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Performance factors in the Hedge Fund Industry

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ABSTRACT

Alternative investments are a new but fast growing phenomenon in the South African market, hedge funds in particular were introduces to our market in the year 2000. Assets under management by hedge funds have enjoyed fast growth over the years relative to assets managed by mutual funds. Including hedge funds in an investment portfolio represents a unique proven opportunity for pension funds to protect their investments during bear markets.

Unfortunately only a limited number of investors outside the industry understand what factors drive returns in hedge fund strategies. The hedge fund industry is still a mystery to many investors who as a result have not been able to take advantage of absolute returns generated through investing in hedge funds.

This quantitative research aimed to determine which dominant factors drive strategy aggregate returns in the Hedge Fund Industry through correlation. It also aimed to analyse regression of these factors to returns on different strategies as well as among themselves. Lastly to develop models of hedge fund aggregate returns by equity strategy using the Arbitrage Pricing Theory (APT) model.

Results of the research show that the Mid Cap index is the primary driver of equity strategies selected in this research. The Long Short interest rates as the secondary driver, the Long Bias has the small cap index and global markets as the secondary driver, for the Market Neutral strategy has a short position in small caps as its secondary performance and resource indices are the secondary performance drivers for the Global Macro strategy.

DECLARATION

I declare that this research project is my own, unaided work. It is submitted in partial fulfilment of the requirements of the degree of Master of Business Administration for the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other university.

…….. Date: …….

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DEDICATION

To my beloved dad, Majalimane Rueben Mdhluli, and brother Sibusiso Sifiso Mdhluli, may your souls rest in peace.

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List of Abbreviations and Terms

JSE	Johannesburg Stock Exchange
ALSI	All Share Index
SWIX	Shareholder Weighted Index
Findi30	Financial and Industrial 30
Resi	Resources Index
MidCap	Medium Capitalisation Index
SmallCap	Small Capitalisation Index
Top40	Top 40 Stocks by Market Capitalisation
ALBI	All Bond Index
Cash	Cash Deposits
Resi20	Top 20 Resources Index
NC3MM	Long Dated Interest Rates
NC1YM	Short Dated Interest Rates
Indi25	Top 25 Industrial Index
Fini15	Top 15 Financial Index
BRSPOT	Brent Spot Price
FTWORU	FTSE All World Index
GOLR	Gold Spot Price
FCRB	Commodity Research Index
USGB10	USA 10 Year Government Bonds
PLAT	Platinum Index
EURZAR	Euro Rand Exchange Rate
USDZAR	United States Dollar Rand Exchange
Long Bonds	R157 maturing in 2015
Shape of **Yield** Curve	Coupon Paid as a Percentage of Capital
PCE_YOY_%	Private Credit Extension (Year on Year)
M3_YOY_%	Money Supply Percentage Year on Year

Chapter 1 Introduction to the Research Problem

1.1 Introduction

Since the early 1990's hedge funds have become an increasingly popular asset class in the alternative investments space. Malkiel and Saha (2005) estimate that the amount invested globally in hedge funds rose from $50 bln in 1990 to approximately $ 1 trillion by the end of 2004. They further add that market makers estimate that in 2004 alone hedge funds accounted for more than half of daily trade on the floor of the NYSE. Since the start of the bear market in stocks four years ago, Hedge Funds have been growing at a rate of 20% per year. A total of 8500 such funds controlled $1.0 trillion in 2004, the hedge fund market is expected to increase to $1.5 trillion by 2010 (Evans, Atkinson and Cho, 2005).

Hedge funds typically are organised as limited partnerships with the fund manager serving as a general partner and the investors serving as limited partners (Kidwell, Peterson, Blackwell and Whidbee, 2003). These partners make substantial personal investments into the fund. They take large risks on speculative strategies, such as leverage bets, program trading, swaps, and arbitrage. Hedge Fund managers are flexible in making investment decisions because of the lack of strict regulation in the industry (Liang, 1999).

Malkiel and Saha (2005) state that because hedge funds use substantial leverage, they play a far more important role in the global securities markets than the size of

their net assets indicate. Leverage has the effect of magnifying positions taken by hedge funds. Dor, Dynkin and Gould (2006) state that hedge funds play an increasingly important role in institutional portfolios as an alternative to investments in traditional asset classes.

Dor *et al*. (2006) add that hedge funds contend with minimal disclosure requirements as well as flexible mandates which allow the use of leverage, short selling derivatives and highly illiquid securities, these may present serious challenges for investors. These challenges include among others, correctly assessing risk and return characteristics, accurately measuring left-tail risk of funds with relatively short return histories provided by database compilers as well as comparing performances of funds within the same style.

Hedge Funds have traditionally been for the affluent investor. They have been known as investment vehicles restricted to sophisticated high net worth investors (Fung and Hsieh, 2009). In the US funds required that investors invest a minimum of $250K. Also a lockup period would be imposed to prevent early redemption (Liang, 1999). Innovative fund of funds, now allow investments of as little as $25000, compared with the previous minimum (Evans et al. 2005).

A well balanced and structured portfolio containing hedge funds can provide superior long-term returns with lower volatility than one without hedge funds. The inclusion of hedge funds in portfolios represents a unique proven opportunity for pension funds to protect their investments during bear markets (Gregoriou and Duffy, 2006). Investors have to do their fund selection carefully and examine issues like structure

of management, incentive fees, size of the fund as well as the number of managers involved in the fund if they want to invest in hedge funds.

1.2 Motivation for the Study

Only a limited number of people outside the industry understand what factors drive returns in hedge funds as well as how these factors relate to each other. The hedge fund industry is still considered mysterious by many (Anderson and Atlas, 2005). What adds to the mystic is the fact that the market for non traditional approaches to investing in markets like South Africa has only really taken off in the last three years (Cadiz, 2009). The researcher plans to clear some of the mysteries of hedge funds with this paper by determining multi-dominant factors that drive Hedge Fund Aggregate Returns as well as correlate the relationships of these factors with aggregate returns by strategy and among themselves.

Growth in allocations to alternative investments such as hedge funds, Private Equity and Venture Capital by private clients and institutions are expected to trend toward the higher allocation levels adopted by international investors. A minimum of 50% growth in Hedge Fund allocations in the foreseeable future is implied, currently 20% in developed countries and 2% in South Africa (Cadiz, 2009).

Ward & Muller (2005) state that a significant improvement in the efficient frontier can be achieved, if market constraints are relaxed. They explain that this is because of an expanded universe of securities which becomes available when these constraints

are relaxed, hedge funds have less restrictions. The efficient frontier considers a universe of risky investments and explores what might be an optimal portfolio based upon those possible returns of investments (Ramushu, 2005).

Edward & Liew (1999) report that the efficient frontier that they construct is expanded significantly when hedge funds are included in portfolios. The inclusion of hedge funds raises the portfolio's expected return (net of fees) by 200 basis points for a given level of risk (Abromowitz, 2007).

Gregorio and Duffy (2006) support the conclusion that a well balanced portfolio containing hedge funds can provide superior long-term returns with lower volatility than one without hedge funds. Hedge Funds are important source of absolute returns in the alternative investments market.

Assets under management by hedge funds have enjoyed faster growth over the past 10yrs relative to assets managed by mutual funds. Hedge Funds and mutual funds perform the same economic function, but hedge funds are largely unregulated while mutual funds are tightly regulated (Stulz, 2007).

1.3 Purpose of the Research

The purpose of the research is :

- The first is to determine which dominant factors drive strategy aggregate returns in the Hedge Fund Industry.

- The second is to assess the correlation/ regression of these factors to returns on different aggregate strategies as well as among themselves.
- Lastly develop a multifactor model of hedge fund returns by aggregate strategy using the APT model.

1.4 The South African Hedge Fund Industry

Assets under management in the industry increased to more than R31 bn as at end June 2008 (Novare, 2008), a huge jump from R2,1 bln in June 2003 when the Novare survey first came out. At the end of 2005, an estimated R9,5 billion was managed by South African hedge-funds. Assets under management had grown by 280% since 2000. These assets represented approximately 0,1% of the total global hedge-fund assets under management (Abromowitz, 2007). Assets under management in 2009 are estimated to be R27 bln as a result of the recent turmoil in the financial markets, and account for between 0.6 to 0.7% of global funds under management (FAnews, 2009).

1.4.1 Growth in the S.A. Hedge Fund Industry

Total assets under management in the South African hedge fund industry have continued to grow strongly despite the recent period of market turmoil. Kidwell *et al.* 2003) note that the hedge fund industry has been experiencing tremendous change and growth due to massive inflow of capital, new funds are being formed as a result.

"Growth has predominantly been spurred by increasing interest from the retirement funds, larger institutions and the broader acceptance that effectively constructed hedge fund portfolios should offer downside capital protection, relatively less volatility and diversification benefits" (Peregrine, 2007 p.3).

Abromowitz (2007) identifies the drivers of growth in the South African hedge fund industry to have mainly been:

- Ultra high net worth individuals seeking returns in alternative investments.
- Academics research on the performance mechanisms of hedge funds.
- The acceptance of alternative investments as a separate asset class.

1.4.2 Diversifying through Hedge Funds

Eleven hedge fund managers managed in excess of R1bn each across their single strategy hedge fund products, these managers comprised of 56% of total industry assets at June 2008 (Novare, 2008). Novare, (2008) further add that in South Africa 23% of hedge funds are equity market neutral, 42% are equity long short and 14% as multi strategy, which is made up of the two most common strategies. This provides evidence of a lack of diversity/ concentration of risk into just two investment approaches. Globally hedge fund managers diversify their risk into a number of strategies, explained below.

The reason why global hedge funds diversify the strategic portfolio allocation, is as to improve the prospective risk adjusted returns, thereby fulfilling the requirement to deliver high expected returns with controlled risk and minimized downside (Cadiz, 2009). Diversification is imperative when constructing a portfolio, it consists of spreading investments among different available assets or asset classes so as to reduce the overall risk of a portfolio construction and management (Lhabitant, 2002).

In a study conducted by Peregrine (2007), they found that through the use of bi-plots, a meaningful degree of diversification between hedge fund styles in the South African market is evident. The sources from which alpha is generated seem to have been slightly decoupled from the local indices tending to be associated with specific international drivers, but coupled with an obvious exposure to small-and mid-capitalisation shares.

There had been a remarkable acceptance of hedge fund strategies as a viable source of diversification in the design of mainstream asset allocation strategies. Hedge funds returns are superior and for that they charge relatively high fees, typically around 2% per annum plus 20% for any outperformance (Mazwana, 2007).

1.4.3 Scale of the industry

Hedge funds are one of the fastest growing sectors of the financial services industry or alternative-investments sector in the world (Lo, 2008). The number of South

African hedge funds has rapidly increased to 100 with funds estimated at R27bln (previously R31 bln) in 2009, due to the global credit crunch (Moneyweb, 2009).

Respondents to the Novare Survey (2008) indicated that the South African Hedge Fund industry has capacity to double funds under management to R68 bln in the next year. Also the same study revealed that just over 6% of participating hedge funds have a track record in excess of seven years with an estimated 38% of industry assets are managed by funds with track records spanning three to five years. If this industry doubles in funds under management to R68 bln, this industry will no longer be insignificant therefore investors ought to be aware of the factors that drive the absolute returns in hedge funds.

1.5 Recent Developments in the Hedge Fund Industry

The recent turmoil in financial markets has left equity markets with losses of about 40% while the hedge fund industry only fell 17%. In South Africa 90% of funds delivered positive growth (Moneyweb, 2009). Unfortunately as noted by Towle, (2006) academics do not agree on theoretical benefits of hedging, they also do not agree on any empirical evidence to suggest whether hedging in South Africa is beneficial or not.

There has been some consolidation in the hedge fund industry as a result of the credit crisis. During 2008 many South African hedge funds had to contend with significant outflows, initially as offshore investors looked for liquidity in markets with

favourable redemption terms (FAnews, 2009). Moneyweb (2009) estimates this out flow to be 10% of industry assets.

Falling equity prices prompted portfolio rebalancing exercises that led to further outflows. The credit crisis has increased the business risk of investors in these funds, smaller managers especially could find themselves with insufficient assets to maintain business stability (FAnews, 2009).

1.6 Regulation of the S.A. Hedge Fund Industry

Hedge Funds are investment funds, operated on a private basis and not regulated by the Financial Services Board in South Africa. They are not regulated because they employ investment strategies, that fall outside the current regulatory framework. Financial Services Board (2004). In most geographic regulatory jurisdictions hedge funds are either unregulated or lightly regulated. It is for this reason that only few investors take advantage of this lucrative industry.

Many investors shy away from this unregulated market as there are no procedures in place to ensure that their funds will be properly managed and that, currently investors have no recourse should their hedge fund investments be mismanaged (Betsalel, 2006).

Investors are expected to push for greater transparency and more regular performance updates from their fund managers. The South African hedge fund

industry has been characterised by a high degree of self-regulation, with minimum standards set by investors like fund of funds (FAnews, 2009).

Huge advances have been made towards regulating the South African hedge-fund market. From the Finance Minister's perspective a well regulated South African hedge fund industry would be critical in attracting foreign investment and the ministry therefore supports the introduction of the South African hedge-fund legislation (Abromowitz, 2007).

As of the beginning of 2008 managers had to apply for special category financial services provider licences from the Financial Services Board for the first time. The FSB also has specific solvency requirements for licensed financial services providers including that assets should exceed liabilities at all times (Novare, 2009). The industry is self regulated, with minimum standards set by investors like funds of funds. In adopting international best practice, domestic funds have tendered to make use of independent administrators, prime brokers and custodians like Peregrine Securities. A total of 88% of funds outsource services to administrators.

1.7 Disadvantages of hedge funds

Some of the main disadvantages of hedge funds as highlighted by Gregoriou (2003) are:

- Hedge Funds lack transparency.
- Hedge fund managers borrow money and shares to increase returns, by leveraging, this in turn increases the risk of the fund failing.

- Hedge funds experience borrowing risk.
- Some hedge funds offer the investor poor liquidity.
- Hedge funds have substantial key-person risk.
- The combination of a basic fee and performance-based fee results in investors' paying a high total fee and that may well exceed any value created over the long term.
- Legislation limits institutional and retail investors use of the hedge funds.
- The lack of explicit hedge-fund regulation leads to lack of protection of investors.
- Measurement of hedge-fund performance is not transparent.

1.8 Conclusion

Hedge Funds are still not well understood but are becoming a major source of absolute returns in the alternative investment space. Various authors have developed models to help predict hedge fund returns by replicating the Sharpe 1992 model using different Hedge Fund styles. Sharpe proposed an asset class factor model for performance attribution and style analysis of mutual fund managers. His model showed that only a limited number of major assets classes is required to successfully replicate the performance of an extensive universe of U.S. mutual funds (Fung and Hsieh,1997). Lack of stringent regulation and transparency are the biggest challenges faced by the industry, investors tend to shy away from industries faced with these challenges. Also hedge fund operations and performance are dependant on the manager as the key person. This then creates a huge key-person risk.

Chapter 2 LITERATURE REVIEW

2.1 Introduction to literature review

The purpose of literature review in research is to share with the readers the results of other studies that are similar to the research being currently conducted. Literature review provides a basis for establishing the importance of the study with other findings and also relates a study to the larger ongoing dialogue in the literature about a topic, clearing concepts and extending prior studies (Creswell, 2003). Understanding and prediction are two main purposes of theory, to predict the results we must have an explanation of why variables behave the way they do, theories provide these explanations (Zikmund, 2003).

Literature review helps summarize broad themes in the literature, the researcher can also use literature review to relate the problem under study. Literature review can also be used as a methodological review, in which the researcher dwells on methods and definitions (Creswell, 2003).

This study provides a literature of the empirical work and theory in the Hedge Fund industry, key variables that are influential in driving hedge fund strategy aggregate returns in global markets are identified from literature. In the South African market, key variables are also identified and tested against strategy aggregate returns. A correlation and regression analysis is conducted to assess the relationship between the (dependant variable) strategy aggregate returns and the (independent variable) which factors that drive strategy returns. A relationship amongst independent

variables is also assessed in relation to strategy aggregate returns. The researcher will design a best fit model of performance for each of the four equity investment aggregate strategies chosen in the South African hedge Fund market, these are:

- The Long-Short Strategy.
- The Long Bias Strategy.
- The Market Neutral Strategy.
- The Global (Trading) Macro Strategy.

2.2 The concept of Hedging

Almost everyone participates in hedging, immovable property owners hedge when they buy insurance for their properties, vehicle owners hedge by buying comprehensive insurance cover. By the same token you can acquire 'insurance' on a portfolio to provide some protection against an adverse event in the marketplace (Strong, 2002). "Hedging is the process whereby a financial instrument such as a derivative is bought or sold in order to offset (hedge) the risk that the price of another asset or security will rise or fall" (Marx, Mpofu and van der Venter, 2003, p.202).

2.3 What are Hedge Funds?

Hedge funds have become prevalent in the sophisticated world of alternative investments (Nicholas, 1999). 'Hedge funds were so named because of their

investment strategy aimed at systematically reducing the risk with respect to the direction of the market by pooling investments in the mix of short and long market positions' (Lhabitant, 2004, p.26). Lhabitant (2004) goes on to define hedge funds as privately organised, informally regulated and professionally managed pools of capital only available to the few. Hedge funds follow varying investment strategies that are adopted by other types of investment funds, this then poses a challenge in accurately defining them (Abromowitz, 2007).

'The term hedge fund, is said to have originated in 1949 when Alfred Winslow Jones combined a leveraged long stock position with a portfolio of short stock in an investment fund with an incentive fee structure' (Nicholas, 1999, p.26). The Financial Services Board (2004) states that if a fund exhibits either of the following two characteristics, then that fund should be defined as a Hedge Fund:

- Hedge Funds utilise some form of short asset exposure returns. (Short selling is the process of selling securities not owned by the seller.)
- Hedge Funds use leverage.

The main goal of a hedge fund is to provide consistent, above-market return while substantially reducing the risk of loss (Kidwell, Peterson, Blackwell and Whidbee, 2003).

2.4 Hedge Fund Performance

Hedge Funds are made up of investment pools that utilise a combination of analytical techniques and market philosophies to develop financial models that identify, evaluate and execute trading decisions (Kidwell *et al*. 2003). Hedge funds can leverage, trade derivatives and short stocks. They always try to beat a market average and seek positive returns even in down markets. Mutual funds, on the other hand are restrictive in the way they can invest. Hedge Funds use leverage that mutual funds cannot use, so the power of a certain sum of money is always magnified (Sussman, 2004).

According to Marx *et al*. (2003) performance entails evaluation of both the manager's market timing and security selection. Performance relative to risk, is the portfolio managers' ability to diversify the portfolio and thereby eliminate unsystematic risk. Performance is relative over time and to other portfolios, and is compared to benchmark market.

Hedge funds are renowned for producing stable returns irrespective of an equity bear or bull market (Novare, 2004). Investors buy an absolute performance fund like a hedge fund or sell on the premise their capital will be protected, irrespective of what happens in the market. Typically such funds will outperform more aggressive general equity unit trusts. As markets have been sold off, investors want the "security" offered by an absolute return funds rather than facing the prospect of the wide scale capital depreciation (Finweek, 2009). Hedge Funds align compensation with absolute performance, in mutual funds on the other hand compensation is tied

to performance against a benchmark, like S & P Index or assets under management (Finweek, 2009).

Maxam, Nikbakht, Petrova and Spieler (2006), found that monitoring, valuations and performance assessment of hedge funds is confounded by the paucity and inconsistency of available data. Hedge funds do not regularly report their performance and rarely divulge holdings. Grecu, Malkiel and Saha (2007) found that poor performance and failure are the main reason funds stop reporting to data gathering services like TASS. Others suggest that funds stop reporting because they do not need to attract new capital, that is because of success rather than failure. During the period 1995 -2000, new hedge funds appeared in the database at an average rate of 23 percent a year, while funds disappeared at a rate of 11 percent a year. The total reported amount of assets under management increased from $56 bln to $123 bln (Kao, 2002).

Accurate appraisal of hedge fund performance must recognize the freedom with which managers shift asset classes, strategies, and leverage in response to changing market conditions and arbitrage opportunities. The standard measure of performance is the abnormal return defined by a hedge fund's exposure to risk factors (Bollen and Whaley, 2009). Hedge Funds performance may also be influenced by sophisticated investors, and limited government oversight (Ackermann, McEnally, and Ravenscraft , 1999).

2.5 Performance/ Return drivers in Hedge Funds

Literature reviewed shows that in sophisticated global markets, hedge fund returns are driven by factors discussed below:

2.5.1 Risk

Hedging is a technique used to neutralise those unavoidable factors that threaten profit in a business, risk (Stephens, 2000). A hedge is a risk taken with the purpose of offsetting another risk.

'In the world of asset allocation, risk is divided into two components: Systematic risk and unsystematic risk. Systematic risk is the force to which all investments within a market are subject and which therefore must be borne by all investors. Unsystematic risk is confined to the peculiarities of an individual investment and may be diversified away' (Ramushu, 2005, p.18).

Systemic risk in hedge funds is used to describe the possibility of a series of correlated defaults among financial institutions that occurs over short period of time and is usually caused by a single major event (Lo, 2008). Agarwal and Naik (2004) conducted a study which showed that working with systematic risk exposures of hedge funds, recent performance appears significantly better than their long-run performance.

- Hedge Funds expose banking institutions to risk through proprietary trading activities, credit arrangement, structured products, and prime brokerage services.
- Risk facing hedge funds are nonlinear and more complex than those facing traditional asset classes. Hedge fund risk models require more sophisticated analytics because of the dynamic nature of hedge fund investment strategies and the impact of fund flows on leverage and performance (Lo, 2008).

Systematic risk factors contained in hedge fund returns include liquidity, volatility and left tail risk (Lo, 2008).

Hedge funds are not evaluated against a passive benchmark and can therefore follow more dynamic trading strategies. They can take short positions in securities, and therefore can bet on capitalization spreads or value-growth spreads. As a result hedge funds can offer exposure to risk factors that traditional long-only strategies cannot offer (Agarwal and Naik, 2004). The world of financial securities is a multifactor world consisting of different risk factors, each associated with its own factor risk premium, investors wishing to earn risk premium associated with different kinds of risk factors need to employ different kinds of investment strategies (Argarwal and Naik, 2004).

Hedge funds provide unique risk and return opportunities, both as stand-alone investments and as diversifiers, in traditional stock and bond portfolios (Gregoriou and Rouah, 2002). Over the past decade, pension funds have been allocating an increasing amount of their assets to alternative investments. Hedge funds provide

superior risk adjusted returns and low volatility, and show evidence of low correlation to traditional stock, bond and currency markets. Hedge funds have exhibited low volatility and superior performance during negative S&P 500 quarters.

Bacmann, Jeanneret and Scholz (2007) state that alternative risk factors partially integrate the dynamics of hedge fund strategies in their payoff structure. They have the effect of contributing significantly in explaining variations in hedge fund returns. These risk factors are therefore used as a proxy for the dynamics of hedge fund strategies. In their study to measure correlation between hedge fund returns and world equities Bacmann (2007) found that, correlations of hedge funds with traditional investments are driven by the dynamic components of alternative investment strategies. Measured correlation is biased by the ability of hedge funds to adjust to current market conditions.

The introduction of hedge funds in recent years has changed the risk/reward landscape of financial investments. The risk/ reward profile for most hedge funds differs from traditional investments, these differences then have significant implications for systematic risk (Chan, Getmansky, Hass and Lo, 2006). Kao (2002) confirms that market information implied by financial market asset pricing, such as volatility measures, can provide investors with timely and relevant risk.

Investors in hedge funds are faced with a massive risk of selecting dismally performing funds failing ones (Malkiel and Saha, 2005). It is for this reason that investors in hedge funds need to understand the risk return relationship presented by hedge fund strategies.

Before any hedge fund strategy can be decided upon or implemented, it is important to analyse the risk that needs to be hedged. It is the result of this analysis that will give guidance to the most appropriate hedging instrument and hedging strategy (Stephens , 2000). Alternative investments such as hedge funds can be profitable in both up and down markets but their most important feature is their non-sensitivity to the globalisation of stock and portfolios (Gregorio and Rouah, 2002).

2.5.2 Hedge Fund Investment Strategies

Hedge fund strategies depend on manager skills and investment opportunities available at the time, two factors that are not scalable (Lhabitant, 2002). Size is not a determinant of success in the hedge fund industry, unlike in traditional investment management.

Hedge Funds are classified by the types of strategies they implement. In emerging markets however hedge funds are defined by the markets they operate in and not the strategies they follow. Thus emerging market hedge funds are heterogeneous and are free to adopt a variety of strategies such as long/short, event driven, global macro and fixed income arbitrage.

Hedge-fund styles can be classified according to how funds manage the first or second order of the distribution of systematic risk factors. Hedge funds differ as to

whether they are taking “market directional” bets, that is whether they are taking systematic risk versus idiosyncratic risk (Kao, 2002).

Gregorio and Duffy (2006) state that within each hedge fund style, returns are determined by changes in the market environment and economic conditions, such as the adjustment of default spreads or the inherent volatility of a particular form strategy.

The following hedge fund investment strategies are implemented by hedge fund managers.

1. Tactical trading – Strategies that speculate on the direction of the market prices of currencies, commodities, equities and/or bonds on a systematic or discretionary basis. There are two types of tactical trading strategies, Global Macro Strategy and the Managed Futures Strategy (Lhabitant, 2004).

Hedge funds managers who participate in these strategies take long or short positions that reflect their speculative view on how macroeconomic factors, such as the level of international asset markets, interest rates and currencies will move (Abromowitz, 2007).

Global funds follow quite risky strategies which are compensated by relatively high mean returns. The focus of Global hedge funds is absolute returns and they often

have an opportunistic investment style with frequent use of leverage, and hence it is not quite volatile (Gregorio and Duffy, 2006).

2. **Equity Long Short** – Strategies that invest in equities, and combine long investments with short sales to reduce but not eliminate market exposure. Five types, Global Strategy, Regional Strategy, Sectorial Strategy, Emerging Market Strategy and Dedicated short bias Strategy (Lhabitant, 2004).

A short hedge is entered into to protect the value of an inventory. A short hedge is used by the owner of an equity to lock in the value of the inventory prior to the transferring of title to a buyer. A decline in prices generates profits in the equities market on the short hedge. A long hedge is entered into by an equities user (buyer) to fix acquisition costs, and in effect assure a certain profit margin (Kleinman, 2001).

In this strategy hedge funds purchase undervalued securities and sell short overvalued securities. Derivatives are also used by these funds in order to obtain long or short exposure required by the fund. A market neutral fund falls into this strategy, it is a type of long-short equity fund that holds long and short position in such that the fund is protected from market volatility (Abromowitz, 2007).

Market neutral funds have an average return of 14% per cent a year and a median Sharpe ratio of 0.86. Funds with this style tend to combine relatively low volatility with reasonable mean returns (Gregorio and Duffy, 2006). Gregorio and Neal (2006) found that sector funds have a median Sharpe ratio of 0.88, similar to the event-

driven and market neutral funds, but the mean return of sector funds is quite risky because sector funds focus on the volatile technology sector.

Kouwenberg (2003) found that emerging market funds are an outlier in the hedge fund universe. They had relatively poor returns in the period 1995-2000. The average return was 6.3 percent, combined with above average volatility of 30.4 per cent. Emerging market funds tend to pick stocks in developing countries that have suffered from market downturns. Kouwenberg (2003) found that hedge funds have significantly positives alphas on average, except for Emerging Markets funds. The non-normality of return distribution is most pronounced for Event-driven and Market Neutral funds, Emerging Market funds and Fund of Funds.

Gregorio and Rouah (2002) affirm that there are two inherent risks in multi manager hedge funds: style risk and manager skill. Style risk refers to the possibility of hedge fund not working in certain environments and conditions. For example 'market-neutral' strategies are typically neutral to the direction, but not to the volatility of markets.

3. **Event-Driven** – These strategies focus on debt, equity and trade claims from companies that are in a particular stage of their cycle, such as spin-offs, mergers and acquisitions, bankruptcy, re-capitalisation and share buybacks. Three types, Distressed Strategy, Risk Arbitrage and Event-driven multi-strategy (Lhabitant, 2004). "Event driven investing is a strategy that seeks to profit from price imbalances or fluctuations" (Kidwell *et al.*

2003, p.623). These hedge funds invest in companies where a corporate event has occurred or is expected to occur (Abromowitz, 2007).

There are very few successful event driven funds with Sharpe Ratios above 2. On average, funds with this style tend to combine relatively low volatility with reasonable mean returns (Gregorio and Duffy, 2006).

4. **Relative value arbitrage** – Relative value arbitrage strategies attempt to capitalise on relative discrepancies between related instruments, including equities, debt, options and futures. Made up of Convertible Arbitrage Strategy, Fixed income arbitrage Strategy and Equity market neutral Strategy (Lhabitant, 2004).

Relative value strategy hedge funds take positions in underlying securities that are underpriced or overpriced relative to one another in order to arbitrage the relative mis-pricings (Abromowitz, 2007).

5. **Others** – The fund of funds strategy allows investors to access and participate in a variety of strategies and gain diversification through a single investment. Multi-strategy funds on the other hand implement a variety of dynamic strategy allocations as market conditions change**.** Multi-strategy hedge funds as noted by Lo (2008) can exercise the flexibility to allocate capital among strategies falling within several traditional hedge fund disciplines.

Multi strategy hedge cannot be easily assigned to any traditional category and can easily respond to market opportunities. Also included in the multi strategy category are hedge funds employing unique strategies that do not fall under any of the other descriptions (Lo, 2008). Fund of funds have relatively low risk on average, similar to Event driven and market neutral funds (Kouwenberg, 2003).

Ammann and Moerth (2008) investigated the performance of fund of hedge funds. Their results indicated that larger funds of hedge funds display higher returns, lower deviations, higher Sharpe ratios, and higher alphas based on a multifactor model. They did not find evidence of performance persistence in fund of hedge funds returns.

Fung & Hsieh (1997) study shows that Hedge funds follow strategies that are significantly different from mutual funds, and support the claim that these strategies are very dynamic. Flexibility to choose among many asset classes and to employ dynamic trading strategies that frequently involve short sales, leverage and derivatives allow hedge funds to deliver absolute returns. Fung and Hsieh (2007) found that mutual funds are highly correlated with standard asset classes. In contrast hedge fund managers and commodity trading advisors generate returns that have low correlation to the returns of mutual funds and standard asset classes. Leverage has the effect of expanding small profit opportunities into larger ones but also expands small losses into larger losses (Chan *et al*. 2006).

The concept of 'style' should be thought of in two dimensions: location choice which refers to the asset classes used by managers to generate returns and trading strategy which refers to the direction (long/short) and quantity (leverage) applied to the assets to generate returns. (Fung and Hsieh, 1997).

2.5.3 Alpha

Hedge funds are a principal source of excess returns, or alpha. Alpha can be viewed as the measure of a portfolio's return that is attributable to the skill of the portfolio manager. A principal source of alpha for portable strategies has been the returns derived from long/short equity funds, long short strategies comprise the dominant strategies utilised by hedge funds. The alpha component of the hedge fund's return can be isolated through the introduction of further derivatives (Ali, 2005).

Kouwenberg (2003) in his paper considers the added value of an investment in hedge funds from the perspective of a passive investor. He found that hedge fund alphas are positive, even after correcting for the non-normality of the hedge fund return distribution. Over longer periods, however, the added value of the hedge funds is severely hampered by the large number of funds disappearing from the database. On average, no strong evidence is found that non-normality of hedge funds returns affects alphas. Brown *et al* on the other hand found some evidence of performance persistence based on alpha, mean return improves the chance of outperformance in the out-of-sample period, they attribute it to style differences

among classifications and conclude that there is a lack of managerial skill in the industry.

Gregorio and Duffy (2006) explain that Fung and Hsieh find no persistence in the hedge fund returns, suggesting that returns have no relation with managerial skill. They also affirm that Goldman Sachs and FRM also report that managerial skill has no relationship with performance, and that newly created hedge funds outperformed well-known hedge funds.

Kao (2002) found that equity market-neutral funds provided better and more consistent alphas for both the equity and bond asset classes than other funds. The strategy achieved high average active returns in all market conditions. Market neutral and arbitrage hedge funds appear to be better sources of excess returns than long-only portfolios. Kao (2002) continues to state that market neutral funds have a more attractive active risk-return profile than fixed-income arbitrage strategies. Equity market-neutral funds positive exposure to market risk enhanced their performance advantage over fixed- income arbitrage funds during equity bull markets. The strategy most closely aligned with pure-alpha play is the market-neutral strategy, followed by the long-short strategy and the trading macro hedge fund strategy. (Peregrine, 2007).

Gregoriou and Duffy (2006) discuss that Brown, Goetzmann and Ibbotson (1999) document 50 percent of hedge fund managers disappear within 30 months, while only 4 per cent had been in business for ten years. In their study, Gregoriou and Duffy (2006) found that the median survival of all hedge funds from 1990 to 2001 is

5.51 years using the ZCM database. According to BGP the probability of survival is affected by investment style, size beta, and style consistency.

Manager selection is critical when building a hedge fund portfolio, selecting managers with strong performance is more important with hedge fund managers than with traditional managers though still important, but less crucial is strategy allocation. The decision about which long short manager to invest in is likely to have a greater impact on portfolio performance than the decision about how much to allocate to equity long/short managers versus event driven managers. (Reddy, Brady and Patel, 2007).

2.5.4 Incentive Fees

A management fee is based on asset size. An incentive fee is established separately to align the manager's interest with the fund's performance and is usually paid after a the manager has achieved the hurdle rate (Liang, 1999). A majority of hedge funds also have "high watermark" provision, under which a manager is required to make up any previous losses before an incentive fee will be paid (i.e. cumulative returns have to be above the huddle rate). In some funds a manager could also owe investors a rebate of fees charged in previous years. These incentives give managers a motive to act in the interest of investors than in the case of the mutual funds. (Liang, 1999) Incentive fees explain some of the higher performance, but not the increased total risk in hedge funds (*Ackermann et al*.1999).

Edwards and Caglayan (2001) found significant differences in the magnitude of excess returns for different hedge fund investment style. They also found that incentive fees are positively related to performance. Also their study found evidence of performance persistence among both winning and losing hedge funds, although the evidence of persistence differs significantly with investment style. Their results are consistent with the view that manager skill may exist in hedge funds and that such skill may be a partial explanation for the impressive performance of hedge funds during the 1990s (Edwards and Caglayan, 2001).

2.5.4.(a) Performance Fees, Age and Size of the Fund

Gregoriou and Duffy (2006) determine that performance fees explain hedge fund performance, but they do not find a significant relationship between performance and age, size. Liang (1999) on the other hand observed a positive correlation with performance fees, fund assets, and lock-up periods, but negative with age of the fund. Fung and Hsieh (1997) further observe that four factors explain hedge fund returns: management fees, fund size, fund age and leverage. Hedge fund strategies have no correlation with downturns in the stock markets thereby minimizing downside risk.

The Van Hedge Global Fund Index shows that size is positively related to performance while Gregoriou and Rouah (2002) find that performance of hedge funds is not related to size. Agarwal and Naik (2004) determine that hedge fund size is influenced by past performance, but that larger size ultimately leads to inferior

performance. Gregoriou and Rouah (2002) found that there is little evidence to suggest that the size of a hedge fund impacts its performance.

2.5.4 (b) Management Fees

The fund manager has the goal of maximising his management fees by maximising the return on the fund, and winning a mandate for further years. Managers apply their skill to achieve these objectives. Skill in this context being described as the ability to transform risk into return (Dorey, Joubert and Vencatasawmy, 2005)

Hedge funds charge a management fee of 1-2% along with a performance fee of 20% on capital appreciation, funds of hedge funds on the other hand charge a management fee of 2 % and a performance fee of 10%. Most funds stipulate a high watermark on their performance fees which guarantees that in the event of poor performance, the fee will not be charged until prior losses are recouped.

Hurdle rates are meant to convey confidence to investors that their fund will experience high returns. One recent study suggests that among hedge funds in the Zurich Capital markets database, those with hurdle rates have outperformed those without. Top performing funds tend to set high standards that benefit investors, whereas underperforming funds tend to select their managers poorly in order to attract more clients and increase their asset base (Gregoriou *and Rouah, 2002).*

Gregoriou and Rouah (2002) also note that some multi-manager hedge funds also charge front loaded fees as well as management and performance fees. The unique fee structure and incentive-based compensation of hedge funds are important factors driving their performance.

Hedge funds are one of a number of new asset classes or strategies that have emerged providing potentially attractive opportunities in terms of risk diversification and return benefits. These strategies are being offered at a significant premium from a fee perspective because of the perception that these newer strategies offer unique opportunities for alpha generation (Mazwana, 2007). Hedge fund fee structures appear to be quite high (Brunel, 2007).

2.5.5. Leverage

Brunel (2007) states that most hedge funds strategies involve the use of some of leverage, explicitly in many so-called market neutral strategies and more implicitly in many long/short equity portfolios. Hedge funds leverage the portfolio to construct an exposure to the desired factors. They also argue that if the main source of value-add that hedge funds strategies provide is from leverage, then these strategies might not be all that attractive.

Gregoriou and Duffy (2006)'s citation of Amin and Kat, states that geared (leveraged) funds have higher attrition rates, and fund size is related to survival, with smaller funds dying more rapidly.

Evaluating understanding and analyzing the relationship between portfolio leverage and the performance of any individual hedge fund manager or hedge fund-type strategy are crucial to any due diligence process. It seems doubtful that systematic internal portfolio leverage combined with traditional long only investment strategies has a particularly high chance of producing returns that are competitive with those of hedge fund managers (Brunel, 2007).

2.5.6 Volatility

Accounting for forecasted next-period volatility generates portfolios with the best risk-return profile among all portfolios under construction. Most hedge fund indices exhibit time-varying volatility and volatility clustering. Switzer and Omelchak (2009) found that after accounting for transaction costs, out-of-sample results indicate that all dynamic hedge fund index portfolios largely outperform the S&P 500 Index, both on an expected return and risk-adjusted return basis.

Keunzi and Shi (2007) study identifies and explores the effectiveness of volatility factors that seem to provide explanations concerning the exposures of equity-related hedge fund managers. These exposures can be driven either be dynamic trading strategies that replicate the behaviour of options or by strategies involving the actual purchase and sale of options or other volatility-related instruments. He concluded that the choice of a volatility factor does in fact influence performance.

Hedge Funds are more volatile than both mutual funds and market indices. (Ackermann *et al*. 1999).

Hedge funds usually reduce their beta when market volatility increases. For the macro and managed futures strategies, an increase in the market volatility leads them to increase their beta. The volatility of macro-economic variables is related to market volatility and macro funds have more business opportunities when the macroeconomic variables are more volatile. Fund of funds on the other hand are very heterogeneous (Racicot and Theoret, 2007).

2.6 Replicating Hedge Fund Returns

Sharpe (1992) designed an asset class factor model for performance attribution and style analysis of mutual fund managers. Through his model Sharpe demonstrated that only a limited number of major asset classes were required to successfully replicate the performance of an extensive universe of U.S. mutual funds (Fung and Hsieh, 1997). Sharpe's model has since been adapted by many authors in attempts to design models that will replicate absolute returns achieved by alternative investors, at a fraction of the cost. The challenge of pursuing alpha in a hedge fund manager is driving the industry to consider cheaper compensation structures (Mazwana, 2007).

Fung and Hsieh (1997) in their study proposed the extension to Sharpe's (1992) model for analyzing investment management styles with the objective to have an

integrated framework for analyzing traditional managers with relative return targets, as well as alternative managers with absolute returns. Kao (2002) proposed a multifactor risk analysis framework in an attempt to help analyze hedge fund investment style and risk and return drift over time.

Hasanhodzic and Lo (2007) claim that all hedge funds do is expose the investor to an alternative beta and once that alternative beta has been stripped out of the hedge fund performances, the majority of hedge fund managers are probably no more skilful than traditional managers. This then leads us to the conclusion that hedge funds managers do not deserve high performance fees that they charge for their investment strategies, if their skills are overrated and if their hedge fund strategies can be replicated through less expensive methods of investments. There is a new breed of "synthetic" hedge funds that purports to deliver comparable returns after costs, to the hedge fund indices at a fraction of the cost." (Malkiel and Saha, 2005).

Kat (2007) states that in a drive to reduce costs and improve investor returns, as well as avoid the many disadvantages of hedge funds such as illiquidity and lack of transparency; the market has recently seen several innovations to replicate hedge fund index returns. He also reckons that hedge fund return replication entails generating hedge fund-like returns by mechanically trading asset classes. The major drive behind hedge fund replication is the realisation that the majority of hedge fund managers do not have enough skill justify fees they charge (Kat, 2007).

"Synthetic" hedge funds produce no fee alpha, also do not cost a fortune to run hence there is growing interest in hedge fund return replication as a cheaper option

to obtaining fund-like returns. Replication products solve a range of problems surrounding hedge funds investment, they offer improved liquidity, transparency and capacity (Kat, 2007)

Keunzi and Shi (2007) argue that anyone can easily implement a replication portfolio using exchange-traded instruments, which make any results extraordinarily useful in the context of synthetic replication and risk management.

Kouwenberg (2003) on the contrary argues that most investors will have difficulty replicating a hedge fund strategy if it involves short selling positions, leverage and large positions in the OTC (over the counter) derivative markets. Long only managers in the traditional space have additional restrictions on their investment policies. They often have to track a predefined benchmark closely as per their mandates. He adds that non-linear factor models as well as models with dynamic trading strategies might not be suited to measure performance of a hedge fund from the point of a constrained investor, such as a pension fund.

Mazwana (2007) argues that in a hedge fund employing long-short equity strategy, the fund manager will go long smaller cap under researched shares and sell short over researched more liquid large caps. This process is then repeated across a diversified portfolio of holdings. He goes on to affirm that William Short argues that you can replicate this exact strategy by buying Russell 2000 futures and selling S&P 500 futures, an exercise which effectively costs very little. What stood out of Short's study was that not all strategies are replicable, the presence of beta is pronounced in some strategies more than in others.

2.7 AFRICAN STOCK MARKETS

The researcher discussed above factors that drive hedge fund performance in global hedge fund markets as viewed by academic literature. However in less sophisticated markets like Africa and more importantly South Africa, hedge fund performance is more aligned to Equity Markets performance, which in turn is driven by macro-economic as well as commodity price factors.

The characteristics of African markets in general are restrictive to so many of the hedge fund strategies implemented abroad. Our markets are small in size relative to global markets, illiquid and do not offer as much corporate activity as developed markets. It is for this reason that we cannot compare variables that drive the hedge fund returns discussed above, directly with drivers of performance in African markets. The researcher will develop a model of South African Hedge fund returns by stategy, using variables that drive the South African equities market.

African countries have made dynamic efforts to become full participants in the global economy. Seventeen stock exchanges across the continent were established in the past two decades. Equity flows to Africa doubled in the years between 2004 and 2008 to USD 7 billion per year, representing a further symbol of growing international confidence in the continent's growth potential. Most African stock markets are still small and unsophisticated, but growing. Egypt, returned nearly 2000% in the period 2002-2008, making it the best performing global equity market for the period (Guller and Ruttmann, 2009). African market capitalisation is dominated by its four biggest markets, namely South Africa at 60% market share of the total USD 312 billion,

followed by Egypt at USD 83 billion, third is Morocco at USD 64 billion and Nigeria at USD 40 billion, the remainder of USD 40 billion (9%) is shared by the remainder of 13 countries. South Africa and Egypt together make up nearly 75% of the entire continents current market capitalisation, which makes them the two largest, most liquid equity markets on the continent (Guller and Ruttmann, 2009).

Most African markets exhibit high risk, high return, low liquidity and risk of violent currency movements. However these risks are compensated by excessive returns relative to typical emerging market indices. In this context it is interesting to note that African indices typically tend to track the development of commodities prices quite closely. A synthesized index of African markets quite closely fits the development of both oils and metals prices (Guller and Ruttmann, 2009).

2.8 THE SOUTH AFRICAN STOCK MARKET

The South African Stock Market (JSE) was formally established on the 8th November 1887 to accommodate a rapidly developing gold mining industry. In 2005, it was demutualised and incorporated as JSE Ltd. In June 2006 the JSE was listed on its own exchange. The JSE remains the only equities exchange in South Africa and is licensed to operate as a securities exchange in terms of the Securities Services Act. Under this act the JSE is responsible for approving all listings, regulating trading functions as well giving authority to users. The JSE also monitors and regulates the conduct aimed at protecting the integrity of the markets and investors interest (Investment Focus, 2007/2008).

Trading, clearing and settlement services for the equities market, the financial and agricultural derivatives markets and the interest rate products market, are all services operated by the JSE. The JSE is supervised and licensed as a self regulatory organisation by the Registrar of Securities Services under the Securities Services Act.

The JSE, is the 17th largest exchange in the world by market capitalisation (Mokoena, 2008). At the end of 2006, as a percentage of GDP the South African equity market capitalisation was the 2nd highest of the top 50 countries by equity market capitalisation. This value demonstrates the importance of equity finance to the capital markets of South Africa (Marais, 2008).

South African Equities are a very good example of where value is available for the global investor and prospective returns are likely to reward rather than disappoint investors. South African earnings have consistently surprised on the upside, the local environment of strong commodity prices, rising infrastructure spend and ongoing consumer spending is very supportive of substantial margins (Quinn, 2007).

Lamba and Otchere (2001) state that the South African equity market has been influenced by developed markets, except Japan since the end of Apartheid and that this signals the high levels of the South African economical and financial markets.

Samouillhan and Shannon (2008) state that the behaviour of certain key variables, such as the interest rate, the exchange rate and the gold price, are some of the factors widely viewed as being influential to price determination on the JSE.

According to Samouilhan and Shannon (2008), positive correlation exists between the JSE domestic market returns and international market returns as well as domestic market volatility and international market volatility. The literature also goes on to state that, foreign markets cannot be used as a signal of future JSE behaviour, since the return and volatility positive associations with foreign markets were found to exist principally during the same concurrent trading period.

2.9 Variable selection process

The researcher will test the correlation of variables that drive the equities market to Equity hedge Fund Strategies. A logical fundamental reasoning will be used as a basis for selecting variable for each strategy.

Equity Market Index variables will be used across the Long Short, Long Bias, Market Neutral and the Global Macro Strategies. The reason for using these indices is that our research covers only Equity Hedge Fund Strategies.

Equity market variables that are common to all Equity strategies:

ALSI	FINDI 30	MID CAP	Top 40	INDI 25
SWIX	RESI	Small Cap	Resi 20	FINI 15

Other variables that will be common to all strategies are Macro Economic variables because they affect equities markets in general. These are Inflation, Shape of the Yield Curve, Retail Sales, PCE YOY%, M3 YOY%, Trade Balance) Commodities and resources (GOLR, PLAT, BRSPOT) as well will also be common because the South African economy is a commodity/ resources based economy. Interest rates, the NC3MM and the NC1YM as well because hedge funds use collateral (leverage) to buy stocks on credit.

Currency exposure in hedge fund aggregate strategy returns is represented by the EURZAR and the USDZAR. International exposures will come from Global Markets, FCRB, USGB10 and FTWORU.

Lastly, bonds are represented by the ALBI and Long Bonds. Cash is also used by some hedge funds.

Variable selecting for the model is a trial and error process. The trick is to look at the fundamentals of the strategy and decide if it has exposure to variety of variables.

The Long Short Strategy

These funds take long positions in selective stocks and go short on the stocks they anticipate will fall in price. The aim is to limit exposure to the equity market.

The Long Bias Strategy

This strategy works similar to the long short, but takes net long positions.

The Market Neutral Strategy

In this category funds bet relative price movements using the long short strategy, stock index arbitrage, convertible bond arbitrage and fixed income arbitrage.

The Global Macro Strategy

In this strategy, fund managers will invest in global indices of markets outside their country of origin. They will select stocks and bonds with no specific strategy preference. Funds that specialise on emerging markets operate under this strategy.

2.10 Academic Theories to explain Asset Pricing

2.10.1 Hedge Funds and the Efficient Market Hypotheses

The EMH, is the idea that market prices incorporate all information rationally and instantaneously. The EMH can be traced back to Paul Samuelson (1965). In an information efficient market price changes must be unforecastable if they are properly anticipated, ie if they fully incorporate the information and expectations of all market participants. The EMH is relevant for the hedge fund industry because the

primary attraction of the hedge funds is higher expected returns. If the EMH is true, then it should not be possible to generate higher returns after adjusting for risk (Lo, 2008).

Bodie, Kane and Marcus (2009) define the EMH as the notion that stocks already reflect all available information. They differentiate between three versions of EMH. (1) The weak-form hypothesis states that stock prices already reflect all information that can be derived by examining market trading data such historical prices, trading volume or short selling interest. (2) The semi-strong form hypothesis states that all publicly available information regarding the prospects of a firm must be reflected already in the stock price. In addition to historical prices, fundamental data on the firm's product line, quality of management, balance sheet composition, patents held, earning forecasts, and accounting practices are already in the price. (3) The strong-form version of the EMH states that stock prices reflect all information relevant to the firm, even including privileged information only available to company insiders.

"The market is competitive enough that only differentially superior information or insight will earn money, the easy pickings have been picked' (Bodie *et al*. 2009, p.375).

2.10.2 Factor Models CAPM and APT

'Factor models are tools that allow us to describe and quantify the different factors that affect the rate of return on a security during any time period' (Bodie *et al*. 2009,

p.320). Uncertainty in asset returns has two sources : macroeconomic factors and firm-specific events. Returns in the market reflect both macro factors as well average sensitivity of firms to those factors. A single-index regression, imposes an incorrect assumption that each stock has the same relative sensitivity to each risk factor (Bodie *et al*. 2009).

Multifactor models on the other hand are a better description of security returns. 'If stocks differ in their betas relative to the various macroeconomic factors, then lumping all systematic sources of risk into one variable such as return on the market index will ignore the nuances that better explain individual-stock returns' (Bodie *et al.* 2009, p.321). They go on to state that security pricing models give us a simple way to measure our exposure to various macroeconomic risks and construct portfolios to hedge those risks. Factor betas provide a foundation for hedging strategies.

Joubert (2005) conducted a study whose findings support the view that profits from a hedge fund, over and above the short-term interest rate, depend on the existence of a gap between the risk free return implied in share returns, after adjusting for systematic risk, and the short term interest rate.

The form of a single factor model:

$$r_i = E(r_i) + \beta_i F + e_i$$

A multifactor model :

$$E(r_Q) = \beta_{p1}E(r_1) + \beta_{p2}E(r_2) + (1-\beta_{p1} - \beta_{p2})\, r_f$$

The APT model has been developed as an alternative to the CAPM. The CAPM has been a useful model for explaining the pricing of risky assets. However its assumptions have been criticised on several grounds (Arthur, Colin, Carter and Abizadeh, 1988).

The capital asset pricing model is an economic model for valuing stocks, securities, derivatives and assets by relating risk and expected return. CAPM measures the additional risk premium if investors are to accept for additional risk. The CAPM model says that this expected return that these investors would demand is equal to the rate on a risk-free rate security plus a risk premium. The model further purports that if the expected return cancels, investors will refuse to invest and the investment should not be undertaken (Value Based Management, 2009).

The CAPM asserts that securities will be priced to give investors an expected return comprised of two components: the risk-free rate, which is compensation for the time value of money and the risk premium determined by multiplying a benchmark risk premium (Bodie *et al*. 2009).

CAPM – The general form

$$E(r_i) = r_f + \ddot{y}_i\, [E(r_{m)} - r_f)]$$

Where :

$E(r_i)$ is the expected return of a security.

r_f is the rate of a 'risk-free' investment

r_m is the return rate of the appropriate asset class

Beta ($ÿ_i$) is the overall risk in investing in a large market, like the JSE and it equals 1. Each company also has a Beta. A company's Beta is that company's risk compared to the Beta (Risk) of the overall market. Beta measures the volatility of the security, relative to the asset class (Value Based management, 2009).

The APT model is used to analyse the relationship between risk and return for assets. In their study, Arthur *et al.* (1988) found that the arbitrage theory results support previous capital asset pricing model findings that the estimated risk associated with agricultural assets is low. This finding is more robust for the arbitrage pricing theory application because it provides a better explanation of the relation between risk and return than does the capital asset pricing model.

The APT model requires less restrictive assumptions than the CAPM. The APT model developed by Ross in 1976 is gradually replacing the CAPM as a model of asset pricing. APT concurs with the fundamentals behind the CAPM, namely, the co-variability of an asset's return with the returns of other assets is important to a risk-averse investor with diversified portfolio. The APT model can be utilised to provide evidence on the relationship between risk and return for assets. CAPM ascribes the common variation to a single factor, with an associated quantity called

beta, (ÿ), which generates returns for each asset via a linear relationship (Arthur *et al*. 1988).

Multifactor models like the APT model give us a much richer way to think about risk exposures and compensation for those exposures that the single-index model-like the CAPM. The APT model yields an expected return-beta relationship using a well diversified portfolio that practically can be constructed from a large number of securities (Bodie *et al*. 2009).

2.11 Conclusion

The differences in hedge fund return drivers make it difficult for the researcher to compare hedge fund performance strategy returns in South Africa with Global markets. Factors that drive returns in Global hedge funds as discussed in section 2.5 above are only relevant for developed markets. South African market characteristics do not allow for some of the hedge fund strategies to be implemented. Our hedge fund industry looks to the equities market for returns. We also saw through arguments in section 2.8 above that the equities market in South Africa is driven by factors Interest rates, Exchange Rates, the Gold Price, International markets, Domestic market and Volatility measures. In constructing the multifactor models of performance for hedge fund strategies, the researcher will implement the APT model using a variety of factors to assess the model that best defines returns by South African popular strategy.

Chapter 3 Hypotheses

The researcher selected four equity strategies that are implemented by South African Hedge Fund Industry managers. The aim of the this research is to run statistical models using aggregates achieved by hedge fund and variables relevant for each strategy implementation to assess correlation and regression as well as decide on a model of returns for each hedge fund strategy aggregate. As discussed in Chapter 2, our market characteristics are not conducive for most of the global strategies.

The research questions for this study are as follows:

a. Which independent variables (factors) are significant drivers of aggregate returns in different Hedge Fund Strategies? (Correlation).

b. How do these variables relate amongst themselves in driving or explaining aggregate Hedge Fund Strategy returns? (Regression).

c. What is the best fit model of returns for each of the four strategies selected?

Strategy aggregate returns are our dependent variables. Aggregate returns depend on market variables (independent variables) as driving factors of performance. In this study we aim to test the factors that drive returns (independent variables) in relation to strategy aggregate return.

3.1 Hypotheses relating to the Long-Short Strategy

3.1.1 Correlation Analysis Hypothesis 1

The null hypothesis (H_o) states that there is no correlation between the selected variables and Hedge Fund returns in the Long-Short Strategy.

The alternative hypothesis (H_1) states the there is a correlation between the selected variables and Hedge Funds returns in the Long-Short Strategy.

Stated differently: $H_o: b_1 = 0$ $H_1: b_1 \neq 0$

H_o : ALSI, SWIX, FINDI30, MidCap, SmallCap, Top40, ALBI, NC3MM, NC1YM, FINI15, FTWORU, GOLR, EURZAR, UDSZAR, Global Markets, Inflation, Retail SalesYOY% and INDI25 = 0

H_o : ALSI, SWIX, FINDI30, MidCap, SmallCap, Top40, ALBI, NC3MM, NC1YM, FINI15, FTWORU, GOLR, EURZAR, UDSZAR, Global Markets, Inflation, Retail SalesYOY% and INDI25 ≠ 0

3.1.2 Regression Analysis Hypothesis 2

$H_o = R_e = r + \ddot{y}_1 ALSI + \ddot{y}_2 SWIX + \ddot{y}_3 FINDI\ 30 + \ddot{y}_4 MidCap + \ddot{y}_5 Small\ Cap + \ddot{y}_6 Top\ 40 + \ddot{y}_7 ALBI + \ddot{y}_8 NC3MM + \ddot{y}_9 NC1YM + \ddot{y}_{10} FINI15 + \ddot{y}_{11} FTWORU + \ddot{y}_{12} GOLR +$

ÿ$_{13}$EURZAR + ÿ$_{14}$UDSZAR + ÿ$_{15}$Global Markets + ÿ$_{16}$Inflation + ÿ$_{17}$Retail SalesYOY% + ÿ$_{18}$INDI25 = 0

H$_1$ ÿ R_e = r +ÿ$_1$ALSI + ÿ$_2$SWIX + ÿ$_3$FINDI 30+ ÿ$_4$MidCap + ÿ$_5$SmallCap + ÿ$_6$Top 40 + ÿ$_7$ALBI + ÿ$_8$NC3MM+ ÿ$_9$NC1YM + ÿ$_{10}$FINI15 + ÿ$_{11}$FTWORU + ÿ$_{12}$GOLR + ÿ$_{13}$EURZAR + ÿ$_{14}$UDSZAR + ÿ$_{15}$Global Markets + ÿ$_{16}$Inflation + ÿ$_{17}$Retail SalesYOY% + ÿ$_{18}$INDI25 = 0

3.2 Hypotheses relating to the Long Bias Strategy

3.2.1 Correlation Hypothesis 3

The null hypothesis (H_o) states that there is no correlation between various variables and Hedge Fund returns in the Long Bias Strategy.

The alternative hypothesis (H_1) states the there is a correlation between various variables and Hedge Funds returns in the Long Bias Strategy.

Stated differently: *H_o: $b_1 = 0$* *H_1: b_1 ÿ 0*

H_o: ALSI, SWIX, FINDI30, RESI, MidCap, SmallCap, Top 40, ALBI, CASH, RESI20, NC3MM, NC1YM, INDI25, FINI15, FTWORU, EURZAR, USDZAR, Global Markets, Inflation, Shape of the Yield Curve and Retail Sales YOY% = 0

H_o: ALSI, SWIX, FINDI30, RESI, MidCap, SmallCap, Top 40, ALBI, CASH, RESI20, NC3MM, NC1YM, INDI25, FINI15, FTWORU, EURZAR, USDZAR, Global Markets, Inflation, Shape of the Yield Curve and Retail Sales YOY% ÿ 0

3.2.2 Regression Analysis Hypothesis 4

$H_o = R_e = r + ÿ_1ALSI + ÿ_2SWIX + ÿ_3FINDI\ 30 + ÿ_4RESI + ÿ_5MidCap + ÿ_6Small\ Cap + ÿ_7Top\ 40 + ÿ_8ALBI + ÿ_9\ CASH + ÿ_{10}RESI20 + ÿ_{11}NC3MM + ÿ_{12}NC1YM + ÿ_{13}INDI25 + ÿ_{14}FINI15 + ÿ_{15}FTWORU + ÿ_{16}EURZAR + ÿ_{17}USDZAR + ÿ_{18}GlobalMarkets + ÿ_{19}Inflation + ÿ_{20}Shape\ of\ the\ Yield\ Curve + ÿ_{21}Retail\ Sales\ YOY\% = 0$

$Ho\ ÿ\ R_{e} = r + ÿ_1ALSI + ÿ_2SWIX + ÿ_3FINDI\ 30 + ÿ_4RESI + ÿ_5MidCap + ÿ_6Small\ Cap + ÿ_7Top\ 40 + ÿ_8ALBI + ÿ_9\ CASH + ÿ_{10}RESI20 + ÿ_{11}NC3MM + ÿ_{12}NC1YM + ÿ_{13}INDI25 + ÿ_{14}FINI15 + ÿ_{15}FTWORU + ÿ_{16}EURZAR + ÿ_{17}USDZAR + ÿ_{18}GlobalMarkets + ÿ_{19}Inflation + ÿ_{20}Shape\ of\ the\ Yield\ Curve + ÿ_{21}Retail\ Sales\ YOY\% = 0$

3.3 Hypotheses relating to the Market Neutral Strategy

3.3.1 Correlation Hypothesis 5

The null hypothesis (H_o) states that there is no correlation between the various variables and Hedge Fund returns in the Market Neutral Strategy

The alternative hypothesis (H_1) states the there is a correlation between the various variables and Hedge Funds returns in the Market Neutral Strategy.

Stated differently: $H_o: b_1 = 0$ $H_1: b_1 \neq 0$

H_o : ALSI, SWIX, FINDI 30, RESI, Mid Cap, Small Cap, Top 40, ALBI, CASH, RESI20, NC3MM, NC1YM, INDI 25, FINI 15, BRSPOT, FTWORU, GOLR, FCRB, USGB10, PLAT, EURZAR, UDSZAR, Global Markets, Long Bonds, Inflation, Shape of the Yield Curve, Retail Sales, PCE%, M3YOY% and Trade Balance Rbln = 0

H_o : ALSI, SWIX, FINDI 30, RESI, Mid Cap, Small Cap, Top 40, ALBI, CASH, RESI20, NC3MM, NC1YM, INDI25, FINI15, BRSPOT, FTWORU, GOLR, FCRB, USGB10, PLAT, EURZAR, UDSZAR, Global Markets, Long Bonds, Inflation, Shape of the Yield Curve, Retail Sales, PCE%, M3YOY% and Trade Balance Rbln ≠ 0

3.3.2 Regression Hypothesis 6

$H_o = R_e = r + \beta_1 ALSI + \beta_2 SWIX + \beta_3 FINDI\ 30 + \beta_4 RESI + \beta_5 MidCap + \beta_6 Small\ Cap + \beta_7 Top\ 40 + \beta_8 ALBI + \beta_9 CASH + \beta_{10} RESI20 + \beta_{11} NC3MM + \beta_{12} NC1YM + \beta_{13} INDI25 + \beta_{14} FINI15 + \beta_{15} BRSPOT + \beta_{16} FTWORU + \beta_{17} GOLR + \beta_{18} FCRB + \beta_{19} USGB10 + \beta_{20} PLAT + \beta_{21} EURZAR + \beta_{22} UDSZAR + \beta_{23} Global\ Markets + \beta_{24} Long\ Bonds + \beta_{25} Inflation + \beta_{26} Shape\ of\ the\ Yield\ Curve + \beta_{27} Retail\ Sales + \beta_{28} PCE\% + \beta_{29} M3YOY\% + \beta_{30} Trade\ Balance\ Rbln = 0$

H_o ÿ R_e = r +ÿ$_1$ALSI + ÿ$_2$SWIX + ÿ$_3$FINDI 30+ ÿ$_4$RESI+ ÿ$_5$MidCap + ÿ$_6$Small Cap + ÿ$_7$Top 40 + ÿ$_8$ALBI + ÿ$_9$ CASH+ ÿ$_{10}$RESI20 + ÿ$_{11}$NC3MM + ÿ$_{12}$NC1YM + ÿ$_{13}$INDI25 + ÿ$_{14}$FINI15 + ÿ$_{15}$BRSPOT + ÿ$_{16}$FTWORU + ÿ$_{17}$GOLR + ÿ$_{18}$FCRB + ÿ$_{19}$USGB10 + ÿ$_{20}$PLAT + ÿ$_{21}$EURZAR + ÿ$_{22}$UDSZAR + ÿ$_{23}$Global Markets + ÿ$_{24}$Long Bonds + ÿ$_{25}$Inflation + ÿ$_{26}$Shape of the Yield Curve + ÿ$_{27}$Retail Sales + ÿ$_{28}$PCE% + ÿ$_{29}$M3YOY% + ÿ$_{30}$Trade Balance Rbln = 0

3.4 Hypotheses relating to the Global Macro Strategy

3.4.1 Correlation Hypothesis 7

The null hypothesis (H_o) states that there is no correlation between various variables and Hedge Fund returns in the Global Macro Strategy

The alternative hypothesis (H_1) states the there is a correlation between the various variables and Hedge Funds returns in the Global Macro Strategy.

Stated differently: H_o: $b_1 = 0$ H_1: b_1 ÿ 0

H_o : ALSI, SWIX, FINDI30, RESI, MidCap, SmallCap, Top 40, ALBI, CASH, RESI20 NC3MM, NC1YM, INDI25, FINI15, BRSPOT, FTWORU, GOLR, FCRB, USGB10, PLAT, EURZAR, UDSZAR, Global Markets, Long Bonds, Inflation, Shape of the Yield Curve, Retail Sales YOY%, PCE%, M3YOY% and Trade Balance Rbln = 0

H_o: ALSI, SWIX, FINDI30, RESI, Mid Cap, Small Cap, Top 40, ALBI, CASH, RESI20 NC3MM, NC1YM, INDI25, FINI15, BRSPOT, FTWORU, GOLR, FCRB, USGB10, PLAT, EURZAR, UDSZAR, Global Markets, Long Bonds, Inflation, Shape of the Yield Curve, Retail Sales YOY%, PCE%, M3YOY% and Trade Balance Rbln ÿ 0

3.4.2 Regression Hypothesis 8

$H_o = R_e$ = r +ÿ$_1$ALSI + ÿ$_2$SWIX + ÿ$_3$FINDI 30+ ÿ$_4$RESI+ ÿ$_5$MidCap + ÿ$_6$Small Cap + ÿ$_7$Top 40 + ÿ$_8$ALBI + ÿ$_9$ CASH+ ÿ$_{10}$RESI20 + ÿ$_{11}$NC3MM + ÿ$_{12}$NC1YM + ÿ$_{13}$INDI25 + ÿ$_{14}$FINI15 + ÿ$_{15}$BRSPOT + ÿ$_{16}$FTWORU + ÿ$_{17}$GOLR + ÿ$_{18}$FCRB + ÿ$_{19}$USGB10 + ÿ$_{20}$PLAT + ÿ$_{21}$EURZAR + ÿ$_{22}$UDSZAR + ÿ$_{23}$Global Markets + ÿ$_{24}$Long Bonds + ÿ$_{25}$Inflation + ÿ$_{26}$Shape of the Yield Curve + ÿ$_{27}$Retail Sales YOY% + ÿ$_{28}$PCE% + ÿ$_{29}$M3YOY% + ÿ$_{30}$Trade Balance Rbln = 0

H_o ÿ R_e = r +ÿ$_1$ALSI + ÿ$_2$SWIX + ÿ$_3$FINDI 30+ ÿ$_4$RESI+ ÿ$_5$MidCap + ÿ$_6$Small Cap + ÿ$_7$Top 40 + ÿ$_8$ALBI + ÿ$_9$ CASH+ ÿ$_{10}$RESI20 + ÿ$_{11}$NC3MM + ÿ$_{12}$NC1YM + ÿ$_{13}$INDI25 + ÿ$_{14}$FINI15 + ÿ$_{15}$BRSPOT + ÿ$_{16}$FTWORU + ÿ$_{17}$GOLR + ÿ$_{18}$FCRB + ÿ$_{19}$USGB10 + ÿ$_{20}$PLAT + ÿ$_{21}$EURZAR + ÿ$_{22}$UDSZAR + ÿ$_{23}$Global Markets + ÿ$_{24}$Long Bonds + ÿ$_{25}$Inflation + ÿ$_{26}$Shape of the Yield Curve + ÿ$_{27}$Retail Sales YOY% + ÿ$_{28}$PCE% + ÿ$_{29}$M3YOY% + ÿ$_{30}$Trade Balance Rbln = 0

Chapter 4

4.1 Research Methodology

The researcher conducted quantitative casual research with the purpose of identifying cause-and-effect relationships amongst variable factors that drive aggregate returns in hedge fund strategies. In a causal study, you can observe how changes in one variable (independent variable) affect the result on another variable (dependent variable) Zikmund (2003). A variable as defined by Creswell (2003) as an organisational attribute that can be measured or observed. The hypotheses for this study were formulated in a way that predicted an expectation of the relationships to be ascertained and prediction about influence of variables that drive the market on the aggregate returns achieved by hedge funds strategies.

Zikmund (2003) states that from a scientific research point of view, causal relationships are impossible to prove. He goes on to state that nonetheless researchers seek certain types of evidence to be able to understand and predict relationships. This research aimed to ascertain significant variables that drive hedge fund investment aggregate strategy returns, the relation of these independent variables on a dependent variables (aggregate returns) as well as assess the relationship amongst variables. And lastly formulate an appropriate model of returns for the chosen strategies. The quantitative research method allowed the researcher to measure the variables of interest (Leedy and Ormrod, 2005).

Quantitative research entails a huge amount of literature at the beginning of a study to guide the researcher's questions or hypotheses, literature is often used at the beginning of the study to introduce a problem, literature is included as well at the end of the study for the researcher to compare the results of the study with the existing findings in the literature (Creswell, 2003).

4.2 Defence of method

The quantitative method is highly useful in answering questions about relationships that exist among variables to help clarify and predict these relationships (Leed and Ormrod, 2005).

By using the quantitative method researchers seek explanations and predictions that will help to establish, confirm and validate relationships as well as develop generalizations that contribute to theory (Leedy and Ormrod, 2005).

Since the focus of the research was to identifying and measure factors that influenced an outcome as well as understand the best predictors of outcome, a quantitative method was best suited (Creswell, 2003).

In a quantitative research study, the problem is best addressed by understanding what variables influence an outcome. The researcher's problem is one in which understanding variables that explain or relate to an outcome helps the investigator understand and explain the problem (Creswell, 2003).

4.3 Population and Sampling

The population of interest for this study were hedge fund managers practicing in the hedge industry. According to the Novare Survey (2009) there are currently 100 hedge fund managers in South Africa. 'Sampling involves any procedure that uses a small number of items or a portion of a population to make a conclusion regarding the whole population' Zukmund (2003, p.70). The sample used for this study was hedge fund managers who apply the Long Bias, the Long Short Strategy, the Global Macro Strategy as well as the Market Neutral Strategy in the South African Hedge Fund Market. Eighty percent of the 100 hedge fund managers use the above hedge fund strategies. Aggregate monthly returns of these strategies were studied over the period from January 2002 –December 2008. In line with quantitative research, the sample size was adequate for the study conducted. The researcher used non-probability sampling.

4.4 Data collection

This study was performed exclusively on historical data from the period of June 2002 to June 2008. The research methodology therefore consisted of a quantitative analysis of secondary data. Only data from Bloomberg, Hedge Fund News database, Peregrine Securities as well the Johannesburg Stock Exchange were gathered. The above sources of data are highly credible in the Hedge Fund industry and financial market in general. Hedge Fund News (formerly known as Africahedge)

have over the past years compiled hedge fund data of the South African industry. Peregrine Securities is a prime broker which services 80% of the hedge funds, the company keeps a comprehensive database on the hedge fund industry. A database is defined by Zikmund (2003) as a collection of raw data, logically arranged in a manner that allows for it to be stored and processed by a computer.

The researcher gathered data from various sources of factors that drive returns in the Equities Market. These factors range from Indices like the ALSI, SWIX, Findi30, Resi20, Midcap, Smallcap, Top40 Indi25 and the Fini15. Commodity prices, Brent Oil, Gold Price, Platinum Price as well as the commodities Index. Data from the Bond Index was collected. Currency data was also collected, Rand dollar exchange as well as the Euro Rand exchange rate. Other data collected was Economic data, Retail Sales, M3 YOY%, Trade Balance, Unemployment and PCE. Interest Rates information, Repo Rates and GDP figures were also collected. Lastly the researcher collected data from world Indices, the Dow Jones Industrial Index, the FTSE 100, EMEA Index and the VIX Index. Hedge Fund aggregate returns by strategy data also collected from Peregrine and Hedge Fund News. All other data was from Bloomberg and the JSE.

All data were considered monthly with an annual average computed for the purpose of the analysis. When using secondary data, the time period must be consistent with the researcher's period of study (Zikmund, 2003).

The disadvantage of secondary data or historical data, as stated by Zikmund (2003) is that this is data previously collected for some other project other than the one of

interest to the researcher. This data has to be customised to suite the research at hand. He goes on to state the advantage of secondary data is that it can be gathered faster and more inexpensively.

4.5 Data Analysis

The researcher used a simple correlation coefficient, a statistical method to analyse data collected. Quantitative method involves interpreting the numbers by using statistics. Data was adjusted to South African measurements to allow interpretation (i.e.dollars converted to rands). A correlation study examined the extent to which independent variables related to aggregate hedge fund returns. Simple correlation coefficient is a measure of the co-variation between two variables (Zikmund, 2003).

Also a multiple regression analysis was used to allow for the simultaneous investigation of the effect of multi independent variables on a dependent variable (aggregate hedge fund returns). A multiple linear regression helps device an equation in which two or more independent variables are used to predict the dependent variable (Leedy and Ormrod, 2005).

The researcher used all variables that drive returns in each strategy to ascertain correlation of each of the variables with Hedge Fund Aggregate Returns by Strategy. Only the significant variables to the strategy were accepted as drivers of returns in each of the five strategies chosen. This exercise was performed for each of the chosen strategies. The researcher was then in a position to decide on the

multifactor model of performance drivers of each of the hedge fund investment strategies.

The researcher also performed a regression analysis to assess the relationship among factors of performance.

4.6 Data Analysis Process

Step 1: All data relevant in driving the Equities Market was collected from sources named above.

Step 2: Correlation was performed using Long Biased, Long-short, Global Macro and Market Neutral (Equity Strategies) aggregate returns with variables that drive Equity Markets:

ALSI, SWIX, FINDI30, RESI, MidCap, SmallCap, Top 40, ALBI, CASH, RESI20 NC3MM, NC1YM, INDI25, FINI15, BRSPOT, FTWORU, GOLR, FCRB, USGB10, PLAT, EURZAR, UDSZAR, Global Markets, Long Bonds, Inflation, Shape of the Yield Curve, Retail Sales YOY%, PCE%, M3YOY% and Trade Balance Rbln

Step 3: Regression Analysis was performed using independent variable that show significant correlation for each of the strategies.

Step4: An ANOVA test was implemented to decide on the best fit model of returns for the above strategies

Step 5: A model of returns for each aggregate strategy was decided on.

4.7 Research Limitation

A lot has been written globally on hedge fund and their investment strategies. In South Africa however, the market for alternative investments has only just taken off (Cadiz, 2009). Hedge funds have only been in existence in South Africa since the year 2000 and only started to be noticed in 2002. Lack of solid literature posed as a research limitation for this study. Only Novare and Symmetry actuaries consistently survey the industry, as a result there are no diverse arguments from the South African literature sources.

Hedge funds are unregulated, and no official government sources of data exist, therefore investors are forced to rely on private database vendors. Also hedge funds have a high attrition rate than mutual funds, which makes it difficult to compare performances year on year. Gregoriou and Duffy (2006). It is for these reasons that biased results in hedge fund research are possible.

Hedge funds are not obliged to disclose their performances to databases. They contend with minimal disclosure requirements. As a result one cannot be 100% certain that all data from databases is consistent as it is compiled by private companies.

The researcher also found that there is not much available literature review on the Johannesburg Stock Exchange equities market. Some of the information used is working knowledge of the market by the researcher.

Chapter 5 FINDINGS

5.1 Long-Short Strategy

Step 1: Variable Selection

In this step the researcher tested for correlation of market variables that are relevant to the long short aggregate returns. The rationale behind this testing is that only variables that have a significant impact on the model of long short hedge fund aggregate returns should be used. A significant correlation coefficient implies a presence linear relationship between the Long Short aggregate strategy returns and the independent market variables.

The significance of the correlation coefficient is assessed using the following hypothesis =test

H_0 : Correlation (Hedge fund strategy return, Independent variable) = zero

H_1 = Correlation (Hedge fund strategy return, Independent variable) ÿ zero

P þ Value = 5%

Rodgers and Nicewander (1988) suggest using the Pearson R test to when assessing the significance of the correlation coefficient between two variables.

Test Statistic = Rho* ý (N þ 2) / (1- Rho^2)

Where: Rho = Correlation

N= sample size, and Test statistic is distributed Student-T with N-2 degrees of freedom.

In the Long-Short Strategy, the sample size is 53. A significance level of 5% is applied. Reject H_0 if t is greater than 2.008 or less -2.008 and fail to reject H_0 if t is between -2.008 and 2.008 (see Student t distribution in Appendix A).

Test Results: The Long-Short Strategy.

Table 1 : **Correlation Test Results**

	Correlation coefficient	T - Stat	Critical Level	Result	Include in Model
ALSI	0.44	3.53	2.008	Reject H_0	**TRUE**
SWIX	0.74	7.94	2.008	Reject H_0	**TRUE**
FINDI 30	0.85	11.56	2.008	Reject H_0	**TRUE**
RESI	0.16	1.16	2.008	Fail to reject H_o	FALSE
MidCap	0.92	16.72	2.008	Reject H_0	**TRUE**
SmallCap	0.91	15.91	2.008	Reject H_0	**TRUE**
Top 40	0.53	4.46	2.008	Reject H_0	**TRUE**
ALBI	0.48	3.86	2.008	Reject H_0	**TRUE**
Cash	(0.25)	(1.88)	2.008	Fail to reject H_o	FALSE
Resi 20	0.18	1.28	2.008	Fail to reject H_o	FALSE
NC3MM	(0.28)	(2.12)	2.008	Reject H_0	**TRUE**
NC1YM	(0.32)	(2.37)	2.008	Reject H_0	**TRUE**
INDI 25	0.78	8.94	2.008	Reject H_0	**TRUE**
FINI 25	0.79	9.21	2.008	Reject H_o	**TRUE**
BRSPOT	0.04	0.25	2.008	Fail to reject H_o	FALSE
FTWORU	0.74	7.79	2.008	Reject H_0	**TRUE**
GOLR	(0.36)	(2.72)	2.008	Reject H_0	**TRUE**
FCRB	0.15	1.11	2.008	Fail to reject H_o	FALSE
USGB10	0.23	1.67	2.008	Fail to reject H_o	FALSE
PLAT	0.00	0.03	2.008	Fail to reject H_o	FALSE
EURZAR	(0.46)	(3.70)	2.008	Reject H_0	**TRUE**
USDZAR	(0.53)	(4.50)	2.008	Reject H_0	**TRUE**
Global Markets	0.61	5.54	2.008	Reject H_0	**TRUE**
Long Bonds	(0.12)	(0.85)	2.008	Fail to reject H_o	FALSE
Inflation	(0.35)	(2.71)	2.008	Reject H_0	**TRUE**

Shape of the Yield Curve	0.25	1.87	2.008	Fail to reject H_o	FALSE
Retail Sales	0.37	2.83	2.008	Reject H_0	**TRUE**
PCE YOY%	(0.10)	(0.79)	2.008	Fail to reject H_o	FALSE
M3 YOY%	(0.19)	(1.35)	2.008	Fail to reject H_o	FALSE
Trade Balance	0.11	0.79	2.008	Fail to reject H_o	FALSE

Step 2 Regression Model Results

The independent variables where the research rejected the null hypothesis are subsequently included in the following multi-regression model:

$H_o =$ $R_e = r + ÿ_1ALSI + ÿ_2SWIX + ÿ_3FINDI\ 30 + ÿ_4MidCap + ÿ_5SmallCap + ÿ_6Top40 + ÿ_7ALBI + ÿ_8NC3MM + ÿ_9NC1YM + ÿ_{10}FINI\ 15 + ÿ_{11}FTWORU + ÿ_{12}GOLR + ÿ_{13}EURZAR + ÿ_{14}USDZAR + ÿ_{15}Global\ Markets + ÿ_{16}Inflation + ÿ_{17}Retai_l\ Sales = 0$

$H_1 =$ $R_e = r + ÿ_1ALSI + ÿ_2SWIX + ÿ_3FINDI\ 30 + ÿ_4MidCap + ÿ_5SmallCap + ÿ_6Top40 + ÿ_7ALBI + ÿ_8NC3MM + ÿ_9NC1YM + ÿ_{10}FINI\ 15 + ÿ_{11}FTWORU + ÿ_{12}GOLR + ÿ_{13}EURZAR + ÿ_{14}USDZAR + ÿ_{15}Global\ Markets + ÿ_{16}Inflation + ÿ_{17}Retai_l\ Sales\ ÿ\ 0$

The significance of the regression model is assessed using the following hypothesis test

The test for significance of regression in the case of multiple linear regression analysis is carried out using the analysis of variance. The test is used to check if a linear statistical relationship exists between the response variable and at least one of the predictor variables. The statements for the hypotheses are:

$H_0 : \ddot{y}_1 = \ddot{y}_2 = \ddot{y}_3 = ... = \ddot{y}_J = 0$

H1 = $\ddot{y}_j$ ÿ 0 for at least one j

The test for H_0 is carried out using ANOVA at 5% significance level. H_0 is rejected if the p-value of the F-ration is less that 5% and fail to reject H_0 if the value is greater than 5%.

Table 2: **Test Results: Significance of the regression model**

ANOVA

	df	SS	MS	F	p-value	Outcome
Regression	15	0.063	0.004	20,211	0	Reject H_0
Residual	37	0.008	0			
Total	52	0.070				

We reject the H_0 that the regression coefficients are all equal to zero.

Table 3: **Testing the goodness of fit**

Regression Statistic	
Multiple R	0.94
R Square	0.89
Adjusted R Square	0.847
Standard Error	0.014
Observations	53

	Coefficients	Std Error	t-Stat	P-Value	Results
Intercept	0.338	0.027	1.256	0.217	Accept Ho
ALSI	0.205	0.180	1.139	0.262	Fail to Reject Ho
MidCap	-0.028	1.047	-0.027	0.979	Fail to Reject Ho
SmallCap	-0.035	0.262	-0.134	0.894	Fail to Reject Ho
Top40	-4.411	8.071	-0.547	0.588	Fail to Reject Ho

Cash	10.671	6.597	1.618	0.114	Fail to Reject Ho
NC1YM	-1.064	0.353	-3.017	0.005	Fail to Reject Ho
Indi25	0.101	0.139	0.726	0.472	Fail to Reject Ho
FINI15	-0.090	0.111	-0.814	0.421	Fail to Reject Ho
GOLR	-0.058	0.071	-0.823	0.416	Fail to Reject Ho
FCRB	-0.019	0.076	-0.248	0.805	Fail to Reject Ho
EURZAR	-0.164	0.115	-1.420	0.164	Fail to Reject Ho
USDZAR	-0.182	0.111	1.641	0.109	Fail to Reject Ho
Global Mkt	5.000	9.333	0.536	0.595	Fail to Reject Ho
Inflation	0.039	0.605	0.064	0.949	Fail to Reject Ho
Retail Sales YOY%	-0.034	0.084	-0.409	0.685	Fail to Reject Ho

Output results in Table 3 show that the goodness of fit of the model as measured by R^2 = 94%. This means that the model explains 94% of the Long-Short Strategy returns. Despite the model being an extremely good predictor of returns, the coefficient statistics, fails the hypotheses test, i.e. the hypothesis that they are equal to zero.

The results in Table 3 have evidence of multicolinearity. Multicollinearity in regression occurs when predictor variables (independent variables) in a regression model are more highly correlated with other predictor variables than with the dependent variable. Multicollinearity does not adversely affect the regression equation if the purpose of research is only to predict the dependent variable from a set of predictor variables. The predictions in the regression will still be accurate, and the overall R^2 will give an indication of how well the predictor variables in the model predict the dependent variable (Albright, Winston and Zappe, 2006).

Albright *et al.* (2006) also proceed to state that in regression, multicollinearity can be a problem if the purpose of the study is to estimate the contributions of individual

predictors. When multicollinearity is present, p values can be misleading and the regression coefficients' confidence intervals will be very wide and may vary dramatically with the addition or exclusion of just one participant. The solution to dealing with multicollinearity is removing any highly correlated variables from the model. Multicollinearity inflates the variances of the parameter estimates. This inflation of variances may lead to lack of statistical significance of individual independent variables even though the overall model may be significant. This is especially true for small and moderate sample sizes. Such problems will result in incorrect conclusions about relationships between independent and dependent variables. Abright et al (2006).

Albright et al (2006) assert that another way to deal with multicollinearity is to drop of the independent variables in order to produce a model with significant coefficients.

Following the approach of dropping variables from the model the researcher comes to the following regression model :

***Table 4*: Summary of Output** ANOVA

	df	SS	MS	F	P-value	Result
Regression	2	0.059	0.030	133.144	0.000	Reject Ho
Residual	50	0.111	0.000			
Total	52	0.070				

***Table 5*: Goodness of fit Summary of Output**

Regression Statistic	
Multiple R	0.918
R Square	0.084
Adjusted R Square	0.836
Standard Error	0.015
Observations	53

	Coefficients	**Std Error**	**t-Stat**	**P-Value**	**H_0 test**
Intercept	4.000	0.013	3.516	0.1%	Reject H_0
Midcap	0.645	0.046	13.920	0.0%	Reject H_0
NC1YM	-0.417	0.134	-3.114	0.3%	Reject H_0

In the table 5 above the significant level for the regression coefficient $R^{2\,=}$ 92%. We have achieved a good model fit with less fewer variables than we used in Table 1 and 2. All the other variables that we dropped only accounted for 2% of the regression coefficient. The model explains 92% of the Long-Short Aggregate Returns.

5.2 The Long Bias Strategy

Step 1 : Variable Selection

As in the long short strategy, the researcher in this step tested for correlation of market variables that are relevant to the long bias aggregate returns. The rationale behind this testing is that only variables that have a significant impact on the model of long short hedge fund aggregate returns should be used. A significant correlation coefficient implies the presence linear relationship between the long short aggregate strategy returns and the independent market variables.

The significance of the correlation coefficient is assessed using the following hypothesis =test

H_0 : Correlation (Hedge fund strategy return, Independent variable) = zero

H_1 = Correlation (Hedge fund strategy return, Independent variable) ÿ zero

P þ Value = 5%

In the Long Bias Strategy, the sample size is 53. A significance level of 5% is applied. Reject H_0 if t is greater than 2.008 or less -2.008 and fail to reject H_0 if t is between -2.008 and -2.008 (see Student t distribution in Appendix A).

Test Results: Long Bias Strategy

Table 6 : **Correlation Test Results**

		T- STATS	CRITICAL LEVEL	Result	Include in Model ?
ALSI	0.606	5.443	2.008	Reject Ho	**TRUE**
SWIX	0.815	10.054	2.008	Reject Ho	**TRUE**
Findi30	0.853	11.657	2.008	Reject Ho	**TRUE**
Resi	0.353	2.695	2.008	Reject Ho	**TRUE**
MidCap	0.901	14.805	2.008	Reject Ho	**TRUE**
SmallCap	0.879	13.172	2.008	Reject Ho	**TRUE**
Top40	0.649	6.098	2.008	Reject Ho	**TRUE**
ALBI	0.470	3.806	2.008	Reject Ho	**TRUE**
Cash	-0.384	-2.973	2.008	Reject Ho	**TRUE**
Resi20	0.353	2.699	2.008	Reject Ho	**TRUE**
NC3MM	-0.437	-3.468	2.008	Reject Ho	**TRUE**
NC1YM	-0.479	-3.896	2.008	Reject Ho	**TRUE**
Indi25	0.804	9.654	2.008	Reject Ho	**TRUE**
Fini15	0.805	9.703	2.008	Reject Ho	**TRUE**
BRSPOT	0.005	0.033	2.008	Fail to reject Ho	FALSE

FTWORU	0.628	5.757	2.008	Reject Ho	**TRUE**
GOLR	-0.158	-1.140	2.008	Fail to reject Ho	FALSE
FCRB	0.160	1.158	2.008	Fail to reject Ho	FALSE
USGB10	0.168	1.218	2.008	Fail to reject Ho	FALSE
PLAT	0.053	0.377	2.008	Fail to reject Ho	FALSE
EURZAR	-0.295	-2.203	2.008	Reject Ho	**TRUE**
USDZAR	-0.303	-2.269	2.008	Reject Ho	**TRUE**
Global MARKETS	0.717	7.352	2.008	Reject Ho	**TRUE**
Long Bonds	-0.221	-1.620	2.008	Fail to reject Ho	FALSE
Inflation	-0.345	-2.621	2.008	Reject Ho	**TRUE**
Shape of Yield Curve	0.365	2.797	2.008	Reject Ho	**TRUE**
RETAILS SALES_YOY_%	0.293	2.190	2.008	Reject Ho	**TRUE**
PCE_YOY_%	-0.036	-0.259	2.008	Fail to reject Ho	FALSE
M3_YOY_%	-0.221	-1.617	2.008	Fail to reject Ho	FALSE
TRADE BAL Rbn	0.129	0.930	2.008	Fail to reject Ho	FALSE

Step 2 Regression Model Results

As per in the Long-Short Strategy, the independent variables where the research rejected the null hypothesis are subsequently included in the following multi-regression model:

$$H_o = R_e = r + ÿ_1 ALSI + ÿ_2 SWIX + ÿ_3 FINDI\ 30 + ÿ_4 RESI + ÿ_5 MidCap + ÿ_6 Small\ Cap + ÿ_7 Top\ 40 + ÿ_8 ALBI + ÿ_9\ CASH + ÿ_{10} RESI20 + ÿ_{11} NC3MM + ÿ_{12} NC1YM + ÿ_{13} INDI25 + ÿ_{14} FINI15 + ÿ_{15} FTWORU + ÿ_{16} EURZAR + ÿ_{17} USDZAR + ÿ_{18} GlobalMarkets + ÿ_{19} Inflation + ÿ_{20} Shape\ of\ the\ Yield\ Curve + ÿ_{21} Retail\ Sales\ YOY\% = 0$$

$H_1 = R_e = r + ÿ_1ALSI + ÿ_2SWIX + ÿ_3FINDI\ 30 + ÿ_4RESI + ÿ_5MidCap + ÿ_6Small\ Cap + ÿ_7Top\ 40 + ÿ_8ALBI + ÿ_9\ CASH + ÿ_{10}RESI20 + ÿ_{11}NC3MM + ÿ_{12}NC1YM + ÿ_{13}INDI25 + ÿ_{14}FINI15 + ÿ_{15}FTWORU + ÿ_{16}EURZAR + ÿ_{17}USDZAR + ÿ_{18}GlobalMarkets + ÿ_{19}Inflation + ÿ_{20}Shape\ of\ the\ Yield\ Curve + ÿ_{21}Retail\ Sales\ YOY\% \ ÿ\ 0$

In this strategy too the test for significance of regression is carried out using the analysis of variance. The test is used to check if a linear statistical relationship exists between the response variable and at least one of the predictor variables. The statements for the hypotheses are:

$$H_0 : ÿ_1 = ÿ_2 = ÿ_3 = ... = ÿ_J = 0$$

$$H1 = ÿ_j \ ÿ\ 0 \text{ for at least one } j$$

The test for H_0 is carried out using ANOVA at 5% significance level. H_0 is rejected if the p-value of the F-ration is less that 5% and fail to reject H_0 if the value is greater than 5%.

Table 7: **Test Results: Significance of the regression model :**

ANOVA

	df	SS	MS	F	P-Value	Results
Regression	15	0.062	0.004	18.327	0	Reject Ho
Residual	37	0.008	0.000			
Total	52	0.070				

We reject the H_0 that the regression coefficients are all equal to zero.

Table 8: **Testing the goodness of fit**

Regression Statistics	
Multiple R	0.939
R Square	0.881
Adjusted R Square	0.833
Standard Error	0.015
Observations	53

	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Results***
Intercept	0.042	0.031	1.367	0.180	Accept H_0
Resi	0.088	0.178	0.494	0.624	Accept H_o
MidCap	-0.189	1.068	-0.177	0.861	Accept H_o
SmallCap	0.078	0.264	0.295	0.770	Accept H_o
Top40	-4.387	8.217	-0.534	0.597	Accept H_o
ALBI	0.191	0.198	0.967	0.340	Accept H_o
NC1YM	-0.390	0.329	-1.184	0.244	Accept H_o
Indi25	0.212	0.177	1.197	0.239	Accept H_o
Fini15	-0.022	0.141	-0.157	0.876	Accept H_o
FTWORU	-0.012	0.140	-0.086	0.932	Accept H_o
EURZAR	-0.129	0.103	-1.253	0.218	Accept H_o
USDZAR	0.145	0.116	1.251	0.219	Accept H_o
Global MARKETS	4.956	9.519	0.521	0.606	Accept H_o
Inflation	0.510	0.636	0.801	0.428	Accept H_o
Shape of Yield Curve	0.138	0.308	0.448	0.657	Accept H_o
RETAILS SALES_YOY_%	-0.061	0.080	-0.753	0.456	Accept H_o

Output results in Table 8 show that the goodness of fit of the model as measured by R^2 = 94%. This means that the model explains 94% of the Long Bias Aggregate Returns. Despite the model being an extremely good predictor of returns, again the coefficient statistics, fails the hypotheses test, i.e. the hypothesis that they are equal to zero.

The researcher is once again faced with the evidence of multicolinearity in the Table 8 results. Please refer to the Long-Short Strategy above for a discussion on multicollinearity in regression.

The researcher yet again followed the approach of dropping variables from the model in order to resolve multicolinearity. The outcomes to the following regression model :

***Table 9*: Summary of Output** ANOVA

	df	*SS*	*MS*	*F*	*P-Value*	*Result*
Regression	3	0.082	0.027	114.717	0.000	Reject H_o
Residual	50	0.012	0.000			
Total	53	0.094				

***Table 10*: Goodness of fit Summary of Output**

Regression Statistics	
Multiple R	0.934
R Square	0.873
Adjusted R Square	0.848
Standard Error	0.015
Observations	53

	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Ho Test**
Intercept	0	#N/A	#N/A	#N/A	
MidCap	0.319	0.135	2.371	0.022	Reject Ho
SmallCap	0.320	0.121	2.659	0.010	Reject Ho
Global MARKETS	0.152	0.070	2.158	0.036	Reject Ho

In the Table 10 above the significant level for the regression coefficient R^2 = 93%. We have achieved a good model fit with fewer variables than we used in Table 6 and 7. All the other variables that we dropped only accounted for 0.5% of the regression coefficient. The model explains 93% of the Long Bias Aggregate Returns.

5.3 Market Neutral Strategy

In this step the researcher tested for correlation of various variables that are relevant to the Market Neutral Hedge Fund aggregate returns as done in the previous two strategies.

The significance of the correlation coefficient is assessed using the following hypothesis =test

H_0 : Correlation (Hedge fund strategy return, Independent variable) = zero

H_1 = Correlation (Hedge fund strategy return, Independent variable) ÿ zero

P þ Value = 5%

In the Market Neutral Strategy, the sample size is also 53. A significance level of 5% is applied. Reject H_0 if t is greater than 2.008 or less -2.008 and fail to reject H_0 if t is between -2.008 and -2.008 (see Student t distribution in Appendix A).

Test Results : Market Neutral Aggregate Results

Table 11 Correlation Test Results

	Market Neutral Aggregate	T-STATS	CRITICAL LEVEL	Result	Include in Model ?
ALSI	0.318	2.39	2.008	Reject Ho	TRUE
SWIX	0.529	4.45	2.008	Reject Ho	TRUE
Findi30	0.543	4.61	2.008	Reject Ho	TRUE
Resi	0.191	1.39	2.008	Fail to reject Ho	FALSE
MidCap	0.541	4.59	2.008	Reject Ho	TRUE
SmallCap	0.434	3.44	2.008	Reject Ho	TRUE
Top40	0.412	3.23	2.008	Reject Ho	TRUE
ALBI	0.346	2.63	2.008	Reject Ho	TRUE
Cash	-0.126	(0.91)	2.008	Fail to reject Ho	FALSE
Resi20	0.193	1.41	2.008	Fail to reject Ho	FALSE
NC3MM	-0.200	(1.46)	2.008	Fail to reject Ho	FALSE
NC1YM	-0.237	(1.74)	2.008	Fail to reject Ho	FALSE
Indi25	0.481	3.91	2.008	Reject Ho	TRUE
Fini15	0.556	4.78	2.008	Reject Ho	TRUE
BRSPOT	0.137	0.99	2.008	Fail to reject Ho	FALSE
FTWORU	0.391	3.04	2.008	Reject Ho	TRUE
GOLR	-0.209	(1.53)	2.008	Fail to reject Ho	FALSE
FCRB	0.256	1.89	2.008	Fail to reject Ho	FALSE
USGB10	0.217	1.59	2.008	Fail to reject Ho	FALSE
PLAT	0.040	0.29	2.008	Fail to reject Ho	FALSE
EURZAR	-0.295	(2.20)	2.008	Reject Ho	TRUE
USDZAR	-0.388	(3.01)	2.008	Reject Ho	TRUE
Global MARKETS	0.447	3.57	2.008	Reject Ho	TRUE
Long Bonds	0.047	0.34	2.008	Fail to reject Ho	FALSE
Inflation	-0.302	(2.26)	2.008	Reject Ho	TRUE
Shape of Yield Curve	0.254	1.88	2.008	Fail to reject Ho	FALSE
RETAILS SALES_YOY_%	0.132	0.95	2.008	Fail to reject Ho	FALSE
PCE_YOY_%	-0.213	(1.56)	2.008	Fail to reject Ho	FALSE
M3_YOY_%	-0.223	(1.63)	2.008	Fail to reject Ho	FALSE

TRADE BAL Rbn	0.016	0.11	2.008	Fail to reject Ho	FALSE

Step2 : Regression Model Results

As per the previous strategies discussed, the independent variables where the research rejected the null hypothesis are subsequently included in the following multi-regression model:

$H_o = R_e = r + ÿ_1ALSI + ÿ_2SWIX + ÿ_3FINDI\ 30 + ÿ_4MidCap + ÿ_5Small\ Cap + ÿ_6Top\ 40 + ÿ_7ALBI + ÿ_8INDI25 + ÿ_9FINI15 + ÿ_{10}FTWORU + ÿ_{11}EURZAR + ÿ_{13}EURZAR + ÿ_{14}GlobalMarkets + ÿ_{15}Inflation + ÿ_{16}LongBonds = 0$

$H_1 = R_e = r + ÿ_1ALSI + ÿ_2SWIX + ÿ_3FINDI\ 30 + ÿ_4MidCap + ÿ_5Small\ Cap + ÿ_6Top\ 40 + ÿ_7ALBI + ÿ_8INDI25 + ÿ_9FINI15 + ÿ_{10}FTWORU + ÿ_{11}EURZAR + ÿ_{13}EURZAR + ÿ_{14}GlobalMarkets + ÿ_{15}Inflation + ÿ_{16}LongBonds\ ÿ\ 0$

Also in the Market Neutral Strategy, the test for significance of regression is carried out using the analysis of variance. The test is used to check if a linear statistical relationship exists between the response variable and at least one of the predictor variables. The statements for the hypotheses are:

$$H_0 : ÿ_1 = ÿ_2 = ÿ_3 = ... = ÿ_J = 0$$

$$H1 = ÿ_j\ ÿ\ 0 \text{ for at least one } j$$

The test for H_0 is carried out using ANOVA at 5% significance level. H_0 is rejected if the p-value of the F-ration is less that 5% and fail to reject H_0 if the value is greater than 5%.

Table 12: **Test Results: Significance of the regression model**

ANOVA

	df	*SS*	*MS*	*F*	*P-Value*	*Result*
Regression	14	0.0016	0.0001	2.85961	0.0051	Reject Ho
Residual	38	0.0016	0.0000			
Total	52	0.0032				

We reject the H_0 that the regression coefficients are all equal to zero.

Table 13 Testing for goodness of fit Results

Regression Statistics	
Multiple R	0.716
R Square	0.513
Adjusted R Square	0.334
Standard Error	0.006
Observations	53

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Results*
Intercept	0.01	0.00	3.73	0.00	Fail to accept Ho
ALSI	(0.15)	0.10	(1.53)	0.13	Accept Ho
SWIX	0.51	0.26	1.95	0.06	Accept Ho
Findi30	0.43	0.47	0.91	0.37	Accept Ho
MidCap	0.49	0.44	1.11	0.28	Accept Ho
SmallCap	0.02	0.11	0.21	0.83	Accept Ho
Top40	4.06	3.37	1.20	0.24	Accept Ho
ALBI	0.02	0.09	0.18	0.86	Accept Ho
Indi25	(0.34)	0.27	(1.26)	0.21	Accept Ho
Fini15	(0.14)	0.16	(0.84)	0.41	Accept Ho
FTWORU	0.00	0.06	0.02	0.98	Accept Ho
EURZAR	0.05	0.04	1.06	0.30	Accept Ho

USDZAR	(0.05)	0.05	(0.95)	0.35	Accept Ho
Global MARKETS	(4.82)	3.90	(1.24)	0.22	Accept Ho
Inflation	(0.04)	0.29	(0.15)	0.88	Accept Ho

Output results in Table 13 show that the goodness of fit of the model as measured by R^2 = 72%. This means that the model explains 72% of the Market Neutral Strategy returns. Despite the model being an extremely good predictor of returns, again the coefficient statistics fails the hypotheses test, i.e. the hypothesis that they are equal to zero.

The researcher is once again faced with the evidence of multicolinearity in the Table 3 results. Please refer to the Long-Short Strategy above for a discussion on multicollinearity in regression.

The researcher yet again followed the approach of dropping variables from the model in order to resolve multicolinearity. The outcomes to the following regression model :

***Table 14*: Summary of Output** ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Results*
Regression	2	0.0011	0.0005	12.6288	0.0000	Reject Ho
Residual	50	0.0021	0			
Total	52	0.0032				

***Table 15*: Goodness of fit Summary of Output**

Regression Statistics	
Multiple R	0.579
R Square	0.336
Adjusted R Square	0.309

Standard Error	0.007
Observations	53

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Ho Test*
Intercept	0.010	0.001	9.060	0.00%	Reject Ho
MidCap	0.181	0.054	3.330	0.16%	Reject Ho
SmallCap	-0.102	0.057	-1.804	3.73%	**Accept Ho**

In the table 15 above the significant level for the regression coefficient $R^{2 =}$ 58%. We have achieved a good model fit with fewer variables than we used in Table 11 and 12. All the other variables that we dropped only accounted for 13.6% of the regression coefficient. The model explains 58% of the Market Neutral Aggregate Strategy Returns.

5.4 The Global Macro Strategy

In this step the researcher tested for correlation of various variables that are relevant to the Global Macro Hedge Fund Aggregate Returns as done in the previous three strategies.

The significance of the correlation coefficient is assessed using the following hypothesis =test

H_0 : Correlation (Hedge fund strategy return, Independent variable) = zero

H_1 = Correlation (Hedge fund strategy return, Independent variable) ÿ zero

P þ Value = 5%

In the Market Neutral Strategy, the sample size is also 53. A significance level of 5% is applied. Reject H_0 if t is greater than 2.008 or less -2.008 and fail to reject H_0 if t is between -2.008 and -2.008 (see Student t distribution in Appendix A).

Test Results : Global Macro Aggregate Returns

Table 16 Correlation Test Results

	Global Macro Aggregate	T- STATS	CRITICAL LEVEL	Result	Include in Model ?
ALSI	0.511	4.24	2.008	Reject Ho	TRUE
SWIX	0.548	4.68	2.008	Reject Ho	TRUE
Findi30	0.514	4.28	2.008	Reject Ho	TRUE
Resi	0.384	2.97	2.008	Reject Ho	TRUE
MidCap	0.489	4.01	2.008	Reject Ho	TRUE
SmallCap	0.470	3.80	2.008	Reject Ho	TRUE
Top40	0.520	4.35	2.008	Reject Ho	TRUE
ALBI	0.052	0.37	2.008	Fail to reject Ho	FALSE
Cash	-0.259	(1.92)	2.008	Fail to reject Ho	FALSE
Resi20	0.373	2.87	2.008	Reject Ho	TRUE
NC3MM	-0.330	(2.50)	2.008	Reject Ho	TRUE
NC1YM	-0.337	(2.56)	2.008	Reject Ho	TRUE
Indi25	0.517	4.31	2.008	Reject Ho	TRUE
Fini15	0.483	3.94	2.008	Reject Ho	TRUE
BRSPOT	-0.098	(0.71)	2.008	Fail to reject Ho	FALSE
FTWORU	0.436	3.46	2.008	Reject Ho	TRUE
GOLR	0.139	1.00	2.008	Fail to reject Ho	FALSE
FCRB	0.112	0.81	2.008	Fail to reject Ho	FALSE
USGB10	0.041	0.30	2.008	Fail to reject Ho	FALSE
PLAT	0.068	0.49	2.008	Fail to reject Ho	FALSE
EURZAR	0.110	0.79	2.008	Fail to reject Ho	FALSE
USDZAR	0.009	0.06	2.008	Fail to reject Ho	FALSE
Global MARKETS	0.539	4.58	2.008	Reject Ho	TRUE
Long Bonds	-0.122	(0.88)	2.008	Fail to reject Ho	FALSE

Inflation	-0.204	(1.49)	2.008	Fail to reject Ho	FALSE
Shape of Yield Curve	0.273	2.02	2.008	Reject Ho	TRUE
RETAIL SALES_YOY_%	0.278	2.07	2.008	Reject Ho	TRUE
PCE_YOY_%	0.045	0.32	2.008	Fail to reject Ho	FALSE
M3_YOY_%	-0.025	(0.18)	2.008	Fail to reject Ho	FALSE
TRADE BAL Rbn	0.098	0.70	2.008	Fail to reject Ho	FALSE

Step 2 Regression Model Results

As per in the previous three strategies, the independent variables where the research rejected the null hypothesis are subsequently included in the following multi-regression model:

$H_o = R_e$ = r +ÿ$_1$ALSI + ÿ$_2$SWIX + ÿ$_3$FINDI 30+ + ÿ$_4$MidCap + ÿ$_5$Small Cap + ÿ$_6$Top 40 + ÿ$_7$ALBI + ÿ$_8$INDI25 + ÿ$_9$FINI15 + ÿ$_{10}$FTWORU + ÿ$_{11}$EURZAR + ÿ$_{12}$USDZAR + ÿ$_{13}$GlobalMarkets + ÿ$_{14}$LongBonds + ÿ$_{15}$Inflation = 0

$H_1 = R_e$ = r +ÿ$_1$ALSI + ÿ$_2$SWIX + ÿ$_3$FINDI 30+ + ÿ$_4$MidCap + ÿ$_5$Small Cap + ÿ$_6$Top 40 + ÿ$_7$ALBI + ÿ$_8$INDI25 + ÿ$_8$FINI15 + ÿ$_{10}$FTWORU + ÿ$_{11}$EURZAR + ÿ$_{12}$USDZAR + ÿ$_{13}$GlobalMarkets + ÿ$_{14}$LongBonds + ÿ$_{15}$Inflation ÿ 0

In this strategy also the test for significance of regression is carried out using the analysis of variance. The test is used to check if a linear statistical relationship exists

between the response variable and at least one of the predictor variables. The statements for the hypotheses are:

$$H_0 : \ddot{y}_1 = \ddot{y}_2 = \ddot{y}_3 = ... = \ddot{y}_J = 0$$

$$H1 = \ddot{y}_j \ddot{y} \ 0 \text{ for at least one j}$$

The test for H_0 is carried out using ANOVA at 5% significance level. H_0 is rejected if the p-value of the F-ration is less that 5% and fail to reject H_0 if the value is greater than 5%.

Table 17 Significance of the Regression model Test Results

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Result*
Regression	16	0.016	0.001	1.648	0.055	Accept Ho
Residual	36	0.022	0.001			
Total	52	0.038				

We reject the H_0 that the regression coefficients are all equal to zero.

Table 18 Testing for the Goodness of fit Results

Regression Statistics	
Multiple R	0.6502
R Square	0.4227
Adjusted R Square	0.1662
Standard Error	0.0246
Observations	53

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Results*
Intercept	0.044	0.064	0.694	0.492	Accept Ho
ALSI	0.205	0.307	0.668	0.508	Accept Ho

SWIX	-0.487	1.003	-0.485	0.631	Accept Ho
Findi30	-2.293	2.311	-0.992	0.328	Accept Ho
Resi	0.236	0.410	0.576	0.568	Accept Ho
MidCap	0.686	1.857	0.369	0.714	Accept Ho
SmallCap	0.215	0.478	0.450	0.655	Accept Ho
Top40	3.894	14.222	0.274	0.786	Accept Ho
Resi20	-0.796	0.823	-0.967	0.340	Accept Ho
NC3MM	-0.885	2.005	-0.441	0.662	Accept Ho
NC1YM	0.412	1.635	0.252	0.802	Accept Ho
Indi25	1.065	1.074	0.991	0.328	Accept Ho
Fini15	0.454	0.689	0.659	0.514	Accept Ho
FTWORU	0.135	0.187	0.718	0.477	Accept Ho
Global MARKETS	-2.879	15.910	-0.181	0.857	Accept Ho
Shape of Yield Curve	-0.031	0.553	-0.056	0.955	Accept Ho
RETAILS SALES_YOY_%	0.047	0.162	0.293	0.771	Accept Ho

Output results in Table 18 show that the goodness of fit of the model as measured by R^2 = 65%. This means that the model explains 65% of the Market Neutral Aggregate Strategy Returns. Despite the model being an extremely good predictor of returns, again the coefficient statistics fails the hypotheses test, i.e. the hypothesis that they are equal to zero.

The researcher is faced with the evidence of multicolinearity in the Table 18 results. Please refer to the above for a discussion on multicollinearity in regression.

The researcher again followed the approach of dropping variables from the model in order to resolve multicolinearity.

Table 19 Summary of Output

	df	*SS*	*MS*	*F*	*P-value*	*Result*
Regression	2	0.0113	0.0056	10.6926	0.0001	Reject Ho
Residual	50	0.0264	0.0005			
Total	52	0.0377				

Table 20 Goodness of fit Summary of Output

Regression Statistics	
Multiple R	0.5473
R Square	0.2996
Adjusted R Square	0.2716
Standard Error	0.0230
Observations	53

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Result*
Intercept	0.009	0.004	2.509	0.015	Reject Ho
Resi	0.108	0.052	2.075	0.043	Reject Ho
MidCap	0.232	0.070	3.292	0.002	Reject Ho

In the table 20 above the significant level for the regression coefficient $R^{2 =}$ 55%. We have achieved a good model fit with fewer variables than we used in Table 16 and 17. All the other variables that we dropped only accounted for 10% of the regression coefficient. The model explains 55% of the Global Macro Aggregate Strategy Returns.

Chapter 6 Interpretation of FINDINGS

As discussed in chapter 1, the objective of this study is (1.) to determine which *market* factors/ variables are correlated to returns in the hedge fund industry by strategy. (2) To assess the regression of significant factors to returns on different strategies as well as among themselves. (3) To develop a multifactor model of hedge fund returns by equity strategy using the APT model.

6.1 Long-Short Strategy

6.1.1 Correlation Hypothesis 1

The market variables that the researcher selected to test correlation in the Long-Short strategy are:

Table 21 : Long-Short market variables

Market Indices	Market Indices Cont.	Commodities		Currencies	Macro Economic
ALSI	Small Cap	BRSPOT	Cash	EUROZAR	Inflation
SWIX	Top 40	GOLR	USG10	USDZAR	NC3MM
FINDI 30	ALBI	PLAT	Long Bonds		NC1YM
RESI	Cash	FCRB			Shape of the Yield Curve
Mid Cap	Resi 20				
INDI 25	Global Markets				
FINI 25	FTWORU				

The correlation hypotheses test reject H_0 at a 5% significance level on the following variables:

Table 22 Long Short g Aggregate significant variables

ALSI	Small Cap	NC1YM	GOLR	Inflation
SWIX	Top 40	INDI 25	EURZAR	
FINDI 30	ALBI	FINI 25	USDZAR	
Mid Cap	NC3MM	FTWORU	Global Markets	

A significant correlation between two variables implies that there exists a linear relationship between the Long-Short aggregate strategy returns at the variables in Table 22.

Results are interpreted as follows:

Market Indices

The Long-Short strategy returns are shown to have a very high link with the general South African equity market indices. In particular the Long-Short strategy has very similar performance characteristics as those of small and mid cap indices, with correlation coefficient of 0.91 and 0.92 respectively. Global markets are also shown to be highly related to the Long-Short strategy returns i.e. the correlation levels are weaker within the local markets.

Local market indices and resources indices have no significant relationship to the Long-Short aggregate returns. This is despite the SA equity market being largely regarded as a resource centric market.

Commodities

Commodities indices with the exception of gold have no significant relation to the Long-Short strategy returns. This is despite the empirical observation on the influence of commodities to the South African economy.

Results show that the Gold spot price has a significantly negative relationship with the Long-Short aggregate returns. This result is in contrast to the widely held view that a strong gold price is associated with strong local currency. A strong currency is sufficient in containing inflation and promoting of low interest rates, a major driver of South African economic growth.

Currency

Both the EURZAR and the USDZAR currencies exhibit negative relation to the Long-Short aggregate returns. This implies that a strong currency will positively influence the Long-Short aggregate strategy returns. This outcome is in contrast to the Gold Spot outcome which supports the notion of strong currency being conducive to South African markets.

Macro-Economic Factors

Inflation and interest rates have a negative relation to the Long-Short strategy. In the South African inflation targeting environment, low inflation translates to low interest rates which are necessary for the South African consumer led economy. Therefore low interest rates are important in driving the economy.

6.1.2 Regression Hypothesis 2

An empirically observed co-variation is a necessary but not sufficient condition for causality (Albright et al. 2006). The objective of the regression model is to establish which variables have a casual relationship with the Long-Short aggregate strategy.

The regression output results using all the significantly correlated variables had an R^2 of 92% implying a significant casual relationship between this variables and the Long-Short Aggregate. However, due to the high inter-correlation of the predictor variables the exact nature of the relationship could not be determined.

The final model has two variables Mid Cap and Short-Term interest rates had a similar predictive power as the 18 variable model. The two factor model explained 92% of the Long-Short aggregate returns. Faced with a choice of an 18 variable model and a 2 variable model the fewer variable model is always preferred provided it has a similar predictive power as the latter. This is called the principle of parsimony (Albright et al. 2006).

The final regression model is therefore:

$R_{LS\ Aggregate}$ = alpha + ÿ$_{MidCap}$ * Mid-cap Index + ÿ$_{NC1YN}$ * NC1YN + þ,

Using our research data the regression coefficients estimate are shown in Fig 1 yields the following regression model :

$R_{LS\ Aggregate}$ = 4% + 0.65 * Mid-cap Index Return - 0.417* NC1YN

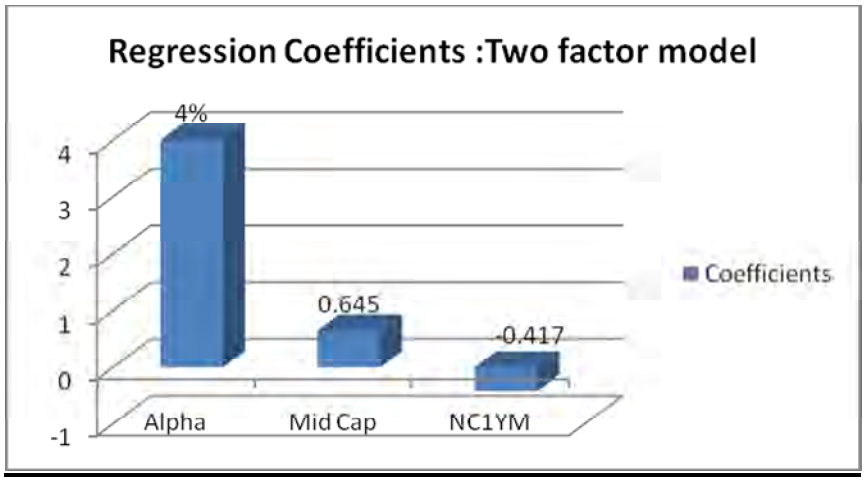

Fig 1

A 1% move in the mid cap index returns will cause a 0.65% move to the Long-Short Aggregate returns. A 1% upward move in short term interest rate will cause a -0.42% decline to the Long-Short Aggregate returns.

Over and above the passive allocation to the known market variables, there is evidence of Long-Short strategy specific returns as measured by the intercept term of 4%. This means that the average contribution of other sources of value add is 4%.

Joubert (2005) finds that the primary source returns in Long-Short hedge funds is the increase in capital value of the equity hedge. Secondary returns are provided by interest rate received on cash deposits and collateral accounts and by net dividends received on the long side of the strategy. Also related to the 4% strategy specific return would be the alpha purported by the hedge

6.2 Long Bias Strategy

6.2.1 Correlation Hypothesis 3

Variables that the researcher selected to test correlation in the Long Bias aggregate Strategy are:

Market Indices		**Commodities**		**Currencies**	**Macro Economic**
ALSI	Small Cap	BRSPOT	Cash	EUROZAR	Inflation
SWIX	Top 40	GOLR	USG10	USDZAR	NC3MM
FINDI 30	ALBI	PLAT			NC1YM
RESI	Cash	FCRB			Shape of the Yield Curve
Mid Cap	Resi 20				Long Bonds
INDI 25	Global Markets				
FINI 25	FTWORU				

The correlation hypotheses test reject H_0 at a 5% significance level on the following variables:

ALSI	Small Cap	NC1YM	GOLR	Inflation
SWIX	Top 40	INDI 25	EURZAR	

FINDI 30	ALBI	FINI 25	USDZAR	
Mid Cap	NC3MM	FTWORU	Global Markets	

Market Indices

Market indices results in the Long Bias Strategy resemble exactly those of the Long-Short strategy with the exception of the resource indices.

Resources are shown have a significantly positive relationship to the Long Bias aggregate. This is to be expected as the un-hedged component of the Long Bias aggregate is exclusively exposed to the South African equity market which is predominantly resources based.

Commodities

None of the commodities indices exhibit a significant relationship to the Long Bias aggregate. This is a surprising result given that the resources indices have been shown to have a significantly positive relationship to the Long Bias strategy.

Currency

Currency results here are the same as the ones in the Long-Short strategy.

Macro-Variables

Macro variables are exhibit the same results as in the Long-Short strategy with an addition of variable, Shape of the Yield Curve. The shape of the yield curve (Long

Rates-Short Rates) is regarded as the reflection of market expectations about GDP future growth.

When the yield curve has the normal shape (long rates higher than short rates) it is an indication that the market expects the economy to improve in the future. If the curve becomes a flat line, this is a signal that the economy will grow at a slower pace. An inverted yield curve is an indication that the market is expecting a recession in the near future.

6.2.2 Regression Hypothesis 4

The regression model of the significantly correlated variables encounters similar problems as the Long-Short Aggregate resulting the final parsimonious three factor model:

$R_{LB\ Aggregate} = \ddot{y}_{mid\text{-}cap} * \text{Mid-cap Index} + \ddot{y}_{small\ Cap} * \text{Small Cap} + \ddot{y}_{global\ markets} * \text{Global Markets} + \beta,$

Using our research data the regression coefficients estimates are shown in Fig 2 yielding the following regression model which explains 93% of the Long Bias Aggregate returns:

$R_{LB\ Aggregate} = 0.32 * \text{Mid-cap Return} + 0.32\ \text{Small Cap Return} + 0.15* \text{Global Markets}$

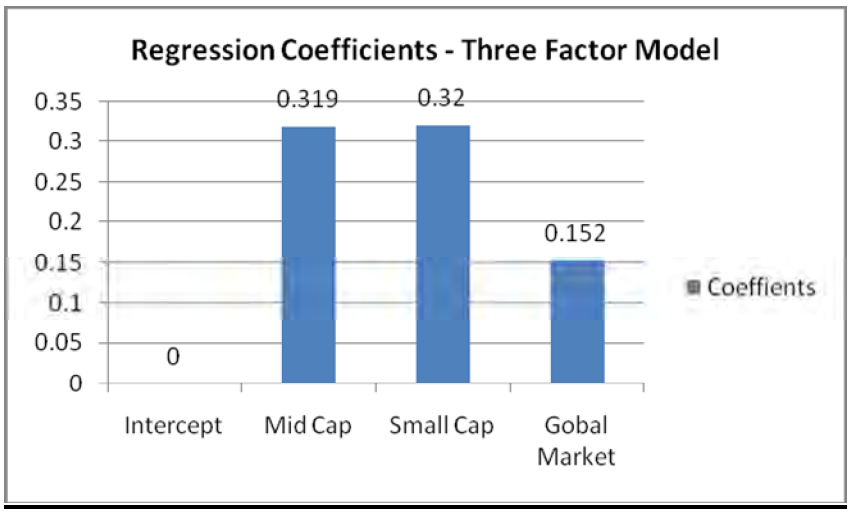

Fig 2

A 1% move in the mid cap index returns will cause a 0.32% move to the Long-Short Aggregate returns. A 1% move in the Small Cap index returns will cause a 0.32% move to the Long-Biased Aggregate returns. Global markets also have a predictive power to the Long Bias returns with a 1% move in Global markets resulting in a 0.15% in Long Bias Aggregate. Using the London Stock Exchange as a proxy for the international markets, Samouilhan (2006) concluded that there exists a positive relationship between domestic market returns and international market returns. Bullish (bearish) international returns were found to be associated with bullish (bearish) domestic returns.

Of particular interest is the intercept (strategy specific return) that estimated to be equal to zero implying that Long Bias funds are exclusively about investing in normal market sectors with little evidence of the wizardry.

6.3 Market Neutral Strategy

6.3.1 Correlation Hypothesis 5

Market Indices	**Market Indices Cont.**	**Commodities**		**Currencies**	**Macro Economic**
ALSI	Small Cap	BRSPOT	Cash	EUROZAR	Inflation
SWIX	Top 40	GOLR	USG10	USDZAR	NC3MM
FINDI 30	ALBI	PLAT	Long Bonds		NC1YM
RESI		FCRB	Cash		Shape of the Yield Curve
Mid Cap	Resi 20				Retail Sales YOY%
INDI 25	Global Markets				PCE YOY
FINI 25	FTWORU				Trade Bal Rbn
					M3 YOY%

The correlation hypotheses test reject H_0 at a 5% significance level on the following variables:

ALSI	Small Cap	Inflation	EURZAR
SWIX	Top 40	Global Markets	USDZAR
FINDI 30	ALBI	FINI 25	
Mid Cap	INDI 25	FTWORU	

Market Indices

Market indices results in the Market Neutral Strategy exhibit the same results as the long Short Strategy. However, the general levels of correlation are systematically lower than the Long-Short aggregate.

Commodities

Commodities in the Market Neutral Strategy show the same kind of results as the Long Bias i.e. no significant correlation exists between the Market Neutral Aggregate and the commodity price.

Macro-Variables

Macro variables, with exception of inflation are shown to have an insignificant relation to the Market Neutral aggregate strategy. Inflation has a negative correlation to the Market Neutral Strategy implying that lower inflation is conducive to the aggregate Market Neutral strategies.

Currencies

Currency results are the same as the two previous strategies.

6.3.2 Regression Hypothesis 6

The regression model of the significantly correlated variables encounters similar problems as the Long-Short Aggregate, resulting in the final parsimonious two factor model:

$R_{MN\ Aggregate}$ = alpha + ÿ$_{mid\ cap}$ * Mid-cap Index + ÿ$_{small\ Cap}$ * Small Cap + þ ,

Using our research data the regression coefficients estimate shown in Fig 3.

Aggregate returns are:

$$R_{LB\ Aggregate} = 0.01+0.18 * \text{Mid-cap Return } -0.1 \text{ Small Cap Return}$$

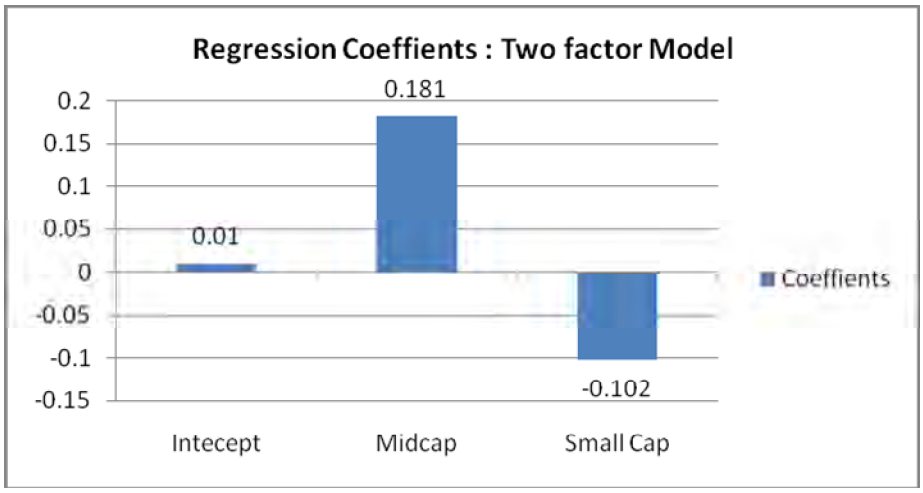

Fig 3

The regression model explains 58% of the Market Neutral aggregate strategy returns. Adjusting for the number of variables in the model reduces R^2 to 31% which is significantly low compared to the previous strategies. Therefore reliability of our model is low, suggesting that there are other unknown 'return factors' in the Market Neutral space than a pure allocation to the different market variables. This is despite the overall model being a significant predictor of the Market Neutral aggregate returns.

The Mid Cap index again features as one of the key drivers of the Market Neutral aggregate returns. A 1% move in the Mid Cap index will yield a 0.18% return to the

Market neutral strategy while small cap have an opposite influence. A 1% move in Small Cap index yields a -0.1% move in the Market Neutral returns. The strategy specific alpha is estimated at 1% significantly lower than the 4% estimate of the Long Short Aggregate.

6.4 Global Macro Strategy

6.4.1 Correlation Hypothesis 7

Tested variables

Market Indices	**Market Indices Cont.**	**Commodities**		**Currencies**	**Macro Economic**
ALSI	Small Cap	BRSPOT	Cash	EUROZAR	Inflation
SWIX	Top 40	GOLR	USG10	USDZAR	NC3MM
FINDI 30	ALBI	PLAT	Long Bonds		NC1YM
RESI		FCRB	Cash		Shape of the Yield Curve
Mid Cap	Resi 20				Retail Sales YOY%
INDI 25	Global Markets				PCE YOY
FINI 25	FTWORU				Trade Bal Rbn
					M3 YOY%

The correlation hypotheses test reject H_0 at a 5% significance level on the following variables:

ALSI	Small Cap	Resi	NC3MM
SWIX	Top 40	Global Markets	NC1YM
FINDI 30	Fini15	Resi 20	Shape of the

			Y.Curve%
Mid Cap	INDI 25	FTWORU	Retail Sales YOY%

Market indices

Market Indices in this strategy results are the same as Market Neutral but slightly higher.

Commodities

Results in this strategy also the same as in the Long Bias and Market Neutral.

Currency

Results here are the same as in the Long-Short strategy.

Macro Variables

Macro variable results in this strategy are the same as in the Long Bias Strategy except for inflation. While the negative relationship is maintained the correlation number is not significantly different from zero. GDP growth indicators (Shape of the

yield curve and Retail Sales) have a significant relationship with the Global Macro strategy.

6.4.2 Regression Hypothesis 8

The final model is represented by the following two factor model:

$$R_{\text{global macro strategy}} = 0.9\% + 0.11 * \text{Resi} + 0.23 * \text{Mid Cap}$$

The model explains 55% of Global Macro strategy returns, is output is significantly low. Adjusting for the number of variables, R^2 drops to 27%. This implies that 73% of the returns cannot be explained by a mere allocation to known indices.

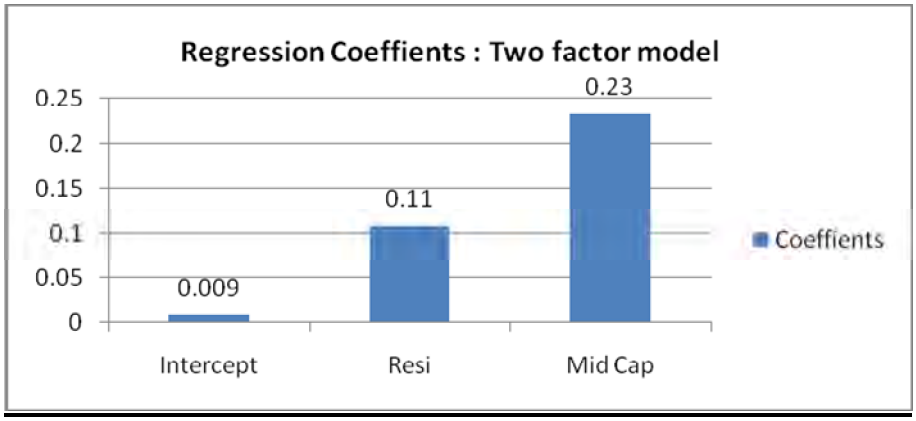

Fig 4

As the prior strategies, the Mid Cap index is a significant predictor of the Macro Trading Strategy returns with every 1% move yielding a 0.23% move to the strategy returns. Resources index are for the first time also significant predictors within the

Global Macro. A 1% move in the resources index leads to a 0.11% gain in the Global Macro strategy. The hedge fund manager specific alpha is 0.9%, i.e significantly different to zero.

Chapter 7 Conclusion

The results of this research regarding the performance factors within the hedge fund industry are mixed relative to the literature review. While some strategies are consistent with global findings others refute such conclusions of prior authors in the subjects. Gregoriou and Rough (2002) found that hedge funds exhibit non-sensitivity to the global markets. This research refutes this finding in one strategy, the researcher found that Global Markets are a secondary driver of aggregate returns in the Long Bias strategy.

Gregorio and Duffy (2006) in their study found that changes in economic conditions determine returns. This research refutes this finding in the South African aggregate hedge fund data. None of the Equity strategies studied have macro economic variables as drivers of returns.

Guller and Ruttmann (2009) found that oils and metals are drivers of African market returns, this conclusion was not evident in this research.

7.1 Diversification

Gregoriou and Rouah (2002) found that hedge funds are excellent diversifiers and show low correlation to traditional stock, bond and currency markets. Malkiel and Saha (2005) agree with the view that hedge funds are excellent diversifies as they

exhibit low correlation to market indices. This research on South African data has shown consistency with the findings of these authors, except on the Mid Cap and Small Cap Indices.

7.1.1 Diversification with other traditional asset classes

Diversification has been put forward as the main reason why the hedge fund industry had an exponential growth and why pension funds are expected to increase their allocation to the sector. Global hedge funds diversify the strategic portfolio allocation to improve risk adjusted returns (Cadiz, 2009). We also saw from Lhabitant (2002) that diversification consists of spreading investments among different available assets or asset classes so as to reduce the overall risk of a hedge fund.

The results of this research show that an allocation to hedge fund will not necessarily yield the diversification benefits. Long Short and Long Bias strategy have an extremely high correlation to the Mid Cap and Small Cap indices. While this does not mean that it necessarily always the case, in the last five years consistent with our data it has been so. High correlation with only two market indices does not support the arguments by Cadiz (2009) and Lhabitant (2002).

Market Neutral and Global Macro trading on the other hand do offer the purported diversification benefits because their returns are also influenced by some other factors other than broad market indices. As noted earlier, their models in this research only explain just over half their returns.

7.1.2 Diversification within the alternative asset classes

The different hedge fund strategies are shown to be independent of the performance of alternative asset classes such Oil, Gold and Platinum are independent but, Gold is an exception with a negative relation to the Long Short Strategy. As such diversification still exists between hedge funds and these alternative asset classes.

Samouillhan and Shannon (2008) state that the behaviour of certain key variables, such as the interest rate, the exchange rate and the gold price, are some of the factors widely viewed as being influential to price determination on the JSE.

This research found negative correlation between Gold and some of the strategies, which is surprising and maybe alluding to the fact that South African hedge fund managers have eccentric investment behaviours.

7.1.3 Diversification within the hedge fund sector

While different strategies are highly correlated, their performance drivers are slightly diverse. What is common amongst all four equity strategies is the use of the Mid Cap index in the equity market as their primary performance driver.

Secondary performance drivers differ by strategy:

The Long Short has South African interest rates as the secondary driver. The Long Bias has the small cap allocation and global markets as the secondary drivers Market Neutral strategy has a short position in small caps as its secondary performance driver and resource indices are the secondary performance drivers within the Global Macro strategy.

Mazwana (2007) states that there has been a remarkable acceptance of hedge fund strategies as a viable source of diversification. The Peregrine (2007), found evidence of a meaningful degree of diversification between hedge fund styles through the use of bi-plots, in the South African market.

7.2 Performance Replication

More than 90% of the Long Short and Long Bias strategy performance can be replicated by a linear combination of well known and tradable market indices. This implies that investing in a Long short and a Long Bias strategy (as a whole) is not too different from investing in mid cap and small cap indices as a sector that most institutional investors are well acquainted to. The inference is that this may be the key reason why long short has a biggest share of the institutional allocation in the hedge fund sector.

The modelling was less successful on Market Neutral and Global Macro trading strategies implying a remarkable existence of pure strategy alpha within these strategies. The regression models explained just over 50% of the returns, with the sources of the remainder of the outcomes not clear. The mystique has therefore not been completely cleared as was the aim of the research on the Market Neutral and Global Macro strategies. There remains therefore a significant reliance on the skill or lack thereof of the fund manager within these strategies to drive returns.

7.3 Absolute Returns

Gregoriou and Duffy (2006) found in their study that hedge funds are a source of absolute returns. This research found mixed results among the four aggregate strategies.

Whether or not hedge funds can offer absolute returns varies by strategy.

- The Long Short strategy has a constant return of 4% irrespective of the market direction. The strategy will experience negative returns to the extent that this 4% cushion has been depleted i.e. mid cap index falls in excess of -6%. This research agrees with Ali (2005) that, the long short strategy is renowned for excess returns.

- The Long Bias aggregate does not show any absolute return characteristics expected from hedge fund returns. The strategy has a zero unconditional

return and a long positive exposure to all the significant market indices (small caps, mid caps and global markets).

- The unconditional return in the Market Neutral Aggregate is at 1%. This result cannot be regarded as a safety net for absolute returns. The absolute returns will therefore be to the extent that small cap underperform the mid cap index.

- Global Macro strategy also has minimal unconditional return, 0.9% with directional exposure to both the Resources Index and Mid Cap index. Given that the linear model can only explain half the strategy aggregate returns; the results are inconclusive of whether the absolute returns are achievable in this strategy.

7.4 Recommendations for further Research

- This research was conducted with available data from January 2002 – December 2008. This period falls within a boom listing period in the small cap and medium cap arena. The researcher would like to recommend further research into this topic using data from the beginning of the market downturn period, February 2008 – the end of the recession. It would be interesting to see if the Mid Cap Index will still be a primary driver of returns.

- Fung and Hsieh (1997) found no persistence of returns in their study. A similar study would be interesting for the South African market.

- Hedge funds are a new phenomenon in South Africa. Novare (2008) notes that the maximum experience of a hedge fund manager in South Africa is seven years. A study into the influence of manager skill/ experience in driving returns would also be recommended for future studies.

- Analysis on data was performed on aggregate returns of equity strategies. Further research is recommended exploring fund specific research if data can be available directly from hedge fund managers.

Appendix A : T-Distribution Table

df	0.4	0.25	0.1	0.05	0.025	0.01	0.005	0.0025	0.001	0.0005	df
1	0.324919	1.000001	3.077685	6.313749	12.70615	31.82096	63.6559	127.3211	318.2888	636.5776	1
2	0.288675	0.816497	1.885619	2.919987	4.302656	6.964547	9.924988	14.08916	22.32846	31.59977	2
3	0.276671	0.764892	1.637745	2.353363	3.182449	4.540707	5.840848	7.4532	10.21428	12.92443	3
4	0.270722	0.740697	1.533206	2.131846	2.776451	3.746936	4.60408	5.59754	7.17293	8.610077	4
5	0.267181	0.726687	1.475885	2.015049	2.570578	3.36493	4.032117	4.773319	5.893526	6.868504	5
6	0.264835	0.717558	1.439755	1.943181	2.446914	3.142668	3.707428	4.316826	5.207548	5.958718	6
7	0.263167	0.711142	1.414924	1.894578	2.364623	2.997949	3.499481	4.029353	4.785252	5.408074	7
8	0.261921	0.706386	1.396816	1.859548	2.306006	2.896468	3.355381	3.832538	4.500762	5.041366	8
9	0.260956	0.702722	1.383029	1.833114	2.262159	2.821434	3.249843	3.689638	4.29689	4.780886	9
10	0.260185	0.699812	1.372184	1.812462	2.228139	2.763772	3.169262	3.581372	4.143658	4.586764	10
11	0.259556	0.697445	1.36343	1.795884	2.200986	2.718079	3.105815	3.496607	4.024769	4.436879	11
12	0.259033	0.695483	1.356218	1.782287	2.178813	2.68099	3.054538	3.428431	3.929599	4.317844	12
13	0.258591	0.69383	1.350172	1.770932	2.160368	2.650304	3.012283	3.372479	3.852037	4.220929	13
14	0.258212	0.692417	1.345031	1.761309	2.144789	2.624492	2.976849	3.325695	3.787427	4.140311	14
15	0.257885	0.691197	1.340605	1.753051	2.131451	2.602483	2.946726	3.286041	3.732857	4.07279	15
16	0.257599	0.690133	1.336757	1.745884	2.119905	2.583492	2.920788	3.251989	3.686146	4.014873	16
17	0.257347	0.689195	1.333379	1.739606	2.109819	2.56694	2.898232	3.222449	3.645764	3.965106	17
18	0.257123	0.688364	1.330391	1.734063	2.100924	2.552379	2.878442	3.196583	3.610476	3.921741	18
19	0.256923	0.687621	1.327728	1.729131	2.093025	2.539482	2.860943	3.1737	3.579335	3.883324	19
20	0.256742	0.686954	1.325341	1.724718	2.085962	2.527977	2.845336	3.1534	3.551831	3.849564	20
21	0.25658	0.686352	1.323187	1.720744	2.079614	2.517645	2.831366	3.13521	3.527093	3.819296	21
22	0.256432	0.685805	1.321237	1.717144	2.073875	2.508323	2.818761	3.118839	3.504974	3.792229	22
23	0.256297	0.685307	1.319461	1.71387	2.068655	2.499874	2.807337	3.103996	3.484965	3.767636	23
24	0.256173	0.68485	1.317835	1.710882	2.063898	2.492161	2.796951	3.090536	3.466776	3.745372	24
24	0.256173	0.68485	1.317835	1.710882	2.063898	2.492161	2.796951	3.090536	3.466776	3.745372	24
25	0.25606	0.68443	1.316346	1.70814	2.059537	2.485103	2.787438	3.078203	3.450186	3.725145	25
26	0.255955	0.684043	1.314972	1.705616	2.055531	2.478628	2.778725	3.066889	3.43498	3.706664	26
27	0.255858	0.683685	1.313704	1.703288	2.051829	2.472661	2.770685	3.056521	3.42101	3.689493	27
29	0.255684	0.683044	1.311435	1.699127	2.045231	2.46202	2.756387	3.03804	3.396271	3.659516	29
29	0.255684	0.683044	1.311435	1.699127	2.045231	2.46202	2.756387	3.03804	3.396271	3.659516	29
30	0.255606	0.682755	1.310416	1.69726	2.04227	2.457264	2.749985	3.029782	3.385212	3.645982	30
40	0.255039	0.680673	1.303076	1.683852	2.021075	2.423258	2.704455	2.971174	3.306923	3.550958	40
50	0.254699	0.679428	1.298713	1.675905	2.00856	2.403267	2.677789	2.936977	3.261375	3.495952	50
60	0.254473	0.678601	1.295821	1.670649	2.000297	2.390116	2.660272	2.914567	3.231689	3.460154	60
70	0.254312	0.678011	1.293763	1.666915	1.994435	2.380802	2.647903	2.898742	3.210807	3.43498	70
80	0.254191	0.677569	1.292224	1.664125	1.990065	2.373872	2.638699	2.886954	3.195237	3.416353	80
90	0.254097	0.677226	1.291029	1.661961	1.986673	2.368497	2.631568	2.877896	3.183231	3.401947	90
100	0.254022	0.676951	1.290075	1.660235	1.983972	2.364213	2.625893	2.870656	3.173773	3.390451	100
110	0.25396	0.676727	1.289295	1.658823	1.981766	2.360721	2.621273	2.864763	3.165987	3.381138	110
120	0.253909	0.67654	1.288646	1.65765	1.979929	2.357829	2.617417	2.859852	3.159512	3.373425	120
200	0.253684	0.675718	1.285798	1.652509	1.971894	2.345132	2.600627	2.838497	3.131499	3.33981	200

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