood by SA pension fund managers' should be accepted and is in in-line with the proposition.

6.6.3 Proposition 1C

Proposition 1C: Pension fund managers have not made efforts to understand private equity through in-depth research.

These key decision makers are expected to perform deep dive due diligence to identify and mitigate risks which include but not limited to liquidity, credit and market risks (National Treasury, 2011a; National Treasury, 2011b). In the context of pension funds, Szigety (2013) and Inderst (2010) argued that cashflow risk, reinvestment risk, J-curves, illiquidity risk, conflict of interest, leverage risk and regulatory risk top the list in the asset allocation decision making process. Only regulatory risk and illiquidity risks were mentioned by the respondents.

Cashflow risk

Cumming & Johan (2009) showed that weaker regulatory environments have a higher probability of paying cash distributions than stronger ones. They also showed that SA private equity funds have a higher probability of paying cash distributions to SA pension funds than developed countries private equity funds to their respective pension funds. This insight from the literature review did not come through in the findings.

J-curve risk

Ewens, Jones, & Rhodes-Kropf (2013) supported Murphy (2006) with a very important perspective that fund of funds significantly deal with the concentration risk and improve the overall diversification of private equity by improving of the J-curve profile. GP's of private equity fund of funds choose and invest in a number of private equity funds over a different periods of time, known as vintage years. The overall fund of funds will typically have a better and J-curve profile than the underlying funds as illustrated in Figure 7 of section 2.3.4. 80% of the respondents made it plain that they had not done any meaningful and relevant research on the private equity asset class, including outsourcing third party research. The 20% that claimed doing research used third party research sourced from private fund of funds managers. Only 1 out of 10 used private equity fund of funds in their asset allocation.

Leverage risk

Heed (2010) argues from two schools of thought, the positive and negative. On the negative, he suggests that when credit cycles deteriorate, interest rate hedging become undermined and capital structures that were once balanced become unsustainable. None of the respondents articulated their concern or comfort on leverage of private equity. Their responses were not in line with the literature review.

In conclusion, the findings in section 5.13 showed that pension fund managers, trustees and asset consultants did not make significant efforts to understand private equity through in-depth research. Therefore sub-proposition 1C 'Pension fund managers have not made efforts to understand private equity through in-depth research' should be accepted and is in-line with proposition and literature review in 2.4.

6.7 Summary

In Chapter 6 comprehensively discussed the results from Chapter 5. It also compared them to the literature review in Chapter 2. It also linked them to the research sub-hypotheses and sub-propositions in Chapter 3.

The proposition was broken into three sub-propositions and all of them were in-line with the main proposition 'SA pension fund managers have not objectively assessed the diversification benefits of private equity in a SA pension fund', as a result it was not accepted. The responses also did not agree with or complement numerous empirical studies over the past three decades displayed evidence that illiquid assets usually offer a premium return over equivalent liquid assets (Hibbert et al., 2009).

In conclusion, The answer for the primary hypothesis, 'Marginal diversification benefits of a SA private equity fund of funds in a South African pension fund are not significant.' is yes, 10% is not enough to meaningfully result in a SA pension fund with a greater upside potential or downside or downside-risk adjusted potential. The null hypothesis was accepted, as three out of four sub-hypotheses were responses were accepted and were not in line with the literature review.

The answer for the proposition, 'SA pension fund managers have not objectively assessed the diversification benefits of private equity in a SA pension fund?' is yes, they have not be objective. The proposition was accepted, as the majority of responses were in line with the sub-propositions and the literature review.

7 CONCLUSION

7.1 Introduction

Chapter 7 gives the principal findings in Chapter 5 which are discussed in Chapter 6, based on the research hypotheses and propositions established in Chapter 3. The findings are synthesised to give integrated perspectives and conclusions. It also discusses the recommendation to various key stakeholders to deliberate based when conducting asset allocation and constructing asset allocation frameworks for South African pension funds. The chapter then ends with suggestions for future studies and an exposition of the research limits.

7.2 Principal findings

The findings were established from a combination of both a quantitative and qualitative study. The primary objective of the research was to test whether SA private equity fund of funds generate the marginal diversification benefits in SA pension funds. Bradfield & Munro (2011) concluded that global equities and bonds introduced significant marginal diversification benefits to SA pension funds. Likewise, the researcher sought to also find the diversification merits of SA private equity in a SA pension fund.

7.2.1 Upside potential

Findings in section 5.5 showed that SA private equity has statistically significant upside potential than SA listed equity, this finding complements the literature reviewed in section 2.5. However, there is no statistical evidence to suggest that adding the maximum allowed SA private equity of 10% to a SA pension fund does will increase the potential upside of the pension fund. This means that the maximum allowed SA private equity in a SA MA high equity South African pension fund will need to be increased further in Regulation 28 before that is achieved.

7.2.2 Downside risk

Findings in section 5.6 showed that there is statistical evidence that SA private equity has less downside than SA listed equity, this finding complements the literature reviewed in section 2.5. However, there is no statistical evidence to suggest that adding the maximum allowed SA private equity of 10% to a SA pension fund does will increase the downside protection of the pension fund. This means that the maximum allowed SA private equity in a SA MA high equity South African pension fund will need to be increased further in Regulation before that is achieved.

7.2.3 Downside risk-adjusted potential

Findings in section 5.7 showed that there was no statistical evidence to show that the adding the maximum allowed SA private equity of 10% to a SA pension fund does increase the downside-risk adjusted potential. The finding was not in line with literature review in section 2.6. This also means that the maximum allowed SA private equity in a SA multi-asset high equity South African pension fund will need to be increased further by the FSB before that is achieved.

There was also no statistical evidence that showed that SA private equity has more downside-risk adjusted potential than SA listed equity, this contradicted the literature reviewed in section 2.5. This is contrary to what the researcher expected given that SA private equity displayed statistically better upside and downside measures.

7.2.4 Pairwise association diversification

SA private equity fund of funds displayed good and statistically significant pairwise diversification properties, as measured by PCC relative to all growth assets classes: SA equity general, SA real estate, Global equity general and Global general real estate. In contrast, SA equity general did not display statistically significant pairwise diversification properties relative to SA general real estate. Interestingly, SA real estate did not display statistically significant diversification relative to both SA equity general and Global equity general, as measured by PCC.

7.2.5 Marginal diversification

Overall, there is no statistical evidence to show that adding the maximum allowed SA private equity exposure of 10% to a SA pension fund enhances three of the four tested diversification dimensions within a SA pension fund. This means that the maximum allowed SA private equity of 10% in a SA MA high equity pension fund will need to be increased further in Regulation 28 before that is achieved.

7.2.6 Minimum investments

Findings in section 6.6.1 showed that over 50% of the pension fund managers expressed the view point that market size and minimum investment are the key practical requirements that they would consider before investing into any asset class. This is one of the many reasons why SA private equity has been excluded from asset allocation of SA pension funds. Very few pension fund managers were aware that SA private equity fund of funds could easily eliminate the minimum investments barrier.

This insight means a change in the minimum investment change from R100,000,000 to R100,000 which can be afforded by each SA MA high equity pension fund.

However, a challenge remains in that SA private equity fund of funds vehicles are still very few in South Africa. More effort and support will have to be put into the growth of fund of funds industry before it the full benefits of minimum investments can be enjoyed.

7.2.7 Illiquidity and reinvestment risk

Findings in section 6.6.2 showed that trustees and asset consultants have the ultimate authority on the illiquidity risk that can be taken by a SA pension fund as they have the ultimate fiduciary duty to draw and endorse invest policy frameworks as well as highlighting the unaccepted risks. 40% of the pension fund managers argued that they are already taking illiquidity risk through unlisted credit and their risk appetite would not allow them to take on more.

Only 20% of the pension fund managers gave a well-thought through process on how they would quantify the minimum premium they would require for the lock-in and the maximum private equity exposure they would fit their portfolio construction process.

7.2.8 Private equity research

Findings in section 6.6.3 showed that pension fund managers, trustees and asset consultants did not make meaningful efforts to understand private equity through in-depth research. Pension fund managers' understanding of the key private equity's cash flow, J-curve and leverage risks, in the context of portfolio construction was limited. The decisions that these three key stakeholders do seem to have been made based on biased frameworks.

7.3 Recommendations to key stakeholders

7.3.1 SA pension fund managers

SA private equity did not introduce statistically significant marginal diversification benefits to SA pension funds presently because of the low maximum allowed limit of 10%. This should not stop pension fund managers and other key decision makers from researching the asset class for future opportunities. The National treasury increased maximum allowed global assets for South African pension funds from 15% in 2010 to 25% in 2011 (National Treasury, 2011). The researcher expects a similar trend in private equity as more research, interest and debate is deployed on to the asset class. Pension fund managers must at least apply themselves to the

understanding of the key performance and risk factors of SA private equity fund of funds. This will potentially equip them with more tools to build a more objective asset allocation paradigms for potential opportunities in private equity fund of funds.

7.3.2 Trustees and asset consultants

What is clear from the findings is that trustees and asset consultants have not applied an objective decision making processes for drafting investment policy frameworks. It appears that they have not optimally aligned the long-term liabilities of pension fund members to the investment horizons of the underlying asset classes. The researcher agrees with Ang & Kjaer (2012) who argued that long-term investors should demand an appropriate illiquidity premium as compensation to invest in illiquid investment vehicles such as private equity.

The trustees and asset consultants should write more flexible mandates that allow pension fund managers the choice to invest in private equity, if an opportunity for significant marginal diversification exists. However, they should also mandate the pension fund managers to quantify illiquidity risk premium required and to quantify the opportunity cost of holding illiquid assets such as private equity.

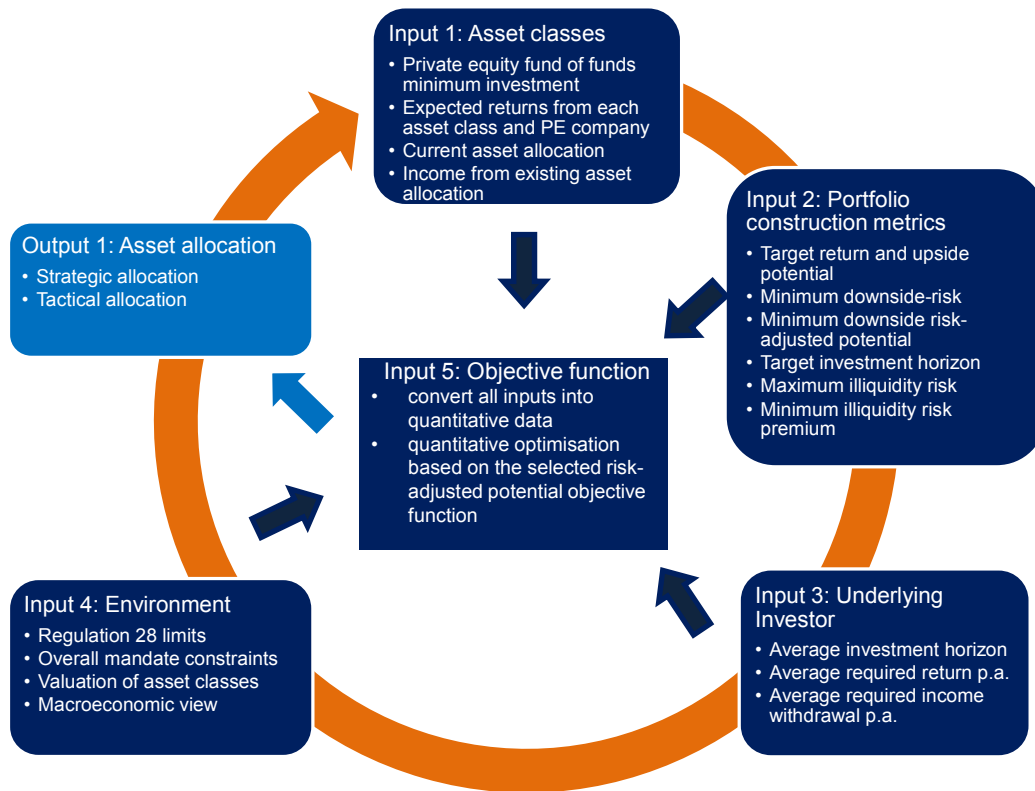
7.3.3 National treasury and Financial services board

The National treasury and Financial services board (FSB) have a very crucial role to play in order to make private equity a viable strategic investment for SA pension funds. Firstly, the two regulators should engage the SA pension fund managers, trustees and asset consultants with the aim to increase the maximum allowed exposure to private equity. Secondly, the two regulators should mobilise and incentivise the growth of the private equity fund of funds.

This is because the findings of this study show that the maximum allowed private equity by the Regulation 28 of Pension funds act will have to increase in order generate meaning diversification in SA pension funds. To add to that, SA pension fund of funds plays a very important role of reducing the minimum investment and diversifying the vintage risk.

7.4 Suggested framework for SA pension funds

Figure 23: Suggested framework for SA pension funds



Source: Own

Through a process of reviewing the findings in Chapters 5 and 6, the researcher suggested framework in Figure 23 to guide SA pension fund decision makers who want to include SA private equity fund of funds in their strategic and tactical asset allocation. The framework has five inputs that all key decision makers should consider namely, asset classes, portfolio construction metrics, underlying investor, environment and optimisation objective function.

In input 1 or asset classes, one of the key aspects is the minimum investment amount into private equity vehicle, which has up to now acted as a barrier to entry for most pension funds. Input 2 or portfolio construction metrics, includes defining the maximum allowed illiquidity risk in the SA pension fund as well as the minimum required premium to compensate for the reinvestment risk. Input 3 or underlying investor defines the SA pension fund's average investment horizon, withdrawal income and required return. In input 4 or environment sets the boundaries of the

solution and determines which asset classes need to be favoured at the expense of others. These boundaries include macroeconomics, valuations, Regulation 28 and other mandate limits. Input 5 or objective function defines the ultimate quantitative criteria for optimising and choosing the combination of asset classes. The process feeds back and should be repeated as input variables change.

7.5 Suggestions for future research

The researcher recommends further research into the following areas:

- Conduct a quantitative research that determines the SA private equity fund of funds' allocation required to make the marginal diversification benefits in a pension fund statistically significant.
- Conduct a quantitative research that determines the maximum percentage share of outperformance fee on SA private equity fund of funds' required to make the marginal diversification benefits in a pension fund statistically significant at the current maximum allowed allocation to private equity of 10%.
- Conduct a research that identifies and quantifies the risk premia among the SA private equity fund of funds, direct SA private equity and listed SA private equity.
- Conduct a qualitative research that explores the role of private equity in the South African long-term insurance industry in meeting the long-term liabilities.
- Conduct a research on how to effectively grow the private equity fund of funds industry.

7.6 Limitations of the research

- Trustees and asset consultants were not interviewed, their perspectives were only captured indirectly through the pension fund managers.
- The regulators were not interviewed, their latest perspectives were not captured.
- The data period had limited business and economic cycles. The analysis lacks perspectives of the potential outcomes of the underlying asset classes in pre-2006 financial crises such as the Asian crisis, Tech bubble, Great depression and dual Rand regime.
- Private equity data is recorded quarterly and hence all assessment could not be done at more granular intervals.
- The sample size of private equity fund of funds is very small because the industry is yet to get established.

7.7 Summary

Chapter 7 gave the principal findings that were established in Chapter 5 and discoursed in Chapter 6. The research primarily concluded that there were no statistical evidence to suggest that the 10% maximum allowed exposure to private equity fund of funds does generates marginal diversification benefits in a South African pension fund. It also concluded that SA pension fund managers have behavioural biases regarding allocation of capital to private equity fund of funds.

Chapter 7 also made recommendations to the three key stakeholder groups; pension fund managers, trustees and asset consultants, National treasury and Financial services board (FSB). It also gives recommendations of future studies before ending with a list of the limitations that the researcher experienced.

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9 APPENDICES

9.1 Appendix 1: Letter to respondents

Dear Sir/ Madam

I am currently studying towards an MBA at Gordon Institute of Business Science (GIBS). My research is on the marginal diversification benefits of private equity fund of funds on South African pension funds. The research requires me to collect and analyse interview data from pension fund managers in South Africa.

I contacted your company telephonically and asked for contact details of the pension fund manager. Please note that individual firms, funds or persons will not be identified in the research. All responses will be treated with utmost confidentiality and anonymity. Upon completion, results will be available to you at your request.

Your participation is very crucial to the success of the study and is greatly treasured.

Please also find attached a signed letter of consent assuring confidentiality and anonymity, as well as allocated time for the interview and my research supervisor's contact details.

Yours sincerely,

Conlias Mancuveni

438211@mygibs.co.za

079 602 8260

9.2 Appendix 2: Interview consent form

Dear Participant

I am conducting quantitative research on the marginal benefits of private equity on South African pension funds. I also want to balance my quantitative analysis with some interview derived qualitative perspectives on the views of pension fund managers on private equity. Our interview is expected to last about 1 hour, and will help us understand why SA pension funds are not currently not allocating capital to private equity. It will possibly help us to identify areas of improvement in order to start seeing capital allocations to private equity.

Your participation is voluntary and you can withdraw at any time without penalty. Of course, all data will be kept confidential. If you have any concerns, please contact my supervisor or I. Our details are provided below.

Researcher name : CONLIAS T.M. MANCUVENI Supervisor name : SHAUN COLLYER

Researcher signature :

Email : 438211@mygibs.co.za Email : shaun.collyer@yahoo.com

Phone : 079 602 8260 Phone : 011 253 7244

Signature of participant :

Date : 01-Jul-15

9.3 Appendix 3: Interview schedule and guidelines

A high-level draft interview conversation guide is presented below.

Part 1: General and Background Information

I appreciate the time and opportunity to interview you.

I would like to confirm and assure the confidentiality of the data I will collect from you. If required, this interview can be anonymous and your name and/ or that of your company will not be reflected in the report.

Kindly read through the consent form, a copy of which was also emailed to you on confirmation of this interview and complete it if before we proceed with the interview.

The title of the research is “Marginal diversification benefits of private equity on a South African pension fund”.

The key aims of the qualitative component of this research are to:

- Gain understanding of reasons as to why despite the National Treasury allowing SA pension funds to invest 10% of their capital in private equity, pension fund managers are preferring to not invest in the asset class.
- Gain understanding of the perceptions of pension fund managers on the risks embedded in private equity relative to other eligible asset classes.

The interview will be on both conversational and exploratory bases. Please feel free to speak candidly and not to be limited to only answering the proposed questions.

Do you have any questions before we go ahead?

Part 2: Interview

- Ask questions as per questionnaire (see part 4)
- Ask factual before opinion questions

Part 3: Concluding the interview

Is there anything more that you would want to add?

Inform the interviewee of the next steps of analysing the collected information, which will be compiled into a draft that could be sent to the interviewee if need be.

Thank the interviewee for their time and information provided.

Part 4: Interview Questions

Introduction to Interview

As at 31 December 2014, the 10 year annualised returns for SA private equity and SA listed equity (as measured by the ALSI total returns) generated annualised returns of 19.1% and 18%, respectively.

Effective 1 July 2011, the National Treasury amended Regulation 28 of South African pension funds Act by increasing the maximum allowed allocation to private equity for SA pension from 2.5% to 10%. It also stated that up to 5% could be allocated per fund of private equity fund, whilst only 2.5% could be allocated per private equity fund.

However, four years later the perceptions of SA pension fund managers towards private equity seem not to have changed. SA pension fund managers have not reciprocated with meaningful capital allocations to private equity in support of the regulator's initiatives and in acknowledgment of good historical returns generated by private equity.

Questions

- 1. Question 1A:** What is or would potentially be your decision criteria for private equity or private equity fund of funds strategic allocation, in the context of the new Regulation 28 of the Pension Funds Act?
- 2. Question 2A:** In your own opinion, do you think the extra return from direct private equity or private equity fund of funds fully compensates for the illiquidity and reinvestment risk? What do you think should be the minimum illiquidity risk premium per annum?
- 3. Question 1B:** How would you mitigate the illiquidity and reinvestment risk of SA private equity or private equity fund of funds if it was part of the strategic allocation for your SA MA high equity pension fund?
- 4. Question 2B:** Do you think private equity fund of funds significantly mitigate the vintage concentration, duration and illiquidity risk inherent in direct private equity? Why?

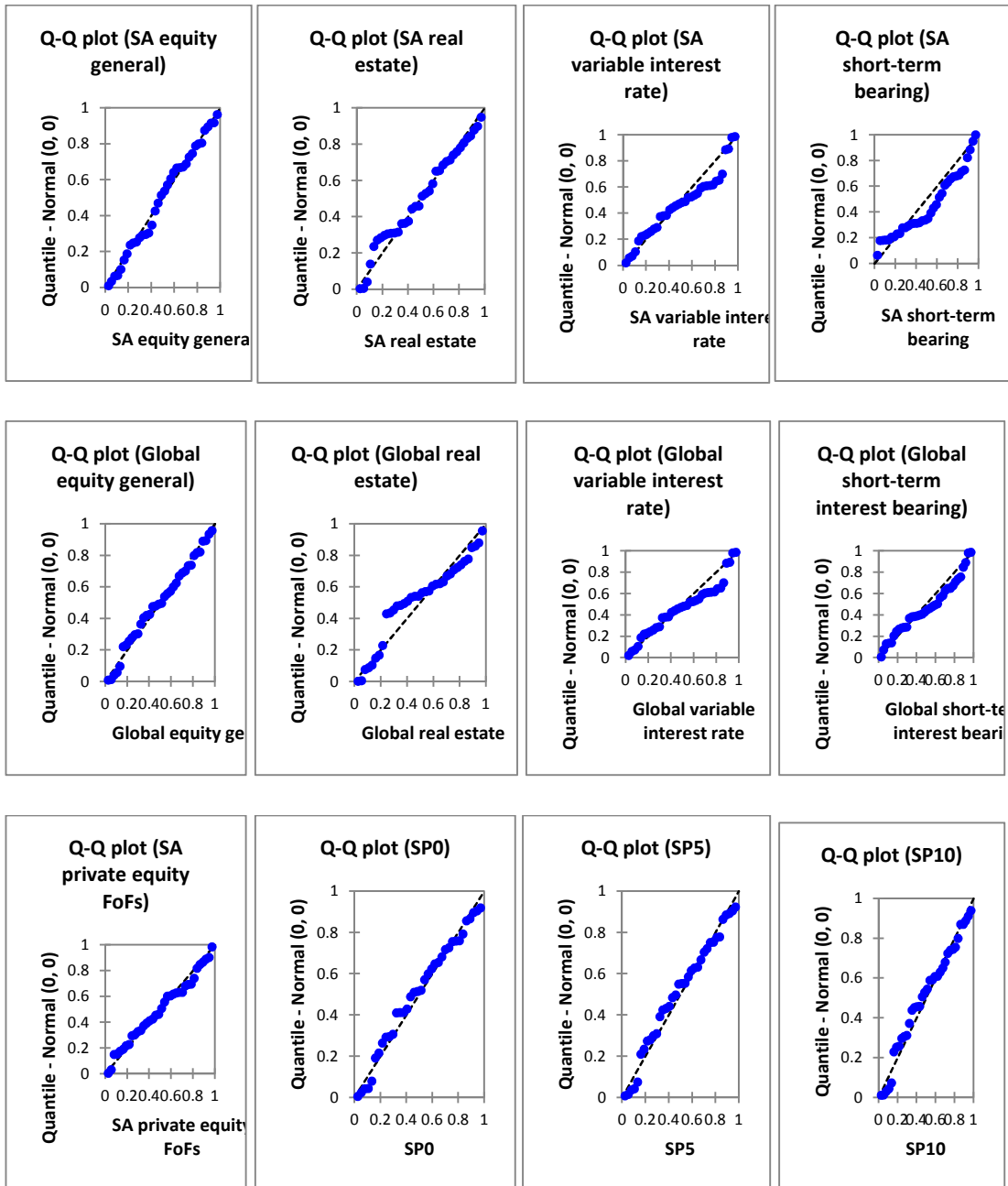
5. **Question 1C:** What research have you done or intend to do on SA private equity or private equity fund of funds, given that it is in your universe of investable asset classes?

6. **Question 2C:** What needs to change in SA private equity or private equity fund of funds before you can practically consider investing into the asset class?

7. **Question 3C:** In your own opinion, why do you think a significant number US and EU pension fund managers are willing to strategically allocate capital to private equity and private equity fund of funds? What needs to change before the SA pension fund managers' behaviour changes?

9.4 Appendix 4: Normality tests

Normal q-q plots



9.5 Appendix 5: Ethical clearance

**Gordon Institute
of Business Science**
University of Pretoria

Dear Conlias Mancuveni

Protocol Number: Temp2015-01499

Title: Marginal diversification benefits of private equity on a South African pension fund

Please be advised that your application for Ethical Clearance has been APPROVED.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,

Adele Bekker