

# **The Diversification Properties of Hedge Fund Investments**

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## **Abstract**

This study analyses the trade off between manager specific and systematic risk of portfolio of hedge funds. We compare the properties of naively constructed portfolios with those of fund of hedge funds, in order to assess the added value of the hedge fund managers. The results suggest that the hedge fund investor is confronted with the dilemma of having either a concentrated portfolio with a high volatility but a low systematic risk or holding a well diversified portfolio with a low volatility but a high systematic risk. This dilemma can be mitigated by employing fund of hedge funds, where the trade off between volatility and systematic risk is less pronounced.

In a final step we employ a restricted bootstrapping method to evaluate the relative importance of the two components in the portfolio construction process: strategy diversification and manager diversification. The analysis reveals that bottom up manager diversification is much more important than top down strategy allocation.

These results question the validity of the current industry trend towards open platform solutions.

## Introduction

The assets invested in hedge funds globally have increased dramatically over recent years. While at the beginning of the 90s less than 50 billion US dollars were invested in hedge funds, it is estimated that at the end of 2004 the total amount committed to hedge funds stood at close to 1000 billion US dollars. A significant portion of this growth in assets has been achieved over the recent bear market when hedge funds were propagated as an alternative to equity investments.

Hedge funds are bought for two reasons: Firstly, stable returns and secondly, low systematic risk, in particular a low correlation with the equity market. Recent research has cast doubt on some of those beneficial diversification properties of hedge fund investments. Fung and Hsieh (2002) find a high degree of correlation between hedge fund indexes and standard asset classes like U.S. and non U.S. equities or high yield U.S. bonds. Amin and Kat (2003) demonstrate that adding hedge funds to a balanced portfolio reduces for a given return level the standard deviation but also reduces skewness and increases kurtosis. Liew (2003) suggests that the expected diversification benefits of hedge funds are illusory and disappear under extreme market conditions. In down markets hedge fund aggregate exposure to the market tends to increase rapidly. Liew is able to show that the beta between the CSFB/Tremont index and the S&P500 increases in periods of market dislocation with betas near unity in the most extreme cases. For other studies documenting the changes of hedge fund correlation in bull and bear markets see Edwards (2001) and Schneeweis (1999).

The current study extends the existing research on the diversification properties of hedge fund investments in three ways:

Firstly, we focus explicitly on the trade off between manager specific and systematic risk an investor faces when building a portfolio of hedge funds. The fortunes of a hedge fund investment depend to a large extent on the skills of the individual manager employed. Therefore, when investing in hedge funds the diversification among various funds is more important than in a situation where the capital is placed in mutual funds. The diversification of manager specific risk due to diversification among different funds is a straight forward, well understood process. However the effect on the systematic component of risk is a topic which has received only little attention.

Secondly we analyse the impact of fund of hedge funds. The influence of fund of hedge funds has increased significantly over recent years. Even among institutional investors a majority accesses hedge funds through fund of funds. What kind of trade off between manager specific and systematic risk does an investor face who invests in hedge funds through fund of funds?

Finally we will attempt to evaluate the importance of pure manager versus strategy diversification. When building a portfolio of hedge funds two decisions are required: Firstly, in which strategies shall I invest and secondly which managers shall I select. Both decisions impact the risk profile of the resulting hedge fund portfolio. By imposing restrictions on the strategy allocation during the portfolio building process we are able to measure the relative importance of the two types of decisions.

The study is organised as follows: In section 1 we present the data and our method of analysis. Section 2 analyses the trade off an investor faces when diversifying between hedge funds: lower volatility versus higher systematic market risk. As a proxy for market risk we use the correlation with the MSCI-World. Section 3 extends the analysis to fund of funds. By comparing the result of a naive portfolio construction process with the hedge fund portfolios of the fund of fund managers we are able to judge the added value of fund of funds. In section 4 we focus on the characteristics of the different hedge fund strategies and attempt to evaluate the relative importance of the two components in the portfolio construction process: strategy and manager diversification. Section 5 concludes this study and summarises the implications for investors.

## **I. Data and Methodology**

The empirical analysis is based on return data from the TASS database. TASS which is the information and research unit of Tremont Capital Management Inc. is one of the best established data provider in the hedge fund industry<sup>1</sup>. For example, it is employed to calculate the family of CSFB/Tremont indices, the first asset weighted hedge fund indices. TASS currently provides information on 3'000 hedge funds managed by more than 1'300 fund managers.

The data period we are focusing on runs from October 2000 to September 2003. We restrict our selves to a relative short data period of three years in order to minimise the impact of the survivorship bias. All funds which do not possess a full return history over the entire observation period are discarded. This leaves us with monthly returns on 1301 funds, 1033 single manager funds plus 268 fund of hedge funds.

The universe of hedge funds is very heterogeneous. Hedge funds operate in a very wide range of markets and pursue a multitude of trading strategies. Various attempts have been made to structure this unwieldy universe. One approach is to define categories, based on qualitative criteria<sup>2</sup>. The category definition is typically based on the trading strategy pursued (i.e. long /short, short bias) and / or describes the market segment in which the manager is active (i.e. fixed income, emerging markets). These categories are commonly called strategies.

TASS has defined ten strategies. The appendix contains a list of all strategies, including a brief description.

In this study we focus on two risk measures: firstly the standard deviation and secondly the correlation with equity markets as a measure of systematic market risk. As a proxy for equity markets we use the return series of the MSCI-World including net dividends.

In case of the hedge fund portfolios both risk measures contain a manager specific and a market or segment specific component. In order to isolate these two components we create series of randomly selected portfolios. The first portfolio contains one hedge fund the final portfolio of the series contains 60 funds. The underlying assumption is that with 60 funds the manager specific component is absent as it has been sufficiently diversified. The portfolios are created employing bootstrapping methodology. After each draw the chosen fund is returned back to the database. For each portfolio size a 100'000 repetitions are conducted. The series of portfolios resulting out of the bootstrapping exercise are the result of a naive portfolio construction process. In a second step we compare these initial results with the risk profile obtained from fund of funds. This allows us to judge the added value of the fund of fund managers. In a final step we impose strategy restrictions on the portfolio construction process, in order to evaluate the relative importance of strategy and manager diversification.

## **II. Manager Specific versus Systematic Risk**

The typical hedge fund sales pitch starts with a referral to the superior risk / return profile of the fund, probably citing an attractive Sharpe-Ratio or an appealing draw-down measure. Then attention is drawn to the low correlation of the fund with equity markets, as an indication of the fund's suitability as an addition to a portfolio of traditional assets, and in general the hedge fund sales person is right. The return of a typical hedge fund exhibits a low correlation with equity markets. As graphic 1 shows, the correlation of a single hedge fund with the MSCI-world is on average roughly 0.2. This compares favourably with the correlation of a typical equity mutual fund, where correlation with the world equity market – depending on chosen geographic region and industry - starts at 0.6 and can easily exceed 0.9. The weakness of the correlation argument lies in the fact that although the correlation of a single hedge fund with the equity markets is low, the standard deviation is quite high. In our

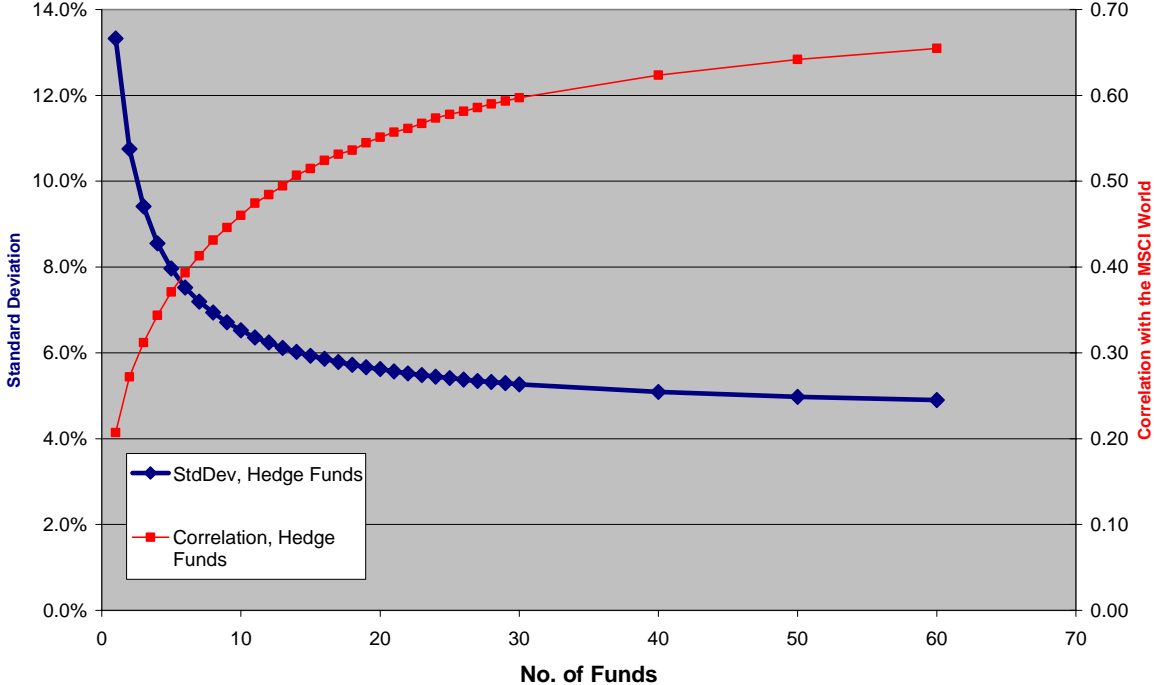
sample, over the period October 2000 to September 2003 the standard deviation of one fund is on average almost 14%. The high standard deviation – a reflection of the manager specific component – forces the investor to diversify among several hedge funds. By combining different funds the investor reduces effectively the volatility of his overall hedge fund investment. In graph 1 this is represented by the nicely downward sloping blue curve. While over the period October 2000 to September 2003 the average hedge fund in the TASS data base displayed a standard deviation of close to 14%, a portfolio of ten randomly selected hedge funds displays on average a standard deviation of less than 7%.

However, diversifying among different hedge funds has a second, less desirable effect. The systematic risk, measured here by the correlation with the MSCI-world, increases significantly. The average single hedge fund possesses a correlation of 0.2, a portfolio of ten funds displays a correlation of almost 0.5 and for a well diversified portfolio of hedge funds the correlation with the MSCI-world reaches almost 0.7, which is comparable with an investment in a non main stream equity market, like the IBEX or the Hang Seng.

What is the rationale behind this process? The reduction in the standard deviation is straight forward. By combining different managers the volatility caused by the decisions of the individual managers is smoothed out, the volatility is reduced down to the non-diversifiable level of risk. This effect is well known from the stock market.

But why do we observe the increase in the systematic risk, the correlation with the equity market? The strategy of each hedge fund comprises two elements: the individual manager skill, the potential source of alpha and a systematic market component, the source of beta. In a single hedge fund the skill element is dominant and overrules the systematic component. By diversifying among different funds the manager specific component gets filtered out and the investor is left with a portfolio of hedge funds where the systematic risk is dominant.

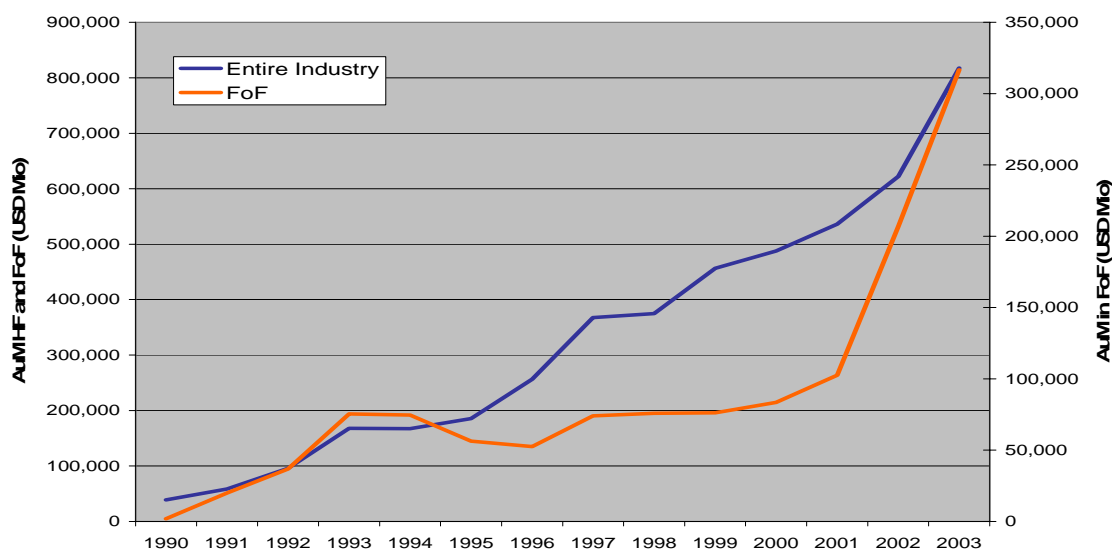
Graph 1



### III. Fund of Hedge Funds

Fund of funds have always played an important role in the hedge fund industry. Already at the beginning of the 90s roughly one third of the total capital committed to hedge funds was invested through fund of funds. In recent years the trend in favour of fund of funds has again accelerated. In 2002 and 2003 fund of funds attracted new capital of USD 100 billion and 30 billion respectively. Single manager funds on the other hand experienced a net outflows in 2002 and gathered only USD 3 billion in 2003, see Hedge Fund Research Industry Report 2003.

Graph 2



The motivation for an investor to invest into a fund of funds instead of a single fund are three fold:

Firstly, fund of funds offer a convenient way to diversify the manager specific risk of individual hedge funds. Secondly, investing into fund of funds, instead of single funds, cuts the investors' administrative workload, as the number of positions in his portfolio is significantly reduced. Finally, fund of funds offer the prospect of enhanced returns, as they aim to add value by active top down strategy and bottom up single hedge fund selection<sup>3</sup>. The disadvantage of investing in hedge funds through a fund of funds is an additional fee layer of approximately 2%, see Fung and Hsieh (2000).

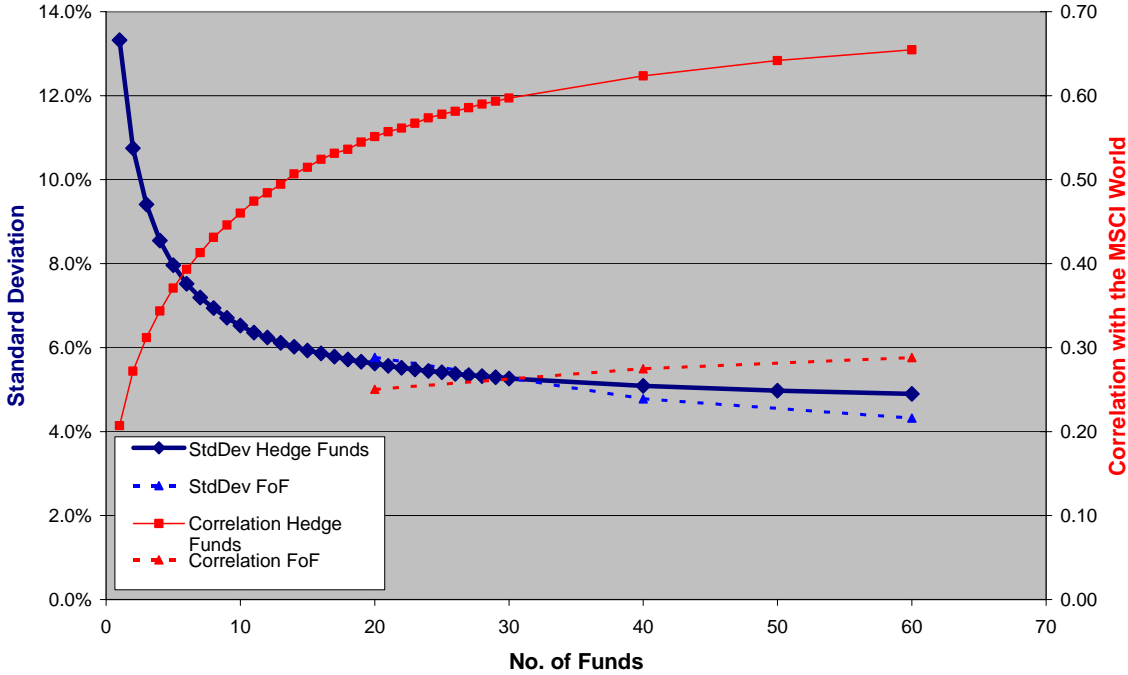
As fund of funds are diversified portfolios of single manager hedge funds the question arises what kind of trade off between manager specific and systematic risk faces an investor who accesses hedge funds through fund of funds. In order to allow a comparison between a randomly selected portfolio of hedge funds and fund of funds it is necessary to make an assumption how many single manager funds one fund of funds contains on average. In this analysis we will work with the assumption that the average fund of funds consists of 20 hedge funds. There are some fund of funds which are broadly diversified, covering all strategies. These funds typically invest in a large number of single manager funds, they may be comprised of more than 50 funds. On the other hand there are specialist fund of funds which concentrate only on one segment of the hedge fund universe, e.g. European Long/Short equity. These funds may consist of less than ten single managers. The TASS database does not allow to distinguish between the different classes of fund of funds, therefore the assumption of 20 managers per fund of funds seems not unreasonable. Another motivation for using the number 20 is that the volatility of the average fund of funds is approximately the same as the one of a portfolio of 20 randomly selected hedge funds, see graph 3.

Comparing the solid lines in graph 3, which describe the randomly selected portfolios of hedge funds, with the dotted lines which represent portfolios of fund of funds, it becomes apparent that the risk profile of fund of funds is superior. The broad direction is the same for randomly selected portfolios of hedge funds and fund of funds. By increasing the number of funds the investor trades a lower level of volatility for a higher systematic risk. However the trade off between manager specific and systematic risk is more attractive for fund of funds than for randomly selected portfolios of hedge funds. Investing in hedge funds through fund of funds, results in a lower level of systematic risk for the same level of volatility.

The explanation for this phenomenon is straight forward. When building portfolios by selecting randomly hedge funds out of the TASS data base we ignore deliberately important issues like a well balanced strategy allocation or compatibility of the investment styles of the individual managers. The fund of funds on the other hand aims for a low correlation with equity markets in order to make his fund an attractive addition to a portfolio of traditional securities.

The fund of funds manager will therefore choose hedge funds which harmonise with each other in order to achieve a low level of volatility while at the same time minimising the increase in systematic risk. For this risk management task the fund of funds manager employs two instruments: strategy diversification and manager diversification. In the next section we will try to determine the relative importance of these two instruments.

Graph 3



## IV. Strategy Versus Manager Diversification

The portfolio construction process at a fund of fund comprises two elements: firstly top down strategy allocation, secondly bottom up manager selection. Both elements fulfil tactical allocation (return enhancement) and risk management functions.

The different strategies differ in terms of volatility, co-movement with other financial variables and co-movement among themselves. Strategy diversification utilises these different characteristics in order to achieve a strategy allocation which fulfils the risk requirements of the overall portfolio. For example, one might want to counterbalance a large allocation to Long/Short Equity funds, which display a strong dependency on equity markets, with an appropriate weighting in Managed Futures funds, which are negatively correlated with equity markets.

In a similar fashion manager diversification attempts to combine individual funds in such a way that the overall risk objectives are satisfied, e.g. funds, which pursue a short term momentum style might be combined with funds, which adhere to a longer term contrarian style.

Table 1

		All Funds ex FoHF	Convert. Arbitrage	Dedicated Short Bias	Emerging Markets	Equity Market Neutral	Event Driven	Fixed Income Arbitrage	Global Macro	Long/Short Equity	Managed Futures	Other	FoHF
Standard Deviation	1	13.3%	6.1%	20.9%	16.0%	7.9%	7.4%	5.2%	13.2%	15.3%	22.1%	9.6%	5.8%
	2	10.7%	5.2%	19.3%	14.0%	6.4%	6.4%	4.2%	10.6%	12.5%	18.9%	8.3%	4.8%
	3	9.4%	4.9%	18.7%	13.1%	5.6%	5.9%	3.6%	9.3%	11.3%	17.4%	7.5%	4.3%
	5	8.0%	4.5%	18.3%	12.1%	4.7%	5.4%	3.0%	8.1%	10.1%	16.1%	6.6%	-
	10	6.5%	4.1%	17.9%	11.4%	3.7%	4.8%	2.3%	6.9%	9.0%	15.0%	5.7%	-
	20	5.6%	3.9%	14.2%	11.0%	3.1%	4.5%	1.9%	6.2%	8.4%	14.4%	5.0%	-
	40	5.1%	3.7%	-	10.8%	2.7%	4.3%	1.6%	5.8%	8.1%	14.1%	4.3%	-
Correlation	60	4.9%	3.7%	-	10.7%	2.5%	4.2%	1.2%	4.7%	8.0%	14.0%	2.9%	-
	1	20.7%	4.7%	-72.9%	47.2%	0.2%	29.8%	-6.6%	10.3%	36.4%	-26.3%	27.7%	25.0%
	2	27.2%	7.5%	-81.0%	53.0%	-0.1%	38.4%	-6.6%	13.6%	48.0%	-32.3%	32.8%	27.5%
	3	31.2%	9.7%	-83.9%	57.9%	-1.6%	43.0%	-6.4%	15.5%	55.0%	-34.9%	35.7%	28.8%
	5	37.1%	12.6%	-86.4%	63.3%	-2.8%	48.5%	-5.5%	17.4%	63.8%	-38.3%	41.3%	-
	10	46.0%	16.8%	-88.4%	68.7%	-5.2%	55.4%	-4.6%	19.2%	73.5%	-42.1%	50.8%	-
	20	55.1%	19.9%	-89.1%	71.7%	-7.2%	60.9%	-4.4%	20.6%	79.9%	-44.6%	59.8%	-
40	62.4%	21.5%	-	73.3%	-8.3%	64.5%	-5.3%	21.5%	83.5%	-45.8%	65.7%	-	
60	65.5%	22.1%	-	73.8%	-8.6%	65.9%	-5.6%	21.7%	84.7%	-46.2%	65.7%	-	

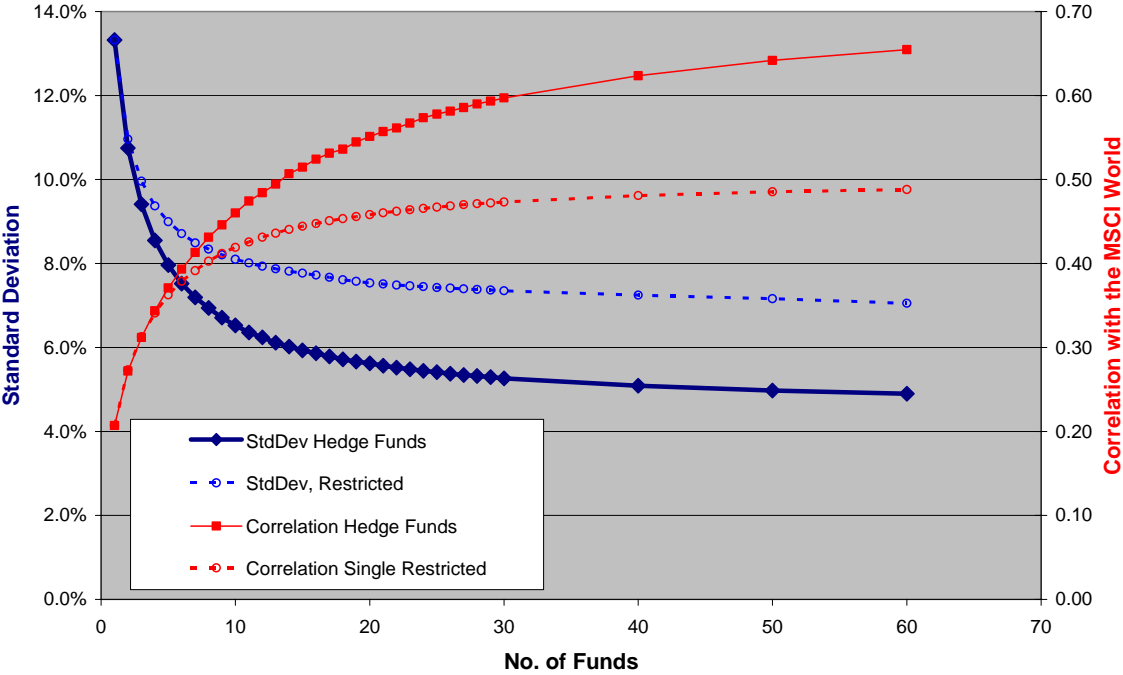
Both elements in the risk management process, strategy and manager diversification, have an impact on the risk profile of the portfolio of hedge funds. In order to evaluate the relative importance of these two elements we turn again to our portfolios of randomly selected hedge funds. This time we impose the restriction of strategy homogeneity on the portfolio construction process, i.e. if the first draw yields for example a Long/Short Equity fund all subsequent draws are restricted to Long/Short Equity funds. This ensures that for each portfolio size, each of the 100'000 portfolios contains only funds of the same strategy. The results of this restricted portfolio construction process are described by the dotted lines in graph 4. Again the general picture looks the same as for the unrestricted portfolios. By increasing the portfolio size successively a lower level of volatility is exchanged against a higher correlation with equity markets. However both developments are less pronounced in case of the restricted portfolios.

The higher level of volatility in case of the constrained portfolios is easily explained. By imposing the restriction of strategy homogeneity the portfolio construction process can only employ manager diversification. The gap between the dotted and the solid blue line is explained by the absence of the strategy diversification element.

At this point we are already able to quantify the importance of the two elements. Diversifying among hedge funds employing strategy and manager diversification reduces the standard deviation from 13.3% for the single average hedge fund to 4.9% for the average portfolio of 60 hedge funds. When taking away the strategy diversification element the achievable

minimum rises to 7.0%. Therefore roughly three quarter of the overall achievable volatility reduction is due to manager diversification, only one quarter is due to strategy diversification. The correlation results less intuitive. What is the reason for the less pronounced increase in the correlation numbers in case of the restricted portfolios? An explanation might run like this: The universe of hedge funds is governed by three classes of risk factors: manager specific, strategy specific and systematic market risk. Moving along the dotted red line the manager specific risk component is removed, which makes the systematic market risk, here measured by the correlation with the MSCI-world, more dominant. By allowing the portfolio construction process to diversify away the strategy specific risk component as well, we are left with an even higher level of systematic market risk.

Graph 4



**V. Conclusion**

This study has shown that a low systematic risk of a single manager hedge fund on itself is almost irrelevant. Hedge fund returns display a high level of volatility due to their strong manager specific risk. As a consequence when hedge funds are added to a portfolio of traditional assets it happens almost always in the form of a diversified portfolio of hedge funds and not through an investment in a single hedge fund. However, diversifying among hedge funds leads typically to an increase in the systematic risk. The investor is therefore confronted with the dilemma of having either a concentrated portfolio with a high volatility but a low systematic risk or holding a well diversified portfolio with a low volatility but a high systematic risk.

This dilemma can be defused by utilising fund of funds. The trade off between manager specific and systematic risk is less pronounced in case of fund of funds. Apparently it is possible to contain the increase in systematic risk by employing a prudent strategy allocation in conjunction with selecting managers whose trading strategies harmonise with each other. The evidence presented in this paper suggests further that bottom up manager diversification is more important than top down strategy allocation. The volatility and the systematic risk of



the overall portfolio depends predominantly on the decisions in respect to manager selection, strategy allocation plays only a minor role.

These are important results in light of the current trend toward open platform investing. In an open platform solution the investor employs one or several fund of fund managers to provide research and administrative services. The actual investment decision and the portfolio construction lie with the investor himself. The advantage of this approach is that the investor is able to utilise fund of fund managers only in their specific area of expertise, in addition the open platform approach is often more cost efficient. The danger is obvious that funds are combined which on a stand alone basis are attractive investments but do not harmonise. As a consequence, the investor is fully exposed to the trade off between manager specific and systematic risk.

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## **Appendix**

### **The Strategies of the TASS database**

Convertible Arbitrage: Exploiting price inefficiencies between convertible securities and stock

Dedicated Short Bias: Equity and derivatives portfolios with net short, “bearish” focus

Emerging Markets: Equity and fixed-income investments in emerging markets worldwide

Equity Market-Neutral: Offsetting long and short equity positions that are beta-neutral, currency-neutral, or both

Event-Driven: Corporate strategies focused on distressed securities, high-yield debt, Regulation D, and risk arbitrage

Fixed-Income Arbitrage: Exploiting price inefficiencies between related debt securities

Global Macro: Directional macroeconomic strategies

Long-Short Equity: Directional equity and equity derivative strategies

Managed Futures: Listed futures strategies often driven by technical or market analysis

Multi Strategy: Multiple strategies

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<sup>1</sup> See Agarwal, Daniel, and Naik 2004 for a comparison of the TASS database with the Hedge Fund Research and Zurich Capital Markets database.

<sup>2</sup> See Fung and Hsieh 2002 and Fung and Hsieh 2004 for a critique on the peer-group based approach.

<sup>3</sup> See Ineichen 2003 for a discussion of the ability of FoHF-managers to add value.