The Search Continues -Problems of finding a consistent performance measure for Hedge Funds

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Abstract

The question of whether the choice of performance measure (PM) matters when evaluating Hedge funds has for a long time been subject to debate . This study explores the same question with a sample of individual monthly data from 669 Hedge Funds over a 10 year period. The standard rank correlation tests usually applied when studying the topic yield weaker correlations between the PM:s in our study than in earlier studies. This indicates that the choice of Performance Measure does indeed matter when evaluating Hedge Funds, and maybe also that the canonical performance measure is yet to be found.

1 Introduction

Hedge funds are simply put investment funds that do not have to be as transparent as other investment vehicles. They are administered by professional manager firms that investors put their trust in to deliver desired returns (Singh,2010), [6]. Hedge funds are limited to a certain group of accredited investors. They are not required to have the same transparency as mutual, or other types of investment funds, and they are also not subject to the same regulatory oversights. This permits hedge funds to take on higher risk levels than other funds and apply leverage to their investments which can lead to both higher returns and higher losses. The special features of hedge funds create anomalies in their return data. It is often not normally distributed and displays higher kurtosis and skewness than regular fund return data (diBartolomeo, 2014), [11]. This creates problems when using financial performance measures which often rely on the mean variance measure of risk that assumes normally distributed data.

A great deal of literature has tried to figure out to which degree special performance measures are necessary for different types of performance data. This paper draws on these studies and examines how different performance measures ranks the performance of hedge funds according to 20 more and less common performance measures. Spearman rank correlation tests between the fund rankings of different performance measures are performed both for all funds as a group and when grouped as belonging to 9 common Hedge fund strategies. Results display that the hedge fund return data does indeed display anomalies in its return data. The computed performance measures (which will be abbreviated PM:s in the sequel) are found to generally be less correlated than in earlier studies. The strongest correlations most measures have are with the Sharpe ratio. There also seems to be a clear relationship between higher correlations for smaller samples of funds.

The outline of this paper is as follows. In the 'Theory' part, section 2, we first give a very brief overview of previous work. Then, in subsection 2.2 we describe the different hedge fund strategies, according to which we have grouped the funds that we study. In the following subsection 2.3 we list the different performance measures, and also try to indicate the motivation behind them. In section 3, the 'Method' part, we describe how the material has been collected and analysed, and discuss some of the many difficulties that appeared along the way. In section 4 we give the results and in section 5 the conclusion, followed by the bibliography. Finally, we include the correlation tables that show to what extent the rankings given by the different PM:s are correlated within each group of funds with similar strategies. As these tables show a rather low degree of correlation (see the 'Conclusion' part for a discussion of this), we also include a sample table for the ranking within one of the strategy groups, which intuitively might give a feeling of somewhat higher correlation between the different PM:s than showed in the correlation tables. This raises the question whether the Spearman test gives a good picture of correlation between ranking tables that – as here – are rather long. At any rate, the 'intuitive' correlation indicated by the ranking tables themselves,

does also not seem to be very high, which also raises the question how reliable these performace measures really are.

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2 Theory

2.1 Earlier studies

Amongst the earlier studies on the subject are Eling and Schumacher (2007), [2]. They created 11 performance measures based on 10 different hedge fund indices and rank them with a Spearman rank correlation test. All their measures produce nearly the same ranking and they therefore conclude that evaluation according to the standard Sharpe ratio seems justifiable. The authors point out that they are aware of the limits their paper contains considering it is based on hedge fund indices and not individual fund data. For further studies they also suggest adding performance measures that are evolved on the basis of correlations such as the Treynor, Jensen and Treynor-Black measures. In Eling et al (2011) both classical performance measures and others that are more tailor made for hedge funds are examined according to the same rank correlation procedure. They conclude once again that the different PM:s produce an almost identical rankings with exception for the Treynor ratio.

Nguyen-Thi-Than (2007)[5] draws on Eling and Schuhmacher(2007), [2] when conducting a similar rank correlation test for 149 individual funds that follow a long short equity strategy for 5 year monthly performance data. Nguyen-Thi-Than (2007) further criticizes earlier studies for performing the study on a too large group of funds. According to the author, this can hide inconsistencies in smaller subsamples of the fund group. She concludes that the rankings are similar when applying a Spearman rank correlation test but significantly different when comparing rankings based on deciles. Zakamouline (2010), [8], criticizes Eling (2006)[3] for their conclusion that the choice of performance measure does not matter. He claims that this conclusion is based on a series of faults with their investigation. Amongst these are that their studied time period is too short and that the performance measure could give different correlations when computed for longer investment horizons than 1 month. Another problem he states is that the Spearman rank correlation is not enough for drawing conclusions about ranking similarities amongst the PM:s. Instead similarly to Nguyen-Thi-Than (2007) he applies a ranking system based on how funds in different deciles of the ranking move depending on the PM:s. Further he states that the PM:s are to selectively chosen, and that, moreover, in many cases normal distribution is assumed when computing the measures. As a final criticism, he states that the concentration of funds with non-normally distributed data is too small in their sample. Elling (2009), [4] once again perform a similar anallysis. This time employing a large fund database with individual hedge fund data. They once again find that the PM:s have strong correlations with the Sharpe ratio with the exception when different parameters of certain tailored hedge fund measures parameters are varied to simulate more aggresive investment strategies. In this last case they find that the correlations diminish drastically.

In this study we divide the large number of funds in groups according to investment strategies. Below, in the first subsection we describe each of the strategy groups we are looking at. The funds within each group are then ranked according to certain performance measures, whose definitions and properties we summarize in the second subsection.

2.2 Hedge fund strategies

A short presentation of each hedge fund strategy is given below as taken from Barclays Hedge and the Lipper Fund database.

Long short equity
This strategy is the most common one and the one employed by most funds in the sample. The funds of this type take long positions in stocks that are expected to appreciate and short positions in stocks that are expected to decline. This strategy relies a lot on the managers ability to make the right stock pickings and is therefore not without risks. Hedge fund assets are usually not very liquid which could make it more difficult to sell shares than for example mutual funds. These risks combined with usual high fees makes this one of the riskier hedge fund strategies.

Managed futures CTA:s
This is possibly the oldest hedge fund style. Fund managers are required to go through a rigorous process to obtain the commodity trading advisor (CTA) title, issued by the CFTC organization. The strategies employed by this class are extremely varied. Managed futures traders take long and short positions in futures contracts, government securities and options on futures contracts. Many times algorithmic trading and high frequency trading (HFT) strategies are employed in this class. The Lipper fund database (from which the data is downloaded) classify the managed futures and CTA managers into 2 different types: Systematic or trend following traders. The first type of traders rely on historical analysis and an often algorithmic type of trading to anticipate future price movements. The second type are discretionary traders that rely more on fundamental analysis and managerial expertise when choosing how to invest.

Emerging Markets
Hedge Funds following this strategy are funds that invest in emerging markets. They can focus on special regions or many different ones. The emerging markets typically have incomes on the lower to middle end of the world range. Often these are countries that are gradually opening themselves up to more global capital flows. The funds that apply this strategy invest in both debt and equity. Hedge funds that invest according to this strategy can enjoy several benefits compared to mutual funds investing in the same region. While mutual funds often are restricted to investing in stocks and bonds the hedge funds can invest in more sophisticated investments like real estate currencies and derivatives. The hedge funds may also use leverage to boost their investments.

Event Driven
Funds that use this strategy seek to prosper from different corporate events. Examples are arbitrage from corporate mergers (often in market upswings) or investments in distressed securities (often in market downswings).

Multi strategies
The investors here – as the name implies – take part in a variety of investment strategies. Examples of different strategies can for instance be: convertible bond arbitrage, equity long/short, statistical arbitrage and merger arbitrage. Noted benefits are here that the fund manager can switch between different strategies to the one that currently gives the best opportunities.

Global Macro
For this strategy, managers seek to profit from global imbalances and geopolitical events. This is the broadest possible strategy a hedge fund can pursue. Fund managers often invest in fixed income securities, foreign exchange markets and major equity. Generally, they invest in financial instruments that are broad in scope and fluctuate based on systematic risk. Fund managers of this type can generally be divided into currency, stock and interest rate trading. In currency trading the strategy generally focuses on a currencys strength versus another currency. Investors focus on

all global macroeconomic factors that affect the value of exchange rates. Different currency instruments like over the counter (OTC) transactions, options and forward rate agreements (FRA:s) can be subject to currency investments. In stock trading investors use equity indexes and try to benefit from growth from the country represented by the equity index. A focus on investing in liquid assets with risk restricted to market risk is also common. And, in interest rate trading investors focus on investments that follow the interest rates of sovereign global debt.

Equity market neutral
Funds aim to have a net market exposure of zero to market factors. Managers hedge investments through a combination of long and short stock positions. The two main market neutral strategies are statistical arbitrage and fundamental arbitrage. Strategy that aims at taking profits taken arbitrage opportunities from price abnormalities (based on historical price analysis) in equity. The fundamental arbitrage is based on a more fundamental type analysis of the companies to make arbitrage opportunities on stocks. One of the advantages of this investing strategy is obviously its ability to not be overly sensitive to market fluctuations. Disadvantages can be that the fund lacks in ability to truly creating a zero-beta exposure and that the fund loses less in bear markets but also gains less in bull markets.

Creditfocus
These hedge funds invest primarily in debt. Funds invest in bank loans, high yield debt, preferred stocks of companies in distress and different debt structured securities. Funds of this type tend to be more active during economic downturns and during restrictive credit markets

Fixed Income Arbitrage
Funds in this strategy seek to profit from arbitrage opportunities amongst fixed income securities. Investment can be done in both simple fixed income instruments like government and corporate bonds and more structured ones like credit default swaps (CDS:s).

2.3 Performance Measures

A financial performance measure helps you to evaluate your investments. The measurement tools can be of many different types usually risk/return related.

Sharpe ratio like performance measures

These measures evluate the risk adjusted performance of investments. In the numerator they often have excess returns (over risk-free rate) this is divided by some sort of risk measure.
The Sharpe Ratio
The PM: is given by:

$$S_p = \frac{E(r_p) - r_f}{\sigma_{r_p}} \tag{1}$$

It is the excess return divided by the standard deviation of returns. $E(r_p)$ stands for expected return,r_f is the risk free rate and σ_{r_p} is the standard deviation of the returns The Sharpe ratio is the most standard of all performance measures. It measures a return to volatility ratio. This measure has been criticized for not being applicable to hedge fund returns due to its assumption that the returns its used on are normally distributed. Another critique is that it uses the standard deviation that considers both positive and negative deviations from the expected return (Singhal,2016)[12]. To deal with these problems many variations of the Sharpe ratio that for example use modifications of the standard deviation or considers investors preferences for distribution skewness have been proposed.

The ASSR (adjusted for skewness Sharpe ratio)

$$ASSR = S_p\sqrt{1 + b_3\frac{Skew}{3}S_p} \tag{2}$$

This measure is taken from Zakamouline & Koekebakker (2009), [13] Here The S_p once again is the Sharpe ratio, the b_3 depends on the investors risk adversion in an expected utility framework. The measure takes into account the investors preferences to higher moments of the distribution within expected utility theory. To describe the investors preference to the skewness of the distribution they use the Arrow Pratt absolute measure of risk aversion. This measures behavior in humans when exposed to uncertainty (Varian,1992)[14] . A value of b_3 equal to 1 would imply a CARA (constant absolute risk aversion) utility function any parameter larger than 1 equals a CRRA (constant relative risk aversion) utility function. In the thesis 3 different ASSR values are computed. The first one represents the usual CARA utility which often is assumed to hold for investors. The second one is the value usually applied by Morningstar (Caporin et. al, 2013)[7] and the third one is the value applied by Sharma (2004), see op. cit..

The Yitzhaki Gini ratio
This was proposed by Yitzhaki (1982)[10]. This PM has the same numerator as the Sharpe ratio but proposes a Gini coefficient instead of standard deviation to measure risk. In this thesis the Gini coefficient is computed through a procedure proposed by Yitzhaki (1982). 2 versions of this measure are computed labeled Yi_p and and Z_p . Yi_p is the Sharpe like ratio in Eq. 4. Z_p in Eq 5 is another way to construct a measure based on the Gini coefficient, which is related to one suggested by Caporin et al, [7]. (As the measure proposed by Caporin et al however is obviously unreasonable we have modified the formula). Y_j in Eq 3 here equals $r_{p_j} - r_f$.

$$G_p = \Gamma = \sum_{j=1}^{J}\sum_{k>j}^{J}|Y_j - Y_k| = \frac{1}{2}\sum_{j=1}^{J}\sum_{k=1}^{J}|Y_j - Y_k| \tag{3}$$

$$Yi_p = \frac{E(r_p) - r_f}{G_p} = \frac{E(r_p) - r_f}{\frac{1}{2}E(|r_p - r_f|)} \tag{4}$$

$$Z_p = (E(r_p) - r_f)(1 - G_p) \tag{5}$$

The Dowd (risk to volatility ratio)
The Dowd is a generalization of the Sharpe ratio proposed by Dowd (2000), [15]. It gives the investor a return ratio to extreme risk instead of total risk. The measure becomes a Sharpe ratio with VAR (value at risk) in the denominator instead of standard deviation. It is said to measure return against extreme rather than normal risk.

$$RVaR_p = \frac{E(r_p) - r_f}{VaR_{r_p,a}} \tag{6}$$

Value at Risk is here given by:

$$VaR_\alpha = \min\{l; Pr(L > l) \leq 1 - \alpha\} \tag{7}$$

A VaR at a 1% confidence level implies that the investor is 99% certain to not lose more than this value (Investopedia), with $\alpha = 2.358$ taken from the T-dist(0.01)

PM:s that use lower partial moments (LPM:s)

The following 3 PM:s use LPM:s, which are defined by

$$LPM_m(\tau) = \frac{1}{n}\sum_{1}^{n} max(\tau - r_i; 0)^m.$$

The LPM:s distinguish normal volatility from volatility that is below a certain threshold value. The threshold value τ used throughout the thesis is set to 0.0352% (the average monthly Treasury bill rate for the studied period). The PM:s with LPM are non parametric PM:s and thus better suited to return distributions with non normal return distributions.

The Omega ratio

$$\Omega_i(\tau) = \frac{r_i^d - \tau}{LPM_1(\tau)} + 1 \tag{8}$$

τ is here defined as the investors minimum acceptable return (threshold return) (Kaplan & Knowles, 2004)[16]
The Omega ratio was proposed by Keating & Chadwick (2002)[9]. Unlike the Sharpe ratio it does not assume normally distributed return data but rather the actual distribution of the data. The Omega ratio is defined as the probability weight of gains versus losses for some threshold return target. One of its benefits amongst investors is that it takes the four moments of the distribution data into account. With a higher ratio comes a higher area of gains vs losses for some threshold (the LPM threshold). The omega ratio has been criticized for not being the universal performance measure that its proponents claim. Critics have pointed out that it obscures a lot of the distributions downside tail risk and makes investors prone to build up more highly leveraged capital structures (Frey 2009)[17].

The Sortino ratio
The Sortino ratio is similar to the Sharpe ratio in that it has the same numerator but divides it by downside risk (risk below a certain threshold) instead of the regular standard deviation. This is claimed to benefit investors with a positive skew in their return distributions.

$$SOR_i(\tau) = \frac{r_i^d - \tau}{\sqrt{LPM_2(\tau)}} \tag{9}$$

The Kappa 3 ratio
Both the Sortino and the Omega measure are generalizations of the Kappa measure (Kaplan, 2004)[16]. The three measures can in generalized form be written:

$$K_n(\tau) = \frac{r_i^d - \tau}{\sqrt[n]{LPM_n(\tau)}} \tag{10}$$

Notice that K_1 here becomes the Ω-measure, while K_2 is the Sortino ratio. Kappa 3 is K_n for $n = 3$.

The Upside potential ratio The upside potential ratio was first suggested by Sortino et al.(1999a,b)[18]. It allows an investor to choose an investment that has a relatively good upside performance per unit of downside risk. It is often seen as a measure somewhere between the Sortino and Omega ratio. Here the numerator can be thought of as the potential for success, (Derbyshire& Hampton, 2014)[1].

$$U = \frac{\sum_{min}^{\infty}(R_r - R_{min})P_r}{\sqrt{\sum_{-\infty}^{min}(R_r - R_{min})^2 P_r}} = \frac{E[(R_r - R_{min})_+]}{\sqrt{E[(R_r - R_{min})_-^2}}, \tag{11}$$

where the returns R_r have been put into increasing order. Here P_r is the probability of the return R_r and R_{min}, which occurs at $r = min$ is the minimal acceptable return.

Market return dependent PM:s

The Treynor ratio This is a measure of the excess return per unit of market risk. Risk here is defined as the beta measure. The Beta measures whether the investment is more or less volatile compared to the market. Like CAPM this measure assumes that all individual risk has been diversified away and therefore only measures excess returns compared to systematic risk. The Treynor ratio is then defined as:

$$T_p = \frac{\bar{r}_p - \bar{r}_f}{\beta_p} \tag{12}$$

Where Beta is defined as:

$$\beta = \frac{Cov(r_i; r_m)}{Var(r_m)}.$$

Jensens alpha
Jensens alpha, proposed by Jensen (1968), [19] displays the excess return of the portfolio of what has been predicted by the Capital asset pricing model (CAPM). Jensens measure shows if the fund is earning a proper return for its level of risk. It is in this thesis computed as:

$$\alpha_J = (R_P - R_F) - \beta_P(R_M - R_F) \tag{13}$$

Where R_p equals the funds return, R_F is the risk free rate and R_M is the market return. So if the fund has earned a higher excess return R_P-R_F from what has been predicted by CAPM the α is positive.

The M^2 ratio

$$M^2 = \frac{\sigma_M}{\sigma_P}(R_P - R_F) - R_F \tag{14}$$

Here the R_P is the fund return R_F is the risk free rate σ_M and σ_P are the market and fund return volatility respectively.
This measure was proposed by Modigliani and Modigliani (1997)[21]. This measure is similar to the Sharpe ratio but also compares the funds risk to the risk of a market portfolio. It can be interpreted as the funds return if its volatility had been equal to the one of a market benchmark. Some benefits this measure has over the Sharpe ratio is that it produces a ratio that is more meaningful than the dimensionless Sharpe ratio. It can also handle negative returns which make the Sharpe ratio difficult to interpret (Derbyshire& Hampton, 2014)[1]. .

The GH2 measure
The measure was developed by Graham and Harvey(1997)[20].

It draws on both the M2 measure and Jensens alpha to evaluate the funds. The GH2 ratio leverages up or down the hedge fund to match the volatility of the market. The measure is the difference in returns of the leveraged fund and the market return.

The Information Ratio

$$\Delta_t = R_{P_t} - R_{B_t}, \quad \bar{\Delta} = \frac{1}{T}\sum_1^T \Delta_t = \frac{1}{T}\sum_1^T (R_{P_t} - R_{B_t}) \tag{15}$$

$$Information = \frac{\bar{\Delta}}{TE} = \frac{\bar{\Delta}}{\sqrt{\frac{1}{T}\sum_1^T (\Delta_t - \bar{\Delta})^2}} \tag{16}$$

R_{P_t} and R_{B_t} here equals the fund return and the market return.

The information ratio according to Goodwin (1998)[22] is the excess returns of the fund compared to a market benchmark divided by the volatility of those excess returns. This ratio identifies whether the fund manager has beaten the market benchmark. A high information ratio implies that the manager has consistently beaten the market benchmark.

PM:s based on maximum drawdown These measures use Drawdowns which are defined as the largest losses during a specified time period (Investopedia)[26].

The Sterling Ratio

$$OSTR_i = \frac{r_i^d}{(\frac{1}{N}\sum_{j=1}^N -MD_j) + 10\%} \tag{17}$$

$$STR_i = \frac{r_i^d - r_f}{\frac{1}{N}\sum_{j=1}^N -MD_j} \tag{18}$$

Compounded annual return divided by an average of the most significant drawdowns during the studied period, the MD here stand for Maximum drawdown. Usually this measure is calculated over 3 year but here ir is the average maximum drawdown during the 10 year time period. The + 10% is arbitrary and used to correct the average drawdown to more reflect actual drawdowns. There seem to be different opinions on whether this 10% should be added or subtracted from the denominator.(Barclays Hedge)[25], (Investopedia)[24]. A third version is also computed based on the ratio computed by Eling (2007) which subtracts by the risk free rate in the numerator and doesnt use the arbitrary +-10% in the numerator.

The Burke Ratio

$$BR_i = \frac{r_i^d - r_f}{\sqrt{\sum_1^N MD_j^2}} \tag{19}$$

Proposed by (Burke,1994),[23]. The Burke ratio is also computed less sensitive to outliers. Here the square root in the denominator weighs the larger losses more than the smaller ones as it deems those losses more important.

3 Method

In this thesis 10 year monthly return data from 669 individual hedge funds are taken from the Lipper fund database is analyzed. The funds are divided into 9 different subcategories depending on the strategies they employ. This was done with the notion that managers employing different strategies would be more or less risk averse giving raise to different types of return data. The results

would also be more meaningful to individual Hedge fund managers employing one of the strategies. Another benefit of this is that grouping the funds this way gives rise to different distribution moments for the different subgroups allowing one to more closely examine how the anomalies of the data affects the different measures. Finally, the need to group funds in smaller groups when performing similiar analysis, has previously been stated by Nguyen-Thi-Than, (2007)[5] . Although discussing a similar topic, this thesis is disimilar to them in many ways. Firstly, it employs a larger data set than Nguyen-Thi-Than (2007) of individual fund data. Secondly, it groups the funds according to many smaller groups which which is uncommon and rarely done in similar analysis. Earlier studies (e.g. Eling et al. (2011), Zakamouline (2010)) tend to group both surviving and dissolved funds in large groups, around 3000 funds. This makes it hard to know if their results are also relevant for smaller groups of and individual funds. Lastly it uses a measure (Yithzaki Gini-ratio) that to my knowledge has not been used in similar studies before.

Firstly a Jaques Berra normality test (H0=data is normally distributed) with (p=0.01) is performed on all funds to categorize how large the share of funds with approximately non normally distributed data is. Results of this test along with data of distribution moments for both funds can be found in the Appendix (table 31). The 20 different PM:s for each fund were computed in MATLAB and code for this can be delivered upon request. The funds were then ranked according to each PM and finally a Spearman rank correlation matrix between the different PM:s was created in Stata. The rank correlation matrices are also located in the Appendix (tables 1-27).

Data

The individual hedge fund rolling performance data is taken from the Thompson Reuters financial data service, more specifically from the LIPPER funds database TASS which contains data on more than 7,500 actively reporting hedge funds. It is however only a fraction of these funds that actually contain data for the studied time period of 10 years. Common problems with the data have been random gaps in the time period and funds that have been liquidated or just stopped reporting return data. To find funds that contained data for the desired time period all available fund data sorted by strategy first had to be downloaded in its entirety. This data was then filtered to only obtain the funds that had data for the 10 year monthly return period. Finally, 10 year monthly return data for 669 individual hedge funds belonging to 10 strategies was collected for the period 31 july 2007-31 june 2017. All collected monthly rolling performance data is stated in USD. To obtain the data was not easy and took a significant part of the effort in writing this thesis.

Survivorship bias:

The Lipper fund did not contain (to my knowledge) data on dissolved funds, which makes this study a possible victim of survivorship bias. This occurs when funds that perform badly or dissolve stop reporting data (Investopedia)[**?**]. As the data on dissolved funds was not available I have not found a way to correct for this. Even if I would have had data on these dead funds it is hard to see how one would perform a similar 10 year ranking study with them when they all have been active different time periods.

Several of the constructed PM:s depend on market return factors. Information on where the funds invest and 25 different market return indices where therefore also downloaded from the Thompson Reuters financial database. The market return indices used when computing these PM:s can be given upon request.

4 Results

4.1 Descriptive statistics

The following descriptive statistics were obtained (see table 31). In the first column a percentage of funds that reject the null hypothesis in the the Jaques-Berra test for normality (p=0.01) can be seen. We see that in all cases apart from the Managed future CTA:s strategy this ratio is over 70%. Thus, in almost all cases, more than 79% of the funds do not pass the normality test. One can compare this to the earlier studies were the same ratio often lay around 40%.

All funds except this category also have negative skewness which implies that these funds have had frequent small gains and a few extreme losses. A possible explanation to the common negative skewness is that the studied time period includes the financial crisis of 2008, where many of the funds suffered great losses. The kurtosis is in all cases higher than the normal distribution which equals 3. This supports the view that hedge funds do indeed have higher spikes and fatter tails than other return data. The mean of all Hedge fund returns per month during the studied period is significantly higher than the treasury bill rate (0.49% vs 0.04%). But this high return could also be partly due to survivorship bias.

4.2 Results from Correlation matrices

These results show that the computed PM:s have considerably weaker correlation with each other than in earlier studies, like Eling (2006),[3] or Zakamouline (2010),[8]. A possible explanation is that my datasample has considerably more anomalies than hedge fund return data in earlier studies with a higher percentage of funds rejecting the JB-test. One can also wonder whether the Spearman rank correlation test is really suitable for correlations in this context, as a quick look at a ranking of funds in a random strategy makes it seem that the funds are more correlated than the test shows (table 33:35).

Most of the PM:s seem to have their strongest correlation with the Sharpe ratio. It is usually the same PM:s that are correlated with this ratio but the strength of the correlations differ a lot depending on strategy. It is hard to tell if this is due to the difference in strategy or due to the smaller number of funds belonging to the strategy that shows the highest correlation. The different versions of the Sharpe ratio are continuously correlated (The Dowd, The ASSR). Between the different market measures it is harder to distinguish consistent correlation. Some market measures (like the M2 and GH2) are consistently correlated while others (Treynor, IR and Jensens alpha) seem much more sporadically correlated. The Measures based on LPM seem consistently correlated with each other with a few sudden exceptions. The PM:s based on drawdowns continually seem reasonably correlated with the Sharpe ratio. It is interesting that the Y1 measure generally seems more correlated with the Omega measure than the more similar Sharpe ratio it is based on. This could imply that the non parametric measures actually give different rankings to the parametric ones. There seems to be a clear relationship between higher individual ranking correlations between the measures in smaller than larger groups. This can maybe explain the strong correlations of Eling & Schuhmacher (2007)[2], as they only used data for 10 different hedge fund indices.

5 Conclusion

This thesis has examined the rank correlations of different financial performance measures for Hedge fund return data. The somewhat surprising result is that the correlations seem much less correlated than in earlier studies. This could be due to several factors. Fewer number of funds analyzed , a larger degree of abnormalities in the data, the use of other measures and that this

study is done for a different time period are some possible explanations. The PM that displays the highest consistent correlation with the other measures is the Sharpe ratio. But the weak relative correlations that even this measure displays indicates that it is quite far from the great guiding principle status it has obtained in earlier similar studies. The division of hedge funds into different strategy groups has worked as a way to distinguish how ranking between the funds can depend in different subsamples of funds. It has not given the ability to draw specific conclusions about different PM rankings depending on strategies. The use of the Spearman correlation in this type of surveys is also questioned. Apart from the generally low correlations the measure seems to give it also seems to deliver higher correlations in smaller samples. The search for a consistent hedge fund performance measure thus continues. As suggestions for further research one could use alternatives to the Spearman rank correlation such as a ranking system composed on deciles (Nguyen-Thi-Tan,2007) or Kendall's Tau. One could also perform the test on datasamples with a higher concentration of non normally distributed data. Robustness test such as splitting up the time period is also advised.

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6 Appendix, Tables

Table 1: Long/Short equity

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,01	1,00					
GH2	0,01	0,91	1,00				
Treynor	0,06	0,01	0,01	1,00			
Sharpe	0,04	0,07	0,04	0,06	1,00		
Ir	0,17	0,04	0,02	0,04	0,06	1,00	
Omega	0,04	0,05	0,06	0,08	0,25	-0,06	1,00
Sortino	-0,03	0,07	0,05	0,02	0,32	0,02	0,19
Upside	-0,07	0,01	0,05	-0,05	0,11	0,06	0,01
Kappa 3	0,08	-0,03	-0,05	0,05	0,06	0,06	0,11
ASSR	-0,06	0,03	0,03	0,06	0,57	0,03	0,14
ASSR2	-0,06	-0,01	-0,03	0,07	0,54	0,00	0,24
ASSR3	-0,07	0,05	0,03	0,07	0,54	0,02	0,24
Sterling	0,12	0,15	0,12	0,12	0,02	-0,10	0,13
Sterling2	0,09	0,07	0,03	0,12	0,09	0,05	0,09
Sterling3	0,06	-0,02	-0,01	-0,08	0,23	-0,04	0,16
Burke	-0,03	-0,06	-0,04	-0,04	0,10	-0,03	0,10
Dowd	0,06	0,05	0,04	0,04	0,92	0,07	0,24
Y1	0,03	0,04	0,01	-0,03	0,31	0,00	0,27
Y2	0,00	-0,13	-0,09	0,06	-0,07	-0,02	-0,05

Table 2: Long/Short equity

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	0,32	1,00					
Kappa 3	0,53	0,07	1,00				
ASSR	0,66	0,32	0,43	1,00			
ASSR2	0,65	0,33	0,45	0,77	1,00		
ASSR3	0,71	0,38	0,44	0,84	0,93	1,00	
Sterling	0,03	0,28	0,01	-0,05	0,03	0,03	1,00
Sterling2	0,10	0,18	-0,04	0,09	0,17	0,16	0,76
Sterling3	0,00	-0,01	0,08	-0,08	-0,07	-0,04	0,28
Burke	0,64	0,11	0,31	0,40	0,54	0,46	0,18
Dowd	0,54	0,16	0,44	0,85	0,77	0,71	-0,03
Y1	0,64	0,31	0,42	0,63	0,72	0,77	0,12
Y2	0,00	-0,06	-0,06	0,10	0,11	0,11	0,12

Table 3: Long/Short equity

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,20	1,00				
Burke	0,15	0,03	1,00			
Dowd	0,14	-0,04	0,46	1,00		
Y1	0,26	-0,10	0,51	0,60	1,00	
Y2	0,15	0,16	0,15	0,14	0,02	1,00

Table 4: Managed futures/CTA:s

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,00	1,00					
GH2	-0,04	0,94	1,00				
Treynor	-0,06	0,08	0,08	1,00			
Sharpe	0,02	0,20	0,18	0,03	1,00		
Ir	0,02	0,13	0,10	0,08	0,28	1,00	
Omega	-0,04	0,18	0,15	0,17	0,36	0,33	1,00
Sortino	0,14	0,28	0,25	-0,08	0,22	0,20	0,32
Upside	0,16	0,19	0,18	0,00	0,25	0,26	0,12
Kappa 3	0,09	0,01	0,02	0,06	0,18	0,12	0,13
ASSR	0,01	0,19	0,16	0,05	0,64	0,23	0,46
ASSR2	0,04	0,19	0,20	0,14	0,48	0,20	0,35
ASSR3	0,04	0,15	0,15	0,13	0,56	0,21	0,45
Sterling	0,06	-0,01	-0,04	0,09	0,28	0,05	0,20
Sterling2	0,04	0,03	0,06	0,11	0,16	0,17	0,19
Sterling3	0,11	0,06	0,05	0,12	0,49	0,09	0,32
Burke	-0,16	0,28	0,24	-0,03	0,31	0,15	0,36
Dowd	0,00	0,18	0,16	0,05	0,96	0,26	0,42
Y1	0,01	0,12	0,07	0,10	0,51	0,31	0,54
Y2	-0,06	0,03	0,02	0,05	0,18	0,17	0,14

Table 5: Managed futures/CTA:s

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	0,20	1,00					
Kappa 3	0,04	0,04	1,00				
ASSR	0,24	0,19	0,22	1,00			
ASSR2	0,34	0,21	0,12	0,69	1,00		
ASSR3	0,29	0,24	0,15	0,77	0,85	1,00	
Sterling	0,22	0,16	0,06	0,21	0,23	0,22	1,00
Sterling2	0,31	0,12	0,06	0,21	0,21	0,17	0,55
Sterling3	0,31	0,16	0,06	0,37	0,39	0,44	0,31
Burke	0,43	0,31	0,13	0,34	0,39	0,36	0,23
Dowd	0,22	0,21	0,20	0,63	0,46	0,54	0,26
Y1	0,32	0,25	0,22	0,58	0,49	0,53	0,32
Y2	0,11	0,17	0,04	0,10	0,10	0,16	0,10

Table 6: Managed futures/CTA:s

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,28	1,00				
Burke	0,09	0,29	1,00			
Dowd	0,18	0,50	0,33	1,00		
Y1	0,15	0,35	0,48	0,51	1,00	
Y2	0,08	0,04	-0,01	0,16	0,11	1,00

Table 7: Emerging Markets

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,29	1,00					
GH2	0,30	0,95	1,00				
Treynor	0,15	-0,13	-0,16	1,00			
Sharpe	0,09	-0,08	-0,03	0,16	1,00		
Ir	0,01	0,06	0,07	-0,04	0,05	1,00	
Omega	0,21	0,25	0,22	-0,05	0,43	0,01	1,00
Sortino	0,16	0,08	0,08	0,06	0,53	0,08	0,47
Upside	0,16	-0,09	-0,04	0,09	0,15	0,01	0,24
Kappa 3	0,07	0,01	0,00	0,07	0,44	0,26	0,24
ASSR	0,00	0,00	0,05	0,03	0,85	0,03	0,47
ASSR2	0,07	0,06	0,04	0,15	0,76	-0,10	0,56
ASSR3	0,02	0,06	0,03	0,04	0,71	-0,06	0,62
Sterling	0,08	0,02	-0,02	0,03	0,07	0,03	0,18
Sterling2	0,11	0,11	0,07	-0,04	0,13	0,00	0,29
Sterling3	0,05	0,23	0,18	0,15	0,53	-0,06	0,59
Burke	0,25	0,23	0,24	0,11	0,46	-0,05	0,32
Dowd	0,08	-0,09	-0,04	0,16	0,99	0,06	0,42
Y1	0,17	0,15	0,15	0,05	0,60	0,05	0,80
Y2	-0,17	-0,09	-0,08	-0,03	0,14	0,09	-0,07

Table 8: Emerging Markets

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	0,32	1,00					
Kappa 3	0,53	0,07	1,00				
ASSR	0,66	0,32	0,43	1,00			
ASSR2	0,65	0,33	0,45	0,77	1,00		
ASSR3	0,71	0,38	0,44	0,84	0,93	1,00	
Sterling	0,19	0,11	0,15	0,16	0,18	0,25	1,00
Sterling2	0,13	-0,02	0,11	0,18	0,18	0,27	0,76
Sterling3	0,41	0,08	0,34	0,47	0,56	0,55	0,20
Burke	0,64	0,11	0,31	0,40	0,54	0,46	0,07
Dowd	0,54	0,16	0,44	0,85	0,77	0,71	0,11
Y1	0,64	0,31	0,42	0,63	0,72	0,77	0,26
Y2	0,00	-0,06	-0,06	0,10	0,11	0,11	0,11

Table 9: Emerging Markets

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,28	1,00				
Burke	0,02	0,44	1,00			
Dowd	0,13	0,53	0,46	1,00		
Y1	0,28	0,74	0,51	0,60	1,00	
Y2	0,08	0,03	0,15	0,14	0,02	1,00

Table 10: Event Driven

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	-0,18	1,00					
GH2	-0,19	0,93	1,00				
Treynor	0,25	-0,02	-0,07	1,00			
Sharpe	-0,14	0,00	0,00	0,11	1,00		
Ir	-0,11	0,08	0,18	-0,01	0,02	1,00	
Omega	-0,11	0,06	0,09	0,13	0,65	0,24	1,00
Sortino	-0,02	0,11	0,16	0,18	0,60	0,05	0,30
Upside	-0,01	-0,05	-0,03	0,06	0,31	0,09	0,20
Kappa 3	0,17	0,05	0,06	0,14	0,02	0,05	0,07
ASSR	-0,08	0,05	0,05	0,09	0,85	0,06	0,57
ASSR2	0,08	-0,04	-0,04	0,23	0,82	0,02	0,51
ASSR3	0,06	0,09	0,08	0,18	0,82	0,00	0,49
Sterling	0,11	0,07	0,03	0,10	0,32	0,06	0,30
Sterling2	0,08	0,13	0,10	0,06	0,17	0,01	0,31
Sterling3	0,05	0,11	0,12	0,10	0,41	0,01	0,38
Burke	-0,09	0,24	0,27	-0,16	0,31	0,12	0,36
Dowd	-0,13	0,01	0,01	0,09	0,96	0,01	0,64
Y1	-0,04	0,16	0,16	0,13	0,51	0,21	0,72
Y2	0,03	-0,29	-0,25	-0,07	0,33	0,07	0,19

Table 11: Event Driven

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	0,37	1,00					
Kappa 3	0,02	0,22	1,00				
ASSR	0,55	0,38	0,11	1,00			
ASSR2	0,52	0,25	0,16	0,81	1,00		
ASSR3	0,51	0,21	0,12	0,76	0,95	1,00	
Sterling	0,23	0,31	-0,13	0,25	0,18	0,21	1,00
Sterling2	0,18	0,35	0,04	0,10	0,06	0,06	0,67
Sterling3	0,48	0,34	0,00	0,33	0,26	0,27	0,56
Burke	0,37	0,56	0,02	0,28	0,13	0,18	0,42
Dowd	0,55	0,31	0,03	0,88	0,80	0,78	0,22
Y1	0,28	0,01	0,00	0,46	0,37	0,34	0,30
Y2	0,30	0,13	-0,08	0,29	0,26	0,22	-0,05

Table 12: Event Driven

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,55	1,00				
Burke	0,39	0,53	1,00			
Dowd	0,09	0,32	0,28	1,00		
Y1	0,22	0,39	0,23	0,54	1,00	
Y2	-0,12	-0,02	0,02	0,36	0,10	1,00

Table 13: Multistrategies

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,34	1,00					
GH2	0,40	0,91	1,00				
Treynor	0,48	0,52	0,59	1,00			
Sharpe	0,34	1,00	0,91	0,52	1,00		
Ir	0,56	0,35	0,43	0,48	0,35	1,00	
Omega	0,44	0,83	0,90	0,61	0,83	0,41	1,00
Sortino	0,45	0,75	0,87	0,68	0,75	0,54	0,75
Upside	0,26	-0,13	-0,13	0,10	-0,13	0,13	-0,07
Kappa 3	0,48	0,54	0,60	0,37	0,54	0,34	0,68
ASSR	0,40	0,91	1,00	0,59	0,91	0,43	0,90
ASSR2	0,40	0,91	1,00	0,59	0,91	0,43	0,90
ASSR3	0,40	0,91	1,00	0,59	0,91	0,43	0,90
Sterling	0,25	0,60	0,46	0,48	0,60	0,17	0,56
Sterling2	0,25	0,59	0,45	0,48	0,59	0,17	0,55
Sterling3	0,41	0,92	0,83	0,57	0,92	0,37	0,92
Burke	0,38	0,85	0,97	0,58	0,85	0,46	0,87
Dowd	0,40	0,91	1,00	0,59	0,91	0,43	0,90
Y1	0,44	0,84	0,90	0,61	0,84	0,41	1,00
Y2	0,31	0,14	0,18	0,19	0,14	0,44	0,24

Table 14: Multistrategies

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	-0,07	1,00					
Kappa 3	0,50	0,12	1,00				
ASSR	0,87	-0,13	0,60	1,00			
ASSR2	0,87	-0,13	0,60	1,00	1,00		
ASSR3	0,87	-0,13	0,60	1,00	1,00	1,00	
Sterling	0,44	-0,05	0,49	0,46	0,46	0,46	1,00
Sterling2	0,44	-0,04	0,48	0,45	0,45	0,45	0,99
Sterling3	0,66	-0,05	0,61	0,83	0,83	0,83	0,66
Burke	0,87	-0,16	0,55	0,97	0,97	0,97	0,45
Dowd	0,87	-0,13	0,60	1,00	1,00	1,00	0,46
Y1	0,75	-0,05	0,67	0,90	0,90	0,90	0,54
Y2	0,06	0,26	0,20	0,18	0,18	0,18	0,03

Table 15: Multistrategies

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,65	1,00				
Burke	0,45	0,78	1,00			
Dowd	0,45	0,83	0,97	1,00		
Y1	0,53	0,92	0,87	0,90	1,00	
Y2	0,03	0,20	0,15	0,18	0,22	1,00

Table 16: Global Macro

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,39	1,00					
GH2	0,39	1,00	1,00				
Treynor	0,17	-0,04	-0,04	1,00			
Sharpe	0,50	0,71	0,71	0,07	1,00		
Ir	0,20	-0,04	-0,04	0,06	0,01	1,00	
Omega	-0,03	0,47	0,47	-0,15	0,36	0,02	1,00
Sortino	-0,03	0,30	0,30	-0,13	0,16	0,30	0,59
Upside	0,35	0,18	0,18	-0,09	0,22	0,03	0,12
Kappa 3	0,56	0,16	0,16	0,19	0,26	0,51	-0,19
ASSR	0,47	0,61	0,61	0,09	0,73	0,03	0,41
ASSR2	0,51	0,73	0,73	-0,04	0,61	0,05	0,25
ASSR3	0,47	0,61	0,61	0,09	0,73	0,03	0,41
Sterling	0,00	0,01	0,01	0,02	0,16	0,29	-0,05
Sterling2	0,17	0,22	0,22	-0,13	0,08	0,22	0,10
Sterling3	0,00	0,41	0,41	-0,12	0,25	0,16	0,48
Burke	-0,03	0,24	0,24	-0,03	0,07	0,37	0,29
Dowd	0,56	0,64	0,64	-0,03	0,91	0,09	0,29
Y1	0,16	0,49	0,49	-0,17	0,29	0,11	0,42
Y2	0,28	0,37	0,37	-0,21	0,35	0,28	0,14

Table 17: Global Macro

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	-0,28	1,00					
Kappa 3	0,21	0,19	1,00				
ASSR	0,24	0,24	0,23	1,00			
ASSR2	0,14	0,30	0,23	0,74	1,00		
ASSR3	0,24	0,24	0,23	1,00	0,74	1,00	
Sterling	0,28	-0,08	0,11	0,22	0,09	0,22	1,00
Sterling2	0,24	0,32	-0,02	0,16	0,45	0,16	0,52
Sterling3	0,48	0,14	0,13	0,25	0,45	0,25	-0,09
Burke	0,50	-0,02	0,18	0,04	0,24	0,04	0,01
Dowd	0,25	0,18	0,30	0,81	0,69	0,81	0,33
Y1	0,37	0,13	0,09	0,47	0,67	0,47	0,23
Y2	0,14	0,12	0,25	0,27	0,38	0,27	0,20

Table 18: Global Macro

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,14	1,00				
Burke	0,11	0,82	1,00			
Dowd	0,24	0,27	0,14	1,00		
Y1	0,44	0,42	0,41	0,42	1,00	
Y2	0,12	0,25	0,26	0,41	0,37	1,00

Table 19: Equity Market Neutral

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,02	1,00					
GH2	0,05	0,90	1,00				
Treynor	-0,05	-0,01	-0,10	1,00			
Sharpe	0,24	0,10	0,08	0,15	1,00		
Ir	0,26	0,01	0,00	-0,02	0,02	1,00	
Omega	0,09	0,07	0,05	0,18	0,30	0,22	1,00
Sortino	0,23	0,11	0,12	0,16	0,33	0,21	0,42
Upside	-0,04	-0,15	-0,18	0,07	0,12	0,21	-0,10
Kappa 3	-0,04	0,45	0,47	-0,19	0,17	-0,01	-0,07
ASSR	0,16	0,04	0,02	0,19	0,71	0,11	0,66
ASSR2	0,16	0,04	0,02	0,19	0,71	0,11	0,66
ASSR3	0,16	0,04	0,02	0,19	0,71	0,11	0,66
Sterling	-0,02	0,23	0,26	0,14	0,13	-0,20	0,38
Sterling2	0,33	0,30	0,28	0,14	0,33	0,12	0,32
Sterling3	0,21	0,06	0,04	0,20	0,40	0,30	0,58
Burke	0,15	0,15	0,13	0,36	0,25	0,08	0,26
Dowd	0,24	0,10	0,08	0,15	1,00	0,02	0,30
Y1	0,05	0,05	0,03	0,20	0,46	0,27	0,82
Y2	0,03	0,01	-0,06	0,04	0,13	0,41	0,32

Table 20: Equity Market Neutral

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	-0,16	1,00					
Kappa 3	0,13	0,36	1,00				
ASSR	0,59	0,02	0,07	1,00			
ASSR2	0,59	0,02	0,07	1,00	1,00		
ASSR3	0,59	0,02	0,07	1,00	1,00	1,00	
Sterling	0,32	0,15	0,24	0,48	0,48	0,48	1,00
Sterling2	0,50	0,11	0,22	0,48	0,48	0,48	0,60
Sterling3	0,41	0,28	0,15	0,57	0,57	0,57	0,15
Burke	0,65	0,17	0,19	0,50	0,50	0,50	0,50
Dowd	0,33	0,12	0,17	0,71	0,71	0,71	0,13
Y1	0,38	-0,02	-0,11	0,62	0,62	0,62	0,23
Y2	0,49	-0,10	0,05	0,36	0,36	0,36	0,02

Table 21: Equity Market Neutral

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,26	1,00				
Burke	0,39	0,38	1,00			
Dowd	0,33	0,40	0,25	1,00		
Y1	0,43	0,58	0,14	0,46	1,00	
Y2	0,23	0,30	0,16	0,13	0,29	1,00

Table 22: Credit Focus

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,02	1,00					
GH2	0,02	1,00	1,00				
Treynor	-0,13	0,34	0,34	1,00			
Sharpe	-0,08	-0,05	-0,05	-0,32	1,00		
Ir	0,41	-0,07	-0,07	-0,29	-0,10	1,00	
Omega	-0,18	0,03	0,03	0,23	0,13	0,08	1,00
Sortino	0,11	0,02	0,02	-0,23	-0,07	0,22	-0,11
Upside	0,29	0,09	0,09	-0,19	0,33	-0,15	-0,10
Kappa 3	0,07	0,16	0,16	-0,37	0,06	0,23	-0,21
ASSR	0,16	-0,18	-0,18	-0,03	0,00	0,15	-0,05
ASSR2	0,19	-0,05	-0,05	0,09	0,04	0,09	-0,08
ASSR3	0,20	-0,07	-0,07	0,04	-0,13	0,15	-0,04
Sterling	-0,22	0,24	0,24	0,25	0,01	-0,02	0,23
Sterling2	0,03	0,12	0,12	0,35	-0,20	0,24	0,37
Sterling3	-0,04	0,00	0,00	0,16	0,26	0,23	0,43
Burke	-0,05	0,20	0,20	0,25	0,13	-0,17	0,12
Dowd	-0,08	-0,05	-0,05	-0,32	1,00	-0,10	0,13
Y1	-0,06	-0,21	-0,21	0,05	0,19	0,05	0,80
Y2	0,06	-0,24	-0,24	0,10	0,13	-0,12	-0,30

Table 23: Credit Focus

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	-0,07	1,00					
Kappa 3	0,28	0,18	1,00				
ASSR	0,35	0,08	-0,13	1,00			
ASSR2	0,45	-0,06	-0,18	0,64	1,00		
ASSR3	0,58	-0,04	-0,10	0,81	0,85	1,00	
Sterling	-0,15	-0,18	-0,19	0,03	0,05	0,14	1,00
Sterling2	0,08	-0,34	-0,21	-0,03	0,07	0,16	0,73
Sterling3	-0,02	-0,07	-0,01	0,39	0,22	0,28	0,16
Burke	0,08	-0,12	-0,05	0,23	0,55	0,39	0,20
Dowd	-0,07	0,33	0,06	0,00	0,04	-0,13	0,01
Y1	0,00	0,02	-0,14	-0,01	-0,23	-0,06	0,18
Y2	0,11	0,01	0,02	-0,05	0,17	-0,02	-0,22

Table 24: Credit Focus

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,12	1,00				
Burke	0,13	0,34	1,00			
Dowd	-0,20	0,26	0,13	1,00		
Y1	0,39	0,25	-0,03	0,19	1,00	
Y2	-0,10	-0,04	0,07	0,13	-0,21	1,00

Table 25: Fixed Income Arbitrage

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,37	1,00					
GH2	0,32	0,99	1,00				
Treynor	0,31	0,42	0,43	1,00			
Sharpe	0,66	0,53	0,48	0,46	1,00		
Ir	0,58	0,38	0,39	0,67	0,38	1,00	
Omega	0,53	0,43	0,42	0,46	0,55	0,47	1,00
Sortino	0,64	0,54	0,54	0,44	0,81	0,42	0,44
Upside	0,43	0,28	0,26	0,46	0,39	0,41	0,37
Kappa 3	0,61	0,61	0,61	0,50	0,61	0,66	0,62
ASSR	0,58	0,62	0,61	0,62	0,88	0,52	0,51
ASSR2	0,57	0,71	0,69	0,54	0,80	0,44	0,43
ASSR3	0,59	0,67	0,66	0,61	0,89	0,48	0,44
Sterling	0,37	0,49	0,49	0,52	0,61	0,36	0,50
Sterling2	0,36	0,58	0,59	0,41	0,38	0,48	0,59
Sterling3	0,52	0,52	0,50	0,60	0,80	0,53	0,47
Burke	0,68	0,45	0,43	0,64	0,71	0,61	0,51
Dowd	0,66	0,53	0,48	0,46	1,00	0,38	0,55
Y1	0,52	0,72	0,68	0,44	0,54	0,36	0,68
Y2	-0,02	-0,32	-0,31	-0,17	-0,27	-0,29	-0,23

Table 26: Fixed Income Arbitrage

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	0,54	1,00					
Kappa 3	0,71	0,41	1,00				
ASSR	0,84	0,43	0,63	1,00			
ASSR2	0,87	0,46	0,70	0,91	1,00		
ASSR3	0,83	0,42	0,59	0,98	0,93	1,00	
Sterling	0,49	0,25	0,37	0,58	0,47	0,58	1,00
Sterling2	0,36	0,20	0,50	0,40	0,36	0,41	0,76
Sterling3	0,73	0,38	0,55	0,77	0,67	0,78	0,78
Burke	0,85	0,66	0,67	0,77	0,80	0,76	0,50
Dowd	0,81	0,39	0,61	0,88	0,80	0,89	0,61
Y1	0,48	0,34	0,54	0,47	0,53	0,53	0,42
Y2	-0,29	0,05	-0,30	-0,26	-0,29	-0,28	-0,41

Table 27: Fixed Income Arbitrage

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,60	1,00				
Burke	0,38	0,77	1,00			
Dowd	0,38	0,80	0,71	1,00		
Y1	0,58	0,50	0,49	0,54	1,00	
Y2	-0,49	-0,55	-0,37	-0,27	-0,30	1,00

Table 28: All funds

	Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega
Alpha	1,00						
M2	0,05	1,00					
GH2	0,05	0,81	1,00				
Treynor	0,02	0,03	0,06	1,00			
Sharpe	0,02	0,12	0,10	-0,02	1,00		
Ir	-0,04	-0,02	-0,01	0,00	-0,04	1,00	
Omega	-0,05	0,12	0,14	0,02	0,15	-0,03	1,00
Sortino	0,04	0,09	0,13	0,07	0,15	0,00	0,15
Upside	0,00	0,07	0,10	0,02	0,06	-0,05	0,08
Kappa 3	0,13	0,04	0,07	0,06	0,07	0,01	0,07
ASSR	0,09	0,05	0,06	0,08	0,35	-0,05	0,13
ASSR2	0,07	0,09	0,08	0,05	0,33	0,01	0,22
ASSR3	0,06	0,05	0,07	0,05	0,30	0,00	0,17
Sterling	0,04	0,13	0,14	-0,02	0,05	0,02	0,11
Sterling2	-0,04	0,07	0,12	0,10	0,07	-0,02	0,17
Sterling3	0,02	0,11	0,08	0,00	0,15	0,00	0,14
Burke	-0,06	0,10	0,10	0,03	0,13	-0,06	0,11
Dowd	0,10	0,11	0,13	0,05	0,71	-0,06	0,19
Y1	0,01	0,04	0,07	-0,03	0,22	0,00	0,27
Y2	-0,07	0,05	0,06	-0,04	0,04	0,02	0,10

Table 29: All funds

	Sortino	Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling
Sortino	1,00						
Upside	0,11	1,00					
Kappa 3	-0,01	0,03	1,00				
ASSR	0,13	0,12	0,04	1,00			
ASSR2	0,18	0,05	0,13	0,40	1,00		
ASSR3	0,15	0,12	0,09	0,48	0,61	1,00	
Sterling	0,14	0,10	0,10	0,05	0,07	0,06	1,00
Sterling2	0,10	0,12	0,07	0,09	0,03	0,08	0,34
Sterling3	0,11	0,10	0,05	0,17	0,11	0,12	0,13
Burke	0,14	0,04	0,11	0,11	0,12	0,06	0,07
Dowd	0,14	0,10	0,11	0,34	0,28	0,27	0,10
Y1	0,16	0,11	0,06	0,17	0,13	0,20	0,12
Y2	0,01	-0,05	-0,04	0,05	0,06	0,06	0,00

Table 30: All funds

	Sterling2	Sterling3	Burke	Dowd	Y1	Y2
Sterling2	1,00					
Sterling3	0,12	1,00				
Burke	0,13	0,12	1,00			
Dowd	0,11	0,14	0,16	1,00		
Y1	0,09	0,11	0,14	0,20	1,00	
Y2	0,08	0,07	0,06	0,05	0,05	1,00

Table 31: Descriptive data

Strategy	JB-test (p=0.01) Share that reject H_0	Skewness	Kurtosis	Mean (in%)	Std.dev
Eq long short	0,72	-0,21	5,66	0,48	4,69
Managed futures CTA:s	0,46	0,11	5,56	0,48	5,11
Emerging markets	0,79	-0,10	8,79	0,50	7,76
Event driven	0,95	-0,37	7,53	0,45	3,45
Multistrategies	0,80	-0,90	6,39	0,11	2,57
Global Macro	0,76	0,13	7,16	0,56	3,84
Equity market neutral	0,77	-0,54	7,20	0,40	3,53
Credit focus	1,00	-0,35	10,91	0,80	3,52
Fixed income arbitrage	0,96	-1,39	16,08	0,60	3,70
Mean	0,80	-0,40	8,37	0,49	4,24

Table 32: Funds and strategies

Strategy	Number of funds
Eq long short	232
Managed futures CTA:s	139
Emerging markets	71
Event driven	65
Multistrategies	41
Global Macro	33
Equity market neutral	31
Credit focus	31
Fixed income arbitrage	26
SUM	669

Table 33: Equitymarket neutral fund rankings, every fund name is represented by a number 1:31 (best performing funds in the bottom)

Alpha	M2	GH2	Treynor	Sharpe	Ir	Omega	Sortino
26	29	29	23	29	26	29	29
25	26	26	29	20	25	26	26
20	25	25	26	26	29	20	20
29	20	20	20	25	24	25	25
9	9	9	25	3	9	3	3
14	27	27	9	9	14	9	9
31	14	14	14	14	27	14	14
8	18	18	3	18	28	18	18
18	8	8	8	8	18	2	8
3	28	28	2	2	15	8	2
15	31	31	7	7	20	7	7
2	7	7	31	15	8	4	15
24	15	15	18	4	2	15	10
7	10	10	10	10	31	27	4
5	30	30	12	27	3	12	27
10	3	3	15	12	10	31	28
27	2	2	16	16	30	10	31
12	12	12	4	28	7	16	16
28	16	16	11	31	5	11	12
16	11	11	28	11	22	5	5
11	24	24	24	5	1	30	11
4	4	4	27	30	12	28	6
6	22	22	19	6	11	6	30
17	5	21	17	21	16	21	24
13	21	5	30	24	17	24	21
1	17	17	22	17	13	17	17
21	19	19	1	19	23	22	19
30	23	23	13	22	6	19	22
22	6	6	6	23	4	1	1
19	1	1	5	1	21	23	23
23	13	13	21	13	19	13	13

Table 34: Equitymarket neutral fund rankings

Upside	Kappa 3	ASSR	ASSR2	ASSR3	Sterling	Sterling2	Sterling3
20	29	29	29	29	29	29	29
15	26	20	20	20	20	20	26
28	25	26	26	26	26	26	20
10	9	25	25	25	9	25	25
29	3	3	3	3	25	9	9
8	14	9	9	9	14	14	3
7	2	14	14	14	3	3	14
26	18	18	18	18	2	2	18
25	15	8	8	8	18	18	2
14	24	2	2	2	8	8	8
3	20	7	7	7	15	15	7
9	5	15	15	15	7	7	4
5	8	4	4	4	4	4	15
18	10	10	10	10	12	12	27
4	27	27	27	27	27	27	5
2	7	28	28	28	31	5	12
6	4	12	12	12	5	31	10
16	12	16	16	16	16	16	16
31	28	31	31	31	28	28	31
27	11	5	5	5	11	11	11
12	16	11	11	11	30	30	6
11	6	30	30	30	6	6	28
19	31	6	6	6	10	10	30
24	17	21	21	21	21	21	21
30	13	24	24	24	17	24	24
17	21	17	17	17	24	17	17
21	22	19	19	19	19	19	19
1	1	22	22	22	22	22	22
22	30	1	1	1	1	1	1
23	19	23	23	23	23	23	23
13	23	13	13	13	13	13	13

Table 35: Equitymarket neutral fund rankings

Burke	Dowd	Y1	Y2
29	29	29	30
20	20	26	20
26	26	20	7
25	25	25	31
9	3	3	8
3	9	9	16
14	14	14	21
8	18	18	12
18	8	2	4
2	2	8	19
7	7	7	11
15	15	15	27
10	4	4	10
4	10	27	23
28	27	10	18
27	12	12	22
5	16	16	28
12	28	31	6
16	31	11	17
31	11	5	2
11	5	28	3
6	30	30	9
30	6	6	14
21	21	21	15
24	24	24	25
17	17	17	26
19	19	19	29
22	22	22	1
1	23	1	5
23	1	23	24
13	13	13	13