

Comparative Analysis of Hedge Fund Returns

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Abstract

Hedge funds have an absolute return performance objective stated independently of the global market conditions. Nevertheless they have been compared to classical bond and equity indices by academics since the late 90ies. Independently of their absolute or relative performance it is of particular importance to determine if some hedge funds consistently outperform their peers. This is exactly the objective of this study: Do some hedge funds consistently and significantly outperform others? Do some individual funds or some strategies continuously create alpha in comparison to others?

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I. Introduction

Hedge funds returns has been analysed by academics for a little less than a decade. The seminal early studies were Fung and Hsieh (1997) and Ackermann, McEnally and Ravenscraft (1999). Since then, the literature on the subject has expanded strongly and more and more researchers are focusing on these investment products.

Hedge fund studies can be classified in four global categories. In the first one, we report studies that are focused on hedge fund performance. This include studies that compare the performance of hedge funds with equity and other indices (see for example Ackermann, McEnally and Ravenscraft, 1999; Brown, Goetzmann and Ibbotson, 1999; Liang, 1999; Amin and Kat, 2003; Liang, 2001; Barès, Gibson and Gyger, 2002; Liang, 2003; Agarwal and Naik, 2004). Results of such studies are mitigated. The second field of hedge fund performance analysis compare the performance of hedge funds with mutual funds ones. In this context, Ackermann, McEnally and Ravenscraft (1999) and Liang (1999) find that hedge funds constantly obtain better performance than mutual funds. Finally, performance analysis include the study of the persistence of hedge fund returns (see Brown, Goetzmann and Ibbotson, 1999; Agarwal and Naik, 2000; Capocci and Hübner, 2004). Most studies concluded that there is a proof of persistency in hedge fund returns.

The second global category includes authors that try to analyse and describe hedge funds investment style and to explain these features with style models (see for example Fung and Hsieh, 1997; Brown, Goetzmann and Park, 1998; Brown and Goetzmann, 2001; Liang 2001; Ben Dor and Jagannathan, 2002; Liang 2003). A third part of the literature finally focus on the correlation of hedge funds with other investment products and analyse the power of diversification of hedge funds (see for example Fung and Hsieh, 1997; Schneeweis and Spurgin, 1998; Liang, 1999; Agarwal and Naik, 1999 and Amin and Kat, 2003). Finally other authors have analysed various other aspect of the hedge fund industry. This category includes the "*other studies*". Schneeweis and Spurgin (1999), Jorion (2000), and Berényi (2002) have studied the risks involved in hedge fund investing. Amenc, Martellini and Vaissié (2002) proved that hedge fund returns are not only exposed to the market risk, but that other risks like volatility risk, default risk or liquidity risk have to be considered. Liang (2000) has analysed the presence of survivorship bias in hedge fund data and Fung and Hsieh (2000) includes other biases in their analysis. Ackermann and Ravenscraft (1998) emphasize that the stronger legal limitations for mutual funds than for hedge funds hinder their performance.

Since we focus on the performance of hedge funds, our study will fall in the first global category. We will classify our study as a persistence in performance study because our objective is to determine if some hedge funds consistently and significantly outperform their peers. Our objective is different from

previous studies because we do not compare hedge funds to classical indices. We perform an original analysis in order to determine if some hedge funds significantly outperform their peers over time.

The study is organized as following. Section II describes that methodology. In section III we report the database and analyse the descriptive statistics and the attrition rate present in our database in section IV. In section V we report the bias analysis. We report the results in section VI and conclude in section VII.

II. Methodology

The objective of this study is to analysis hedge fund performance. The first thing we have to underline is that we perform each analysis by separating individual funds from funds of funds as suggested by Liang (2003) and Capocci (2005). We separate them for 3 main reasons. First, we want to avoid the double counting of individual funds that are part of funds of funds which lead to what Capocci (2005) call the fund of funds bias. Secondly, we separate individual funds from funds of funds because funds of funds returns could be biased: there is a double survivorship bias in their returns. More precisely, there are funds of funds that are dissolved and which lead to the presence of survivorship bias in the data when we do not take dissolved funds of funds into account (this is the same notion of survivorship bias as suggested in many other academic studies like Fund and Hsieh, 2000). On the other side, individual funds in the funds of hedge funds portfolio can also be dissolved, which lead to the presence of a second survivorship bias which can be important since the survivorship bias usually estimated are between 1% and 3%. This means that funds of funds returns should be lower than individual fund returns by 1% to 3% annually only because of the presence of the survivorship bias in the underlying funds. Finally, the third reasons why we separate funds of funds from individual funds is that performance and persistence models are usually less precise for funds of hedge funds than they are for individual hedge fund strategies (see Liang, 1999). This should at least partly be explained by the fee structure of the underlying funds of the funds of hedge funds (see Brown, Goetzmann and Liang, 2002). Depending on the performance on the individual funds compared to their hurdle rate and/or high watermark, the funds will charge a performance fee or not and the mix of these fees lead to a noise that cannot be catched by traditional indices used in persistence analysis studies.

The aim of this first part is to determine if some hedge funds consistently and persistently outperform their peers. To achieve this objective, we construct various hedge funds indexes. First we construct a hedge fund global index that contains all the funds present in our database, second we construct various hedge fund strategy indices, an index per strategy.

To test if some funds significantly outperform the indices, we use the following regression.

$$R_{P_t} = \alpha_P + \beta_{P1}R_{I_t} + \varepsilon_{P_t} \quad (1)$$

$p=1$ to number of individual funds and $t=1$ to number of months under analysis

Where R_{pt} is the return of hedge fund p at period t ,

R_{It} is the return of the index considered at period t .

We perform this analysis for each fund compared to the whole hedge fund database index and for each fund compared to its own strategy index. Once these results obtained, we want to determine if momentum is present in hedge fund returns. Active hedge fund selection strategies could increase the expected return on a portfolio if hedge fund performance is really predictable. The hypothesis that hedge fund with an above average return in this period will also have an above average return in the next period is called the hypothesis of persistence in performance. Sirri and Tufano (1998) and Zheng (1999) stressed the importance of persistence analysis in mutual funds. The former documents large inflows of money into last year's best performers and withdrawals from last year's losers. The latter finds that newly invested money in these best performing mutual funds is a predictor of future fund performance. Agarwal and Naik (2003) stressed it for hedge funds.

In order to perform this analysis we follow the methodology of Carhart (1997) using our simple model. All funds are ranked based on their previous year return. Every January, we put all funds into 10 equally weighted portfolios, ordered from highest to lowest past returns. Portfolios 1 (high) and 10 (low) are then further subdivided on the same measure. The portfolios are held till the following January and then rebalanced again. This yields a time series of monthly returns on each decile portfolio from 1/95 to 12/02. Funds that disappear during the course of the year are included in the equal-weighted average until they disappear, then portfolio weights are readjusted appropriately.

Finally, we want to determine empirically if some strategies are consistently better than other. To achieve this objective we use the following regression.

$$R_{D_t} = \alpha_p + \sum_{i=1}^{12} \beta_{p_i} R_{I_t} + \varepsilon_{p_t} \quad (2)$$

$p=1$ to 10 and $t=1$ to number of months under analysis

Where R_{D_t} is the return of decile p at period t ,

R_{I_t} is the return of the hedge fund indexes at period t .

We regress each decile against the hedge fund global index and each strategy index. Doing so, we determine if some deciles are exposed to some strategies indicating that this strategy is particularly present in the corresponding decile.

III. Database

Four main hedge fund databases are available for empirical studies, the Managed Account Reports, Inc./Center for International Securities Derivatives Markets, Hedge Fund Research, Inc, Tass Management and the Barclays database. The three first one are the most used in academic studies. The data providers collect specific information on the funds included. For a majority of funds, they record other useful information such as company name, start and ending date, strategy followed, assets under management, management and incentive fees, manager's name, manager's address, etc. There is no consensus on the definition of the strategy followed but there are similarities. MAR/CISDM defines 9 strategies with a total of 16 sub-strategies. HFR defines 16 different strategies in 2 categories, 11 non-directional and 5 directional strategies, plus the Funds of Funds and the Sector categories. TASS defines 15 strategies. Finally, Barclays define 20 individual strategies.

We use the same database as Capocci (2005) that uses hedge fund data from MAR/CISDM combined with Barclays hedge fund data. These funds include 1873 (61,15%) survived individual funds, 1190 (38,85%) dissolved individual funds, 653 (72%) surviving funds of hedge funds and 254 (28%) dissolved funds of funds. Please see Capocci (2005) for the details regarding the construction of this combined database.

In the past, MAR/CISDM has been used in Fung and Hsieh (1997), Schneeweis and Spurgin (1998), Amin and Kat (2003) and Amenc et al. (2002). The Barclay's database has been mainly used in studies focusing on CTAs. The Barclay hedge fund database has not yet been used in published studies. The database gives monthly net-of-fee individual returns and other information on individual funds and groups them in indices.

Our study is based on data going from 1/1994 to 12/2002 and includes not only the bull market period of the end of the nineties, but also the bear market that follow since 12/2002. This is clearly an edge in comparison with most studies (Ackermann et al., 1999; Brown et al., 1999; Liang, 1999; Liang, 2001; Amin and Kat, 2003) performed before the bear market that do not take this time period into account.

IV. Preliminary analysis

In this section we first analyse the descriptive statistics of the funds in our database. Then, we report attrition rate before describing the correlation analysis between the hedge fund strategies considered.

4.1 Descriptive statistics

Table 1 reports the descriptive statistics of the database. The first column indicates that the great majority of the funds reported in the database are defined as market neutral funds or global funds that each represents around 24% of the global individual hedge funds database. Equity hedge, sector funds,

Global Emerging and Global Macro funds each also represent more than 5% of the global database. On the other side strategies like currency funds, option strategy funds and the non classified funds each represent less than 1% of the data. The death ratios reported are almost all between 50% and 70% indicating high death level for individual hedge funds. Interestingly, this ratio is also high for funds of funds (72%).

INSERT TABLE 1 APPROXIMATELY HERE

Sector funds have offered the highest mean monthly return (1.56%) followed by currency funds (1.2%) and long only leverage funds (1.15%). Short sales ad funds of hedge funds have offered the lowest returns (0.8%), followed by the no-strategy funds (0.85%) and macro funds (0.88%). The no-strategy fund category is also the most volatile one (standard deviation of 4.52%) followed by the best performer, sector funds (standard deviation of 3.6%) and currency funds (3.53%). The less volatile funds are market neutral funds (1.22%), risk arbitrage funds (1.81%) and funds of funds (1.90%). The former offering also the best risk-return trade-off as measure by the Sharpe ratio (0.54), followed by event driven funds (0.39) and risk arbitrage funds (0.34).

4.2 Attrition rate

Attrition rates of hedge funds are largely publicized in academic studies (see for example Fung and Hsieh, 1997; Liang, 2000; Liang 2003). This rate can be defined as the percentage of funds in the database that are dissolved each year. Table 2 reports the birth rate and the attrition rate of the fund in our database for each year under study.

INSERT TABLE 2 APPROXIMATELY HERE

We perform the analysis for the whole database as well as by dividing it in individual funds and funds of funds. Panel A indicates that the birth rate is much higher than the attrition rate, which is normal for a growing industry. On an absolute term, the attrition is high at 8.7% per annum on average and it is particularly high for the last three years of analysis, when the equity market has been particularly difficult. This indicates that a difficult market also impact hedge funds even if these funds have an objective of absolute returns independent of the market conditions.

The figures obtained when separating individual funds and funds of hedge funds are somewhat different¹. The birth rate is more or less the same for funds of funds as it is for individual funds but that the attrition rate is much higher for individual funds as it is for funds of funds. We obtain 9.44% for individual hedge funds against 6.33% for funds of hedge funds. This result indicates that the diversification helps funds of funds to survive in difficult market conditions.

4.3 Correlation analysis

¹ These are not reported for the sake of brevity but available upon request.

As suggested in the introduction, the traditional hedge fund literature contends that, thanks to the weak correlation between hedge funds and other securities, hedge funds are likely to improve the risk-return trade-off when added to a traditional portfolio (see Fung and Hsieh, 1997; Liang, 1999; Amin and Kat, 2003). We report the correlation between the hedge funds strategies, between the hedge fund strategies and the passive investment ones and between the latter in Table 5. Because of the extremely large number of results to be reported, we chose to report ranges in correlations.

INSERT TABLE 3 APPROXIMATELY HERE

In each cell, correlations increase as the colour is darker. Table 3 reports the correlation between the hedge fund strategies. As typically reported (see i.e. Liang, 2003) in the literature, these strategies are in general highly correlated when indices are considered, with the exception of the Short Sellers strategy that systematically goes conversely – as expected. They are all higher than 0.5 (except short selling) and most of them are higher than 0.75. However we have to keep in mind that the correlations reported are the one between hedge fund indices and that, as suggested by Capocci and Capocci (2005), the correlation between individual funds is much lower than the one between indices because of the presence of the presence of diversification. A closer look at their evolution over time indicates that the hedge fund strategies tend to decrease their correlation with other funds in bearish times².

V. Bias analysis

Performance figures are subject to various biases. The 2 most important ones are the survivorship bias that appears when funds that exist over the whole analysis period are considered and the instant return history bias that appears when only the surviving funds are taken into account in a performance analysis study.

5.1 Survivorship bias

The common practice among suppliers of hedge funds databases is to provide information on investable funds that are currently in operation. When only living funds³ are considered, there is a survivorship bias in the figures because dissolved funds tend to have worse performance than surviving funds. We will estimate this bias for our database because we cover a complete cycle that includes a bull and a bear period and because our database contains almost 4000 funds.

² We perform the same analysis over a bull and a bear market period. The cutting point chosen for the identification of the up and down periods has been set at March 2000. This month corresponds to the maximum observed value of the Russell 3000 Index that reached a value of 858.48 during the session of March 24, 2000. During the up period, the monthly index return was positive in 70% of the months (52 out of 74) with an average yearly return of 19.4%. During the down period, the monthly index return was positive in 39% of the months (12 out of 34) and the average yearly return was -16.9%. Those trends are sufficiently strong to allow us to consider the whole sub-periods as, respectively, bullish and bearish. These Tables can be asked to the author.

³ By living funds we mean funds still in operation at the moment of the analysis.

Survivorship bias is particularly important in the case of hedge funds (see Fung and Hsieh, 1997; Fung and Hsieh, 2000; Ackermann, McEnally and Ravenscraft, 2001). Usually this bias is studied on a global basis for full databases including a variety of different strategies. In this study, since we focus on market neutral funds, we will analyse the presence of survivorship bias for the funds in our database.

Survivorship bias can be defined in 2 ways: the performance difference between surviving and dissolved funds (e.g. Ackermann et al., 1999) and the performance difference between living and all funds (e.g. Fung and Hsieh, 2000). We report the bias using both definitions.

INSERT TABLE 4 APPROXIMATELY HERE

Table 4 reports the survivorship bias calculated over the whole period. Panel A reports the yearly returns, the standard deviation and the number of observations for the whole database, the surviving funds and the dissolved funds. The survivorship bias is reported in Panel B where we also report the estimation of the yearly survivorship bias. The results are of particular interest. On a global basis first we obtained a bias of 4.3% using the first definition and 1.08% per year using the classical one. This latter result is in line with the results obtained by Fung and Hsieh (1998), but lower than the 0.30% monthly bias found by Fung and Hsieh (2000), the 3% bias found by Liang (2001) and the industry consensus bias of 3% stressed by Amin and Kat (2003)⁴. On a yearly basis 2000 and 2001 have been years of important differences in results between living and dissolved funds.

The results obtained for individual funds⁵ are a little higher than those obtained for the global database. The bias reported are 4.8% and 1.44% using the 2 definitions. These results are higher than for individual funds. The survivorship bias is lower for funds of hedge funds at 4.08% and 0.96% respectively.

5.2 Instant return history bias

As hedge funds are not allowed to advertise, their managers consider inclusion in a database primarily as a marketing tool. This creates a positive *instant history bias* or *backfilled bias* (Fung and Hsieh, 2000) that occurs because a fund's performance history is backfilled after inclusion. The upward bias results from the likelihood that funds with a poor track record are less likely to apply for inclusion than funds with good performance history.

We use the same two-step methodology as Park (1995), Brown et al. (1997), Fung and Hsieh (2000) to estimate this bias for our hedge fund database. On the one hand, we estimate the average monthly return of the "observable portfolio" which invests in all funds from our database each month. On the other hand, we estimate the average monthly return of the "adjusted observable portfolio"

⁴ We find this consensus value quite high when compared to the 0.8-1.5 bias reported by Malkiel (1995) and Brown and Goetzmann (1995) for US mutual funds.

⁵ Not reported for the sake of brevity but available upon request.

obtained from investing in all these funds after deleting the first 12, 24 and, if possible, 36, 48 and 60 months of returns. The bias is estimated for the whole period and for the bullish and bearish sub-periods in order to compare our results with those obtained by Fung and Hsieh (2000). Results are reported in Table 5.

INSERT TABLE 5 APPROXIMATELY HERE

Table 5 indicates that the mean monthly return of the funds tend to decrease when the first years of returns of the fund are removed. These results are in line with the one obtained in previous studies. Interestingly, this mean monthly return is a little higher when we remove 60 months of data compared to 48 months. This result should be due to the lower number of data available when 60 months of data are removed. Only 34% of the funds have more than 60 months of data.

When individual funds are separated from hedge funds, there results are higher in absolute term but the trend remains the same. An interesting point to stress out is that these results are different for funds of hedge funds. The opposite even emerges over the first 2 years of existence of funds of hedge funds: funds of hedge funds tend to underperform over their first 2 years of existence before outperforming the year after. This results indicates that the experience of the hedge fund selector could be really important.

VI. Peers performance analysis

6.1 Indices analysis

Panel A of Table 6 reports the results of the comparison of performance between the global hedge fund database and each hedge fund strategy. This Table gives us 3 sources of information; first, the alpha column indicates if the strategy considered out- or under-perform the global hedge fund industry over the period studied and the level of significance of this relative performance. Results indicate that 9 strategies create positive alpha and 6 negative but that 5 out of 15 strategies significantly outperform the index over the whole period (risk arbitrage, event driven, market neutral, short sellers and market timing). 2 strategies significantly underperform (global emerging and long only leveraged). The average alpha is slightly positive at 0.10.

Second, the beta column reports the beta of the strategy compared to the hedge fund universe. This figure has the same underlying idea as the beat of a stock compared to an index. A beta lower than 1 means a strategy that is less risky than the universe. A beta greater than 1 means a leveraged version of the universe. As one could expect, each of these indices is significantly and positively exposed to the global hedge fund index. The only exceptions are short sellers that are significantly negatively exposed to the hedge fund index. Some strategies are low beta strategies (risk arbitrage, event driven, global macro, market neutral, market timing, currency funds and options funds). Other are more levered (distressed securities, global emerging, EH, sectors funds, long only leveraged and the no-substrategy

category). These results are in line with what one could expect, arbitrage kind of strategies have a low beta and directional players are higher beta kind of strategies. The only exception to this rule are event-driven funds and macro funds that have a relatively low beta while the strategy is not pure arbitrage. The average beta is slightly below 1 at 0.94.

Finally the R^2 reported are almost all higher than 0.75. The only exceptions are short sellers, currency, option arbitrage and no sub-strategy. These high R^2 indicate that global hedge fund industry performance explain the bulk of the performance of almost each particular strategy and that the alphas reported are pure alpha (the only exception are short sellers that have a significant alpha but a low R^2). It is interesting to note that these results are in line with those obtained by Capocci (2004) that perform the same analysis for commodity trading advisors.

INSERT TABLE 6 APPROXIMATELY HERE

Panel B and C reports the same results while dividing the global hedge fund index between individual funds and funds of funds. Panel B reports results comparable to the one obtained in Panel A. The same strategies create and destroy value over the period compared to the global hedge fund index. Panel C reports some results in line with the previous one (risk arbitrage, event driven, market neutral, short sellers and market timers that significantly outperform the index) but interestingly no strategy significantly underperform the hedge fund of funds index and some other significantly outperform the hedge fund of fund index whereas they didn't outperform the global hedge fund index or the individual hedge fund index (event driven total, equity hedged). The average alpha and beta respectively go from 0.08% and 0.94% for the strategies compared to the global hedge fund index to 0.22% and 1.04% for the strategies compared to the hedge fund of fund index. This indicates an increase in the alpha created by strategies when their performance is compared to fund of hedge fund rather to individual funds.

6.2 Sub-period performance analysis

Let's divide the global period in 2 equal-length sub-periods, before and after June 1998. Table 10 reports the result of the first one, Table 11 the results of the second one. Panel A indicates that more strategies outperform the index over the first sub-period compared to the global period. 9 strategies significantly outperform before June 1998 whereas only 5 outperform over the global period. The market timing strategy is the only that outperform over the global period without outperforming over the first sub-period. Interestingly, the global emerging strategy does not under-perform over the first sub-period suggesting that the Asian crisis impact on this strategy has been limited. As over the global period, global and the global total strategies significantly under-perform the global hedge fund index. Moreover the hedge fund of funds strategy significantly under-perform the global index over the sub-period indicating a difficulty for fund of hedge funds to replicate the performance of the hedge fund industry over that period.

Panel B and Panel C respectively lead to different conclusion. First, the strategies out-performing the individual hedge fund index are no more exactly the same as the one out-performing the global index.. More precisely, all the strategies that significantly outperform or under-perform the individual hedge fund index also out- or under-perform the global index, but some others outperform the global index without outperforming the individual hedge fund index (distressed securities, risk arbitrage, equity). Panel C reports results close to Panel A, the main differences being that some strategies outperform the hedge fund of funds index without outperforming the global hedge fund index (sectors funds and market timing funds) and that the strategies that under-perform the global index no more under-perform the fund of hedge funds index. The mean alpha are higher than previously and increases from 0.13% for the strategies compared to the global hedge fund index to 0.4% for the strategies compared to the fund of hedge fund index. The average beta remain stable at 0.92. As previously, the R² are relatively high except for some strategies (short sellers, currency, option arbitrage and the no sub-strategy).

INSERT TABLE 7 & 8 APPROXIMATELY HERE

The second sub-period results reported in Table 11 are different. Panel A indicates that only 3 strategies significantly out-perform the index (event driven, market neutral and short selling) whereas 3 others significantly under-perform (distressed securities, global and long only leveraged). This result clearly indicates that few strategies consistently out-perform the hedge fund universe over the July 1998-December 2002 period and that the results were spread across the hedge fund strategies. Panel B and Panel C report results in line with Panel A. Over this second sub-period the mean alpha also increases only marginally from 0.04% for the strategies compared to the global index to 0.1% for the strategies compared to the fund of hedge funds index. On the other side, the beta increases strongly from 0.95 to 1.11.

6.3 Bull and bear market analysis

In order to go one step further we perform the same analysis dividing the second sub-period in so-called bullish (September 1998-March 2000) and bearish (April 2000-December 2002) market periods^{6,7}. Over the bullish period, only 3 strategies outperform the global, the individual fund and the fund of hedge funds index (risk arbitrage, market neutral funds and short sellers) and 2 significantly under-perform (global macro and long only leveraged funds) the first 2 indices. The average alpha increases strongly from -0.05% for the individual strategies compared to the global index to 0.34% for

⁶ End of March 2000 corresponds to the maximum of the NASDAQ Index. The S&P 500 reached its maximum in September 2000. For this reason we perform the same analysis using September 1998-September 2000 and October 2000-December 2002 as bullish and bearish market period.

⁷ We do not report the complete results of this analysis but the results can be obtained directly from the author.

the same strategies compared to the fund of hedge funds index. The betas go respectively from 0.97 to 1.07 and the R^2 are in line with the one obtained previously. These results suggest that fund of hedge funds could not replicate the hedge fund industry returns over this period. The bearish market results indicates that 4 strategies outperform in each case (market neutral, short sellers, market timing and option arbitrage funds), that 2 strategies significantly under-perform (global and long only leveraged funds) but that no hedge fund index is significant for the option arbitrage funds indicating that the returns of this strategy over this particular period are uncorrelated from the global hedge fund industry's one. The R^2 remain high but the alpha decrease slightly from 0.03% for the strategies compared to the global hedge fund index to -0.02% for the strategies compared to the fund of hedge funds index. More important than the small difference between the 2 figures is the trend. This result indicates that funds of hedge funds do not under-perform the global hedge fund industry over that period suggesting that professional hedge fund selector have been able to replicate the performance of the hedge fund industry over the bearish market period starting in April 2000.

Results obtained over the sub-periods are in line with the one obtained in the previous paragraph, the only difference being that figures tend to be lower on absolute terms and some strategies that had negative but not significantly negative alpha over the bullish period ending March 2000 have significantly negative one over the period ending September 2000 (distressed securities, global emerging, global total and long only leveraged for the strategies regressed against the global hedge fund index; distressed securities, global total and long only leveraged strategies for the hedge fund strategies regressed against the individual hedge fund index and no significant change for the strategies regressed against the fund of hedge funds index), with average alpha, beta and R^2 close to the previous one. The same pattern emerges when we change the turning point and take October 2000 instead of April 2000 (sector funds and the all individual hedge fund strategy significantly under-perform the global hedge fund index using the second definition of bearish market, sector funds and long only leveraged funds under-perform the individual hedge fund index and sector funds under-perform the fund of hedge funds index). At this point it is particularly interesting to note that the individual hedge fund index weakly under-perform the fund of hedge funds index indicating the ability of funds of hedge fund managers to outperform the hedge fund industry considered as a whole when the market environment is difficult. Another difference using the second definition of bearish market is that the currency strategy is no more significantly exposed to the hedge fund index in any case.

VII. Persistence analysis

7.1 Decile analysis over the whole period

To determine if there is consistency in hedge fund over-performance ability, we perform the decile analysis. We classify the funds over their past 12 months of performance each January and rank them in decile. We perform this classification each January and obtain a series of return for each decile starting in January 1995 (classification based on 1994's returns) and ending in December 2002. The average monthly performance of the worst funds (respect. individual funds or funds of hedge funds) in the database has been 0.85% (0.89% and 0.71%). The best funds have offered 1.43% (1.6% and 1.13%).

Global results are reported in Table 9. Panel A reports the results of the comparison of the global database and the global hedge fund index. This Panel aims at determining if individual funds or funds of hedge funds that offer the greatest returns over one year significantly outperform their peers over time. Results suggest that previous year worst performing funds tend to underperform (but not significantly) and that best performing funds significantly underperform over time. The only funds that significantly outperform over the global period are the funds that have a low beta. Globally, funds with a low beta have a offered alpha (however significant for one decile only). This result indicate that arbitrage strategies tend to outperform directional funds over a full market cycle that includes an up market and a down market period.

This result is very close to the one obtained in Capocci and Hübner (2004) in their persistence analysis of hedge fund returns compared to classical indices. They prove that the funds included in these middle deciles are lower volatility funds that offer consistent returns over time with a limited volatility. This volatility is the real issue with top and bottom funds that tend to be much more volatile.

INSERT TABLE 9 APPROXIMATELY HERE

7.2 Sub-period decile analysis

Results obtained when the analysis period is divided in 2 sub-periods are reported in Table 10. Panel A clearly indicates that previous year best and worst performing funds underperform the global hedge fund industry and that middle decile fund significantly outperform over the first half the period analysed, between 1994 and middle 1998. The top and bottom funds also tend to have a higher beta than middle decile funds. The R^2 obtained are very high, except for decile 1 (worst performing funds). These results confirm that there is a capacity of consistently outperforming the universe for middle decile funds.

INSERT TABLE 10 APPROXIMATELY HERE

Panel B of Table 10 reports the results over the second half of the analysis period. Over this period, there is no significant out- or over-performance even if, as previously, previous year best and worst performing funds underperform. The beta reported are more extreme than over the first sub-period and

the R^2 are marginally lower. Globally, the out-performance ability of some manager come mainly from the first part of the analysis period, before July 1998. Results obtained for individual funds and funds of hedge funds are in line with the global one. The difference being that the alpha obtained for individual funds are marginally higher and those obtained for funds of hedge funds are marginally lower.

7.3 Bull and bear decile analysis

Before concluding, we finally perform the same analysis by dividing the second sub-period in 2 distinctive market period as defined in Capocci et al. (2005): a bullish market period going from September 1998 to March 2000 and a bearish period going from April 2000 to December 2002. Results are reported in Table 11.

INSERT TABLE 11 APPROXIMATELY HERE

Panel A of Table 11 indicates that no decile significantly out- or –under-perform the index over the bullish market period. This means that when the market is growing, there is no significant proof of difference in performance between good and bad funds. As previously, the beta reported decreases between decile D1 and D4 before increasing to decile 10. The R^2 are another time high (except for decile D1 and D2). Panel B on the other side indicates that some funds significantly and consistently outperform their peers over time and that previous year bottom and top performing funds tend to underperform. The beta reported tend to be higher over the bullish market period indicating that funds return are more volatile when market conditions are more difficult. The R^2 are marginally lower.

The bull and bear market analysis indicates that there is no proof of persistence capabilities during a bull market cycle but that some funds significantly and consistently outperform their peers over a bear market.

VIII. Conclusion

The objective of this study is to determine if some hedge funds significantly and consistently outperform their peers over time. We start our analysis by performing the attrition rate, correlation and bias analysis (survivorship bias and instant return history bias analysis). We obtained an average attrition rate close to 8.7%, a survivorship bias of 1.1% and the clear presence of instant history return bias in the data.

The heart of the analysis focus on the performance of hedge fund strategies compared to the hedge fund community before looking at the persistence in this performance. We also perform the same analyses over various sub-periods. Our peer group analysis is interesting because it able us to compare hedge fund strategies with the hedge fund industry considered as a whole. Usually hedge fund are compared to classical indices (see for example Agarwal and Naik, 2000) or included in a portfolio to determine their interest for investors (see for example Ackermann et al., 1999).

We can summarize our results in 7 points:

- 1) Our first result indicates that some strategy significantly outperform the industry over the whole period (for example risk arbitrage funds or market neutral funds) whereas other significantly under-perform (for example global total).
- 2) The sub-period analysis indicates that some strategies could significantly outperform during one sub-period and significantly under-perform over another period (distressed securities for example outperformed the global and the fund of hedge funds index over the first half of the analysis period while significantly under-performing these indices over the second half of the period) indicating that the relative out-performance of hedge fund strategies evolves over time.
- 3) The persistence in performance analysis indicates that some strategies significantly outperform the index over the whole period, whereas other significantly under-perform. There is some proof of persistence in performance for less aggressive funds, but in some cases there is also a proof of significant under-performance. The only way of approaching the ability to outperform is to buy previous year middle decile funds that tend to remain middle decile. This result is very close to the one obtained in Capocci and Hübner (2004) in their persistence analysis of hedge fund returns compared to classical indices.
- 4) We perform the same analysis by separating individual hedge funds from funds of hedge funds. The results obtained are in line with the global one. The only difference being that the average alpha and beta increase for individual funds compared to funds of hedge funds. Our results confirm that funds of hedge funds offer marginally lower returns but that the trends are the same in individual hedge funds and in funds of hedge funds.
- 5) Fourth, short sellers are not only uncorrelated with the classical indices (see Liang, 1999) but our results prove that this strategy is significantly negatively correlated with the hedge fund industry considered as a whole as well as with the fund of hedge funds industry over the various time period studied. Over the global period and some sub-periods this strategy even significantly out-perform the industry stressing the ability of this strategy to diversify hedge fund portfolios.
- 6) Hedge fund indices does not really help describing specific strategies (option or market timers) in certain market conditions. This means that these strategies are particular in the hedge fund industry and differentiate from others.
- 7) The bearish market period analysis indicates that funds of hedge funds tend to outperform (not significantly) the hedge fund industry considered as a whole in difficult market conditions indicating that a professional fund picking could help creating alpha in difficult markets.

The next steps would be first to perform the same analysis over some specific strategies instead of global databases combining several of them. Another interesting point would be to go one step further in understanding how do some hedge fund managers outperform their peers over time and in some market conditions.

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Table 1: Hedge Fund Descriptive Statistics

	Nb	%	Dead funds	Mean	Std dev.	Median	Min	Max	Sharpe ratio
- Distressed sec	122	4%	61%	1,03	2,65	1,09	-12,14	7,37	0,25
- Risk arb	168	5%	77%	0,99	1,81	1,01	-6,89	6,08	0,34
- Event driven	59	2%	17%	1,13	1,96	0,85	-4,16	9,66	0,39
Event Driven Total	349	11%	61%	1,04	2,07	1,09	-8,75	6,44	0,32
Global emerging	226	7%	58%	1,02	3,12	1,36	-13,66	10,97	0,21
Global Macro	190	6%	69%	0,88	2,04	0,73	-4,44	7,33	0,25
Global	702	23%	46%	1,13	3,08	1,12	-10,16	11,88	0,25
Global Total	1118	37%	49%	0,89	2,70	1,05	-11,46	9,62	0,19
Market neutral	731	24%	64%	1,02	1,22	1,00	-4,04	4,61	0,54
Equity Hedge	332	11%	67%	1,13	2,35	1,23	-8,45	8,89	0,32
Sector	277	9%	70%	1,56	3,60	1,73	-11,44	15,33	0,33
Short sales	48	2%	71%	0,80	2,19	0,68	-5,17	7,91	0,19
Long only leveraged	142	5%	73%	1,15	2,89	1,17	-9,27	9,61	0,27
Market timing	43	1%	93%	1,01	1,94	0,91	-6,02	6,19	0,33
Currency fund	4	0%	25%	1,20	3,53	1,14	-10,00	10,36	0,23
Option strategy	3	0%	0%	1,02	2,62	1,16	-11,20	7,83	0,21
No substrategy	13	0%	8%	0,85	4,52	0,26	-10,24	17,18	0,11
Individual funds total	3060	100%	60%	1,09	2,25	1,15	-8,23	8,20	0,32
Funds of Funds	907	NA	72%	0,80	1,90	0,81	-7,32	6,93	0,22

This table reports the descriptive statistics for hedge fund strategies. N stands for number of funds and std dev for standard deviation. Our original MAR/CISDM database consists of 2246 individual funds (including 1061 dissolved funds) and 647 funds of funds (including 211 dissolved funds) over the January 1994-December 2002 period.

Table 2: Attrition Rates

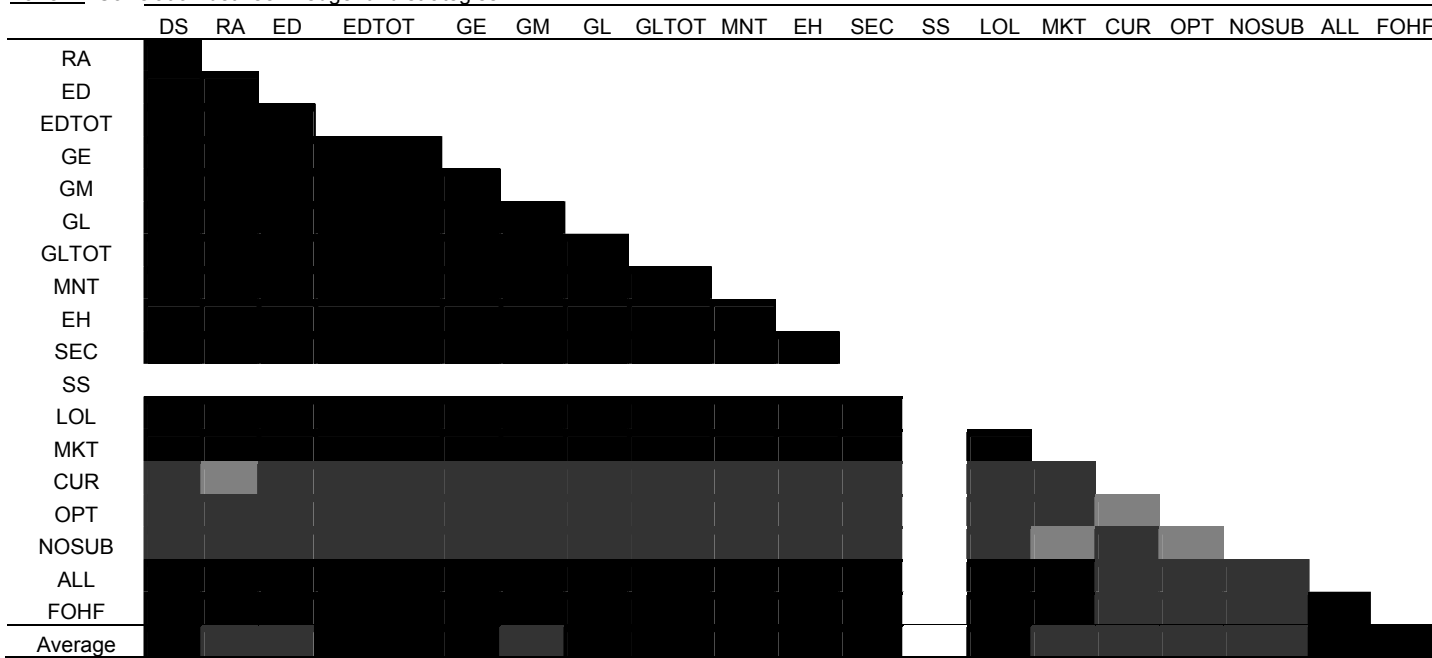
Panel A: Attrition Rate (whole database)

	Year start	New	Dissolved	Year end	Birth rate	Attrition rate
1994	728	237	24	941	32,55%	3,30%
1995	941	277	91	1127	29,44%	9,67%
1996	1127	359	66	1420	31,85%	5,86%
1997	1420	414	104	1730	29,15%	7,32%
1998	1730	387	163	1954	22,37%	9,42%
1999	1954	411	163	2202	21,03%	8,34%
2000	2202	424	225	2401	19,26%	10,22%
2001	2401	448	245	2604	18,66%	10,20%
2002	2604	282	360	2526	10,83%	13,82%
Total		3239	1441	Average	23,91%	8,68%

This table reports the attrition rate for the funds in our database. The attrition rate is defined as the percentage of dissolved funds to the number of funds at year start. Panel A is for the global database, Panel B for individual funds only and Panel C for funds of hedge funds. Deciles are constructed each January on the basis of the previous year's return. Our original MAR/CISDM database consists of 2246 individual funds (including 1061 dissolved funds) and 647 funds of funds (including 211 dissolved funds) over the January 1994-December 2002 period.

Table 3: Correlation Analysis

Panel A: Correlation between hedge fund strategies



This Table reports the ranges of correlation coefficient among hedge funds strategies. For each pair of strategies (in line and in column), the cell represents the range of correlation coefficient for the whole period (01:1994-12:2002). Colour codes for correlations are: >75% in black (■), between 50 and 75% in dark grey (■), between 25 and 50% in medium-dark grey (■), between 0 and 25% in medium grey (■), between -25 and 0% in light grey (■) and <-25% in white (□). DS = Distressed Securities, RA = Risk Arbitrage, ED = Event Driven, EDTOT = Event Driven Total, GE = Global Emerging, GM = Global Macro, GL = Global, GLTOT = Global Total, MNT = Market Neutral, EH = Equity Hedge, SEC = Sector, SS = Short Selling, LOL = Long Only Leveraged, MKT = Market Timing, CUR = Currency, OPT = Option Arbitrage, NOSUB = No sub-Strategy, ALL = All Individual Funds, FoHF = Funds of Hedge Funds, Our MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period.

Table 4: Survivorship bias

Year	All Funds			Surviving Funds			Dissolved Funds		
	Return	S.D.	Obs.	Return	S. D.	Obs.	Return	S. D.	Obs.
1994	2,2	1,5	10147	3,5	1,3	4646	1,1	1,8	5501
1995	18,1	1,0	12682	18,6	1,0	6258	17,6	1,0	6424
1996	19,7	1,5	15771	21,2	1,4	8336	18,0	1,6	7435
1997	18,6	2,1	19583	19,9	1,9	10949	17,0	2,3	8634
1998	5,5	3,2	22684	5,4	3,0	13503	5,8	3,4	9181
1999	30,4	2,5	25052	29,5	2,3	16436	32,4	3,1	8616
2000	9,2	2,9	28228	12,6	2,4	20104	0,4	4,3	8124
2001	5,4	1,6	30213	7,5	1,4	24326	-2,8	2,7	5887
2002	0,6	1,2	31190	1,3	1,2	29172	-8,4	1,5	2018
Mean 94-02	12,2	2,0	21728	13,3	1,8	14859	9,0	2,4	6868,89

Living - Dead Funds			Living - All Funds		
Year	Return		Year	Return	
1994	2,4		1994	1,3	
1995	1,1		1995	0,5	
1996	3,2		1996	1,5	
1997	2,9		1997	1,3	
1998	-0,4		1998	-0,2	
1999	-2,8		1999	-0,9	
2000	12,2		2000	3,3	
2001	10,3		2001	2,1	
2002	9,7		2002	0,7	

Bias 94-02	0,36	per Month	Bias 1/94-12/02	0,09	per Month
	4,32	per Year		1,08	per Year

This Table reports the survivorship bias of calculated from our database. Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. Survivorship bias is calculated as the performance difference between surviving funds and dissolved funds (Living-Dead Funds) and as the performance difference between surviving funds and all funds (Living-All Funds). All returns are net of fees. Numbers in the table are yearly percentage unless otherwise indicated.

Table 5: Instant Return History Bias

	Panel A: Whole database				Panel B: Individual funds				Panel C: Funds of funds			
	Mean Monthly Return	Monthly Difference	Annual Difference	N of obs. per year	Mean Monthly Return	Difference	Annual Difference	N of obs. per year	Mean Monthly Return	Difference	Annual Difference	N of obs. per year
All	1,02%	NA	NA	21723	1,09%	NA	NA	16437	0,80%	NA	NA	5284
Without 12M	1,00%	0,01%	0,17%	17639	1,04%	0,04%	0,51%	14068	0,87%	-0,07%	-0,90%	4635
Without 24M	0,90%	0,12%	1,43%	14972	0,92%	0,17%	2,01%	11899	0,83%	-0,04%	-0,44%	4035
Without 36M	0,77%	0,24%	2,91%	12638	0,79%	0,29%	3,53%	9982	0,72%	0,08%	0,91%	3501
Without 48M	0,64%	0,38%	4,53%	10547	0,63%	0,45%	5,42%	8334	0,65%	0,15%	1,75%	3007
Without 60M	0,69%	0,33%	3,91%	8696	0,66%	0,43%	5,12%	6878	0,77%	0,03%	0,30%	2573

This Table reports the *instant history bias* calculated from our database. Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. *Instant history bias* is calculated as the performance difference between the average monthly return using the portfolio which invests in all funds each month (the observable portfolio) and the average monthly return from investing in these funds after deleting the first 12, 24, 36, 48 and 60 months of returns (the adjusted observable portfolio). All returns are net of fees and on a monthly basis unless otherwise indicated.

Table 6: Hedge fund peers analysis – global period (1/1994-12/2002)

Panel A: Hedge fund strategies vs. the global hedge fund index					Panel B: Hedge fund strategies vs. the individual hedge fund index					Panel C: Hedge fund strategies vs. the fund of funds index				
	Alpha	Beta		R ²		Alpha	Beta		R ²		Alpha	Beta		R ²
DS	-0,14	1,15	***	0,88	DS	-0,17	1,11	***	0,88	DS	0,02	1,27	***	0,83
RA	0,23	0,74	***	0,78	RA	0,21	0,72	***	0,79	RA	0,35	0,80	***	0,70
ED	0,32	0,80	***	0,77	ED	0,30	0,77	***	0,77	ED	0,42	0,90	***	0,76
EDTot	0,10	0,92	***	0,92	EDTot	0,07	0,88	***	0,92	EDTot	0,23	1,01	***	0,86
GE	-0,36	1,35	***	0,87	GE	-0,38	1,28	***	0,86	GE	-0,21	1,53	***	0,87
GM	0,01	0,86	***	0,83	GM	-0,01	0,82	***	0,82	GM	0,10	0,98	***	0,84
GI	-0,29	1,40	***	0,95	GI	-0,34	1,35	***	0,97	GI	-0,07	1,51	***	0,86
GITot	-0,33	1,20	***	0,92	GITot	-0,36	1,15	***	0,92	GITot	-0,18	1,35	***	0,90
Mkt ntl	0,48	0,54	***	0,90	Mkt ntl	0,47	0,51	***	0,90	Mkt ntl	0,54	0,60	***	0,88
EH	0,04	1,07	***	0,96	EH	0,02	1,02	***	0,96	EH	0,19	1,18	***	0,91
SEC	-0,05	1,58	***	0,90	SEC	-0,10	1,52	***	0,91	SEC	0,20	1,71	***	0,82
SS	1,41	-0,60	***	0,35	SS	1,44	-0,59	***	0,37	SS	1,27	-0,59	***	0,26
LOL	-0,17	1,30	***	0,94	LOL	-0,21	1,25	***	0,94	LOL	0,02	1,41	***	0,86
MKT	0,24	0,77	***	0,72	MKT	0,22	0,73	***	0,72	MKT	0,33	0,86	***	0,71
CUR	0,22	0,96	***	0,34	CUR	0,19	0,93	***	0,35	CUR	0,38	1,02	***	0,30
OPT	0,24	0,69	***	0,34	OPT	0,24	0,66	***	0,34	OPT	0,29	0,80	***	0,34
NOSUB	-0,42	1,25	***	0,36	NOSUB	-0,47	1,21	***	0,36	NOSUB	-0,20	1,32	***	0,31
ALL	0,03	1,04	***	1,00	ALL	na	na	na	na	ALL	0,17	1,15	***	0,94
FoHF	-0,08	0,87	***	0,96	FoHF	-0,09	0,82	***	0,94	FoHF	na	na	na	na
Mean	0,08	0,94		0,77	Mean	0,06	0,90		0,76	Mean	0,22	1,04		0,72

This Table reports the result of the peer analysis calculated from our database. Our original The global hedge fund index contains all the funds and funds of funds in our database, the individual hedge fund index contains all the individual funds in our database and the fund of funds index contains all the fund of hedge funds in our database. DS = Distressed Securities, RA = Risk Arbitrage, ED = Event Driven, EDTOT = Event Driven Total, GE = Global Emerging, GM = Global Macro, GL = Global, GLTOT = Global Total, MNT = Market Neutral, EH = Equity Hedge, SEC = Sector, SS = Short Selling, LOL = Long Only Leveraged, MKT = Market Timing, CUR = Currency, OPT = Option Arbitrage, NOSUB = No sub-Strategy, ALL = All Individual Funds, FoHF = Funds of Hedge Funds, Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. All returns are net of fees and on a monthly basis unless otherwise indicated.

Table 7: Hedge fund peers analysis – first sub-period (1/1994-6/1998)

Panel A: Hedge fund strategies vs. the global hedge fund index						Panel B: Hedge fund strategies vs. the individual hedge fund index						Panel C: Hedge fund strategies vs. the fund of funds index					
	Alpha		Beta		R ²		Alpha		Beta		R ²		Alpha		Beta		R ²
DS	0,25	**	0,99	***	0,82	DS	0,18		0,97	***	0,83	DS	0,54	***	0,97	***	0,71
RA	0,29	**	0,80	***	0,64	RA	0,23		0,80	***	0,67	RA	0,57	***	0,75	***	0,50
ED	0,36	***	0,67	***	0,62	ED	0,33	***	0,64	***	0,60	ED	0,50	***	0,71	***	0,63
EDTot	0,28	***	0,88	***	0,84	EDTot	0,22	***	0,86	***	0,85	EDTot	0,55	***	0,85	***	0,71
GE	-0,39		1,36	***	0,82	GE	-0,44	*	1,30	***	0,79	GE	-0,10		1,44	***	0,84
GM	-0,19		0,95	***	0,77	GM	-0,22		0,91	***	0,75	GM	0,02		1,01	***	0,79
GI	-0,22	**	1,32	***	0,91	GI	-0,30	***	1,30	***	0,94	GI	0,20		1,27	***	0,77
GITot	-0,48	***	1,25	***	0,88	GITot	-0,54	***	1,21	***	0,88	GITot	-0,14		1,26	***	0,82
Mkt ntl	0,45	***	0,59	***	0,89	Mkt ntl	0,42	***	0,57	***	0,88	Mkt ntl	0,60	***	0,61	***	0,86
EH	0,15	**	1,02	***	0,93	EH	0,09		0,99	***	0,92	EH	0,42	***	1,03	***	0,86
SEC	0,14		1,45	***	0,86	SEC	0,05		1,42	***	0,88	SEC	0,59	***	1,41	***	0,73
SS	1,40	***	-0,54	***	0,14	SS	1,48	***	-0,57	***	0,17	SS	1,10	***	-0,37	***	0,06
LOL	-0,13		1,32	***	0,90	LOL	-0,21		1,30	***	0,91	LOL	0,27		1,30	***	0,78
MKT	0,09		0,98	***	0,66	MKT	0,04		0,96	***	0,66	MKT	0,35	**	1,00	***	0,61
CUR	1,10	***	0,60	***	0,28	CUR	1,05	***	0,59	***	0,29	CUR	1,30	***	0,56	***	0,22
OPT	-0,08		1,03	***	0,63	OPT	-0,11		0,99	***	0,63	OPT	0,15		1,06	***	0,59
NOSUB	-0,44		0,80	***	0,13	NOSUB	-0,55		0,83	***	0,15	NOSUB	-0,05		0,63	**	0,07
ALL	0,06	***	1,03	***	0,99	ALL	na		na		na	ALL	0,35	***	1,02	***	0,90
FoHF	-0,19	**	0,92	***	0,94	FoHF	-0,21	**	0,88	***	0,90	FoHF	na		na		na
Mean	0,13		0,92		0,72	Mean	0,08		0,89		0,71	Mean	0,40		0,92		0,64

This Table reports the result of the peer analysis calculated from our database. Our original The global hedge fund index contains all the funds and funds of funds in our database, the individual hedge fund index contains all the individual funds in our database and the fund of funds index contains all the fund of hedge funds in our database. DS = Distressed Securities, RA = Risk Arbitrage, ED = Event Driven, EDTOT = Event Driven Total, GE = Global Emerging, GM = Global Macro, GL = Global, GLTOT = Global Total, MNT = Market Neutral, EH = Equity Hedge, SEC = Sector, SS = Short Selling, LOL = Long Only Leveraged, MKT = Market Timing, CUR = Currency, OPT = Option Arbitrage, NOSUB = No sub-Strategy, ALL = All Individual Funds, FoHF = Funds of Hedge Funds, Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. All returns are net of fees and on a monthly basis unless otherwise indicated.

Table 8: Hedge fund peers analysis – second sub-period (7/1998-12/2002)

Panel A: Hedge fund strategies vs. the global hedge fund index						Panel B: Hedge fund strategies vs. the individual hedge fund index						Panel C: Hedge fund strategies vs. the fund of funds index					
	Alpha		Beta		R ²		Alpha		Beta		R ²		Alpha		Beta		R ²
DS	-0,38	**	1,21	***	0,91	DS	-0,39	*	1,15	***	0,91	DS	-0,32	**	1,42	***	0,91
RA	0,13		0,71	***	0,89	RA	0,12		0,68	***	0,90	RA	0,18		0,81	***	0,85
ED	0,38	***	0,87	***	0,85	ED	0,38	***	0,82	***	0,85	ED	0,43	**	1,00	***	0,83
EDTot	-0,04		0,93	***	0,96	EDTot	-0,04		0,89	***	0,96	EDTot	0,01		1,08	***	0,94
GE	-0,33	*	1,35	***	0,89	GE	-0,33		1,28	***	0,89	GE	-0,26		1,58	***	0,89
GM	0,13		0,83	***	0,88	GM	0,12		0,78	***	0,87	GM	0,17		0,97	***	0,87
GL	-0,31	**	1,43	***	0,97	GL	-0,33	***	1,37	***	0,98	GL	-0,21		1,63	***	0,91
GLTot	-0,23	*	1,19	***	0,95	GLTot	-0,24		1,13	***	0,94	GLTot	-0,18		1,40	***	0,95
Mkt ntl	0,46	***	0,51	***	0,91	Mkt ntl	0,46	***	0,49	***	0,91	Mkt ntl	0,49	***	0,60	***	0,90
EH	-0,01		1,09	***	0,98	EH	-0,02		1,04	***	0,98	EH	0,05		1,25	***	0,94
SEC	-0,13		1,64	***	0,91	SEC	-0,15		1,56	***	0,92	SEC	-0,02		1,86	***	0,86
SS	1,37	***	-0,63	***	0,65	SS	1,38	***	-0,61	***	0,66	SS	1,32	***	-0,71	***	0,59
LOL	-0,24	**	1,28	***	0,96	LOL	-0,25	***	1,23	***	0,96	LOL	-0,15		1,47	***	0,91
MKT	0,21	*	0,66	***	0,86	MKT	0,20	*	0,63	***	0,86	MKT	0,24	***	0,77	***	0,85
CUR	-0,33		1,09	***	0,37	CUR	-0,34		1,04	***	0,38	CUR	-0,26		1,24	***	0,35
OPT	0,21		0,58	***	0,25	OPT	0,21		0,54	***	0,25	OPT	0,23		0,68	***	0,25
NOSUB	-0,06		1,48	***	0,51	NOSUB	-0,07		1,40	***	0,51	NOSUB	0,01		1,72	***	0,51
ALL	0,01		1,05	***	1,00	ALL	na		na		na	ALL	0,07		1,21	***	0,96
FoHF	-0,03		0,84	***	0,98	FoHF	-0,03		0,80	***	0,96	FoHF	na		na		na
Mean	0,04		0,95		0,83	Mean	0,04		0,90		0,81	Mean	0,10		1,11		0,79

This Table reports the result of the peer analysis calculated from our database. Our original The global hedge fund index contains all the funds and funds of funds in our database, the individual hedge fund index contains all the individual funds in our database and the fund of funds index contains all the fund of hedge funds in our database. DS = Distressed Securities, RA = Risk Arbitrage, ED = Event Driven, EDTOT = Event Driven Total, GE = Global Emerging, GM = Global Macro, GL = Global, GLTOT = Global Total, MNT = Market Neutral, EH = Equity Hedge, SEC = Sector, SS = Short Selling, LOL = Long Only Leveraged, MKT = Market Timing, CUR = Currency, OPT = Option Arbitrage, NOSUB = No sub-Strategy, ALL = All Individual Funds, FoHF = Funds of Hedge Funds, Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. All returns are net of fees and on a monthly basis unless otherwise indicated.

Table 9: Decile hedge fund peers analysis (1/1994-12/2002)

Panel A: Global database against the global hedge fund index					Panel B: Global database against the individual hedge fund index					Panel C: Global database against the funds of hedge funds index							
	Alpha	t-stat	Beta	t-stat	R ²		Alpha	t-stat	Beta	t-stat	R ²		Alpha	t-stat	Beta	t-stat	R ²
D1	-0,51		1,22	***	0,50	D1	-0,53		1,17	***	0,50	D1	-0,38		1,34	***	0,46
D2	-0,23		0,85	***	0,68	D2	-0,24		0,82	***	0,69	D2	-0,13		0,94	***	0,63
D3	0,08		0,65	***	0,76	D3	0,07		0,62	***	0,76	D3	0,13		0,73	***	0,74
D4	0,17		0,59	***	0,87	D4	0,16	*	0,57	***	0,87	D4	0,22	**	0,67	***	0,83
D5	0,22	***	0,64	***	0,92	D5	0,22	***	0,61	***	0,92	D5	0,28	***	0,72	***	0,89
D6	0,12		0,80	***	0,92	D6	0,11		0,76	***	0,92	D6	0,18	***	0,91	***	0,91
D7	0,08		0,96	***	0,95	D7	0,07		0,91	***	0,94	D7	0,16	**	1,09	***	0,93
D8	-0,05		1,08	***	0,90	D8	-0,06		1,03	***	0,89	D8	0,04		1,22	***	0,87
D9	-0,24		1,39	***	0,85	D9	-0,25		1,32	***	0,85	D9	-0,12		1,56	***	0,82
D10	-0,78	**	1,97	***	0,81	D10	-0,79	**	1,88	***	0,81	D10	-0,63	*	2,25	***	0,80
D1a	-0,30		1,39	***	0,35	D1a	-0,32		1,33	***	0,36	D1a	-0,15		1,53	***	0,33
D1b	-0,83	**	1,18	***	0,47	D1b	-0,84	**	1,14	***	0,47	D1b	-0,70	*	1,31	***	0,44
D1c	-0,32		1,10	***	0,57	D1c	-0,34		1,06	***	0,58	D1c	-0,18		1,19	***	0,50
D10a	-0,44		1,55	***	0,85	D10a	-0,46	*	1,48	***	0,84	D10a	-0,30		1,75	***	0,82
D10b	-0,58	*	1,84	***	0,79	D10b	-0,59	*	1,75	***	0,78	D10b	-0,44		2,09	***	0,78
D10c	-1,34	***	2,62	***	0,76	D10c	-1,35	***	2,49	***	0,75	D10c	-1,16	***	3,01	***	0,76
Spread 1-2	0,29		-0,36	***	0,16	Spread 1-2	0,29		-0,35	***	0,16	Spread 1-2	0,25		-0,40	***	0,14
Spread 1-10	-0,27		0,76		0,13	Spread 1-10	-0,26		0,71	*	0,12	Spread 1-10	-0,25		0,91	**	0,14
Spread 1a-10c	-1,04		1,23	**	0,15	Spread 1a-10c	-1,03		1,16	**	0,14	Spread 1a-10c	-1,01		1,47	***	0,16
Spread 9-10	-0,54	***	0,59	***	0,46	Spread 9-10	-0,54	***	0,56	***	0,45	Spread 9-10	-0,51	***	0,69	***	0,48

This Table reports the results of the decile hedge fund peer analysis calculated from our database. Our original The global hedge fund index contains all the funds and funds of funds in our database, the individual hedge fund index contains all the individual funds in our database and the fund of funds index contains all the fund of hedge funds in our database. Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. All returns are net of fees and on a monthly basis unless otherwise indicated.

Table 10: Sub-period hedge fund decile analysis

Panel A: Global database against the global hedge fund index (1994/1-1998/6)					Panel B: Global database against the global hedge fund index (1998/7-2002/12)						
	Alpha	t-stat	Beta	t-stat	R ²		Alpha	t-stat	Beta	t-stat	R ²
D1	-0,28		0,97	***	0,53	D1	-0,48		1,30	***	0,50
D2	-0,39	***	0,95	***	0,81	D2	-0,19		0,83	***	0,64
D3	0,16	*	0,71	***	0,85	D3	-0,02		0,62	***	0,73
D4	0,29	***	0,66	***	0,92	D4	0,02		0,56	***	0,87
D5	0,36	***	0,63	***	0,87	D5	0,13		0,63	***	0,94
D6	0,17	***	0,81	***	0,94	D6	0,08		0,80	***	0,92
D7	0,09		1,00	***	0,96	D7	0,04		0,94	***	0,94
D8	-0,22		1,16	***	0,92	D8	0,00		1,06	***	0,89
D9	-0,24		1,32	***	0,90	D9	-0,18		1,42	***	0,84
D10	-0,85	***	1,75	***	0,91	D10	-0,55		2,08	***	0,81
D1a	0,15		1,01	***	0,30	D1a	-0,31		1,52	***	0,37
D1b	-0,53		0,88	***	0,47	D1b	-0,79		1,29	***	0,48
D1c	-0,23		0,93	***	0,58	D1c	-0,25		1,16	***	0,57
D10a	-0,64	***	1,64	***	0,88	D10a	-0,37		1,53	***	0,83
D10b	-0,36	*	1,46	***	0,85	D10b	-0,43		1,98	***	0,80
D10c	-1,80	***	2,45	***	0,81	D10c	-0,87		2,73	***	0,77
Spread 1-2	-0,11		-0,02		0,00	Spread 1-2	0,29		-0,48	***	0,26
Spread 1-10	-0,57		0,78	***	0,29	Spread 1-10	-0,07		0,77		0,11
Spread 1a-10c	-1,95	***	1,43	***	0,33	Spread 1a-10c	-0,56		1,22	*	0,13
Spread 9-10	-0,61	***	0,43	***	0,41	Spread 9-10	-0,37		0,66	***	0,51

This Table reports the results of the decile hedge fund sub-period peer analysis calculated from our database.

Our original The global hedge fund index contains all the funds and funds of funds in our database, the individual hedge fund index contains all the individual funds in our database and the fund of funds index contains all the fund of hedge funds in our database. Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. All returns are net of fees and on a monthly basis unless otherwise indicated.

Table 11: Bull and bear market sub-period hedge fund decile analysis

Panel A: Global database against the global hedge fund index - bull market (1998/9-2000/3) Panel B: Global database against the global hedge fund index - bear market (2000/4-2002/12)

	Alpha	t-stat	Beta	t-stat	R ²		Alpha	t-stat	Beta	t-stat	R ²
D1	0,21		1,09	**	0,37	D1	-0,55		1,43	**	0,33
D2	0,35		0,64	***	0,51	D2	-0,27		1,00	***	0,52
D3	-0,19		0,63	***	0,74	D3	0,00		0,76	***	0,63
D4	0,14		0,50	***	0,85	D4	0,07		0,55	***	0,73
D5	0,08		0,62	***	0,94	D5	0,20	**	0,58	***	0,87
D6	0,22		0,74	***	0,89	D6	0,18	***	0,63	***	0,93
D7	0,14		0,92	***	0,93	D7	0,08		0,80	***	0,89
D8	-0,02		1,02	***	0,84	D8	0,14		1,02	***	0,80
D9	-0,15		1,41	***	0,84	D9	-0,19		1,47	***	0,69
D10	-1,66		2,42	***	0,82	D10	-0,57		2,21	***	0,70
D1a	0,38		1,29		0,23	D1a	-0,38		1,64	*	0,25
D1b	-0,40		1,19	***	0,40	D1b	-0,85		1,37	**	0,31
D1c	0,61		0,86	***	0,37	D1c	-0,38		1,43	***	0,48
D10a	-1,19	**	1,77	***	0,86	D10a	-0,37		1,66	***	0,74
D10b	-1,34	*	2,24	***	0,81	D10b	-0,38		2,13	***	0,68
D10c	-2,47	*	3,24	***	0,76	D10c	-0,96		2,90	***	0,67
Spread 1-2	0,14		-0,45		0,17	Spread 1-2	0,29		-0,43		0,12
Spread 1-10	-1,87		1,33	*	0,24	Spread 1-10	-0,01		0,78		0,05
Spread 1a-10c	-2,85		1,94		0,22	Spread 1a-10c	-0,59		1,26		0,07
Spread 9-10	-1,51	*	1,01	***	0,59	Spread 9-10	-0,38	*	0,74	***	0,56

This Table reports the results of the decile hedge fund bull and bear sub-period peer analysis calculated from our database. Our original The global hedge fund index contains all the funds and funds of funds in our database, the individual hedge fund index contains all the individual funds in our database and the fund of funds index contains all the fund of hedge funds in our database. Our original MAR/CISDM/BARCLAYS database consists of a total of 3060 individual funds (including 1190 dissolved funds) and 907 funds of funds (including 254 dissolved funds of funds) over the January 1994-December 2002 period. All returns are net of fees and on a monthly basis unless otherwise indicated.