An Examination of the Performance of Hedge Funds in South Africa

Submitted by:

Romeo Makhubela

Student number: 9410026T

Tel: (+27) 83 296 0850

Email: romeo.makhubela@gmail.com

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Supervised by:

Prof. Odongo Kodongo

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DECLARATION

I, Romeo Bob Makhubela, declare that this dissertation project is my work. The thoughts and ideas of other individuals have been referred to, citations have been used, and a list of references is included to acknowledge and identify the sources. This dissertation project is submitted to fulfil the requirements of the Masters in Management of Finance and Investment degree at the University of the Witwatersrand, Wits Business School (WBS). This work has not been given to any institution or university for a similar qualification. I further declare that I was given authorization by the WBS research committee to proceed with this research.

ABSTRACT

This study examines the hedge fund industry's performance in South Africa from 31 March 2015 to 31 March 2020. The period under review is significant as the hedge fund industry was first regulated and monitored from 2015 onwards. The industry has been seen by critics and other stakeholders as greedy, corrupt, and charging outrageous investor fees. Since the global financial crisis of 2008 and the subsequent recession, the hedge fund industry has underperformed its respective benchmarks on average. The study seeks to analyse the hedge fund strategies' performance in South Africa against their benchmarks for a 5-year monthly period starting March 2015 to March 2020 against traditional investment products' benchmarks such as the All-Share, SWIX SA, and All bond Index. The exercise aims to establish whether investors are adequately compensated for their fees against these products' risks and returns. Another critical factor in our analysis is to determine whether or not the industry performance has been persistent. Persistency of Performance is tested using different statistical methodologies such as Cross Product Ratio (CPR) Test, Chi-Square (X^2) Test, Cross-Sectional Regression (CSR) Test and, Binomial Test to understand whether skill or luck is a factor in analysing the performance of managers.

Keywords: Hedge fund(s); Strategies; Cross Product Ratio (CPR) Test; Chi-Square (X^2) Test; Cross-Sectional Regression (CSR) Test and, Binomial Test.

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Table of contents

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

AIFM	Alternative Investment Fund Managers
AFGMW	Alexander Forbes Global Manager Watch
ALBI	All Bond Index
AUM	Asset Under Management
CAPM	Capital Asset Pricing Model
CAT IIA	Category Two A
CHFS	Centre for Hedge Fund Supervision
CISCA	Collective Investment Scheme Control Act, No 45 of 2002
CPI	Consumer Price Index
CHI	Chi-Square
CIS	Collective Investment Scheme
CPR	Cross Product Ratio
CSR	Cross Sectional Regression
CTA	Commodity Trading Advisors
FAIS	Financial Advisory and Intermediary Services Act
FFHF	Fund of Funds Hedge Fund
FIAS	Fixed-Income Arbitrage Strategy
FSB	Financial Services Board
FSCA	Financial Sector Control Authority
G20	Group of Twenty
HFR	Hedge Fund Research
HWM	High Water Mark
JSE	Johannesburg Stock Exchange
LL	Lose-Lose
LTCM	Long-Term Capital Management
LSEQ	Long-Short Equity
LW	Lose- Win
MANCO	Management Companies
MNEQ	Market-Neutral Equity
MSHF	Macro-Strategy Hedge Fund
QIHF	Qualified Investor Hedge Fund
RIHF	Retail Investor Hedge Fund
SEC	Security and Exchange Commission

STeFI	The Alexander Forbes Short Term Fixed Interest Index
SWIX	Shareholder Weighted Index
UK	United Kingdom
USA	United States of America
WL	Win-Lose
WW	Win-Win

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 Introduction and background

McCrary (2004, p. 1), defines hedge fund as “a loosely regulated investment company that charges incentive fees while seeking to generate returns that are not highly correlated to returns on stocks and bonds.” In contrast to other traditional investment funds, hedge fund managers have fewer regulatory constraints. They can use different kinds of financial instruments such as commodities, currency, derivatives, interest rate swaps, etc. Critics of the hedge funds have described or labelled the industry as plagued with high fees, unregulated, non-transparent, greedy, corrupt, and enriching fund managers at investors' expense.

The demise of Long-Term Capital Management (LTCM), one of the biggest hedge fund businesses in 2009, nearly collapsed the global financial system due to their highly leveraged positions that did not produce the desired outcome. In his book, *Hedge Fund Mirage: The Illusion of Big Money and Why It's Too Good to Be True*, Simon Lack (2012, p.1), states that "If all the money that's ever invested in hedge funds had been put in treasury bills instead, the results would have been twice as good." He further states that the hedge fund managers have earned great fortunes, whereas investors have done poorly, following the global economic meltdown of 2008.

Industry fund managers have achieved immense fortunes in the history of financial markets. The top 25 hedge fund managers collectively earned $25.3 billion in 2009, with the highest earner being David Tepper of Goldman Sachs with over $4 billion, followed by George Soros with over $3 billion and James Simons receiving over $2.5 billion, according to Jacob Goldstein (2010).

Mallaby (2010) writes that hedge fund supporters see these funds as worthy successors of investment banks. Today, hedge funds are the new Goldman Sachs and Morgan Stanley's of a half-century ago. "Hence rise of hedge funds from almost unnoticed beginnings in the late 1940s to the pinnacle of global finance seventy years later is one of the most pivotal developments for the contemporary international political economy" (Fichtner, 2013, p1)

Fung and Hsieh (1997) pointed out that superior performance in hedge funds has occurred in the past as a result of less regulatory dispensation that hedge portfolio managers experienced. The use of other unconventional investment instruments has helped in

achieving returns better than traditional portfolio managers. Proponents of the industry would argue that allocating capital to hedge funds should be seen as a form of portfolio diversification to other alternative asset classes which can help in improving the portfolio mean-variance characteristic.

Lhabitant (2007) reports that hedge-like activity could be traced back to the United States of America (USA) in the early 1930s, in this regard the researcher found that Karl Karsten, an American economist and academic who was interested in statistical research, had published two books one of which is entitled *Scientific Forecasting* in it he described many hedge fund principles that are still applicable today. Additionally, according to Mallaby (2007), Alfred Winslow Jones created what he called a hedge fund in 1949. His firm, A.W. Jones & Co., set up as a general partnership, was primarily aimed at outside investors. However, Jones also invested much of his wealth in the fund. Jones combined-long positions in what he deemed undervalued stocks with short-selling stocks he believed were overvalued stocks.

A key investment objective of hedge funds is capital protection. Hedge funds should be viewed as absolute return funds that produce positive returns irrespective of how the market performs – the benchmark should aim at achieving "cash-plus" objectives. The hedge fund industry has enjoyed phenomenal growth since it was established in 1949. According to Hedge Fund Research (HFR), a data-based vendor company in Chicago, hedge fund assets reached an all-time peak of $1.93 trillion before the global financial crisis of 2008. It experienced 700 or 7% of firms closing shop and losing 18% of their value during the crisis compared to 9.96% gain achieved in the previous year. Investors pulled an estimated $40 billion during the month of the crisis, and market losses cut the industry assets by $111 billion.

Various hedge fund scholars stratify hedge funds strategies into various groupings dependent upon where in the world the mangers may be practicing and their terrains thereof. Since this research is situated in South Africa an environment where the hedge fund industry is minuscule, the researcher has therefore selected only eight general categorisations, as seen below to contextualise this report:

1. Directional/Trading
2. Event-Driven
3. Relative value
4. Long/short Equity Strategy
5. Fixed-Income Arbitrage
6. Emerging Markets Strategy

7. Managed Futures strategy
8. Hedge Fund of Funds

1.1.1 Directional/Trading strategies are sometimes called the "top-down" strategies and bets on the up or down movement of the market. These strategies create value by exploiting broad macro-economic trends. The fund manager would look at economic variables such as exchange rates, inflation rates, interest rates, industrial production, unemployment, and world politics to make or take directional views. According to Taylor Nicole Rogers (2010), the controversial billionaire Bill Ackman made $2.6 billion for his directional hedge fund by successfully anticipating that the coronavirus pandemic would crash the global stock market.

1.1.2 Event-Driven is a hedge fund strategy that aims to exploit specific short-term opportunities resulting from mispricing in security (equities, bonds, and global markets) prices. An event-driven strategy will focus on critical events that could include corporate restructuring, mergers, acquisitions, corporate takeovers, bankruptcies, financial distress etc.

1.1.3 Relative Value strategies focus on discrepancies in prices among securities that share similar economic and financial characteristics, uses market-neutral strategies thus capitalizing on the securities' mispricing in the market. Whereas as the research shall make a point in later parts of this report that the Fixed-Income Arbitrage would take advantage of short-term anomalies in the yield curve. The market neutral equity strategy makes risk-less profit by buying (long) an undervalued security and selling (short) an overvalued security.

1.1.4 Long/Short is typically implemented by choosing securities that are closely related. The hedge portfolio manager will take a short position (sell) an overvalued security and take a long position (buy) and undervalued security e.g., short Standard Bank security and long FirstRand Bank security. This strategy would normally work when the equity indices underperform but struggle in performance when we experience a bull market.

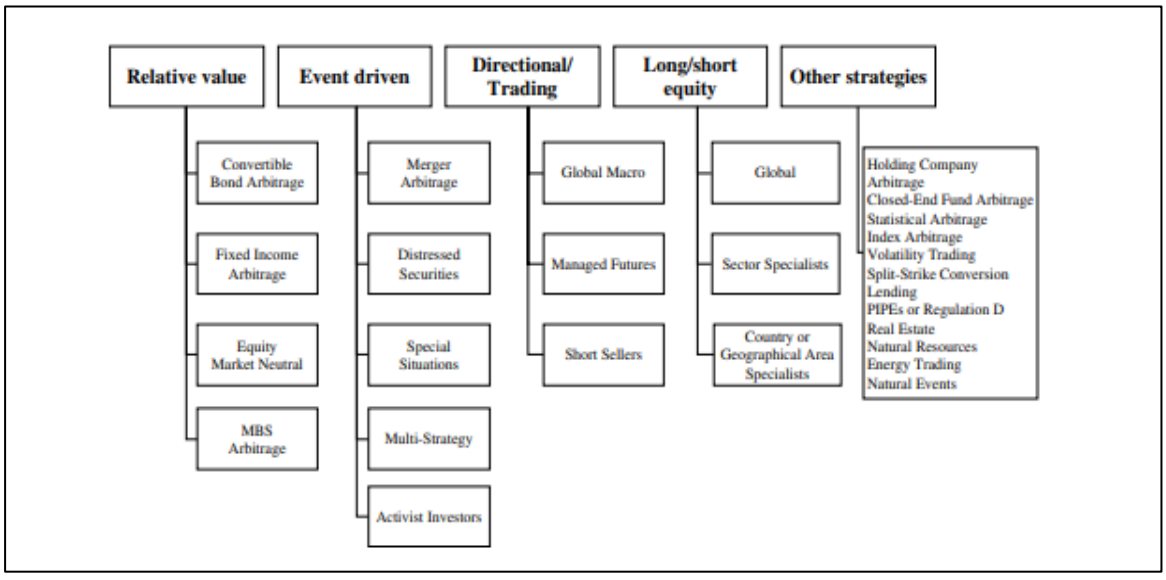
1.1.5 Fixed-Income Arbitrage Strategy is a hedge fund strategy that looks for mispricing opportunities in the fixed-income market. The strategy entails investors taking opposing positions to benefit from small pricing discrepancies while limiting their interest rate risk.

1.1.6 Emerging Markets Strategy specializes in securities investment in countries that are emerging or developing. Fund managers can use leverage funds or money that is borrowed to invest in these markets. Investors plough in less mature markets that exhibit high growth levels with correspondingly high levels of inflation, volatility, political, and liquidity risk.

1.1.7 Managed Futures are hedge fund strategies where fund managers trade a range of futures and foreign exchange instruments to profit from price movements. The portfolio managers are also known as Commodity Trading Advisors (CTA). They will trade futures on bonds, equities, interest rates, currencies, and commodities but taking long and short-term positions.

1.1.8 Fund of Funds provides a platform for investors who might prefer hedge funds that are transparent, liquid, and diversified. Investors can employ experienced investment professionals to conduct due diligence, manager selection, and monitoring. Unfortunately, this creates another layer of 1-1.5% basic fee and 10% outperformance fee. Fund of Funds is a combination of any number of strategies, dependent upon the elected hedge fund manager's identification of those that show optimal returns.

Table 1: Investment Strategies of Hedge Funds



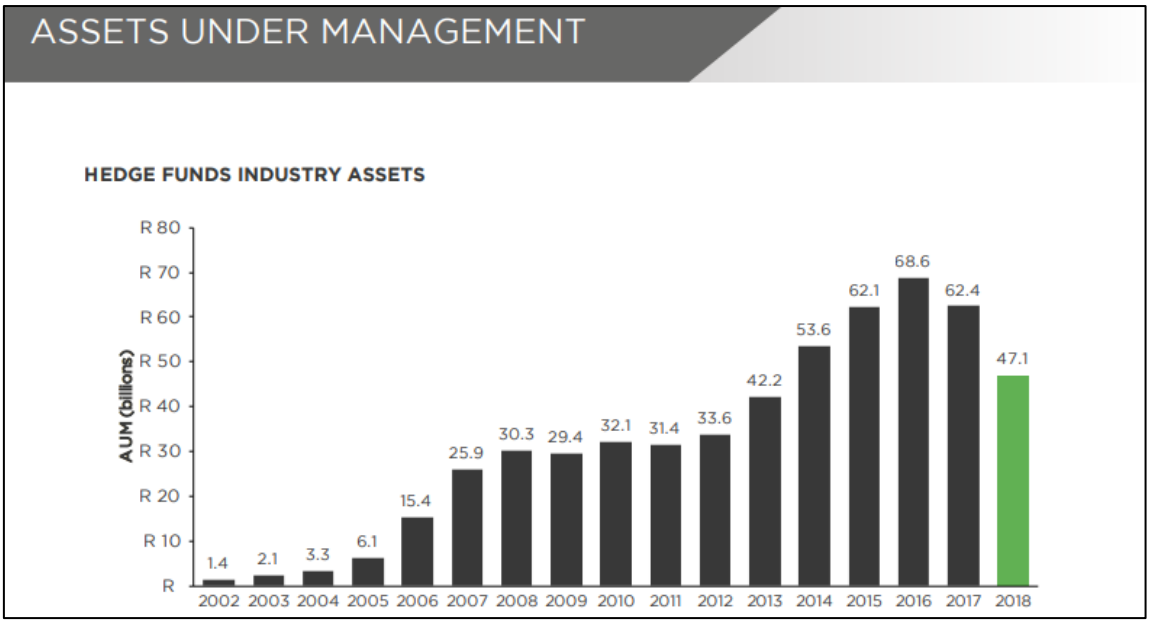
Source: Filippo Stefanini (2006). Investment Strategies of Hedge Funds

1.2 The South African Hedge Fund Industry

The first hedge fund in South Africa was created in 1995. By 2003 the hedge fund industry had experienced growth of close to R2.1 billion. As a result of the huge demand in these complex products, investment professionals organised themselves in 2003 by forming the Alternative Investment Management Association South Africa. The first SA fund of hedge funds was subsequently established in the same year.

This newly established industry continued to expand and peaked at R68.6 billion in 2016 (see Table 2 below.) Of that amount, 2/3 of the assets were coming from intermediaries, namely hedge fund of funds. Due to the control held by the fund of the hedge funds industry, specific minimum requirements were put in place, particularly for single hedge fund portfolios. According to Novare Hedge Fund Survey (2018), the regulators required fund managers to use independent administrators to value their assets, a requirement for managers to trade through the use of prime brokers, establishment of management companies to ensure risk control and monitoring, and the use of independent trustees to act as an oversight on the operations of the business.

Table 2: Graph. 2018. Novare Hedge Fund Survey



To comply with the regulation, the Financial Services Board (now known as Financial Sector Conduct Authority - FSCA) with Financial Advisory and Intermediary Services Act (FAIS) introduced additional license in the form of Category Two A (CATIIA) for the hedge fund managers. Previous hedge fund management experience and high capital adequacy levels became a prerequisite to hold such a license. From 2008 to 2011, there was little growth in

Assets under Management (AUM) despite strong investment performance. From 2012 to 2015, the industry experienced exponential growth, peaking at R62 billion in 2015, which represented roughly 3.48% of the entire Collective Scheme (unit trusts) industry. The South African National Treasury, in 2015, together with the Financial Services Sector Council, released the regulations that will govern the conduct of hedge fund industry in South Africa. From that point onwards the hedge fund sector would be governed by the Collective Investment Schemes Control Act. The purpose of the regulations is to ensure transparency between fund portfolio managers and the industry regulator.

South Africa's dominant hedge fund strategy is the Long-Short Equity strategy, estimated by Novare Investment to be around 60% of the industry. Fixed-Income Arbitrage Strategy follows this at approximately 14%, Market-Neutral Equity at 13%, Macro-Strategy Hedge Fund at 7%, with the balance spread between Volatility Arbitrage, Commodities and other strategies.

1.3 The Legal Structure of Hedge Funds

Alfred Winslow Jones (1949), regarded as the pioneer of hedge funds, structured his hedge fund portfolio as a limited partnership to avoid regulation from the authorities. The limited liability legal structure remains the dominant model for United States (US) hedge funds. There is a misconception that the industry is unregulated, however the most appropriate description would be that hedge funds were established to exploit the industry's relaxed regulatory environment. Fung and Hsieh (1999) agreed with the assertion that exemptions by insinuating that tighter regulations were meant for the unsophisticated general investors, while hedge funds were are meant for well-informed private and institutional investors.

Firstly, our analysis will focus on the USA's legal structure due to its dominance of the industry in general. USA funds are legally structured as a limited partnership or liability to take advantage of tax dispensation. The fund is exempted from tax on the investment performance, but performance is then passed over so that investors pay taxes on their tax bills, preventing the funds from being taxed twice like corporates.

Secondly, funds are structured such that they are given leeway by the Investment Company Act of 1940 in the US. This act ensures that proper disclosure and registration requirements are met and imposes certain restrictions on certain instruments such as leverage .The Investment Company Act was established for unit trusts, and exempts funds with investors below 100. Furthermore, the legislation was further revised to accommodate more investors.

Each "qualified purchaser" would require $5 million in assets if it is an individual investor and $25 million for corporate investors.

Thirdly, because hedge funds are not registered as Investment Company Act of 1940, the registration and disclosure requirements of the Securities Act of 1934 does not apply to them, to partly ensure that the funds can conceal proprietary trading strategies from being copied by other players and to reduce reporting and disclosure costs. To benefit from this dispensation, hedge funds are forbidden public solicitation such as marketing and advertisement of their funds and can only raise money through private placement.

Lastly, hedge funds are also exempted from being governed by the Investment Advisors Act of 1940, which excludes managers from being registered as investment advisors.

1.4 Research Problem

Have hedge funds in South Africa lived up to their expectations regarding superior performance and risk versus other traditional investment products such as active and passive equities, bond indexes, money market, etc.? Are the returns offered by these hedge fund products uncorrelated to other traditional investment products? Do the hedge fund strategies identified in this research justify the high basic and performance fees charged by hedge fund investment professionals?

Hedge Fund products have lost popularity in recent times. This can be substantiated by a recent analysis by Novare Investments Hedge Fund Survey 2018, which documented a fall in assets from a peak of Assets Under Management (AUM) of R68.6 billion in 2016 to R47.1 billion recorded in 2018 (see Table 2 above). Nevertheless, the survey demonstrates the evolution of the sector since 2002 in South Africa, with AUM starting at R1.4 billion. The exponential growth calls into question the performance and perceived value addition to South Africa's hedge fund industry investors. Therefore, this study seeks to deal with the following essential questions:

1. How did the hedge fund industry perform relative to traditional asset classes?
2. What drives the returns of these hedge fund managers? Is it skill or luck in understanding the returns of these funds?
3. Are hedge fund returns persistent over time?

Liang (2001) conducted a study on hedge funds performance and risk between 1990 to mid-1999 in the United States. The study's empirical findings showed that, on average, hedge funds generated returns of approximately 1.11% per month or 14.2% per annum for the period. This was against 18.8% annually achieved by Standard and Poor's 500 indexes, an underperformance of 4.6%. The best performing year was 1993, generating annualized returns of 27%, while the worst performance was -0.6% in 1994.

The most unstable year for hedge funds was in 1998 due to the Russian debt crisis in 1997, an aftermath of the Asian financial crisis that had gripped much of East and Southern East Asia. The annual standard deviation for the different hedge fund strategies was 2.57%, which was much higher than that of preceding years. It then raises the question: Are we experiencing persistency with the returns offered by these fund managers? Does skill or luck play an essential role in generating alpha or excess returns for investors?

1.5 Aims and Objectives of the study

1.5.1 Aim

The research aims to examine the performance and risk of hedge fund strategies in South Africa.

1.5.2 Objectives

Sub-objective 1:

Compare the risk-adjusted performance of South African hedge funds strategies to that of Traditional investment products such mutual funds, equities, and bonds passive indexes.

Sub-objective 2:

Determine whether performance persistence exists for the different hedge fund strategies in South Africa. Is market timing or stock picking a driver of investment performance?

1.6 The purpose and significance of the study

Critics of the hedge fund sector view it as a greedy and corrupt industry that charges outrageous investor(s) fees. However, since the 2008 global financial crisis and the subsequent recession, hedge funds have underperformed their respective benchmarks on average. This research seeks to analyse the hedge fund strategies performance in South Africa against their respective benchmarks for a 5-year monthly period starting March 2015 through to March 2020. Other traditional investment products benchmarks, such as the SWIX and All Bond Index, will also be examined.

Investors and other stakeholders have begun questioning whether hedge funds should be classified as alternative asset classes due to their recent performance, which has mirrored traditional asset classes performance. It begets whether these hedge funds are uncorrelated to traditional asset classes as was proclaimed in the past. The study will give an understanding into whether investors are adequately compensated for the high fees they are paying against the risk and returns associated with these investment products.

An additional critical factor to establish within the South African hedge fund industry is whether there is persistency in performance. The issue of managers' skill or luck becomes critical in understanding that persistency. The South African industry has not reached maturity compared to the global hedge fund industry; hence less research has been done in this market. The study will enhance the body of knowledge in this industry. It will enable local and international investors who have keen interest in the industry, to understand the opportunities that are available in terms of different strategies, how the industry is regulated, and the right investment professionals to back and partner with.

CHAPTER 2: LITERATURE REVIEW

This section will explore previous research that was conducted in the industry. The section is divided into eight sub-sections: Hedge Funds Regulation, Hedge Funds Performance Measures, Size and Performance in the Industry, Performance Persistence in the Industry, Industry Managerial Skills, Fees and Incentives in the Industry and Hedge Funds Biases and Data.

2.1 Hedge Funds Regulation

Regulation can be defined as rules imposed by the government, using penalties as tools intended to alter individual's economic behaviour and private sector entities. In other words, these rules guide behaviour and ensure efficiency even though they may, at times, limit the market mechanism. The industry has gained significant political and economic importance over the past decades. From an economic standpoint, the industry has grown substantially, wherein hedge funds trading has surpassed 50% of daily trading volumes in the equities market. The hedge fund activities have politically attracted governments' attention, more so after the 1997 Asian financial crisis which led to the demise of the LTMC in the US. These two economic events necessitated governments all over the world to have a keen interest in monitoring and regulating the activities of the financial markets.

For an example, USA introduced the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank) of 2010], that authorized the Securities and Exchange Commission (SEC) to introduce legislation that require registration and the enhancement of private equity and hedge funds reporting. The new rules introduced ensure that funds are required to disclosure of strategies and products used by investment firms. This would mean reporting includes performance, performance changes, financing information, risks parameters, counterparty and credit exposure, positions held by the investment firm, percentage of assets traded using algorithms, and split between of debt and equity among other matters.

The Act Also required hedge funds with assets in excess of $150 million to register as investment advisors and disclose their trading activities to the SEC. This registration process aims to prevent those that operate in "shadows of our market," ensuring that fraudulent behaviour is forbidden and that investors are prevented from reckless trading by investment professionals.

The European Union in 2010 adopted a policy directive to regulate the Alternative Investment Fund Managers (AIFMs), wherein hedge funds were featured prominently and were required to register with national regulators. The reason for this was unclear according to Brunnermeirer and Pedersen (2009), the sector did not contribute to the 2008 financial meltdown but played an essential role in worsening it through a transmission mechanism notably due to aggressive selling of shares by industry participants. Brown (2009) shows that even though many people are under the impression that the hedge fund sector did not trigger the world financial crisis, the conclusion amongst people is that the sector did play an important role in deepening the crisis.

To combat the problems caused by the financial crisis, the G20 countries met in London in 2008. South Africa and other member states were advised to introduce regulatory frameworks that would regulate hedge funds and private equity investments. In 2009, phase 1 of the international plans to have hedge funds regulated was approved.

South Africa started its process of enhancing the regulation in 2012. Furthermore, “public comment was part and parcel of the regulatory framework on hedge funds proposed by the National Treasury and the then Financial Services Board. Comments from industry and regulatory bodies were reviewed by Treasury and FSB that laid a good foundation for these draft Regulations" (FSB & National Treasury, 2014, p1).

South Africa was the first country to promulgate comprehensive regulation on hedge funds that become effective in 2015. Prior to this period, the industry had no product-specific regulation.

These new regulations were published on the 6th of March 2015 and became effective in April 2015. Hedge fund managers were given six months from the effective date to organise themselves under the new rules which included establishing or appointing management companies (commonly referred to as "MANCO") and their portfolios would need to comply with the Collective Investment Scheme Register (CIS Registrar) within a period of twelve months. The two most significant changes brought on by the regulations introduced the two different products: firstly, the Retail Investor Hedge Fund (RIHF) and secondly, the Qualified Investor Hedge Fund (QIF). The difference between the two is that the Qualified Investor Hedge Fund has to commit a minimum of R1million of investment and demonstrate that they understand hedge funds' workings and risk.

The act's objectives were to align South Africa with global standards. The introduction of regulatory frameworks and processes on hedge funds has been of paramount importance given the 2008 global financial crisis and the influence that the sector had over financial markets. The global financial crisis should serve as a lesson for the finance industry and a stepping stone to continuously improve the industry.

2.2 Hedge Funds Performance Measures

The performance measurement of hedge funds is a pivotal factor in the investment analysis and risk management process. It is essential to investors and hedge fund managers whose livelihoods are directly linked to their overall performance. The investment performance issue in the hedge fund industry has drawn much criticism and publication of controversial literature. Methods commonly used to measure traditional asset classes' performance, such as long-only equities, mutual funds, fixed income, and commodities indexes, are not appropriate for hedge fund performance measurement.

Hedge funds use complex investment instruments or financial products such as currencies, swaps, equities, mortgage-backed securities, futures, options, etc., to manage their portfolio instead of other traditional investment products. Traditional asset classes' returns, such as mutual funds, are normally distributed. In contrast, the hedge fund returns do not follow a normal distribution curve. According to Schmidhuber and Moix (2001), hedge fund returns are non-symmetric and don't follow a normal distribution curve. That is due to their use of derivatives and other instruments that traditional asset class managers cannot use.

Risk-adjusted return measures are commonly used by financial analysts and investors (both retail and institutional) to select fund managers. The most common performance measure used to analyse returns in the financial markets is the Sharpe Ratio (1966), which measures excess returns (alpha) and deviation from returns (risk). The ratio is good when the performance measurement of the fund's returns are distributed normally.

Treynor and Jensen Ratios' would be an appropriate metric to measure splitting assets' performance into the market index and investment fund. Brooks and Kat (2002) note that hedge funds would normally generate returns that are not normally distributed and cannot be adequately measured using a classic Sharpe Ratio. The Treynor and Jensen Ratios are the most appropriate performance measure for the hedge fund sector. The Jensen Ratio uses the capital asset price model to calculate performance.

Jensen measure is represented as follows $\alpha_p = R_p - [R_f + \beta (R_m - R_f)]$ where

R_p= Portfolio Return

R_m= Market Return

R_f = Risk-Free rate

B = Beta

The Jensen ratio is often criticized from the efficient market hypothesis that markets are efficient and any excess return would be due to luck and not skill. The Treynor overcomes the Jensen ratio's limitation by considering the fund's alpha (excess return) compared to a riskless fund or portfolio.

Treynor measure is represented as follows $\alpha_{p=} (R_{p-} R_f)/ B$

As a result of this factor, a number of measures of performance were established to address the limitation mentioned above. These include Jensen and Treynor ratios, Omega, Sortino, Upside potential, Calmar, Sterling , Burke, Conditional Sharpe, and Modified Sharpe ratios.

The drawdown-based measure is another method commonly used with commodity trading advisors. Lhabitant (2004) argues that fund managers should always do their best, continuously accumulating gains while consistently ensuring that there is downside limitation in managing their portfolios.

2.3 The Nexus between Size and Performance

This subsection reviews literature entailing the relationship between the hedge fund size measured by Asset Under Management and investment performance. The section makes an attempt at establishing whether small firms generate better risk adjusted performance than bigger firms.

Unlike other traditional asset classes, the hedge fund sector is generally known for trading exotic and less tradable instruments such as options, futures, commodities, currency, and other over-the-counter securities. Goetzmann, Ingersoll, and Ross (2003) discovered in their research that due to over reliance on performance fees by portfolio managers for their personal wealth, opportunities are usually not scalable when compared to mutual funds. Most successful hedge fund managers have closed their books for the new inflow of funds

when they reach a certain optimal size. Those that ignored such scalability have ceased to exist due to bad performance, according to Lowenstein (2009).

Research by Goetzmann, Ingersoll, and Ross (2003) established that successful funds are usually disciplined with regard to size of the asset they manage and are unlikely to accept additional funds after reaching a certain optimal point. Fung, Hsieh, Naik, and Ramodarai (2008) show that performance gets negatively impacted by inflow of money. An exception happens in work done by Getmansky (2012), who established a positive relationship between the portfolio's value and the portfolio performance. The author argues that the fund initially benefits from the increase in fund value; however, returns start suffering once the suboptimal level is achieved. Fung and Hsieh (2004) has demonstrated in his seven-factor model that returns of a portfolio decline as assets increase

The relationship between the fund sizes and performance tends to be complex. An investor would ideally need to have a sense of the hedge fund's size before putting money into the fund. Brorsen and Harri (2002) assert that returns of a portfolio or fund decline when there's an increase in fund value. The authors hypothesize that the portfolio manager must close the fund to new investors for the fund's continued good performance.

A similar study by Gregoriou and Rouah (2003), which focused on the relationship between the size of hedge funds and their performance, found that there was no relation between the two factors.

Getmansky (2012), on the other hand, developed a regression technique using the Trading Advisor Selection System (TASS) also referred to as Lipper TASS database that includes the size as a factor. The technique used brought about a positive relationship between current returns and past asset value, recommending that investors should select portfolios near their optimal size.

Research conducted by Gregoriou and Duffy (2006) established that incentives drive fund performance but did not establish any relationship between age and size. Further studies by Teo (2009), Getmansky (2012), and Yin (2016), shown in cross-sectional settings, suggest that hedge fund performance decrease as fund size or value increases.

2.4 Persistency in Hedge Funds

Allocation of capital to the industry by both institutional and private investors is based on past performance. The best way to differentiate skill from luck is through consistent/persistent alpha by the hedge fund managers. Previous studies have established that persistent performance is scarce, and if it exists, it has a short lifespan.

Glode and Green (2010) posit that the ability to hide one's proprietary strategy is a primary cause of persistency and not managerial skills. Managers should weigh the benefits of raising capital versus costs associated with disclosure. The authors concluded that anyone could profit from trading strategies once it's disclosed to the investor public which ultimately could decrease returns to scale for these strategies. Adding new investors to the fund increases the likelihood of the strategy being copied by other players, thus reducing its profitability.

Boyson (2008) discovered that persistency exists when previous performance track record is used. However, fund selection is on manager tenure and previous performance, she established that persistency only existed for quarterly horizon with less experienced managers and past outperformers beating their fellow competitors.

An eight-factor model, designed by Edwards and Caglayan (2001), was used to determine how long performance persistence lasted in the industry. Their findings indicated persistence lasted over one to two-year periods, with the results applying to both "winners" and "losers." In contrast, Bares, Gibson and Gyger (2003) applied the eight-factor model using a non-parametric approach to individual funds. The conclusion in this study was that performance persistency lasted only over one to three months.

Boyson and Cooper (2004) found no evidence of performance persistence if common risk and style factors were the only aspects used in estimation. However, they discovered quarterly persistence when manager tenure was taken into consideration. Baquero et al. (2005) concentrated on accounting for the look-ahead bias in evaluating hedge fund performance. Comparison of the raw and style-adjusted performance of performance-ranked portfolios found evidence of positive persistence at quarterly levels.

Although a lot of literature has been published on the topic of persistence in the hedge fund industry, there is no agreement as to whether performance persists or not. Agarwal and Naik

(2000) found that most studies find short-term persistence, while Harri and Brorsen (2004) also concluded that there is minimal support for long-term persistence in performance.

Gräter (2017) conducted a South African study about hedge fund performance across different strategies relative to the market and their performance persistency. The findings showed that 33 of the 59 hedge fund portfolios performed better than the market. Fifty of the 59 funds were managed with volatility when risk measures such as the standard deviation was used. Joaquim and Moura (2011, p. 447) found "a high percentage of funds with positive and statistically significant alphas. These alphas are mainly for the CAPM model, followed closely by the Style model and the CAPM-IHFA."

2.5 Managerial Skills in the Industry

A manager skill is usually manifested by the fund manager producing an excess return (alpha) or portion of the portfolio return that is not linked to systematic risk. A study by Brunnermeirer and Nagel (2004) found that fund managers are better in market timing than stock picking. Daniel et al. (1997) established that technology shares held by portfolio managers were reduced below their benchmarks before the stock market technology burst.

Managers in the hedge fund industry are more flexible in style than traditional fund managers, such as mutual fund managers, because investors are constrained from selling their investment for a certain period (lock-up period). This feature is unique to hedge fund managers, putting restrictions on cash flow and limiting liquidity problems. These limitations on investor withdrawals enhanced the possibility of generating better returns because managers are forced to pursue long-term arbitrage opportunities.

It is a well-known fact that hedge fund managers use trading strategies that are dynamic and can easily move from one investment style to another based on their managerial discretion, as opposed to traditional investment professionals. Hedge fund managers can shift from one investment style to another if they predict that the alternative style will be more profitable than the current one; their skills allow them to achieve better returns. Agarwal, Daniel, and Naik (2009) found that superior performance is correlated with high managerial discretion. According to Titman and Tiu (2011), hedge portfolio managers in the industry behaved differently from other investment professionals. Returns delivered by these skilled investment managers is less related to systematic risk.

Brown, Goetzmann, and Park (2001) also established that managers in trouble might gamble on investments by taking different strategies, which result in high return volatility. Research by O' Connell and Teo (2009), noted that investors are inclined to change their risk profile by firing managers after experiencing a bad performance.

Aragon (2007) has established a relationship between funds with a lockup clause and those without and discovered that the former tends to perform better than the latter. Liang (1999), Koh, Koh and Teo (2003), Agarwal, Daniel and Naik (2009), and Liang and Schwarz (2011) also confirmed a similar finding in their research as found in work done by Aragon (2007).

A study by Cao et al. (2016) used data to determine the kind of skills that merger arbitrage possess. They found out that skill was a strong point for this group of fund managers, that their know-how had to do with predicting or influencing merger outcomes, although based on managing downside risk.

Lo (2008) suggests using dynamic asset allocation whereby manager allocates certain weights based on expected returns between different asset classes using the co-variances matrix. These kinds of skills help in predicting future returns and allocating capital accordingly. Park (2010) implemented a technique developed by Lo (2008) that breakdown returns from the period 1994 to 2008 into stock picking, risk premium, and market timing components. The author found that stock selection controls over 90% variation in returns than only 9% market timing, concluding that investment professionals in the industry are better in stock picking than market timing.

2.6 Fees and Incentives in the Industry

Do higher basic and performance fees lead to better performance? Lambert and Larker (2004) demonstrate in their theoretical model approach that an optimal way of incentivizing managers is to give them an out-of-the-money options contract. Competing theories exist on employee contracts, which show a positive correlation between performance and incentives. The best-known incentive theory is the Principal-agent Theory that emerged in the 1970s. This theory stipulates that performance can only be improved if shareholders' interests are aligned with employees interests.

Hedge fund managers make their money differently compared to other investment professionals. Their compensation, as opposed to other investment professionals, covers two components: a basic management fee which ranges between 1 and 2% and is paid

irrespective of whether the manager outperforms their respective benchmarks, and a performance fee linked to an outperformance of a particular hurdle rate, which normally ranges between 15-25%. Another important factor of the hedge fund industry that acts as comfort to investors is that most portfolio managers in the industry have their personal wealth invested in their portfolios, thus aligning their interests with investors. This practice is known as "skin in the game," which tends to be a positive signal to investors.

Most performance incentive contracts in the industry fee have a "high water mark" (HWM) embedded into their agreement. This entails that the fund manager share on the upside profit when a predetermined strike price has been achieved. The fund manager will participate in profits if he has achieved certain hurdle rates. If the fund manager underperforms the hurdle rate or benchmark, he will participate once he has recovered from that underperformance.

De Souza and Gokcan (2003) in their study established a positive relationship between performance fees and returns of the portfolio. The authors noted that high performance is always associated with high incentive. Ackermann et al. (1999) and Liang (1999), Edwards and Caglayan (2001) further confirmed in their research analysis that portfolio managers with high performance fees built into their contract tends to perform better. They concluded that higher performance fees are an important factor in aligning both the investor and portfolio manager's interests. Critics of the incentive fees contend that fund managers are likely to liquidate their portfolios after large losses than larger gains. When funds are liquidated after a significant loss, liquidation gives a clear view of the "underwater performance fees," ensuring that performance losses incurred can no longer be offset by possible future profits.

The US's hurdle rate would normally be the Treasury Bill, while South Africa's most common benchmark would be the Alexander Forbes Short Term Fixed Interest (STeFI) Composite Index. Most of the funds will also be subjected to high watermark provision whereby fund managers are expected to make up for losses before participating in the performance fee. Most hedge fund managers with poor performing funds close and start new ones because performance incentives cannot be achieved or be paid before previous watermarks are surpassed.

Study conducted by Amenc, Curtis, and Martellini (2003), established that funds with higher performance fees included in their contract generated higher excess return (alpha) when compared with those with low performance fees. Das and Sundaram (2001) theoretical work

share sentiments such as those of De Souza and Gokcan (2003) who also established that higher performance is linked to higher incentive fee results. Liang (1999) established that funds with good performance track record tend to charge high fees.

Lambert and Larcker's (2004) assert in their research that incentivising employees to work an out-of-the-money contracts are better incentives for managers to perform. Incentives of hedge fund managers are similar to those offered to listed corporates where out-of-the-money options are an incentive to align their interest with those of shareholders.

Ackermann, McEnally, and Ravenscraft (1999) examined in their study the correlation between performance fees and fund performance using risk-adjusted returns. The researchers established a good relationship between performance fees and the Sharpe ratio. A similar study by Liang (1999) also concurred that incentive fees positively correlate with hedging fund performance.

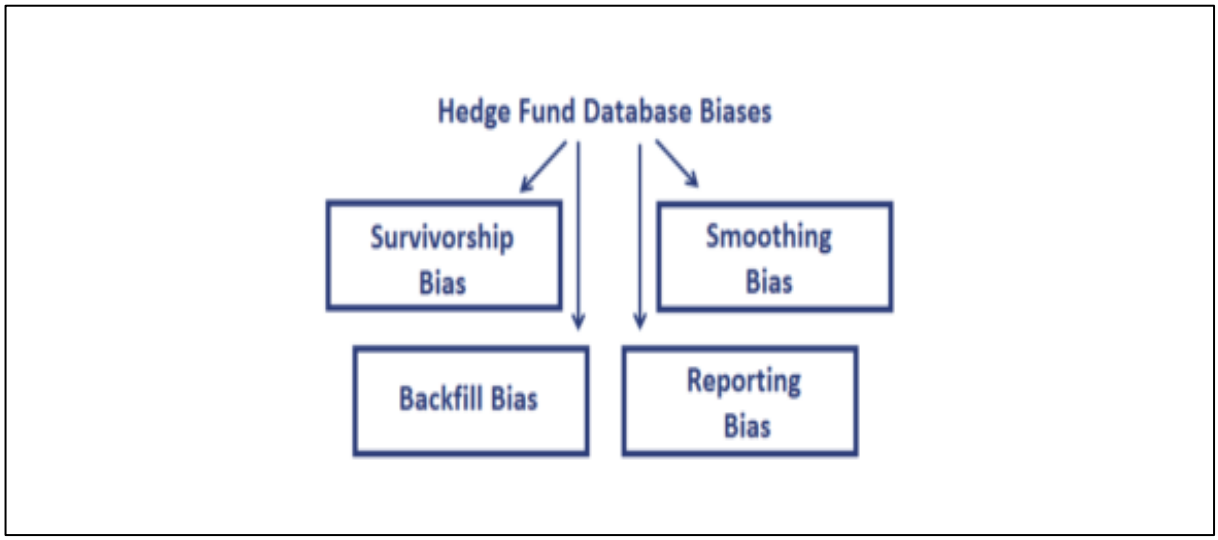
2.7 Hedge Fund Biases and Data

The industry has experienced phenomenal growth in assets under management over the past decades, despite few data vendors providing valuable commercial data to investors, fund managers, consultants, and academics. That can be attributed to the fact that the industry is less regulated; thus, information on hedge performance is voluntarily reported to those data vendors. Consequently, hedge fund data reliability is open to scrutiny and criticism by hedge fund researchers, academics, and the investment community at large.

According to Fung & Hsieh (1999), there are three main factors for this lack of data. Firstly, participation for hedge funds in databases is not mandatory, meaning that they are not obligated to disclose their activities. Secondly, most hedge fund managers' databases that are available were published in the mid-1990s. Lastly, Fung & Hsieh (2002) state that there are different criteria for different databases regarding funds' inclusion.

In as much as some of the biases found within the sector can be rectified, others are not as easily rectifiable.

Table 3: Hedge Fund Database Biases Diagram. Breaking Down Finance. Hedge Fund Database Biases.



Source: Breaking Down Finance, 2020

2.7.1 Survivorship Bias

Survivorship bias, also referred to as liquidation bias, happens when funds that have stopped reporting information and are now disregarded because they are of no interest to investors. What it means is that only operating funds and their data are retained. The disappearance of those funds from the database creates bias and an overestimation of the industry's performance, as per Fung and Hsieh (2001) research.

Research by Brown, Goetzmann, Ibbotson and Ross (1992), Brown and Goetzmann (1995), and Malkiel (1995) have found that liquidation bias in the industry is 0.5 - 1.4% per year. Due to their leveraged induced risk and the use of options and futures by the industry, the survivorship bias is higher than most mutual funds. Fung and Hsieh (1997) in their research analysis point out survivorship bias is as high as 3.54% per annum for commodity trading firms, and reported an annual survivorship bias of 1.5% for hedge funds. Liang (2000) also studied liquidation bias by comparing the two data vendor houses; the Hedge Fund Research (HFR) and TASS databases. It found that HFR survivorship bias was 0.6% compared to 2% experienced by TASS, confirming the TASS database's high attrition rate.

To deal with this problem, we should use both surviving and non-surviving funds from databases to estimate the liquidation bias. Fung and Hsieh (2000), in their work on survivorship bias using the TASS vendor database show that the bias was approximately 3% per year. This was further confirmed by Brown et al. (1999), who studied offshore hedge

funds. Unfortunately, survivorship biases cannot be solved or remedied as they are natural; for example, poor performance will lead to certain funds exiting the database.

2.7.2 Instant History Bias

Instant history bias happens when database vendors request new fund managers to supply their historical returns when they are added to their platforms. To attract investors, especially if performance is good, hedge fund managers would supply their investment performance to the hedge fund database, for publicity and marketing purposes. On the contrary, when performance is not great managers would be reluctant to supply their performance to the database. As a result of that factor, the quality of the data gets compromised.

Posthuma and Van der Sluis (2003) eliminate two years of reported data in their analysis to achieve what they considered quality returns, while Fama and French (1993) in their research analysis excluded two years of research data to factor for that biasness. In their work-study, Brown, Goetzmann, and Park (2001) eliminated fifteen months of data using the TASS database and Edwards and Caglayan (2001). They adopted the indirect approach by removing the twelve months data in the analysis to arrive at a survivorship bias of 1.17%.

Fung and Hsieh (2000) did some work on how to rectify instant history bias. Using the TASS database from 1994 to 1998 they eliminated 12 months of returns and found an instant history bias to settling around 1.4%.

2.7.3 Reporting Bias

Reporting bias, also referred to as selection bias, happens when a fund manager decides to disclose their performance or not to the database vendor, given that reporting in commercial hedge fund databases is not compulsory. The industry relies heavily on managers voluntarily reporting their performance numbers. A portfolio manager may opt to be excluded from the database as they may be in the process of building a track record and opt to be included once this is achieved to attract new investors. Other fund managers may prefer to be excluded from the database once sufficient assets have been raised and would not require investors' additional funds. Another reason for exclusion could be due to poor performance by the fund manager.

Fung and Hsieh (2000) found that the industry database is likely to be bias and missing because both the best and worst-performing funds might not be reporting their returns to the data vendors. The authors proposed investing in funds of funds returns rather than the

normal hedge fund returns data because of the former's track record data reliability than the latter. The self-selection of funds with a poor track record can be counterbalanced by funds that have closed fund inflow from new investors by not reporting their performance to the database. In this case, survivorship and self-selection offset or counterbalance each other.

2.7.4 Smoothing Bias

By their very nature, portfolio managers in the hedge fund industry tend to invest in less traded and illiquid investment products such as over-the-counter instruments, real estate, futures' contracts that are difficult to value and price. These assets are not traded frequently and do not have regular price updates because of their low volatility, which gives them the discretion to smooth their returns. Managers can then exploit the situation to their advantage.

Research by Cassar and Gerakos (2011), in their analysis of smoothing bias have established that portfolios with flexibility in instrument pricing tend to have consistent, intentional smoothing as opposed to those that don't have managerial discretion. Smoothing of returns becomes necessary, which creates a bias towards the riskiness of assets. Brooks and Kat (2002) have suggested econometric modelling approaches to adjust biases caused by return smoothing.

2.8 Fund of Funds Performance

This form of investment is popular to the less sophisticated investors, both retail and institutional. The fund of hedge funds offer investors variety by investing in different managers and strategies, thus providing diversification for investors. The disadvantage is that investors pay separate fees for different strategies and managers, resulting in lower returns than those of normal hedge funds. Park and Staum (1998), in their work, established that normal hedge fund managers diversify 95% of the portfolio to manage risk, negating the benefits that are supposed to come from investing in the hedge fund of funds.

Brown, Goetzmann, and Liang (2004) and Brown, Fraser and Liang (2008) offer two reasons why diversification leads to poor performance. Firstly, they argue that fund of hedge funds receive returns net of management and performance fees. If one or several managers perform well, they are more likely to receive an incentive fee irrespective of whether the overall portfolio does well or not. Secondly, Brown, Fraser, and Liang (2008, p. 1) argue that there is a strong competitive advantage to those funds of funds that are large to absorb fixed

and variable costs. Economies of scale that are found in fund of funds are quite substantial and support the proposition that due diligence is a source of alpha in hedge fund investment.

Big challenge facing investors in this industry is the high degree of unsystematic risk and the lack of disclosure by hedge fund managers coupled with the fact that most well-run funds are closed for new investors. Hedge fund of funds typically resolves these problems by performing in-depth analysis of potential managers to invest in by reviewing the operational and investment side of the business. Diversification of investment across different managers and strategies help in mitigating the risk. However, spot checks of hedge fund managers can be very expensive. Big hedge fund of funds can easily absorb these costs when compared to smaller fund of funds due to their economies of scale, which can help in generating alpha.

Due diligence in hedge fund is defined as the process of examining, reviewing and monitoring the operational and investment side of the business. Most hedge funds lack operational and financial transparency when compared to funds of hedge funds. This is attributed to minimal or lack of disclosure on the authorities' financial and operational matters. Feffer and Kundro (2003) established in their research that 54% of hedge funds that fail to perform can be attributable to operational issues, 38% of the fund due to investment performance issues, and the balance of 8% due to business risk factors.

The study by Brown, Fraser, Liang (2008) found that operational risk factors are have a strong bearing on investment performance of fund, especially where conflict exists between the portfolio manager and the investor. Critics of hedge funds of funds argue that these funds' layers of fees offset the benefits of diversification and due diligence. Fuss, Kaiser, and Strittmatter (2009) contend that most hedge funds have lower standard deviation and small returns.

Most studies have concluded that the fund hedge funds don't deserve the fees they charge to investors. Agarwal, Nanda, and Ray (2013) established that large institutional investors perform much better when they invest directly to hedge funds than indirectly through fund of funds. Brown, Goetzmann, and Park (1999) in their study found little evidence of hedge fund performance persistence, suggesting that an excessive number of managers in the hedge fund of funds may be counter-productive and not generating acceptable returns to investors.

CHAPTER 3: DATA AND METHODOLOGY

3.1 Data

Given that this paper analyses different hedge fund strategies managed by the different fund managers in South Africa and the researcher had defined eight strategies in chapter 1 to capture a global understanding, the study situates its research on the following five - Fixed-Income Arbitrage Strategy, Long-Short Equity Strategy, Macro-Strategy Hedge Fund, Market-Neutral Equity Strategy and Fund of Funds Hedge Fund Strategy. These five are appropriate for the South African environment.

Gathering data for hedge fund research purposes has proven to be challenging as vendors collect data from funds voluntarily. Most managers with a sterling performance are unwilling to provide their performance numbers to vendor databases, according to Edelman, Fung, and Hsieh (2013). It is not compulsory for hedge funds to report their funds' performance in South Africa or the world over, thus creating issues for researchers and academics regarding the quality of the data they use for their analysis.

Hedge News Africa, a leading hedge fund database vendor stationed in South Africa, was the primary source for data for this research report as well as hedge fund of funds surveys such as Novare Investment South Africa, Momentum Alternative Investments, Peregrine Securities Pty Ltd, 27four Multimanager, and Edge Capital.

Supplementary data was also sourced from Bloomberg, Cyrus, FactSet, and Statistics South Africa for March 2015 to March 2020, and all the returns after paying fund managers fees. The data was expressed in the South African Rands for all the strategies researched. The strategies analysed are Fund of Funds Hedge Fund Strategy, Fixed-Income Arbitrage Strategy, Long-Short Equity, Macro-Strategy Hedge Fund, and Market-Neutral Equity.

The Alexander Forbes Short Term Fixed Interest (STeFI) Composite Index is going to be used as benchmark used for all the strategies in our analysis. The JSE All-Share Index, and JSE SWIX Index will be used as a proxy for the South African equity performance and will be benchmarking against the Long-Short Equity and Market-Neutral Equity groupings. South African All Bond Index (ALBI) will be compared with the Fixed-Income Arbitrage Strategy.

Table 4- Hedge Fund Data for 72 Funds (Live funds)

Hedge Fund Type	**Number of Funds**
Macro-Strategy Hedge Fund	10
Long-Short Equity	24
Market-Neutral Equity	9
Fixed-Income Arbitrage Strategy	9
Fund of Funds Hedge Fund	20
TOTAL	**72**

Source: Hedge News Africa, 2020

Table 4 above classifies hedge funds into different investment strategies that are currently active. This report's data is sourced from Hedge News Africa. The analysis covers returns of different hedge fund categories with monthly observations for the period starting 1 March 2015 to 31 March 2020 net of fees.

Returns are net of fees after deducting the basic fee, performance fees, and other fund's expenses. Most hedge fund managers in South Africa would charge a basic fee of between 1% to 1.5% plus a performance fee of between 15 to 20% above a particular hurdle rate.

The significance of the period 2015 as a starting point for this research is that the Financial Services Conduct Authority (FSCA) introduced comprehensive regulations that governed and monitored the industry from that time. Our goal is to understand whether this event impacted hedge funds' performance in South Africa.

3.2 Methodology

3.2.1 Measurement against their benchmarks

Peskin, Urias, Anjilvel and Boudreau (2000) have found in their research that hedge funds should "exhibit" a low correlation compared to traditional asset classes. They should operate as "absolute return funds" because performance should always be positive irrespective of the market direction. In South Africa, hedge funds use the Alexander Forbes Short Term Fixed Interest (STeFI) Index as their performance benchmark. This report's analysis will establish, for the period, whether these strategies have lived to their expectations.

3.2.2 Measurement against traditional asset class indexes

The second measure will analyse the performance of these strategies versus traditional asset class indexes. The following benchmarks below are used for our research.

Table 5- Hedge Fund Strategies against the Traditional Asset Classes

Hedge Fund Type	**Benchmark**
Market-Neutral Equity	Johannesburg Stock Exchange All Share and Shareholder Weighted Indexes and Consumer Price Index (CPI) plus 7%
Long-Short Equity	Johannesburg Stock Exchange All Share and Shareholder Weighted Indexes and Consumer Price Index (CPI) plus 7%
Fixed-Income Arbitrage Strategy	ALL Bond Index Consumer Price Index (CPI) plus 4%
Macro-Strategy Hedge Fund	Median Performance of Alexander Forbes Global Manager Watch Consumer Price Index (CPI) plus 6%
Fund of Funds Hedge Fund	Blended Returns for different Hedge fund Strategies according to their AUM weighting within the SA total AUM hedge fund industry. Consumer Price Index (CPI) plus 4%

3.2.3 Measurement-based on mean-variance measure

Two return/risk measures, commonly used for traditional asset classes in the financial world are Sharpe and Treynor Ratios. Both measures divide alpha or excess return divided by the portfolio risk.

Sharpe ratio can be graphically defined as = $\frac{R_p - R_f}{Q_p}$

Where: R_P = Portfolio Expected Return

R_f = Risk-Free Rate

Q_p = Portfolio Risk

Whereas Treynor Ratio is as follows:

Treynor Ratio = $\frac{rp - rf}{\beta p}$

Where: rp = Portfolio return

rf = Risk-free rate

βp = Beta of the portfolio

3.2.4 Non-traditional Performance (Sortino Ratio)

Sortino Ratio is the most appropriate risk measure for alternative asset classes such as hedge funds. It focuses mainly on the downside loss relative to benchmark. An alternative risk performance measure replaces the Sharpe ratio denominator (standard deviation).

Sortino ratio can be defined as = $\frac{R_p - R_f}{Q_p}$

Where R_P = Portfolio Expected Return

R_f = Risk-Free Rate

Q_p = Negative asset return's standard deviation

Lhabitant (2004) explains in his study that the drawdown measure is the best risk measure for alternative asset classes.

3.3 Methodology for measuring Performance Persistence of Returns

This section of the research presents the methodologies employed to investigate the research objectives of understanding whether hedge fund returns are persistent over time and the skill or luck argument in understanding these funds' returns. It is sensible for persistency analysis to be done within the same hedge fund strategy because different hedge fund strategies follow different risk-return trade-offs. Brown et al. (1999) established a style factor that can lead to a reversal in the persistence phenomenon due to differences in systematic risk levels across different hedge fund managers. In the persistence performance analysis, the procedure proposed by Eling (2009) will be tested. This includes looking at the four-time horizons, namely, one-month, three-months, six-months, twelve-months, and four statistical techniques: the Cross Product Ratio (CPR), the Chi-Square (X^2) Test, the Cross-Sectional Regression Analysis, and the Binomial Test.

3.3.1 Cross Product Ratio (CPR) Test

Under this test measure, we use the technique developed by Brown et al. (1999) and Argawal and Naik (2000a). The authors constructed a table of data that compares successful and non-successful funds. Performance measurement can be measured using the portfolio's net return. The benchmark is defined as the median return of all managers in that strategy for the period under consideration. A return greater than the median return will be regarded as a winner, denoted as W. A return less than the median return for a particular hedge fund strategy will be regarded as a loser and denoted as L.

W1 and L1 will represent winners and losers for the period, or horizon one, respectively, and W2 and L2 will represent winners and losers in period or horizon 2, so persistent winners will outperform in W1 and W2 (W1W2) periods, and persistent losers would underperform in L1 and L2 (L1L2) periods. Winners (W1) in horizon one and losers in horizon two will be labelled as W1L2.

The Cross-Product Ratio (CPR) test is defined as the ratio of the portfolio with performance persistence against those portfolios that don't have a performance persistence, and can be graphically represented as follows:

$$CPR = \frac{W1W2 * L1L2}{W1L2 * L1W2}$$

The null hypothesis for the Cross-product Ratio (CPR) for no persistence performance must be equal one. This means each of the four groups, namely W1W2, W1L2, L2W1, and L1L2 will constitute a quarter of the total funds. According to the study by Christensen (1990), the statistical importance of the Cross-Product Ratio can be tested using the standard error of the natural logarithm. The ratio of the natural logarithm is tested using the Z-score.

When the Z-score of the Cross Product Ratio is greater than 1.96 (2.58), we don't accept the null hypothesis at 5% (1%) confidence level, and Z-score can be calculated as following formula:

$$Z = \frac{\ln(CPR)}{a_{\ln(CPR)}} = \frac{\ln(CPR)}{\sqrt{\frac{1}{W1W2} + \frac{1}{W1L2} + \frac{1}{L1W2} + \frac{1}{L1L2}}}$$

3.3.2 Chi-Square (X^2) Test

The second technique to test performance persistency in our analysis is called Chi-Square, which was developed by the following researchers Park and Staum (1998), Kouwenberg (2003), Agarwal and Naik (2005), they drafted data table of successful and unsuccessful funds similar to the one on Cross Product Ratio test. The test then compares the observed frequency distribution represented by the following distribution of W1W2, W1L2, L1W2, and L1L2 and can be graphically expressed according to the following formula:

$$X^2 = \frac{(W1W2 - D1)^2}{D1} + \frac{(W1W2 - D2)^2}{D2} + \frac{(W1W2 - D3)^2}{D3} + \frac{(W1W2 - D4)^2}{D4}$$

$$D1 = \frac{(W1W2 + W1L2) + (W1W2 + L1W2)}{K}$$

$$D2 = \frac{(W1W2 + W1L2) + (W1L2 + L1L2)}{K}$$

$$D3 = \frac{(L1W2 + L1L2) + (W1W2 + L1W2)}{K}$$

$$D4 = \frac{(L1W2 + L1L2) + (W1L1 + L1L2)}{K}$$

Where K represents the total funds under observation.

Using the distribution of Chi-Square with one degree of freedom, if the value of X^2 is greater than 3.84 (6.64), the null hypothesis of non performance persistence is not accepted at the 5% (1%) confidence level.

3.3.3 Cross-Sectional Regression (CSR) Test

The third technique in our analysis to examine persistency is the CSR. This method looks at portfolio net return at a particular time and regress it with the net return of the previous period.

We then test, statically, the significance of the slope of Beta by utilising the T-values. If the T-value for a normal distribution curve is greater than 1.96 (2.58), then the null hypothesis of no persistence performance is not accepted at the 5% (1%) confidence level.

3.3.4 Binomial Test

A similar technique of creating data table of successful and unsuccessful funds similar to the one used in Cross Product Ratio (CPR) is used for the Binomial test. The performance is defined similarly to the one in CPR, as the fund or portfolio net return (after deducting the manager's fees) less the benchmark, defined as the group of managers' median return for that hedge fund category present at the time of the investigation.

The portfolio whose return is greater than the median return in that group of funds during that period would be classified as Winner (W), and the portfolio whose return is less than the median return of all portfolio is classified as a Loser (L). Thus, we expect only two possible outcomes - the manager outperforming or underperforming the benchmark.
This methodology is similar to that employed by Barès, Gibson and Geyger (2003). The analysis distinguishes five hedge fund strategies and splits the entire period into the equal non-overlapping interval of one, three, six, and twelve months.

To assess each hedge fund manager, the number of overlapping sub periods k_i are counted, which dominate the manager's benchmark. The null hypothesis with the binomial representation by (k_i, n_iP=1/2) is then tested.

Z is calculated as

$$Z = \frac{\frac{X}{n} - p}{\sqrt{\frac{pq}{n}}}$$

Where X represents the number of successful and unsuccessful times in the portfolio's performance history. If Z-score is greater than 1.96 (2.58), then the null hypothesis of no persistence performance is not accepted at a 5% (1%) confidence level.

CHAPTER FOUR: EMPIRICAL EVIDENCE

4.1 Economic conditions prevailing in South Africa during the research period (31/3/2015 to 31/3/2020)

The macro-environment in South Africa has been relatively inimical to market performance over the past half-decade. After averaging 2.6% in the preceding five years, GDP growth slowed persistently to an average of a pedantic 0.8% in 2015-2019, led by a significant contraction in mining, manufacturing, and retail activity. As these are the key sectors listed on the stock exchange, it is not entirely surprising that any strategy that concentrated on the equity market for returns has been disappointing.

The mining sector was hit by a broadly sideways to downward movement in prices of the country's key commodity exports. For example, the price of gold traded within a broad USD200/ounce range of USD1100/ounce to USD1300/ounce for most of the period under consideration, only breaking through the upper end of the band second half of 2019. Simultaneously, gold production volumes also fell persistently due to power constraints, labor issues, and low sector investments. In platinum, prices collapsed from USD1245/ounce at the beginning of the year to close the year firmly below USD900/ounce – the lowest since the onset of the global crisis in 2008. Although rebounding in 2016, platinum prices subsequently embarked on a more protracted decline, reaching a low of USD768/ounce in the second half of 2018 before recovering somewhat after that.

The manufacturing sector also faced weak activity due to power outages. The country's leading electricity producer Eskom runs into major capacity issues that necessitate frequent load-shedding thus interrupting the production process. In contrast, the retail sector mostly struggles from subdued consumer sentiment, decelerating real wage growth, and low disposable incomes.

Furthermore, the cost of borrowing also rose meaningfully during the first year of the period under review. This remained relatively high through the rest of the period, thus constraining consumers' ability to fund credit-related purchases.

Not surprisingly, the weak growth began to impact the fiscal metrics, with revenue undershoots becoming the norm for all of the period under consideration. Successive budget reports anticipated improvements in the revenue line, only to be disappointed halfway through the fiscal year, forcing a downward revision to revenue estimates and result from the

fiscal deficit. Not surprising, after persistent misses, the country eventually lost its investment-grade rating with all three major rating agencies – first with Fitch in 2015, followed by Standard & Poor's rating agency in 2017, and finally Moody's rating agency in March 2020.

The weak growth outcomes also had a meaningful impact on inflation, as domestic demand pressures weakened, bringing inflation down from 7% in early 2016 to 5.3% in 2017, 4.6% in 2018, 4.1% in 2019, and 3.3% in 2020. Interestingly, not only did the headline inflation aggregate decline – the core measure, which strips out food and energy prices also came down from 5.8% in early 2015 to 4.8% in 2017, 4.1% in 2019, and 3.4% in 2020. With both headline growth and inflation turning out this depressed, it is not surprising that nominal GDP growth was well contained; similarly, an environment that is not particularly supportive of equities either. Moreover, there was a relatively uncertain political backdrop, as former President Jacob Zuma (2009 -2018) became increasingly embroiled in a series of allegedly corrupt dealings at a time where policy certainty was conspicuously amiss, particularly in the mining sector. The political challenges did not only serve to place a lid on important investments; they also, despite numerous recommendations to implement well-documented structural reforms, stood in the way of much-needed reforms that would help catapult the country towards a much higher growth path.

4.2 Performance of the Fixed-Income Arbitrage Strategy against Traditional and Non-Traditional Performance Measurements

Table 6 - South Africa Hedge Fixed-Income Arbitrage Strategy

	Media return per Hedge Fund strategy	SA ALL Bond Index (ALBI)	Cash or STeFI Index	SA Consumer Price Index (CPI) +4% Benchmark
Performance	8.64%	5.21%	6.98%	9.30%
Standard Deviation	2.08%	8.20%	0.14%	1.62
Sharpe Ratio	0.80	-0.34	-13.41	1.43
Downside Volume	2.30%	7.55%	N/A	N/A
Sortino Ratio	0.72	-0.48	N/A	N/A

******Returns and standard deviation have been annualized.***

The first hedge fund strategy to analyse is the fixed interest, which primarily invest in government bonds and would look for arbitrage opportunities in the following areas: mortgage-backed securities, yield curve, convertible bonds, and corporate bonds. This strategy has been, by far, the best performing strategy during the period on a risk-adjusted basis. It has generated a median return of 8.64% against Cash (STeFI) return of 6.98%, an outperformance of 1.64% for the five years under review.

The strategy had an annual standard deviation of 2.08%, much better than the 8.2% experienced by the South African All Bond Index (ALBI) during the same period. The performance resulted in the strategy generating a Sharpe Ratio and Sortino Ratio of 0.8 and 0.72, respectively, slightly below the 1.0 mark considered by investors as a very acceptable risk-adjusted return ratio. Seven out of nine, or 78%, of the funds in this category outperformed their Cash (STeFI) benchmark, with two of the funds, namely Coronation Granite Hedge Fund and Ninety One Fixed Income achieving a Sharpe and Sortino ratio of 1 and above.

Bonds as an asset class in South Africa over the five years that the research was conducted, have performed better than equities (see table 7 and 10 below) despite the global downturn, weak economic growth locally, rating downgrade to junk status to sub-investment grade, rising debt, and power sector challenges. Fung and Hsieh (1999) write that Fixed-Income Arbitrage Strategy funds' returns are insensitive to US equities. It turns to make 1% a month or 12% a year with little volatility. These funds can produce equity-like returns with bond-like volatility. All Bond Index cumulative return is 52% over that period (coupons included).

Table 7 – All bond Index performance from 31/3/2015- 31/3/2020 (coupons excluded)

Source: Bloomberg, 2020

Attribution of the total return (coupons included) for the period can be broken down into:

Table 8 - All Bond index return attribution for the period 31/3/2015- 31/3/2020

Factor	Percentage contribution
Coupons	68.7%
Amortisation (pull to par)	0.4%
Roll (down the yield curve as time passes)	3.8%
Shift (parallel movements in the yield curve)~duration	-10.8%
Shape (non-parallel changes in the yield curve	-2.8%
Spread changes (in corporate bonds	-0.9%

Source: Cyrus System, 2021

4.3 Performance of the Long-Shorty Equity Strategy against Traditional and Non-Traditional Performance Measurements

Table 9 - South Africa Hedge Long-Short Equity

	Median return per Hedge Fund strategy	Cash or (STeFI) Index	Shareholder Weighted (SWIX) Index Return	JSE All-Share Index Return	South Africa CPI +7% Benchmark
Performance	5.22%	6.98%	-0.97%	0.47%	12.07%
Standard Deviation	5.96%	0.14%	13.56 %	13.21%	1.24%
Sharpe Ratio	-0.30	-13.41	-0.59	-0.49	4.10
Downside Volume	4.53%	N/A	10.12%	8.78%	N/A
Sortino Ratio	-0.39	N/A	-0.79	-0.74	N/A

******Returns and standard deviation have been annualized***

The second hedge fund strategy is the Long-Short Equity strategy, which aims to generate returns by taking advantage of stocks' mispricing. The strategy delivered a median return of 5.22%, 1.76% below the Cash (STeFI) benchmark of 6.98% but better than equity indexes. Equity as an asset class has not done very well in the past five years, with the JSE All-Share Index and Shareholder Weighted (SWIX) delivering returns of 0.47% and -0.97%, respectively, for the period under observation.

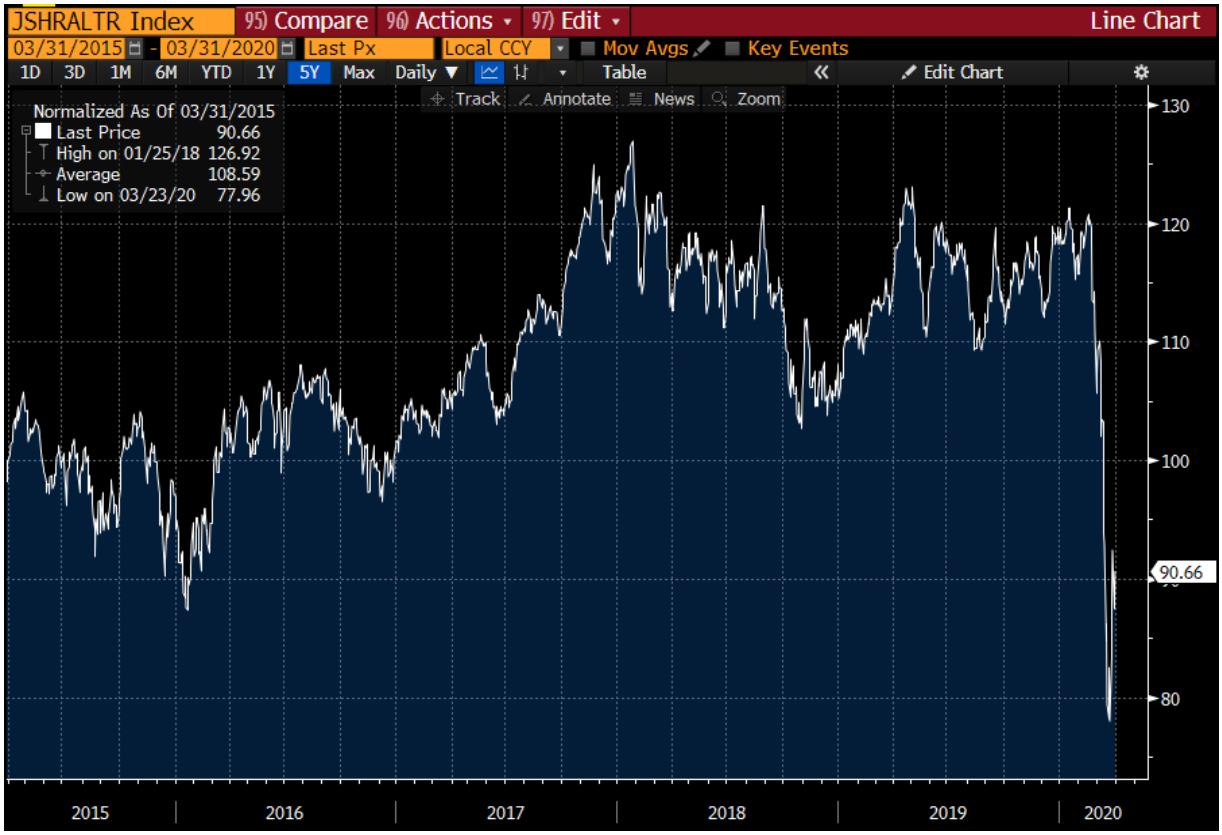
The average Sharpe and Sortino ratios for this strategy have been -0.30 and -0.39, respectively, for the period under review. A Sharpe ratio of -0.30 is extremely bad, as it entails that the investor was better-off in investing in risk-free assets than the strategy. Ineichen (2003) states that Long-Short strategy have positive correlation with the equity indexes. However, hedge fund managers are better at controlling their downsize risk than the long only equity managers. Investors would normally expect the return objective of CPI plus 7% for that kind of risk. However, pursuing this strategy have left investors in a worse off position, demonstrating the tough economic, political, and financial conditions investors have endured in South Africa and globally during the past five years [five years under review].

Only a quarter or 33.3% (8/24) funds analysed in this category outperformed their Cash (STeFI) benchmark. None of them achieved an acceptable Sharpe and Sortino minimum

ratio of 1 benchmarked expected by investors. South African equity performance has experienced pedestrian performance in the past 5 years and can be linked to low economic growth (GDP growth averaged 0.8% during that period, according to Statistics SA). Nevertheless, the story is not complete as most equity markets worldwide had a disappointing performance except for the United States.

South African equity market in dollar terms performed similarly to South Korea over the past five years under review, but better than most emerging markets such as Poland, Turkey and Mexico. All this demonstrates that equities in developed and emerging economies were impacted heavily by global macro factors than local market conditions.

Table 10- JSE Shareholder Weighted Index 31/3/2015-31/3/2020



Source: Bloomberg, 2020

4.4 Performance of the Market-Neutral and Quantitative Strategy against Traditional and Non-Traditional Performance Measurements

Table 11-South Africa Hedge Market-Neutral and Quantitative Strategy

	Media return per Hedge Fund strategy	Cash or (STeFI) Index	Shareholder Weighted (SWIX) Index Return	JSE All-Share Index Return	South Africa CPI +7% Benchmark
Performance	6.48%	6.98%	-0.97%	0.47%	12.07%
Standard Deviation	4.26%	0.14%	13.56%	13.21%	1.24%
Sharpe Ratio	-0.12	-13.41	-0.59	-0.49	4.10
Downside Volume	4.61%	N/A	10.12%	8.78%	N/A
Sortino Ratio	-0.11	N/A	-0.79	-0.74	N/A

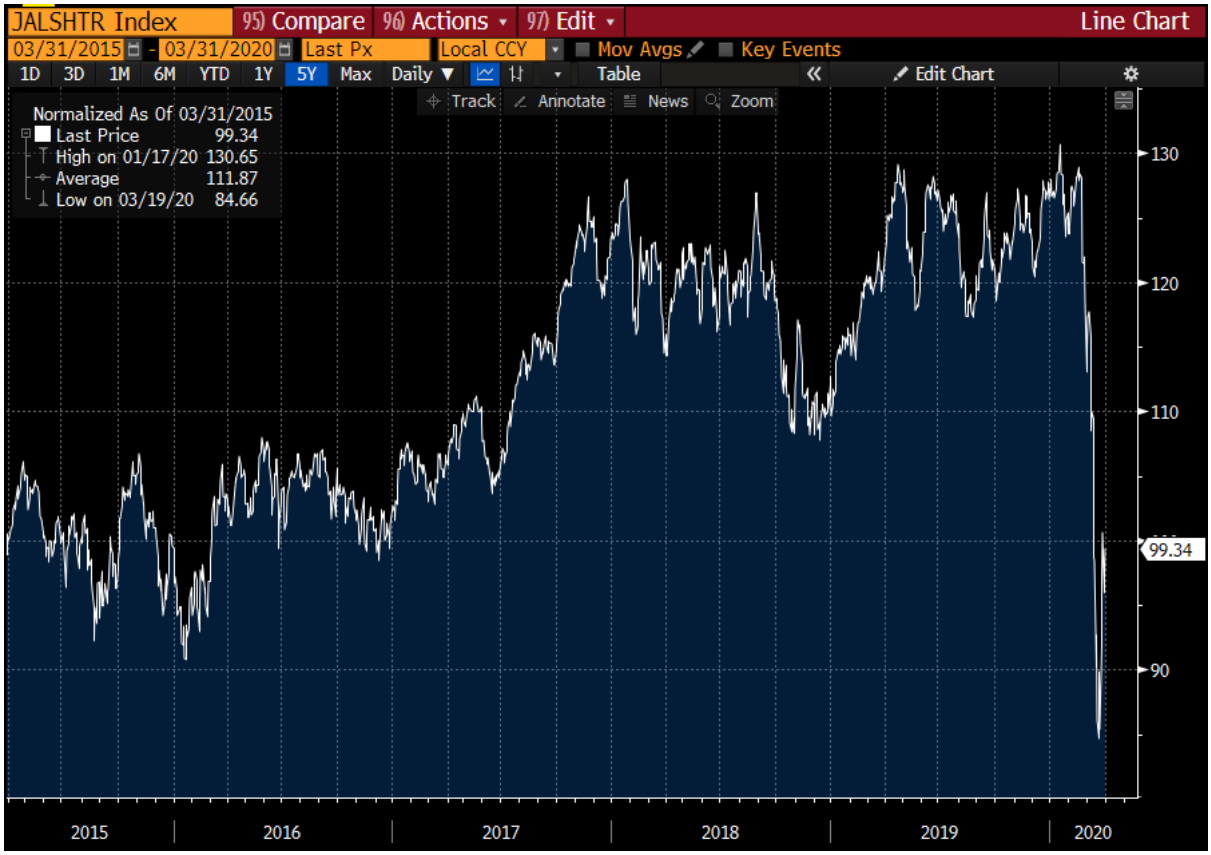
******Returns and standard deviation have been annualized***

Our third strategy is the market-neutral strategy that seeks to generate profits by using paired long and short positions to generate profit, whether we have an upward or downward market environment. The strategy has done better than the Long-Short Equity strategy with a median return of 6.48% versus the Cash (STeFI) benchmark of 6.98%, an underperformance of 0.5% for the research observation period. The average annual risk of the strategy sat at around 4.26% for the period versus the 13.56% and 13.21% experienced by the All Share and SWIX Index, respectively. The strategy for the period achieved Sharpe ratio of -0.12 and Sortino ratio of -0.11 both considered unsatisfactory by investors. Fung and Hsieh (1999) in their analysis found out that Market-Neutral funds have a negative correlation with stock market indices. Billio, Getmansky, and Pelizzon (2012) established a significant correlation between the US equity market and the market-neutral strategy during bull markets, and a non-significant relation during normal and a bear market for the period 1994 - 2005.

Five out of nine or 56% of the funds analysed managed to outperform their benchmarks, with only one, namely Peregrine Capital Pure Hedge, achieving an acceptable Sharpe and

Sortino ratio of 1.0 and above. Once more, pedestrian equity markets have made managers not achieve their absolute return objective of CPI + 7% in the past five years under review. The following strategy would have been affected by the same variables that impacted the Long-Short Equity Strategy because they have the same universe of index or stocks to invest in.

Table 12- JSE All Share Index 31/3/2015-31/3/2020



Source: Bloomberg, 2020

4.5 Performance of the Macro-Hedge Strategy against Traditional and Non-Traditional Performance Measurements

Table- 13 South Africa Macro-Strategy Hedge Fund

	Media return per Hedge Fund strategy	Cash (STeFI) Index	Alexander Forbes Global Large Manager Watch (AFGLW) Benchmark	SA Consumer Price Index (CPI) +6% Benchmark
Performance	9.72 %	6.98%	2.61%	11.07 %
Standard Deviation	8.13 %	0.14	8.64 %	1.24
Sharpe Ratio	0.34	-13.41	-0.48	3.31
Downside Volume	5.06%	N/A	7.19	N/A
Sortino Ratio	0.27	N/A	-0.43	N/A

******Returns and standard deviation have been annualized***

Table 13 summarizes monthly returns on the Macro-Strategy Hedge Fund from 31 March 2015 to 31 March 2020. The hedge fund strategy posted a median return of 9.72%, an outperformance of 2.74 % compared to the 6.98% return generated by the Cash (STeFI) benchmark and better than all hedge strategies after paying the fund managers' fees during the period under consideration. Fung and Hsieh (1999) in their research studied global macro hedge performance strategy versus five equity-market environment cycles and established that the strategy is negatively correlated with stock markets; the strategy underperforms equities in an upmarket and outperforms equities in down markets. The strategy underperformed the absolute return benchmark of the Consumer Price Index (CPI) plus 6% by 1.35%, a benchmark normally used for funds with similar return objectives. It performed much better by about 7.11% when judged against the Alexander Forbes Global Manager Watch (AFGMW), representing a median performance of the top ten different fund managers in South Africa that form part of that survey.

The strategy had annual volatility of 8.13% for the period under investigation. The sampled period coincides with the COVID-19 pandemic, which has created serious financial instability in global markets. Only five out of nine peer funds, or 55.5%, managed to outperform the

Cash (STeFI) benchmark in this hedge fund category. The remaining four (66.6%) underperforming the benchmark with strategy achieving the Sharpe and Sortino ratio of 0.34 and 0.27 respectively but well below 1.0 considered by investors as a good indicator of better risk-adjusted return.

Macro-Strategy Hedge Funds in South Africa is similar to asset allocation funds where the portfolio manager looks at the asset class mispricing. Based on the return experience during those five years, the following asset allocation would have generated the desired outcome, namely:

- Overweight Bonds (both sovereign and corporate)
- Overweight Cash
- Overweight Foreign Assets (currency play)
- Underweight local equities
- Underweight listed properties

The rand depreciated by more than 30% during the period (see table 14 below), aiding the Macro-Strategy Hedge Fund in delivering better returns for the period.

Table 14- Rand vs. US Dollar for the period 31/3/2015-31/3/2020

Source: Bloomberg, 2020

4.6 Performance of the Fund of Funds Strategy against Traditional and Non-Traditional Performance Measurements

Table 15- South Africa Fund of Funds Hedge Category

	Median return per Hedge Fund strategy	Cash or (STeFI) Index	SA Consumer Price Index (CPI) +4% Benchmark
Performance	4.98%	6.98%	9.3%
Standard Deviation	4.57%	0.14%	1.62%
Sharpe Ratio	-0.44	-13.41	1.43
Downside Volume	4.08%	N/A	N/A
Sortino Ratio	-0.42	N/A	N/A

******Returns and standard deviation have been annualized***

The analysis shows that hedge fund of funds has been the worst-performing strategy during the research period. This could partly explain the additional layer of fees that investors have to pay to pursue this strategy. The strategy produced a median return of 4.98%, well below the 6.98% Cash or STeFI index benchmark and 9.3% absolute return benchmark of South African CPI + 4% that institutional investors would seek to invest in this particular strategy. The average annual volatility for the period was 4.57% resulting in the strategy detracting in performance by producing Sharpe and Sortino Ratios of -0.44 and -0.42 respectively, demonstrating the value that fund managers and intermediaries have destroyed in pursuing this strategy. Brown, Goetzmann, and Liang (2005) claim that hedge fund of funds do not add any value to the investor in spite of the high fees that they charge. The general view is that the fund of funds industry offers poor returns to investors. Only 3 out of 20 or 15% of funds analysed outperformed their Cash (STeFI) benchmark with no acceptable Sharpe and Sortino ratio. This strategy did not add value to investors during the period under review. Thus, based on the analysis, hedge fund of funds will have invested higher weighting on the Long–Short, which has performed badly, as shown by the performance of the equity indexes above.

4.7 Cross Product Ratio (CPR) and Chi-Square (X^2)Test Results for Fixed-Income Arbitrage Strategy

Table 16- CPR and X^2 Test Results for Fixed-Income Arbitrage Strategy

Period	WW	WL	LW	LL	CPR	Z-statistic of CPR	X^2-statistic
Monthly	110	130	132	170	1.1065	0.5809	0.3375
Quarterly	157	73	64	210	6.1869	9.2845	92.5116
Semi-Annual	163	44	53	228	13.7492	11.8408	162.2120
Annual	162	37	33	217	36.7335	13.1094	225.1498

***1% Significance Level (Z-score critical value=2.58) ** 1% Significance Level (X^2 critical value=6.63)**

Fixed-Income Arbitrage Strategy has been by far the best performing hedge fund strategy when compared to other strategies during these periods using all fund managers' median returns as the benchmark for performance measurement but still underperforming the acceptable Sharpe and Sortino ratios of 1.0 that is required as a minimum by investors. In analysing performance persistence for this hedge fund category, Lose-Lose (LL) dominates all the periods, reaching maximum in the six months and decreasing in the twelve months. The lack of dominance of winners in this category for all the periods indicate a lack of investment skill in this hedge fund category. The results of the test shows that both the Z-score of the Cross Product Ratio and Chi-Square are significant at 1% level for all periods except the monthly period category.

4.8 Cross Product Ratio (CPR) and Chi-Square (X^2)Test Results for Long-Short Equity

Table 17- CPR and X^2 Test Results for Long-Short Equity

Period	WW	WL	LW	LL	CPR	Z-statistic of CPR	X^2-statistic
Monthly	361	344	344	367	1.1196	1.0622	1.1285
Quarterly	500	188	188	492	6.9602	16.0184	277.3580
Semi-	512	127	121	536	17.8585	20.4040	493.6726

Annual							
Annual	482	102	92	500	25.6820	20.6324	528.0822

***1% Significance Level (Z-score critical value=2.58) ** 1% Significance Level (X^2 critical value=6.63)**

Long-Short Equity strategy has not lived to expectations when measured against the STeFI benchmark during the five-year investigation period due to South Africa's dismal economic performance leading to poor performance by the local equity market. Table 17 above reports a significant existence of negative performance persistence for Long-Short Equity strategy when utilising the median returns as the benchmark set of fund managers falling under this investment category for the period under investigation. For all periods, losers are followed by losers (LL) and dominate most of the possible outcomes except for the three month period where Win-Win (WW) leads. It increases from three months to six months, reaching the maximum and decreasing for the 12 months. The dominance of losers in the one-month, six-month, and twelve-month periods also indicates this negative performance persistence strategy.

The test results are significant at 1% level for both CPR and Chi-Square statistic (X^2) at periods three months, six months, and 12 months. When the STeFI or Cash is used as a benchmark instead of the median return, the Long-Short Equity strategy will show a negative performance persistence. For the entire investigation period, STeFI has performed better than the median benchmark for this category.

4.9 Cross Product Ratio (CPR) and Chi-Square (X^2)Test Results for Market-Neutral Equity Strategy

Table 18- CPR and X^2 Test Results for the Market-Neutral Equity Strategy

Period	WW	WL	LW	LL	CPR	Z-statistic of CPR	X^2-statistic
Monthly	113	127	126	174	1.2287	1.1812	1.3966
Quarterly	168	65	65	215	8.5491	10.5496	122.6125
Semi-Annual	175	46	44	230	19.8864	12.8046	197.6182
Annual	174	25	24	218	63.2200	13.6709	265.2535

***1% Significance Level (Z-score critical value=2.58) ** 1% Significance Level (X^2 critical value=6.63)**

The Market-Neutral Equity Strategy has also underperformed the STeFI performance benchmark during the period under investigation. The findings revealed that performance persistence or dominance in losers (LL) in this category for the month and quarterly periods reach their peak at the six months and start declining in the 12 months. One could argue that skills in this grouping of hedge funds are not recognizable when using this performance persistence measurement. Based on all managers' median returns in a particular hedge category, the performance persistence results can be misleading. It could be argued that, for these funds in South Africa, an appropriate benchmark is the Cash or STeFI benchmark, which, as alluded to earlier, performed better than the median return of these managers in this category. The results of these hedge fund category are all significant at 1% level for both CPR and Chi-Square statistic (X^2) at periods three months, six months, and 12 months.

4.10 Cross Product Ratio (CPR) and Chi-Square (X^2)Test Results for Macro-Strategy Hedge Fund

Table 19- CPR and X^2 Test Results for the Macro-Strategy Hedge Fund

Period	WW	WL	LW	LL	CPR	Z-statistic of CPR	X^2-statistic
Monthly	125	145	141	187	1.1433	0.8100	0.6564
Quarterly	181	83	83	223	5.8591	9.5734	97.8677
Semi-Annual	188	66	65	231	10.1231	11.5475	149.1274
Annual	192	37	36	225	32.4324	13.7037	240.5735

***1% Significance Level (Z-score critical value=2.58) ** 1% Significance Level (X^2 critical value=6.63)**

Macro-Strategy Hedge Fund median return has outperformed the Cash or STeFI performance benchmark during the period under review. Despite the category spectacular performance against the STeFI or Cash benchmark, performance persistence, the report indicates significant negative evidence of performance persistence due to the dominance of losers (LL) in all the periods that hedge fund managers' skill was tested. From Table 19 above, the results of these hedge fund strategy are all significant at 1% level for both CPR and Chi-Square statistic (X^2) at periods three months, six months, and 12 months.

4.11 Cross Product Ratio (CPR) and Chi-Square (X^2)Test Results for Fund of Funds Hedge Category

Table 20- CPR and X^2 Test Results for the Funds of Funds Hedge Category

Period	WW	WL	LW	LL	CPR	Z-statistic of CPR	X^2-statistic
Monthly	283	303	303	291	0.8970	-0.9331	0.8708
Quarterly	407	171	171	391	5.4423	13.1060	182.2922
Semi-Annual	417	120	111	432	13.5243	17.5375	353.663
Annual	414	75	67	424	34.9325	19.5513	494.4187

***1% Significance Level (Z-score critical value=2.58) ** 1% Significance Level (X^2 critical value=6.63)**

Hedge fund of funds has been the worst-performing hedge fund strategy during this period when measured against other hedge fund strategies and the Cash or STeFI benchmark. Lose- Win (LW), and Win-Lose (WL) dominates the monthly period, with LL and WW assuming the 3rd and 4th positions. Win-Win (WW) leads the pack in the three months interval, followed by Lose-Lose (LL), Win-Lose (WL) and Lose Win (LW) falling short significantly when compared to the previous period. Lose-Lose (LL) dominates the six-month and twelve-month periods. The lack of dominance of winners in this hedge category indicates a negative performance persistence. The results of this hedge fund strategy are all significant at 1% level for both CPR and Chi-Square statistic (X^2) at periods three months, six months, and 12 months.

4.12 Cross-Sectional Regression Test

The regression output in Appendix F shows all strategies, namely Fixed-Income Arbitrage Strategy, Long-Short Equity Strategy, Macro-Strategy Hedge Fund, Market-Neutral Equity Strategy and Fund of Funds Hedge Fund Strategy, exhibiting no significant performance persistence in the mean, as demonstrated by the Z-score that is less than 1.96 (2.58) confirming that the null hypothesis is accepted at 5% (1%) confidence level. All strategies are exhibiting a low correlation or R-squared from the regression output. We see less persistence in the standard deviation for all strategies. All strategies groups test inferior R-squared. Apart from the fund of funds strategy, all funds show Skewness's persistence, while Kurtosis only seems not to persist in all the strategies.

Like standard deviations, all strategy groupings, except Fixed-Income Arbitrage Strategy and Macro-Strategy Hedge Fund, seem to have a positive correlation with the South African SWIX index. The persistency with the South African bond market as represented by the All Bond Index (ALBI) seem to be very low, except for the Fixed-Income Arbitrage Strategy. Fundamentally, all strategies show no persistency to investment performance, with the highest being Managed Neutral and lowest being Long-Short strategy.

4.13 Binomial Test

Table 21 below reports the 5% confidence interval results for the Binomial Test at a (1% confidence interval will be covered in Appendix C) for the analysis period beginning 31 March 2015 to 31 March 2020 for five different hedge fund categories, namely, Long-Short Equity (LSEQ), Market-Neutral Equity (MNEQ), Fixed-Income Arbitrage Strategy (FIAS), Macro-Strategy Hedge Fund (MSHF) and Fund of Funds Hedge Fund (FFHF) for the interval period one, three, six and 12 months. Hedge Fund Managers have two possible outcomes when managing their respective portfolios. The manager outperforms or underperforms the benchmark (benchmark defined for this research analysis as the median return for all managers participating in a particular hedge grouping during our defined research period.) Table 21 below reports all managers who participated in the research process. The managers who perform above the median return are denoted ↑, and those underperforming the median return are denoted ↓. The researcher has also done 1% significance Level which will be found in Appendix G.

Table 21: Binomial Test at 5% Significance Level

PERIOD	FUNDS SELECTION	HEDGE STRATEGIES				
		Long-Short Equity (LSEQ)	**Market-Neutral Equity (MNEQ)**	**Fixed-Income Arbitrage Strategy (FIAS)**	**Macro-Strategy Hedge Fund (MSHF)**	**Fund of Funds Hedge Fund (FFHF)**
	Total	24	9	9	10	20
One month	Signif. ↑ or ↓	5 (21%)	4 (44%)	4(44%)	3 (30%)	7 (35%)
	Signif. ↑	3 (12.5%)	1 (11 %)	1(11%)	0 (0%)	3 (15%)
	Signif. ↓	2 (8.3%)	3(33%)	3(33%)	3 (30%)	4 (20%)
Three months	Signif. ↑ or ↓	14 (58%)	4 (44%)	4 (44%)	3 (30%)	8 (60%)
	Signif. ↑	7(29%)	2 (22%)	1 (11%)	1 (0%)	5 (25%)
	Signif. ↓	7(29%)	2 (22%)	3(33%)	2 (30%)	7(35%)
Six months						
	Signif. ↑ or ↓	17 (71%)	5 (56%)	6 (68%)	2 (20%)	14 (70%)
	Signif. ↑	8 (33%)	2 (22%)	2(22%)	0 (10%)	6 (30%)
	Signif. ↓	9(38%)	3 (33%)	4 (44%)	2 (20%)	8 (40%)
12 months	Signif. ↑ or ↓	21 (88%)	8 (89%)	8 (89%)	4 (40%)	17 (85%)
	Signif. ↑	8 (33%)	3 (33%)	2(33%)	2 (20%)	8 (40%)
	Signif. ↓	13 (54%)	5 (56%)	6(56%)	2 (20%)	9 (45%)

From the analysis conducted on the data above, it's concluded that performance persistence exists at monthly periods for all strategies. The situation remains the same for the quarterly period except for Fund of Funds and Long-Short categories. The situation improves during the six months period with the Macro-Strategy Hedge Fund being the one lagging behind. The persistence performance continues to improve in the twelve-month for all hedge fund strategies. Losers continue to dominate all hedge fund strategies for all of the periods tested.

CHAPTER FIVE: CONCLUSION REMARKS

This study's main focus was examining hedge fund strategies most applicable within the South African environment for the period beginning 31 March 2015 through to 31 March 2020. As per the abstract the period under review is significant as the hedge fund industry in the country was first regulated and monitored since 2015 onwards. This research's motivation was due to the criticism levelled against the hedge fund industry globally and locally for being corrupt, greedy, and outrageous on the fees it charges to investors. The following salient points were explored as they were deemed important to various stakeholders in the industry.

1. Did hedge fund managers' report acceptable risk-adjusted returns to investors to justify the higher fees the industry is charging?
2. Do we see performance persistency by the investment professionals in this industry? The investment performance posted by the industry exhibit luck or skill?

The performances of the hedge fund strategies in South Africa were analysed against the Cash or STeFI benchmark; a benchmark widely used in the country by the industry, as well as other market indexes such as JSE All Share Index, Shareholder Weighted Index (SWIX), All Bond Index (ALBI), Alexander Forbes Global Large Watch (AFGMW) and some absolute return benchmarks such as Consumer Price Index plus 4%, 6% and 7%.

The second part of the analysis was to establish whether performance persistence exists within these investment houses by conducting statistical tests such as the Cross Product Ratio, the Chi-Square, and the Cross-Sectional Regression and the Binomial Tests to prove whether persistency exists or not to help potential investors in identifying fund managers with the right skill and talent.

The research findings for the period under investigation establish that all strategies, except for the Fixed-Income Arbitrage and Macro-Strategy Hedge Fund Strategies, underperformed the Cash (STeFI) benchmark. Using the traditional and non-traditional performance measurements such as Sharpe and Sortino ratios, all hedge fund strategies achieved negative Sharpe and Sortino ratios except Fixed-Income Arbitrage and Macro-Strategy Hedge Fund, albeit below the 1.0 ratio investors considers it as an acceptable risk-adjusted return.

Fixed-Income Arbitrage Strategy, with about nine funds represented in the universe, was the best performing strategy with seven out of nine or 78% of the funds outperforming the Cash (STeFI) and All Bond Index benchmark but underperforming that of CPI plus 4% benchmark institutional investors required for such a product.

Market-Neutral Equity was the third-best performing strategy within the group. However, it also failed to outperform the Cash (STeFI) benchmark but performed better than the equity indexes represented in South Africa by SWIX and All-Share Index. The absolute return benchmark of CPI plus 6% had a finer performance than the strategy. Only three out of nine funds outperformed the STeFI and the equity market indexes during the period under review. Not a single fund has achieved a Sharpe and Sortino ratio of 1 and above during the period.

Only 25% of the Long-Short Equity category's funds managed to perform better than the STeFI, albeit with no acceptable Sharpe and Sortino ratios. This category's performance is extremely disappointing, considering that the strategy represents approximately 60% of the industry.

Lastly, the hedge fund of funds had the worst performance for the sector during this period can be attributed to poor manager selection by these intermediaries and the additional layer of fees that investors have to pay for their advice. The strategy underperformed both the Cash (STeFI) and absolute return benchmark, such as CPI plus 4%.

The final part of this study investigated whether the hedge fund strategies relative to performance benchmarks were persistent for four overlapping periods: monthly, quarterly, half-yearly, and yearly using four different test techniques - the Cross Product Ratio test, the Chi-Square test, and the Cross-Sectional Regression test, and the Binomial Test. There was no conclusive evidence of positive significant performance persistence in all the periods for all hedge fund strategies, displaying a lack of skill on average in managing these complex investment products. These results point to the fact that investors can use quarterly momentum strategies during the period to generate excess returns. The momentum investment approach is possible in South Africa because funds do not have lock-up periods, unlike their global counterparts. Value gets destroyed the longer the time horizon, which can help investors and other interested parties gain knowledge that hedge funds perform differently in unique market environments.

In conclusion, all hedge fund strategies in South Africa for the period March 2015 to March 2020 have not performed well against their primary benchmark (STeFI) except for the two

strategies - Fixed-Income Arbitrage Strategy and the Macro-Strategy Hedge Fund. All strategies have not generated a better risk-adjusted return for investors when using Sharpe and Sortino ratios for the period under consideration.

Regarding performance persistency, no strategy exhibited positive performance persistency for all the periods confirming the research's objective that luck rather than skills on average dominated these products' investment management during the investigation period. All strategies did not manage to produce Sharpe Ratio and Sortino Ratio of above 1.0 mark considered by the investment community as a minimum requirement for displaying skills in managing portfolios of this complex nature and thereby not displaying any positive performance persistence. Based on this observation and analysis conducted for this research, the basic fee of between 1-1.5 % per annum paid by investors is unjustified and must be reduced to reflect that reality. Agarwal and Ray (2011) discovered that changes in incentive fees are driven by poor performance in their research. Liang (2001) also found out that poor performance results in a reduction in hedge funds' incentive fees. However, we do have a few pockets of excellence in the market in terms of generating better risk-adjusted performance, albeit small. Proper due diligence should be conducted to identify those portfolio managers with the required skill and talent, and must be rewarded accordingly to recognize their investment abilities.

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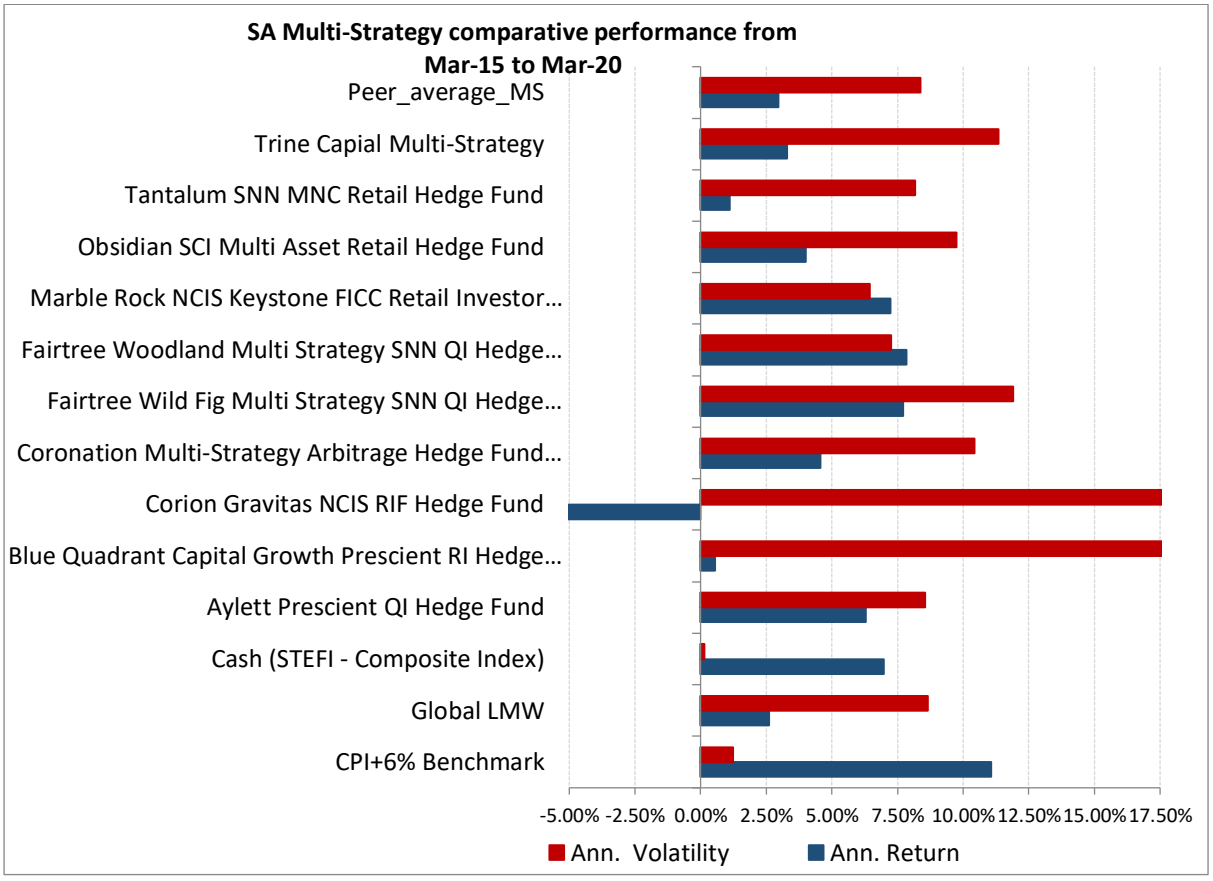
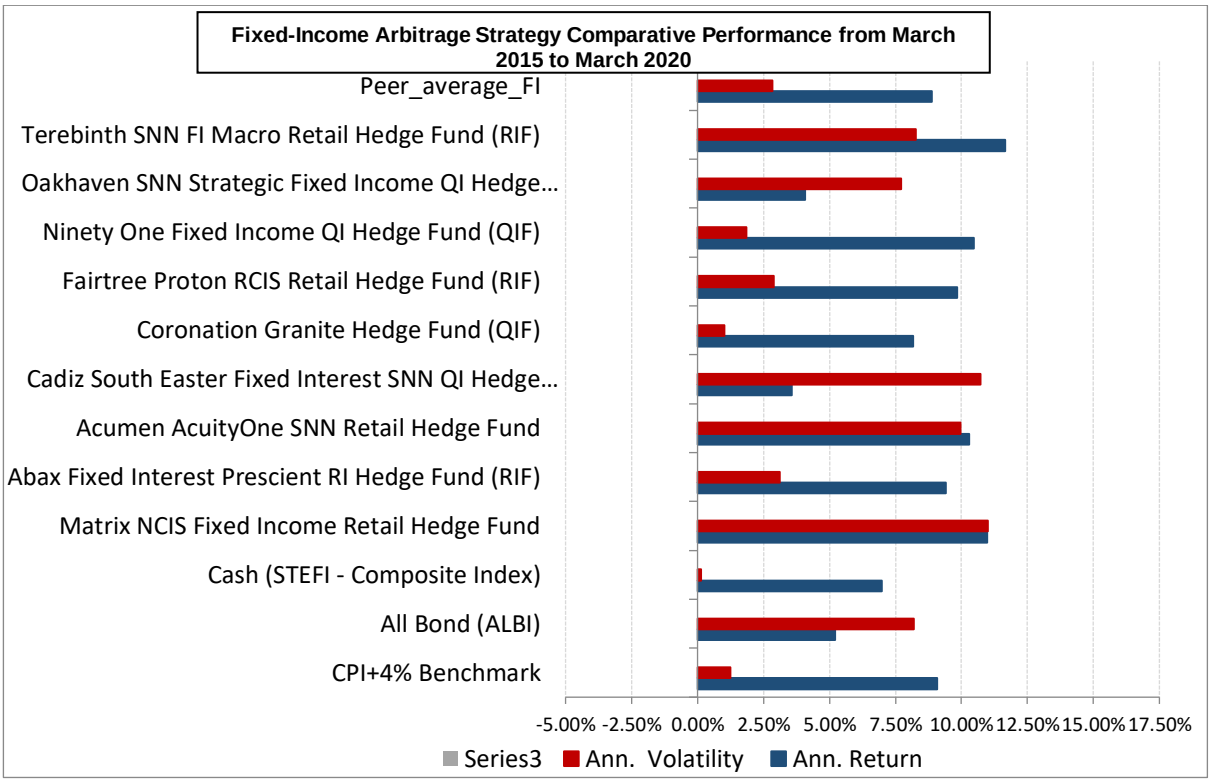
APPENDICES

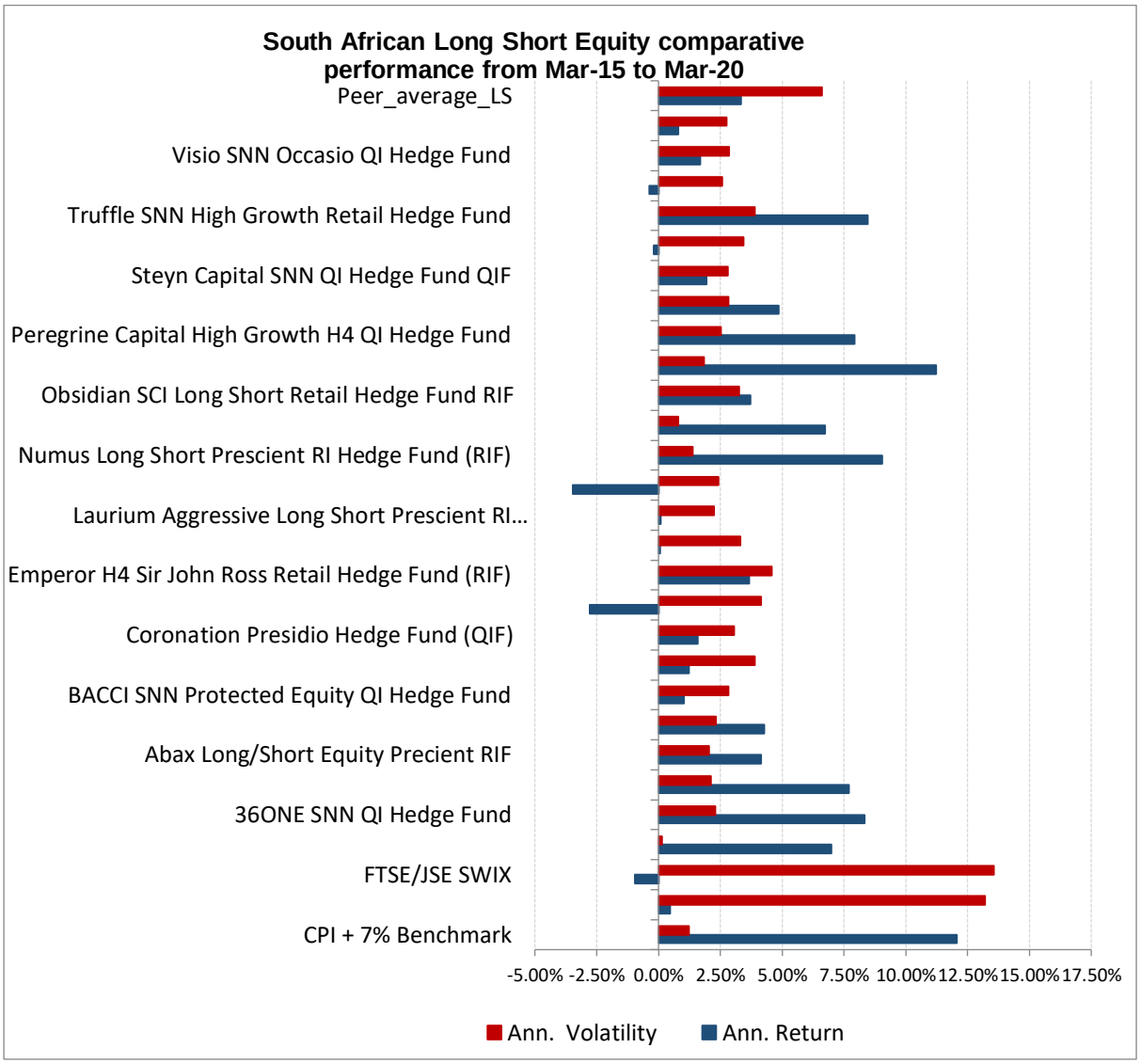
APPENDIX A: SA Multi-Strategy Performance from Mar-2015 to Mar-20



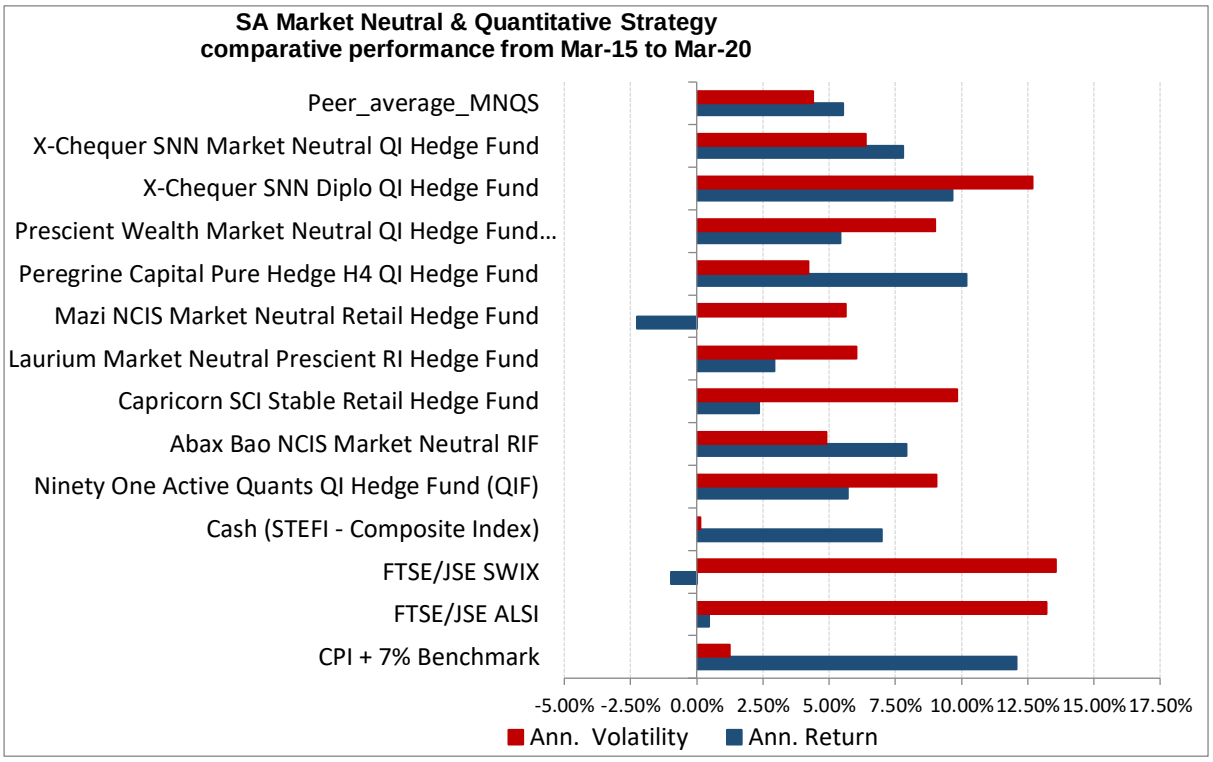
APPENDIX B: Fixed-Income Arbitrage Strategy Comparative Performance from Mar-2015 to Mar-20



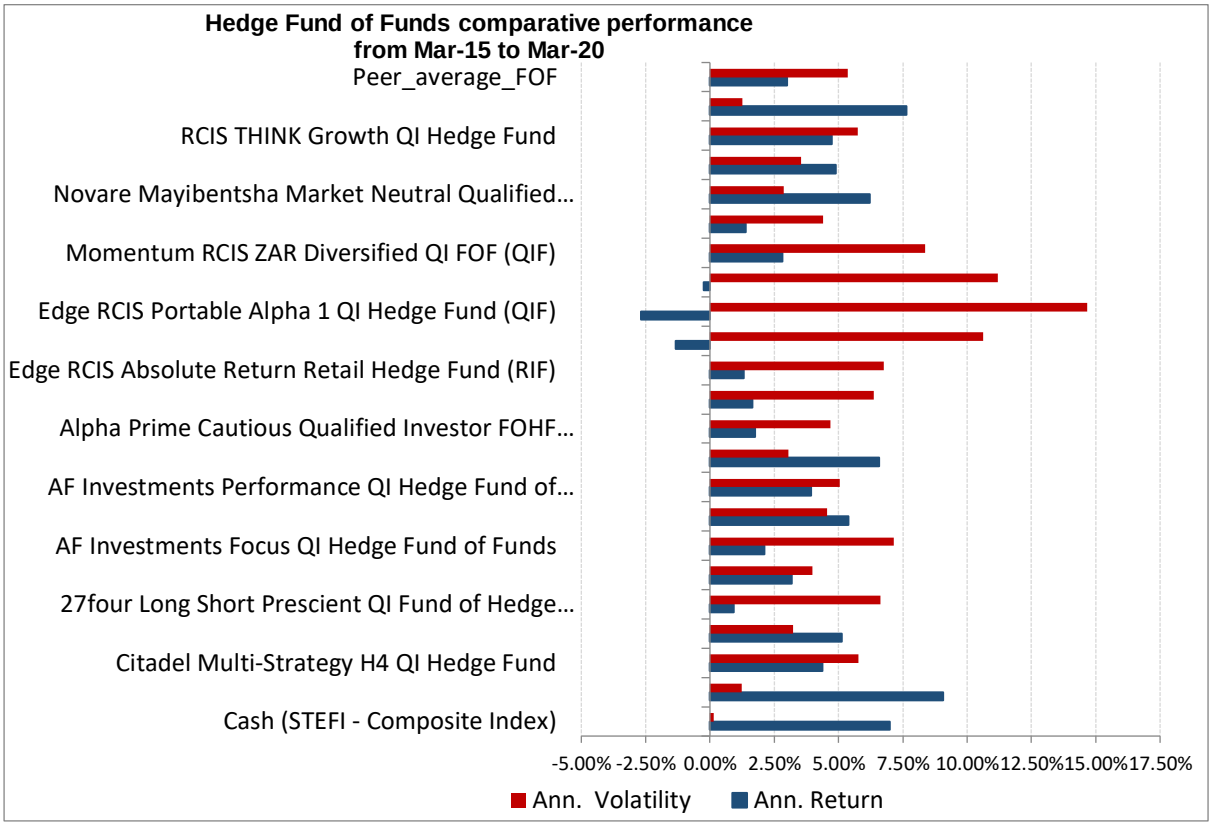
APPENDIX C: South African Long-Short Equity Comparative Performance from Mar-2015 to Mar-20



APPENDIX D: South African Market Neutral Quantitative Strategy Comparative Performance from Mar-2015 to Mar-20



APPENDIX E: Hedge Fund of Funds Comparative Performance from Mar-2015 to Mar-20



APPENDIX F: Cross-Sectional Regression Results for Performance Persistence Test for all Strategies

Multi-Strategy	**Co-efficient**	**T-statistics**	**Correlation**
Mean Return	0.002473	0.0134	0.2382
S.D	0.024150	9.1833	0.4153
Skewness	-2.900780	2.3948	0.5182
Kurtosis	16.48548	0.8373	0.1102
Correlation with Bond	0.405844	3.331350	0.1583
Correlation with Stock	0.430996	7.498122	0.4879

Fixed-Income Arbitrage Strategy	**Co-efficient**	**T-statistics**	**Correlation**
Mean Return	0.007258	1.4635	0.0238
S.D	0.009539	11.9837	0.4327
Skewness	-1.982677	2.1083	0.5127
Kurtosis	12.42953	-0.2772	0.6241
Correlation with Bond	0.289503	7.936120	0.516322
Correlation with Stock	0.092526	3.152062	0.144127

Equity Long-Short	**Co-efficient**	**T-statistics**	**Correlation**
Mean Return	0.002761	1.0839	0.3829
Standard Deviation or Volatility	0.019060	10.8373	0.2739
Skewness	-0.926464	3.0293	0.2724
Kurtosis	4.922900	0.8372	0.5427
Correlation with Bond	0.138580	1.342318	0.029634
Correlation with Stock	0.394684	2.135086	0.656898

Equity Market-Neutral Fund	**Co-efficient**	**T-statistics**	**Correlation**
Mean Return	0.004603	1.9372	0.4629
S.D	0.012670	10.0002	0.3302
Skewness	-1.915683	2.0399	0.6528
Kurtosis	9.007484	1.3628	0.4293
Correlation with Bond	0.086979	1.265311	0.026419
Correlation with Stock	0.394684	10.62828	0.656898

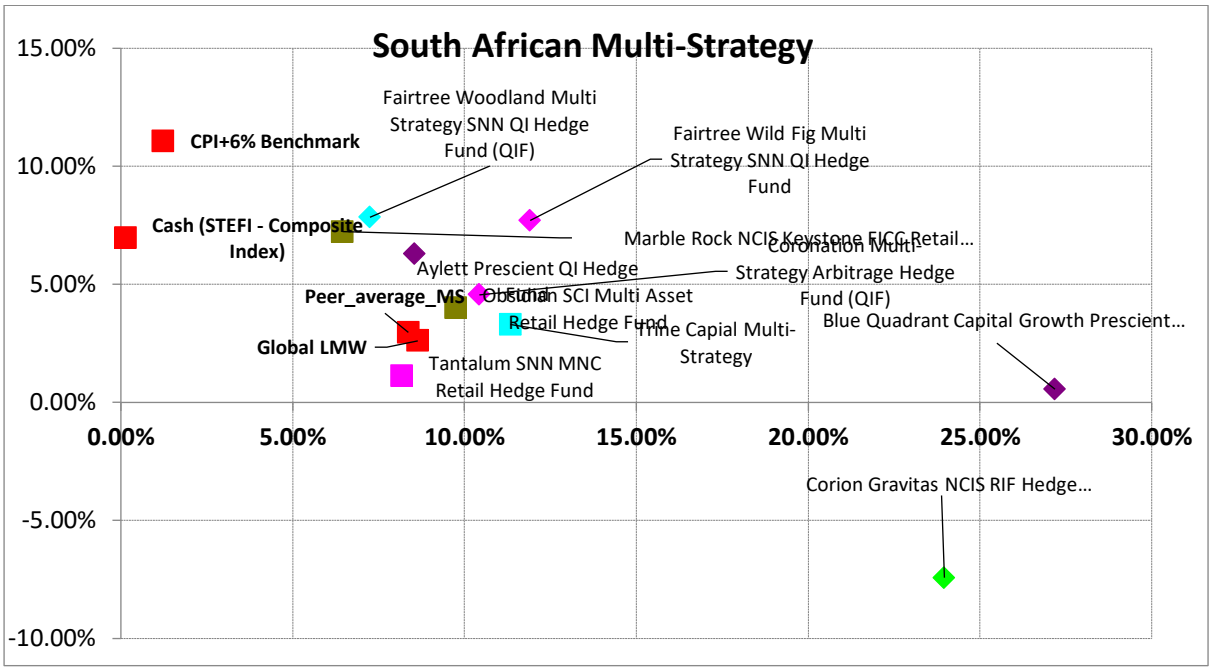
Hedge-Fund-of Funds	**Co-efficient**	**T-statistics**	**Correlation**
Mean Return	0.002489	1.0342	0.17022
Standard Deviation or Volatility	0.015476	11.0065	0.3028
Skewness	-2.009274	0.0572	0.5028
Kurtosis	10.54941	0.0837	0.6257
Correlation with Bond	0.219604	2.739919	0.112877
Correlation with Stock	0.344240	13.59340	0.757979

APPENDIX G: Binomial Test at 1% Significance Level

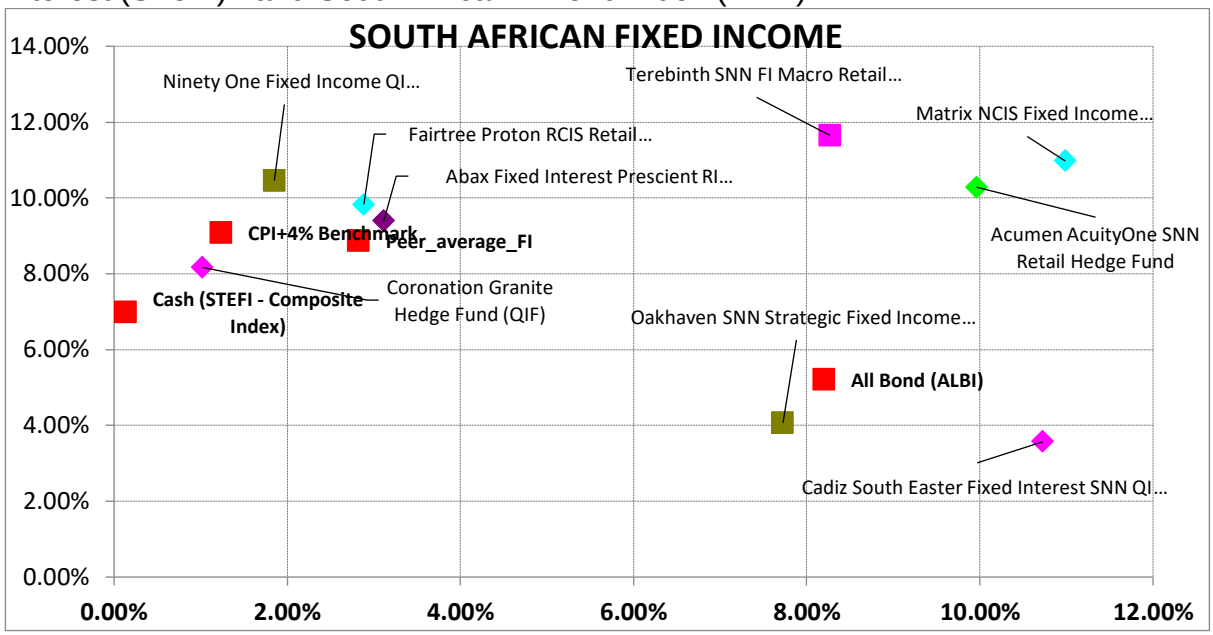
PERIOD	FUNDS SELECTION	HEDGE STRATEGIES				
		Long-Short Equity (LSEQ)	**Market-Neutral Equity (MNEQ)**	**Fixed-Income Arbitrage Strategy (FIAS)**	**Macro-Strategy Hedge Fund (MSHF)**	**Fund of Funds Hedge Fund (FFHF)**
	Total	24	9	9	10	20
One month	Signif. ↑ or ↓	5 (21%)	4 (44%)	4 (44%)	3 (33%)	7 (35%)
	Signif. ↑	3	1 (11%)	1(11%)	0 (0 %)	3 (15%)
	Signif. ↓	(12.5%)	3 (33%)	3 (33%)	3 (33%)	4 (20%)
		2 (8.3%)				
	Signif. ↑ or ↓		4 (44%)	4 (44%)	3 (33%)	12 (60%)
Three months	Signif. ↑	14 (58%)	2 (22%)	1 (11%)	0 (0 %)	5 (25%)
	Signif. ↓	7 (29%)	2 (22%)	3 (39%)	3 (33%)	7 (35%)
		7 (29%)				
	Signif. ↑ or ↓		8 (89%)	6 (66%)	2 (20%)	14 (70%)
	Signif. ↑	17 (71%)	3 (33%)	2(22%)	0 (0 %)	6 (30%)
Six months	Signif. ↓	8 (33%)	5 (56%)	4 (44%)	2(10%)	8 (40%)
		9 (38%)				
	Signif. ↑ or ↓		8 (89%)	8 (89%)	4 (40%)	17 (85%)
	Signif. ↑	21 (88%)	3 (33%)	2 (22%)	2 (20%)	8 (40%)
	Signif. ↓	8 (33%)	5 (56%)	6 (67%)	2 (20%)	9 (45%)
12 months		13 (54%)				

APPENDIX H a: Covers different hedge fund strategies performance against their benchmarks for period under review

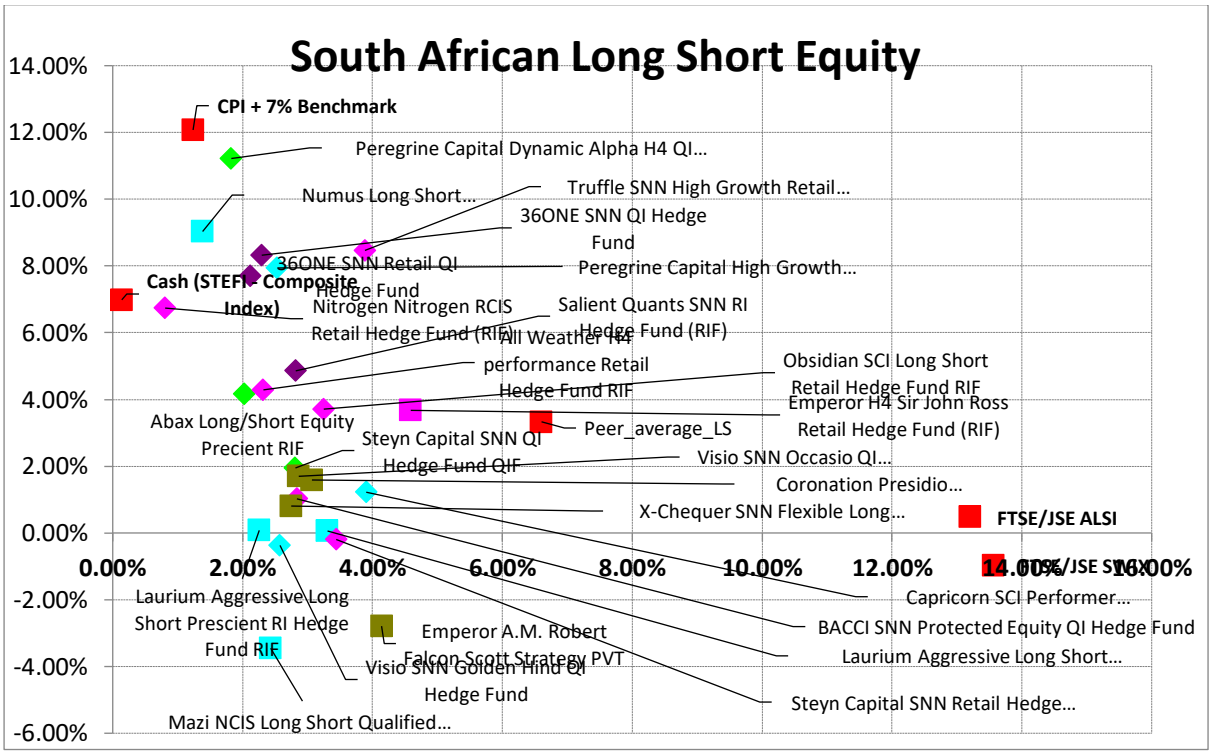
South African Multi-Strategy against Alexander Forbes Short Term Fixed Interest (STeFI), Alexander Forbes Global Large Manager Watch and Consumer Price Index plus 6%



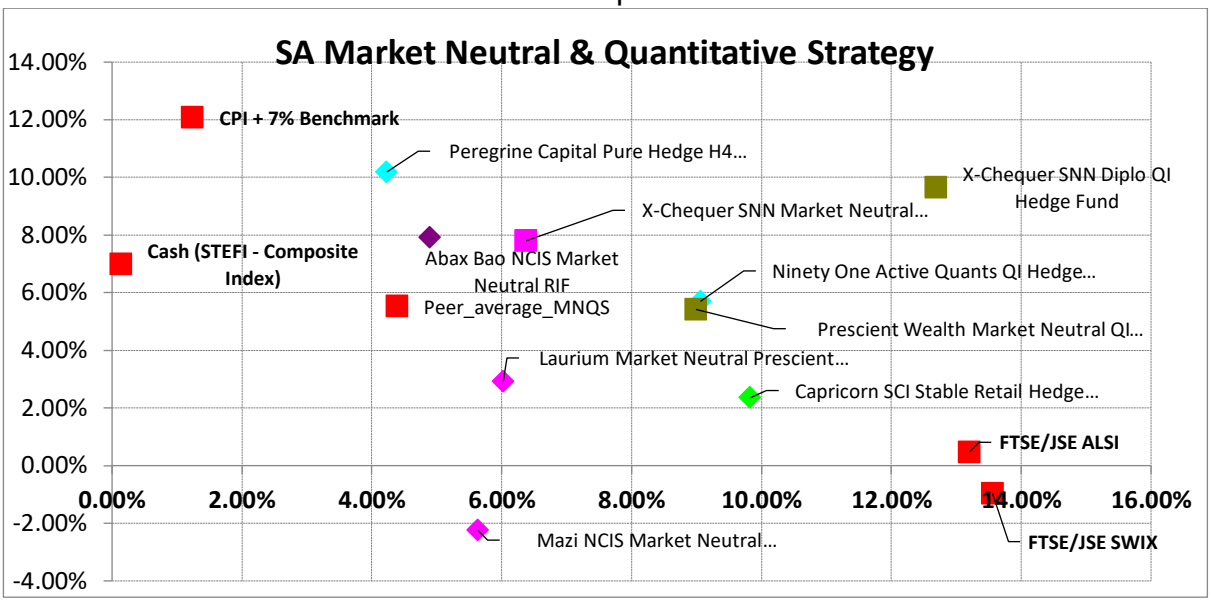
APPENDIX H b: Fixed Interest Strategy against Alexander Forbes Short Term Fixed Interest (STeFI) and South Africa All Bond Index (ALBI)



APPENDIX H c: South African Long Short Equity against Alexander Forbes Short Term Fixed Interest (STeFI), Shareholder Weighted Index (SWIX), JSE All Share Index and Consumer Price Index plus 7%



APPENDIX H d: SA Market Neutral and Quantitative Strategy against Alexander Forbes Short Term Fixed Interest (STeFI), Shareholder Weighted Index (SWIX), JSE All Share Index and Consumer Price Index plus 7%



APPENDIX H e: South African Hedge Fund of Funds against Alexander Forbes Short Term Fixed Interest (STeFI) and Consumer Price Index plus 6%