

EDHEC RISK AND ASSET MANAGEMENT RESEARCH CENTER

Edhec -1090 route des crêtes - 06560 Valbonne - Tel. +33 (0)4 92 96 89 50 - Fax. +33 (0)4 92 96 93 22
Email: research@edhec-risk.com – Web: www.edhec-risk.com

An Analysis of Hedge Fund Performance 1984-2000

CAPOCCI Daniel

University of Liège

HÜBNER Georges

Department of Management, University of Liège
Associate Professor with Edhec



Abstract

Using one of the largest hedge fund databases ever used (2796 individual funds including 801 dissolved), we investigate hedge funds performance using various asset pricing models, including an extension of Carhart's (1997) specification combined with the Fama and French (1998) and Agarwal and Naik (2000) models and a new factor that takes into account the fact that some hedge funds invest in emerging bond markets. This addition is particularly suitable for Event Driven, Global Macro, US Opportunistics, Equity non-Hedge and Sector funds. The performance of hedge funds for several individual strategies and different subperiods, including the Asian Crisis period, indicates evidence of persistence in performance in some cases but it is not stable over time.

JEL Classification codes: G2, G11, G15

Daniel Capocci is the corresponding author. University of Liège, Bld du Rectorat 7-B31, B-4000 Liège, Belgium, tel.: 32 87 784221 - fax: 32 87 787140 - E-mail: dan_capocci@hotmail.com.

Georges Hübner is from the Department of Management, University of Liège and Limburgs Institute of Financial Economics, Maastricht University.

The authors would like to thank David Capocci, Mark Carhart, Bing Liang, Narayan Naik, Roger Otten and seminar participants at the Catholic University of Louvain (UCL) for helpful comments, Kenneth French and Mark Carhart from providing the data on passive investment portfolios, and Jean-Marc Brisny and James Bradburn from Olympia Capital Management for providing access to Hedge Fund Research, Inc. and Managed Account Reports hedge fund data. Georges Hübner thanks Deloitte and Touche (Luxemburg) for financial support. All errors are ours.

Edhec is one of the top five business schools in France owing to the high quality of its academic staff (90 permanent lecturers from France and abroad) and its privileged relationship with professionals that the school has been developing since its establishment in 1906. Edhec Business School has decided to draw on its extensive knowledge of the professional environment and has therefore concentrated its research on themes that satisfy the needs of professionals.

Edhec pursues an active research policy in the field of finance. Its “**Risk and Asset Management Research Center**” carries out numerous research programs in the areas of asset allocation and risk management in both the traditional and alternative investment universes.

Copyright © 2003 Edhec

An Analysis of Hedge Fund Performance 1984-2000

I Introduction

With almost 6.000 funds managing around \$400 billion in capital, hedge funds justify an increased attention in financial press as well as in the academic world. These funds, that have been existing for more than fifty years, are not legally defined but share some common characteristics : they use a broad range of instruments like short selling, derivatives, leverage or arbitrage on different markets. Hedge funds require high minimum investments and their access is limited to individual investors or to institutions with large financial resources. Currently, about 90% of hedge fund managers are based in the US, 9% in Europe, and 1% in Asia and elsewhere. While the number of funds has more than doubled since the mid-nineties, around 80% of hedge funds are smaller than \$100 million, and around 50% are smaller than \$12 million. This reflects the high number of recent entries.

Scientific literature on performance-evaluation yields controversial results. This lack of consensus on the « right » model puts researchers in a quandary (Metrick, 1998). In this paper, we investigate hedge funds performance levels and persistence using various asset-pricing models, including an extension form of Carhart's (1997) model, combined with the models of Fama and French (1998) and Agarwal and Naik (2000) and with a factor, never used previously in this context, that take into account the fact that some hedge funds invest in emerging bond markets. This analysis is carried out for different subperiods including the Asian Crisis period and for several individual hedge funds strategies.

The rest of the paper is organized as follow. Section 2 reviews some of the major mutual and hedge funds performance studies with a focus on the evolution in the models used. Section 3 sets out the performance models we will use. The next Section provides a thorough description of our database. Section 5 brings some insights on hedge fund performance. Section 6 reports results of the performance of hedge funds. Section 7 documents and explains the persistence in hedge fund returns. Section 8 concludes the paper.

II Literature Review

2.1 Performance Studies

Despite the increasing interest that hedge funds have originated due to their recent development, few performance studies have been carried out on hedge funds comparing to

other investment tools like mutual funds. This can partly be explained by their private characteristics and the difficulties encountered to have access to individual funds data. Therefore, it is interesting to succinctly consider the results obtained in the main performance studies of mutual funds before introducing results of studies on hedge funds.

In general, performance studies can mainly be classified in two categories, depending on whether they conclude or deny that mutual funds have significantly higher realized returns than those obtained by following passive strategies¹, inducing that managers of mutual funds have access to sufficient information to recover their costs.

Among studies finding superior mutual funds performance, numerous papers investigate further its persistence. On the one hand, Hendricks et al. (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), and Wermers (1996) show persistence in mutual funds performance for a short period (1 to 3 years), and attribute it to *hot hands*² or to common investment strategies. It is worth noting that Carhart (1997) and Daniel and al. (1997) demonstrated that the momentum effect in the share's returns explain the *hot hands* effect detected by Hendricks, et al. (1993). On the other hand, Ippolito (1989), Grinblatt and Titman (1989, 1992), Elton et al. (1993), Elton et al. (1996), Sirri and Tufano (1998), and Zheng (1999) report a predictability in the mutual funds returns over a longer period of time.

Considering the recent interest for this sector, performance studies on hedge funds are less frequent. Nevertheless, Agarwal and Naik (1999) sustain that persistence in hedge funds performance exists. This issue of persistence in performance is particularly important in the case of hedge funds because, as emphasized by Brown and al. (1997, 1999) and Liang (1999), hedge funds knew an attrition rate much higher than mutual funds. Brown and al. (1999) prove that offshore hedge funds display positive returns adjusted for risk but they attribute this performance to style effect and conclude that there is hardly any evidence of the existence of differential manager skills.

Ackermann and al. (1999) and Liang (1999) who compare the performance of hedge funds to mutual funds and several indices find that hedge funds constantly obtain better performance

¹ See a.o. Lehmann and Modest (1987), Ippolito (1989), and Grinblatt and Titman (1989, 1992) for contenders of superior performance of hedge funds, and Jensen (1969), Malkiel (1995), Gruber (1996) and Carhart (1997) for studies reaching the opposite conclusion.

² This effect means that the securities hold by funds that had better performance one year realize superior returns than other funds the following year.

than mutual funds, although lower than the market indices considered. They also indicate that the returns in hedge funds are more volatile than both the returns of mutual funds and those of market indices. Ackermann and Ravenscraft (1998) emphasize that the stronger legal limitations for mutual funds than for hedge funds hinder their performance. According to Brown and al. (1997), hedge funds showing good performance in the first part of the year reduce the volatility of their portfolio in the second half of the year.

Fung and Hsieh (1997) and Schneeweis and Spurgin (1997) prove that the insertion of hedge funds in a portfolio can significantly improve its risk-return profile thanks to their weak correlation with other financial securities. This low correlation is also emphasized by Liang (1999) and Agarwal and Naik (1999). Amin and Kat (2001) find that stand-alone investment hedge funds do not offer a superior risk-return profile, but that a great majority of funds classified as inefficient on a stand-alone basis are able to produce an efficient payoff profile when mixed with the S&P500. They obtain the best results when 10-20% of the portfolio value is invested in hedge funds. Taking all these results into account, hedge funds seem a good investment tool.

2.2 Evolution in Performance Measurement

In the eighties, performance measures based on the CAPM, like Jensen's alpha (1968) and their extensions, were commonly used in performance evaluation. The recent interest in multi-factor models primarily comes from the literature on the cross-sectional variations in stock return. Several studies³ report that the cross-section of average returns on U.S. common stocks show little relation to the betas of the Sharpe (1964)-Lintner (1965) CAPM or the Breeden (1979) ICAPM. Instead, these authors identify other factors like the size of the company (Banz, 1981), leverage (Bhetari, 1988), earnings/price (Basu, 1983), book-to-market (Rosenberg et al. 1985; Fama and French, 1992), dividend yield (Litzenberger and Ramaswamy, 1979, 1982) and more recently the momentum effect (Jegadeesh and Titman, 1993; Carhart, 1995) that had reliable power to explain the cross-section of average returns. Subsequent multi-factor models include the 8-factor model developed by Grinblatt and Titman (1988), the asset class factor model from Sharpe (1992), the 3-factor model from

³ See e.g. Reinganum (1981), Breeden, Gibbons, and Litzenberger (1989), Fama and French (1996) and Chan, Jegadeesh and Lakonishok (1996).

Fama and French (1993), the 4-factor model from Carhart (1997), and the international model of Fama and French (1998)⁴.

However, recent studies have cast doubt on the usefulness of these new models. Kothari and Warner (1998) show that the Fama and French (1993) 3-factor model provides better results than the classical CAPM, but document that it detects significant abnormal results (including timing) when none really exists. In addition, Carhart (1997) develops his own 4-factor model that proves to be superior to the classical CAPM, the Grinblatt and Titman (1989) 8-factor model and the Fama and French (1993) 3-factor model.

In hedge funds literature, different models have also been used in performance evaluation. In an early study, Fung and Hsieh (1997) extend Sharpe's (1992) asset class factor model and find five dominant investment styles in hedge funds. Schneeweis and Spurgin (1998) also use style analysis based on a multi-factor approach. Brown and al. (1999) and Ackermann and al. (1999) use a single factor model and focus only on total risk. Agarwal and Naik (1999) use regression-based (parametric) and contingency-table-based (non-parametric) methods. Their parametric method regresses alphas (or appraisal ratios) on their lags. For the non-parametric method, they construct a contingency table of winners and losers depending on the alpha. Liang (1999) uses the extension of Fung and Hsieh (1997) model, regressions based on fund characteristics, and classical measure like the Sharpe ratio. Recently, Agarwal and Naik (2000) proposed a general asset class factor model comprising of excess returns on passive option-based strategies and on buy-and-hold strategies to benchmark the performance of hedge funds. Agarwal (2001) uses a model consisting of trading strategy factors and location factors to explain the variation in hedge funds returns over time.

These results suggest that it is necessary to realize performance studies based on multi-factor models, rather than simply use the CAPM, but there exists no unanimously accepted model. Therefore, it is preferable to use several specifications in order to compare the results obtained.

III Performance Measure Models

For comparison purpose, the paper starts its study of hedge funds performance with the CAPM. The basic multi-factor specifications are the Fama and French (1993) 3-factor model and its international version of 1998 (Fama and French, 1998) and the Carhart (1997) model because they are not dominated by any other model in the mutual funds performance

⁴ See Allen and Soucik (2000) for a description of the major models used in mutual funds performance studies.

literature⁵. Finally, we construct a multifactor model that extends the Carhart (1997) model by combining it with factors proposed in Fama and French (1998) model and Agarwal and Naik (2000) and by adding an additional factor.

3.1 The Capital Asset Pricing Model

The first performance model we use is a single index model based on the classical CAPM developed by Sharpe (1964) and Lintner (1965). Its equation to estimate is the following :

$$R_{Pt} - R_{Ft} = \mathbf{a}_P + \mathbf{b}_P (R_{Mt} - R_{Ft}) + \mathbf{e}_{Pt} \quad t = 1, 2, \dots, T \quad (1)$$

where R_{Pt} = return of fund P in month t ; R_{Ft} = risk-free return on month t ; R_{Mt} = return of the market portfolio on month t ; \mathbf{e}_{Pt} = error term; \mathbf{a}_P and \mathbf{b}_P are the intercept and the slope of the regression, respectively.

The intercept of this equation, \mathbf{a}_P commonly called Jensen's alpha (1968) is usually interpreted as a measure of out- or under-performance relative to the market proxy used.

3.2 The 3-factor Model of Fama and French (1993) and its international version of Fama and French (1998)

The Fama and French (1993) 3-factor model is estimated from an expected form of the CAPM regression. It takes the size and the book-to-market ratio of the firms into account. It is estimated from the following extension of the CAPM regression :

$$R_{Pt} - R_{Ft} = \mathbf{a}_P + \mathbf{b}_{P1}(R_{Mt} - R_{Ft}) + \mathbf{b}_{P2}SMB_t + \mathbf{b}_{P3}HML_t + \mathbf{e}_{Pt} \quad t=1, 2, \dots, T$$

where SMB_t = the factor-mimicking portfolio for size ('small minus big') and HML_t = the factor-mimicking portfolio for book-to-market equity ('high minus low')⁶. These factors aim at isolating the firm-specific components of returns.

⁵ Following Bams and Otten (2000) we do not consider the Sharpe's (1992) asset class factor model which is an asset allocation model and not an asset evaluation model.

⁶ See Fama and French (1993) for a precise description of the construction of SMB_t and HML_t .

In the international version of the model, Fama and French (1998) consider twelve major EAFE (Europe, Australia, and Far East) countries and several emerging markets and propose an international factor mimicking for book-to-market equity (HML). The formula is the following :

$$R_{P_t} - R_{F_t} = \mathbf{a}_P + \mathbf{b}_{P1}(R_{M_t} - R_{F_t}) + \mathbf{b}_{P2}IHML_t + \mathbf{e}_{P_t} \quad t=1,2,\dots,T \quad (2)$$

where $IHML_t$ = an international version of HML_t .

According to Fama and French (1998), the international CAPM cannot explain the value premium in international returns, but a one-state-variable international ICAPM that explains returns with the global market return and a risk factor for relative distress captures the value premium in country and global returns.

3.3 The 4-Factor Model of Carhart (1997)

Carhart's (1997) 4-factor model is an extension of the Fama and French (1993) factor model. It takes into account size and book-to-market ratio, but also an additional factor for the momentum effect. Grinblatt, Titman and Wermers (1995) define this effect as buying stocks that were past winners and selling past losers. This model is estimated with the following regression :

$$R_{P_t} - R_{F_t} = \mathbf{a}_P + \mathbf{b}_{P1}(R_{M_t} - R_{F_t}) + \mathbf{b}_{P2}SMB_t + \mathbf{b}_{P3}HML_t + \mathbf{b}_{P4}PR1YR_t + \mathbf{e}_{P_t} \quad t=1,2,\dots,T \quad (3)$$

where $PR1YR_t$ = the factor-mimicking portfolio for the momentum effect⁷

As stressed by Daniel et al. (1997), this model assumes that, in the absence of stock selection or timing abilities, the coefficients of four zero investment factor mimicking portfolios are appropriate measures of multidimensional systematic risk. It identifies a matching passive portfolio return for each fund return.

⁷ For a description of the construction of PR1YR see Carhart (1997).

3.4 An Extended Multi-Factor Model

In order to take into account the different characteristics of the hedge fund industry, we implement a combination and an extension of Carhart's (1997) 4-factor model, the international model of Fama and French (1998), and the model used by Agarwal and Naik (2000) and Agarwal (2001).

This model contains the zero investment strategies representing Fama and French's (1993) size and value, Fama and French (1998) international value and Carhart's (1997) momentum factor, a default factor (Lehman BAA corporate bond index) as introduced by Agarwal and Naik (2000), a factor for non-US equities investing funds (MSCI World excluding US), three factors to take into account the fact that hedge funds invest in US and foreign bond indices (Lehman US aggregate bond index, Salomon world government bond index, and JP Morgan Emerging Market Bond Index) and finally a commodity factor (GSCI Commodity Index). Beyond the combination of existing models, the originality of this model is to feature a factor that take into account the fact that hedge funds may invest in bonds on emerging markets.

In order to take into account the fact that hedge funds invest in a wide range of equities including small and large companies, the market proxy used is the Russel 3000 that represents over 95% of investable US equity market.

Note that Agarwal and Naik (2000) and Agarwal (2001) take several additional factors such as the MSCI Emerging Markets, the Salomon Brothers Government and Corporate Bond Index, and the Lehman High Yield Bond Index. Their high colinearity with other factors lead us not to test these indices further.

Following Agarwal (2001) we chose the Goldman Sachs Commodity index instead of a Gold index used by Fung and Hsieh (1997) as the former indicates better exposure of hedge funds in commodities especially considering the fact that hedge funds may not be investing solely in gold among commodities. Its components are weighted according to their impact on production in the world economy.

$$\begin{aligned}
 R_{P_t} - R_{F_t} = & \mathbf{a}_P + \mathbf{b}_{P1}(R_{M_t} - R_{F_t}) + \mathbf{b}_{P2}SMB_t + \mathbf{b}_{P3}HML_t + \mathbf{b}_{P4}IHML_t + \mathbf{b}_{P4}PR1YR_t \\
 & + \mathbf{b}_{P5}(MSWXUS_t - R_{F_t}) + \mathbf{b}_{P7}(LAUSBI_t - R_{F_t}) + \mathbf{b}_{P8}(SWGBI_t - R_{F_t}) \\
 & + \mathbf{b}_{P9}(JPMEMBI_t - R_{F_t}) + \mathbf{b}_{P10}(LEHBAA_t - R_{F_t}) + \mathbf{b}_{P11}(GSCI_t - R_{F_t}) + \mathbf{e}_{P_t}
 \end{aligned} \tag{4}$$

where RM_t = return on the Russel 3000 index; $MSWXUS_t$ = return of the MSCI World Index excluding US; $LAUSBI_t$ = return on the Lehman Aggregate US Bond Index; $SWGBI_t$ = return on the Salomon World Government Bond Index; $JPMEMBI_t$ = return of the JP Morgan emerging market Bond Index; $LEHBAA_t$ = return of the Lehman BAA Corporate Bond Index; $GSCI_t$ = return of the Goldman Sachs Commodity Index.

IV Data

4.1 Data Providers

First, it is important to stress all information on hedge funds is available exclusively on a voluntary basis, for ‘allowed’ persons depending on the country in which the fund wants to find investors. Fortunately, many hedge funds release monthly information to inform existing investors or to attract new ones. Some data collectors make them, in turn, available to the qualifying public. As stressed by Amin and Kat (2001), there are three main hedge fund database providers in the world. These are ‘Managed Account Reports’ (MAR, 1500 funds), ‘Hedge Fund Research, Inc.’ (HFR, 1400 funds), and ‘TASS Management’ (TASS, 2200 funds). These databases are the most used in academic and commercial hedge fund studies. The MAR database was used, among others, by Fung and Hsieh (1997), Schneeweis and Spurgin (1998), and Amin and Kat (2001). HFR was used by Schneeweis and Spurgin (1997), Liang (1999), Agarwal and Naik (1999, 2000), and Agarwal (2001). TASS database was used in Brown et al. (1997), Fung and Hsieh (2000a, 2000b), and Brown and Goetzmann (2001). The three databases have never been used together in a study, but Ackermann et al. (1999) and Ackermann and Ravenscraft (1998) used a combination of HFR and MAR. Liang (2000) used a combination of TASS and HFR.

Data vendors do not collect performance data. For a majority of funds, they record many other useful information such as company name, start and ending date, strategy followed, assets under management, management and incentive fees, managers name etc. Moreover, each data provider calculates a number of hedge fund indices, one for each type of strategy followed. There is no consensus on the definition of the strategy followed but there are similarities. MAR defines 9 strategies along with 15 sub-strategies. HFR defines sixteen different strategies in two categories, 12 non-directional and 5 directional strategies, plus the Funds of Funds and the Sector categories. Finally, TASS defines 15 strategies.

4.2 Hedge Funds

We obtained hedge fund data from HFR and MAR. Both databases give monthly net-of-fee individual returns and other information on individual funds and group them in indices. We got 198 monthly returns on 1811 individual hedge funds plus 48 HFR indices (16 investment styles with 3 indices for each investment style : onshore, offshore and a combined index) in the HFR database and 2354 individual hedge funds plus 23 indices in the MAR database between January 1984 and June 2000. Then, in each database, we removed funds that appear twice in the same database⁸ and funds with quarterly returns. This gave us 1639 individual hedge funds in the HFR database and 2014 hedge funds in the MAR database.

We further found 857 funds that were present in the two databases. When there was differences in the start or ending date between the two databases, we chose the database presenting more data.

This left us with a total of 2796 individual hedge funds. This is one of the greatest database ever used in hedge funds performance studies. These funds include 1995 (71%) survived funds and 801 (29%) dissolved funds.

4.3 Bias in Hedge Funds Data

Survivorship bias is an important issue in mutual funds performance studies (see Carhart and al., 2000). In response to this concern, data vendors do backfill fund's performance history when a new fund is added to the database. This allows them to provide data that go back beyond the start data of the database itself (usually 1993). Moreover, these providers do not eliminate defunct funds and should normally not suffer from survivorship bias for the years after the start of the databases⁹.

According to Ackermann et al. (1999) and to Fung and Hsieh (2000b), two upward biases exist in the specific case of hedge funds because, since they are not allowed to advertise, they consider inclusion in a database primarily as a marketing tool. The first one is called the *self-selection bias* is present because funds that realize good performance have less incentive to

⁸This happened in three cases: when the same fund (same name, company, and returns) appeared twice in the database; when the same fund (same name, and returns) appeared twice in the database with two different company names; and when the same fund (same company, and returns) appeared twice in the database with two different fund names.

⁹ Unfortunately, it is impossible to find information on defunct funds before the starting date of each database.

report their performance to data providers in order to attract new investors, because they might be considered by the SEC as making illegal advertising. The second point called *instant history bias* or *backfilled bias* (Fung and Hsieh 2000b) occurs because a fund's performance history is backfilled after inclusion. This may cause an upward bias because funds with a poor track record are less likely to apply for inclusion than funds with good performance history. Nevertheless, to avoid polemics, we take all funds (both living and dissolved) into account.

4.4 Risk-free Return and Market Performance

As underlined by Agarwal (2001), a fundamental challenge in a risk-adjusted analysis of hedge funds is the identification of a meaningful benchmark. Fung and Hsieh (1997), Schneeweis and Spurgin (1998) and Liang (1999) use style analysis based multi-factor approach, while Brown et al. (1999) address this issue by employing a Generalized Stylistic Classification (GSC) algorithm and grouping the managers on the basis of their realized returns.

As market performance index in the estimation of the CAPM, we had to choose between the value-weighted portfolio of all NYSE, Amex and Nasdaq stocks usually used in mutual funds performance studies (see for example Fama and French, 1993, 1996, 2000; Carhart, 1997) and the Russel 3000 used in Agarwal and Naik (2000) and Agarwal (2001) hedge funds studies. In Table 1, we compared the descriptive statistics of the two proxies. The results clearly suggest that both market proxies are in fact equivalent and that our results would not be influenced by the market proxy chosen. We decided to take the value-weighted portfolio of all NYSE, Amex and Nasdaq stocks market proxy. We took the one-month T-bill from Ibbotson Associates as the risk-free rate.

Insert Table 1 approximately here

V Data analysis

5.1 Basic Performance

Before going in the heart of our work, panel A of Table 2 contains descriptive statistics of the funds in our database. Given that MAR and HFR classify differently the individual hedge funds, we combine the data for strategies that exist across both databases (sometimes under

different names) and we add the strategies or sub-strategies present in only one database¹⁰. We contrast hedge funds data against the descriptive statistics of the market proxy, the MSCI World excluding US, Fama and French's (1993) SML and HML, Fama and French's (1998) international IHML, Carhart's (1997) momentum factor, Lehman US aggregate bond index, Salomon World government bond index, JP Morgan Emerging Market Bond Index, Lehman BAA corporate bond index (default spread), and Goldman Sachs Commodity Index. These statistics are reported in panel B of Table 2.

Insert Table 2 approximately here

Table 2 provides comparative statistics for the individual hedge funds in our database and for 11 passive investment strategies. For hedge funds strategies, we report the living and dead funds.

Panel A of Table 2 shows that the highest mean return was achieved by the Long Only Leveraged (2.68%) followed by the US Opportunistics Small Caps (2.31%) and by the Sector (1.99%). Strategies that offer the lowest mean return are Foreign Exchange (0.73%), Short Sellers (0.79%) and Market Neutral Convertible Arbitrage (0.98%), whereas the mean return of the whole database is 1.49%. The results are the same for the mean excess returns.

When standard deviation is taken into account through the Sharpe measure (the ratio of excess return and standard deviation), results are somewhat different. Funds offering the best trade-off between risk and return are the Market Neutral Convertible Arbitrage (0.3971), followed by the Event Driven without sub-strategy (0.3575) and the US Opportunistics Small Caps (0.3393). The worse Sharpe ratio was obtained by the Short Sellers (0.0690), which were also in the worst performing funds when risk was not taken into account.

A look at the t-stats indicates that mean returns are significantly different from 0 at the 1% significance level for all funds and that the mean excess returns are significantly different from 0 at the 1% level in all cases but the Short Sellers.

Panel B of Table 2 shows that the mean excess return of the Market Proxy is 0.88% per month (about 12% per year) and statistically different from zero. The mean excess premium of the MSCI World excluding US is an insignificant 0.45% per month. The average SMB and HML returns are insignificant, unlike the results obtained by Fama and French (1993) and Carhart

¹⁰ The description of these strategies is available upon request.

(1997)¹¹. The international HML and the momentum factor give more interesting values. They respectively produced an average premium of 0.41% and 1.14% per month, economically as well as statistically significant. The highest mean return was obtained by the Market Proxy for the equity, and by the JP Morgan Emerging Market Bond Index for the bond. The Sharpe ratios bring the same results, with the only difference that Salomon Government Bond Index (0.1811) and Lehman BAA Corporate (0.2357) have a Sharpe ratio very close to the one obtained by the JP Morgan Emerging Market Bond Index (0.207).

The Sharpe ratio obtained by our whole hedge fund database (0.2054) is very close to the one for the Market Proxy (0.2050), and higher than for the MSCI World Excluding US (0.1005).

5.2 Correlation

Fung and Hsieh (1997), Schneeweis and Spurgin (1997), Liang (1999) and Amin and Kat (2001) report a weak correlation between hedge funds and other financial securities. Hence, the addition of hedge funds to a traditional portfolio could in principle improve its risk-return trade-off.

Table 3 reports correlation coefficients among and between hedge funds strategies defined in Table 2 and passive investment strategies.

Insert Table 3 approximately here

Panel A contains the correlation among hedge funds strategies. There is a high variability between different strategies, ranging from 0.96 (between Equity non-Hedge and US Opportunistics) to -0.79 (between Short Selling and US Opportunistics). 42 correlation coefficients (40%) are greater than 0.80 and 14 (13%) are negative. In particular, Short Sellers are negatively correlated with all the other hedge fund strategies.

Panel B reports correlations (coefficients) between hedge funds and equity, bond and commodity indices. The range is narrower than in the previous case (from -0.65 to 0.87). Correlation coefficients between hedge funds strategies and the Market Proxy are, in almost all cases, greater than 0.5 whereas they are always smaller than 0.3 with the MSCI World excluding US and than 0.5 with bond indices. These results confirm that hedge funds strategies are weakly correlated with traditional investment tools¹².

¹¹ The differences in SMB and HML can be explained by the different periods covered by our studies. Their high variance suggests a very unstable behavior.

¹² Except with the market proxy, but this result can easily be understood since the market proxy contains almost all the American market.

Panel C displays correlations among Passive Investment strategies. All coefficients are below 0.46 and 93% are below 0.3, too low to raise serious multicollinearity concerns.

5.3 Survivorship bias

Survivorship bias has received considerable attention in the academic literature. Two definitions of this bias are commonly used in studies: the performance difference between surviving funds and dissolved funds (e.g. Ackermann et al., 1999) and the performance difference between living funds and all funds (e.g. Liang, 2000). We report the bias using both definitions for the whole period and for 2 sub-periods 1984-1994 and 1994-2000, the turning point corresponding to the moment when data vendors started collecting dead funds.

Insert Table 4 approximately here

In Panel A of Table 4, we report a monthly survivorship bias of 0.30% (or 3.60% per annum) for the whole period using the first formula and in Panel B a bias of 0.07% per month (0.9% per annum) using the second formula. A look at subperiod biases indicates, as expected, that survivorship bias is much higher after 1994, supporting the hypothesis that data vendors collect data on dead funds after 1994.

The value reported using the second definition for period 1994-2000 (1.2%) is very close to the percentage of 1.5% from Fung and Hsieh (1998). It is however lower than the 0.30% monthly bias found by Fung and Hsieh (2000b), the 3% bias found by Liang (2001) and the industry consensus bias of 3% stressed by Amin and Kat (2001)¹³.

These biases indicate that poor performance could be the main reason for disappearance. In Figure 1, we plot returns of the dissolved funds in our database over the 24-month period before their exit dates. It shows a declining return pattern towards the date of exit, indicating inferior performance on average: it corresponds to a decrease of the mean return of almost 3.5% in two years.

Insert Figure 1 approximately here

5.4 Instant Return History Bias

When new funds are added into a database, historical returns are backfilled. This corresponds to a demand by fund managers who market themselves if they have good track records, i.e.

¹³ 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.

after compiling good performance. Fung and Hsieh (2000b) estimate this bias using a 12 month incubation period. They found a 1.4% per year difference in returns for the 1994-1998 period.

Following Park (1995), Brown et al. (1997) and Fung and Hsieh (2000b), we estimate this bias for our hedge fund database in two steps. On the one hand, we estimate the average monthly return using the portfolio which invests in all funds from our database each month (we called this portfolio the observable one). On the other, we estimate the average monthly return from investing in all these funds after deleting the first 12, 24, 36 and 60 months of returns (we called this portfolio the adjusted observable one). The bias is estimated for the whole period and splitting the time period in two in order to compare our results with those obtained by Fung and Hsieh (2000b). Results are reported in Table 5.

Insert Table 5 approximately here

For the 1/84-6/00 period, the observable monthly return averaged 1.49%, while the adjusted observable one was 1.42% (when deleting the 12 first months), 1.26% (24 months), 1.20% (36 months), and 1.15% (36 months). This gives an estimate of approximately 0.9% per year, lower than the 1.4% found by Fung and Hsieh (2000b) for the instant history bias. For the 1/94-6/00 period, the bias of 1.2% per year is closer to the one of Fung and Hsieh (2000b). The remaining difference can be explained by the difference in time period covered and in the database used. Interestingly, our results indicates that the longer the estimation period, the bigger the bias.

VI Hedge Funds Performance

The aim of this section is to determine whether or not hedge funds as a whole and depending on the strategy followed have out-performed the market. We compute all estimations by using Newey-West (1987) standard errors to adjust for any autocorrelation in the returns.

6.1 Performance Measurement using the CAPM

The first performance model used is the CAPM based single index model. Panel A of Table 6 reports the results for the strategies, sub-strategies and for the All Funds category. We use equally weighted portfolio excess returns for each investment style and for the All Funds

category, and we estimate the model for each fund individually¹⁴. The last columns give the distribution of individually estimated alphas per strategy, with the percentage of significantly positive, insignificant and negative alphas at the 5% level. This approach enables us to analyze hedge funds performance in more details.

Insert Table 6 approximately here

The betas estimated in Panel A are rather low, except for the US Opportunistics Growth and the Long only Leveraged, suggesting that it is necessary to use a more detailed model. Overall, two thirds of the strategies produce significantly positive alphas. The All funds category also significantly out-performed the market at the 1% level. In almost all out-performing strategies, more than 30% of the alphas are significantly positive. Surprisingly, for some strategies (e.g. Equity non-Hedge or the Non Classified funds), more than 80% of the individual funds do not significantly out-perform the market, inducing that the best funds must have obtained extremely high returns.

For the remaining strategies, some individual funds also significantly under-perform the market (4% for Emerging and 2% for Funds of Funds)¹⁵. Some arguments may partly explain poor performance: the occurrence of a few significant financial crises in our sample period (the Exchange Rate Market crisis in 1992, the bond market turbulence in 1994, the emerging markets crisis in 1997 and the Russian default) and the double fee structure of the Funds of Funds strategy that lowers their net returns.

6.2 Performance Measurement using Multi-Factor Models

It is presumably better to use a multi-factor model to account for all possible investment strategies. In Panel B of Table 6, we report the results for the Carhart's 4-factor model and in Panel C the results for our combined model applied to hedge funds¹⁶.

¹⁴ To make individual estimation, we require all funds to have consecutive monthly return history for at least 24 months, so that relatively accurate risk measures can be estimated. The next to last column reports the number of funds in each strategy for which an individual estimation could be done.

¹⁵ For the Foreign Exchange strategy, 33% of the funds significantly under-perform the market, but there were only 9 funds in this strategy. This lead us not to insists on them given that these results are not so stable to variation in time period.

¹⁶ We also estimated the Fama and French (1993) model but since we obtained very similar results to those obtained with the Carhart model, we do not report them here.

Panel B and C reveal that the premium on the SMB factor is, in almost all cases, significantly positive. However, in the Short Sellers strategy, the premium is significantly negative. Panel C shows that the HML (respectively IHML) factor seems to add less explanatory power as only one fourth (respectively one seventh) of the factors is significantly positive at the 5% level. The momentum factor does not prove to be a strong indicator of hedge funds behavior. Only 4 out of 28 investment styles exhibit significant momentum loadings (at the 5% level). Moreover, the sign of the coefficients is in 3 cases negative, indicating momentum contrarian strategies.

Panel C also indicates that the World excluding US, the US Bond and the Default factors are in almost all cases not significant. The World Government Bond and the Commodity factor add explanatory power only in few cases. The Emerging Bond factor adds explanatory power in 12 of the strategies and sub-strategies. It is significant (at the 5% level) in almost half of the strategies. Moreover, this factor is significant at the 1% level for the All Funds category.

These results provide some insight into the preferences of hedge funds managers depending on the strategy followed :

- Almost all managers seem to prefer smaller stocks;
- Most Event Driven and US Opportunistics managers prefer stocks with high book-to-market ratios;
- Some Market Neutral managers follow a momentum strategy and others are momentum contrarian;
- One half of the managers invest in emerging bond markets.

These results are close to those found by Mitchell and Pulvino (2000) and Agarwal (2001) for the funds following Event Driven strategies. We find that 30% of the hedge funds show significant excess return, nearly matching the 27% they found. This independently confirms that our approach is able to capture important risk exposure of hedge funds.

Carhart (1997) and Gruber (1996) examine US mutual fund strategies and report that managers prefer smaller stocks as well as growth stocks. The first evidence is consistent with our finding, while the second one is opposite. However, this difference does not exist for all hedge funds managers, given that the HML factor is only significant for some strategies.

Comparing the alpha distribution of Panels B and C shows that, taking more factors into account, fewer individual funds significantly out-performed the market, and more funds have insignificant or negative excess returns.

Evidence on alphas obtained in Panel C is contrasted. The Market Neutral and US Opportunistics strategies give significant positive excess returns, contrarily to the Event Driven and Global strategies. Global Macro, Short Sellers, Market Timing, Equity non-Hedge, Foreign Exchange, Sector, the Non Classified funds and the All Funds category have all significant positive alphas. Finally, as with the single index model, Long only Leveraged funds and Funds of Funds do not significantly out-perform the market. We observe negative (but not significant) alpha's only for the Event Driven no Sub-strategy funds. Our results are in most cases confirmed by the last column. In the All Funds category, for example, more than 30% of the individual alpha's are significantly positive at the 5% level.

Considering the All Funds category, we can observe that hedge funds as a whole :

- Deliver significant excess returns (one fourth of the individual funds gave significant positive excess return) ;
- Seem to prefer smaller stocks ;
- Invest in Emerging Market Bonds.

Overall it seems that the combined model does a good job in describing hedge funds behavior. The average R^2_{adj} increases from 0.35 for the single factor model, to 0.44 for the 4-factor model and to 0.60 for our combined model. The combined model seems particularly adapted to Event Driven (0.78), Global Macro (0.82), US Opportunistics (0.92), Equity non-Hedge (0.91) and Sector (0.80) funds. The R^2_{adj} for the All Funds category increases from 0.66 for the single factor model, to 0.78 for the 4-factor model and to 0.83 for our combined model. The mean R^2_{adj} for the individual hedge funds estimation is up too. Carhart's (1997) model raises the R^2_{adj} by an average 10% over the single index model, but our combined model increases it again by another 6%. For the All Funds category, the increase from the CAPM to Carhart's model is 10% and from Carhart's model to our combined model is another 7%¹⁷.

Our R^2_{adj} are also higher than those obtained by Brown et al. (1997) and Fung and Hsieh (1997). They report R^2 lower than 0.20 in all cases for groups of funds. Schneeweis and Spurgin (1997) report R^2_{adj} between -0.09 and 0.67 with a mean of 0.31 for several hedge funds strategies. Comparing their results with ours for strategies that exist across the two databases, we get greater R^2_{adj} in all cases. For several HFR strategies, Liang (1999) found unadjusted coefficients ranging from 0.23 to 0.77, with an average of 0.49: taking the same strategies, our R^2_{adj} range between 0.27 and 0.88 with an average of 0.60.

¹⁷ Individual results are not reported, but are available upon request.

6.3 Performance over Shorter Periods

In the previous sub-section, we analyze the performance of hedge funds for the 1/84-6/00 period. In order to better interpret these results, Table 7 presents a summary of the same analysis over different sub-periods. We subdivide the whole period in two and four sub-periods, and then report results of the same analysis for the Asian crisis period. The analysis of the Asian crisis period will enable us to determine if some strategies took advantage of the crisis and which one suffered (or not) from it.

Insert Table 7 approximately here

Columns 2 and 3 of Table 7 confirm that the same strategies significantly out-perform the market when the time period is broken in two sub-periods, with 4 exceptions. Three strategies (Short Sellers, Market Timing, and Equity non-Hedge) do not beat the market in the first sub-period but do in the second, while one (Foreign Exchange) does not out-perform the market during the second, but does in the first. The four strategies that do not beat the market over the whole period do not do it either for any sub-period, except for the Funds of Funds that significantly out-performed the market during the first sub-period.

When the time period is divided into four, it is interesting to note that some hedge funds strategies and sub-strategies significantly under-perform the market in the last sub-period.

A closer look at the last two columns of Table 7 suggests that most hedge funds strategies suffered during the 1997-98 period. The last column indicates that 19 strategies and sub-strategies out of the 29 face negative returns, with five being significant (Global, Global International, Global Emerging, Market Neutral Fixed Income and Funds of Funds). Only 5 strategies had significant positive returns during the 1/97-6/98 period (Market Neutral Long/Short, Convertible Arbitrage, Non Classified funds, Relative Value Arbitrage and Foreign Exchange), but only the first three had also significant excess returns during other sub-periods. According to these results, the only sub-strategies that could have significantly benefit from the Asian crisis are the Relative Value Arbitrage and the Foreign Exchange. But one must be cautious because of the short estimation period that could put statistical bias in these results.

Four sub-strategies (Global International, Global Emerging, Equity non-Hedge and Funds of Funds) out-perform significantly the market over a long period of time, but they also significantly under-perform over shorter ones. Moreover, the subdivision in sub-periods

indicates that over-performance is rarely sustainable over every shorter periods of time: only two strategies (Market Neutral Convertible Arbitrage and the Non Classified funds) out-performed the market in the 8 subperiods we considered.

6.4 Comparison with other Studies

Schneeweis and Spurgin (1997) and Liang (1999) find different results from Tables 6 and 7, but they are mainly due to differences in the period studied and to a smaller number of funds in their database¹⁸. Agarwal and Naik (2000) find the same results as ours except that Fixed Income, Risk Arbitrage and Long only Leveraged strategies significantly under-performed the market on average, while we found only small percentages of under-performing funds. Finally, Agarwal (2001) found results close to ours.

VII Persistence in Performance

Our results show significant evidence of superior performance over long period of time for most individual strategies and sub-strategies and for our hedge funds database as a whole. Nevertheless, the results are not stable over shorter period of time, neither for hedge funds as a whole, nor for individual hedge funds. Active hedge funds selection strategies could increase the expected return on a portfolio if hedge fund performance is really predictable. The hypothesis that hedge funds 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) have stressed the importance of persistence analysis in mutual funds. The former document large inflows of money into last years best performers, and withdrawals from last years losers. The latter finds that newly invested money in these best performing mutual funds is a predictor of future fund performance.

7.1 Persistence in One-year Return-Sorted Hedge Funds Portfolios

We follow the methodology of Carhart (1997) using our combined model. All funds are ranked based on their previous year return. Every January, we put all funds into 10 equally

¹⁸ Liang (1999) for example found non significantly positive excess return for the Convertible Arbitrage, Foreign Exchange, Funds of Funds, Market Timing, Sector and Short Selling strategies but found that Growth and Market Neutral strategies significantly under-performed the market.

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 1/85 to 6/00. 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.

The monthly average (respectively maximum and minimum) return to the strategy of investing in portfolio 1 would have been 2.02% (resp. 21.99% and -14.74%) for the 1/85-6/00 period. This is 0.57% higher than the 1.45% (resp. 12.81% and 22.43%) average return earned by the Russel 3000 and 0.99% higher than the 1.03% (resp. 12.69 and -18.72%) return earned on the MSCI World Index. Conversely, the monthly (resp. the maximum and minimum) return to the strategy that invested in the lowest decile would have been 1.45% (resp. 12.84% and -17.74%) over the same period.

Insert Table 8 approximately here

Table 8 reports the results of our calculations. The monthly excess returns on the decile portfolios decrease monotonically between portfolio D1 and D7, but then increases again until portfolio D10. Monthly excess return of portfolio D4 is nearly the same as the one of the last portfolio. The annualized spread is approximately 7% between portfolio D1 and D10. This spread is significant, indicating that without considering risk or other additional factors, there is a significant difference in returns between portfolio D1 and D10. Portfolio D1a contains 35 funds on average and significantly out-performs portfolio 10c by 0.95% per month. Cross-sectional variation in returns is considerably larger among previous year's best performing funds than previous year's worst funds. The subportfolios of the bottom decile show a modest spread of 22 basis point (0.86 to 1.08), whereas the spread in the top decile is a substantial 74 basis point (2.03 to 1.29). 1-2 spread is significant at the 5% level, indicating big differences between top performing funds and other portfolio funds, but the 1-2 spread alpha is not significant, suggesting no persistence. After controlling for the risk factors, the great part of the spread between high and low portfolios disappear. The 1-10 spread goes from a significantly positive 0.58% spread to a non-significant 0.07% one, the 1a and 10c spread decreases from 0.95 (significant) to -0.06% (non significant), and the 1-2 spread reduces from 0.38% significantly positive to a 0.20% non significant spread.

Column 7 suggests that all deciles portfolios (except the last) prefer small stocks. More important, however, is the pronounced pattern in the funds' HML, PR1YR and Emerging Market Bond coefficients (Emerg Bd). First, portfolio D3 to D7 prefer stocks with high book-to-market ratios, whereas portfolios D1, D9 and D10 prefer (but not significantly) those with low book-to-market. Second, returns of the top decile funds are strongly, positively correlated with the one-year momentum factor, while returns in the other deciles are not. Third, the returns of the D4 to D10 deciles are strongly, positively related with the Emerging Market Bond factor. This could explain why the monthly excess return diminishes after decile D3. Thus, the different financial crisis covered by our time period may explain why funds investing in Emerging market Bond are not in the 3 best performing decile portfolio.

Column 4 suggests that funds in top and bottom portfolios do not significantly over- or under-perform the market, with no persistence in returns. This means that these funds are there more by chance or misfortune, rather than by their abilities. Moreover, the standard deviation of top and bottom deciles are the greatest of all, indicating more volatility in returns. Things are different for the funds in the middle deciles. Managers in these portfolios are more likely to stay in these deciles over time, and that these managers beat the market significantly. This suggests that, even if some hedge funds managers take a lot of risk, which lead them to have very high or low returns for short period of time, most managers follow less risky strategies that allow them to out-perform the market for long period of time.

To summarize, Table 8 leads to the following conclusions :

- Best performing funds follow momentum strategies whereas worst performing ones may follow momentum contrarian strategies¹⁹ ;
- Best performing funds do not invest significantly in Emerging Market Bond ;
- Average return funds prefer high book-to-market stocks, whereas best and worst performing ones may prefer low book-to-market ones ;
- No persistence in performance exists for best and worst performing funds, but persistence exists for middle decile funds. Funds in these strategies significantly beat the market and there is a proof of persistence for these funds.

¹⁹ This result confirms those of the previous section when we found that some hedge funds strategies follow momentum strategies and other follow momentum contrarian ones.

7.2 Persistence over Shorter Period

In Table 9, we report estimations dividing our sample period in two sub-periods, considering that the first sub-period does not contain any dissolved funds. In the 1985-1993 sub-period, the first 7 deciles give significantly positive alphas, whereas only funds in decile D9 do in the second sub-period. This suggests that our results over the whole 1985-2000 period are mainly induced by the first part of this period. There is no proof of persistence in returns for the 1994-2000 period. Moreover, the fact that the second sub-period contains dissolved funds may explain why most deciles that significantly out-perform the market over the first sub-period do not over the second²⁰. The positive HML and Emerging Market Bond factor relations are stronger over the second sub-period, while it is stronger over the first sub-period for the momentum factor.

The same analysis for the Asian crisis period²¹ shows that top performing funds of 1996 had significantly lower returns in 1997. The alphas of decile D1 and the 1a-10c spread were significantly negative indicating that the best performing funds (of 1996) significantly underperformed the worst performing funds (of 1996), in 1997. These results confirm our previous conclusion that funds in the first decile have no persistence in returns, and that there have more volatile returns than funds in lowest decile. In the 1/97-6/98 analysis, all decile's alpha were negative, with 5 of them significantly, but decile 1a was the only (sub)decile with positive (but not significant) alpha. This indicates that some funds were not affected by the crisis, probably because their investment strategies were relatively immune to it.

7.3 Total Returns

We repeated the analysis by ordering funds on the basis of their total return from previous year, instead of mean returns. The analysis of the 1985-93 period shows an interesting difference with all our previous results of this section. For the first time, the 1a-10c spread in alpha is significantly positive. This indicates that, when we base our estimations on total returns, and even after adjusting for all risk factors, there is a significant positive difference

²⁰ But one must be cautious with this result, given that this is not the only reason possible. The Bond crisis in 1994, the Asian crisis in 1997-1998, etc. may also explain these differences.

²¹ Numerical results are available upon request.

between the top thirtieth and bottom thirtieth funds for this period. There is also a proof of persistence in returns for the best performing funds²².

7.4 Dissolution Frequencies

Figure 2 shows a histogram of hedge funds dissolution frequencies in one year as a function of the previous year mean return decile. At the beginning of each year, all hedge funds are placed into decile rankings by their mean returns in the previous year. If a hedge fund ceases reporting returns at any time before the end of the year, then this is counted as dissolved.

Insert Figure 2 approximately here

Top 7 deciles have a more or less constant average rate of dissolution of 7%, it is 12.5% for the bottom 3 deciles. This suggests that bad performance may be a major factor for dissolution, but that very good performance is not a protection against it. This result is consistent with the previous finding that there was no persistence in the best performing funds, but that persistence exists in the middle decile one.

7.5 One-Year Persistence for Hedge Fund Strategies

This subsection focuses on the persistence in returns for some hedge funds strategies. We considered 2 strategies with more than 300 funds: Global Macro and Market Neutral. In section VI we found that they significantly out-performed the market for the 1/84-6/00 period. In this sub-section, we determine whether persistence in returns exists for these strategies. We test it for the whole period²³, for 2 sub-periods (before and after 1994), and for the Asian crisis period (1996-97 and 1997-6/98). We classified funds in 10 decile portfolios. For added details, we subdivided the top and bottom decile in 3 for the Market Neutral strategy. Table 10 reports a summary of our results for these strategies.

Insert Table 10 approximately here

Panel A reports the results of the analysis for Macro funds. They show that there is no significant difference between good and bad performing funds. Most of the alphas obtained are significantly positive for the whole period. This suggests that persistence exist for these funds, at least over the whole 1987-2000 period. The 1996-97 Asian crisis sub-periods show that some funds (decile D3) have persistence in their return despite the Asian crisis. This

²² These results are available upon request.

²³ In order to have enough funds to divide our hedge fund sample in portfolios, we began in 1987 for Macro funds.

could either mean that these funds returns were not affected by the crisis, or that they benefit from it. The second hypothesis is more plausible given that we are analyzing Macro funds that per definition anticipate market movements.

Panel B shows the results for the Market Neutral funds. Their are very close to those obtained for the whole hedge funds database in Table 8 (recall that the Market Neutral strategy represents 712 funds, that is 25% of our whole hedge funds database). The only significantly positive alphas are those from the middle deciles²⁴ (for the whole period), and those of the top decile (for the 1985-93 sub-period). Monthly excess return's, 1-10 and 1a-10c spreads are both significant in most of the period considered, but this difference disappear when we take our different factors into account. The only significant spread in alpha is the one from the 97-6/98 period. This indicates that significantly positive difference existed between best and worst performing funds during the Asian crisis period.

As an illustration, Panel C reports Market Neutral's spread decomposition for each of the sub-period considered. There are some interesting differences between these numbers and those obtained for our whole hedge funds database (see Table 8). Five factors have a significant effect on spreads for the Market Neutral funds, without having significant effect on the spreads in the all funds analysis: HML (positive) IHML and Commodity (negative), and Wd Gvt Bd and Default (positive or negative, depending on the period). This indicates that the results obtained for our whole hedge funds database may not be valid for one specific strategy of funds, but that it is more an average result.

VIII Conclusion

Using one of the greatest hedge fund database ever used (2796 individual funds including 801 dissolved), we investigated hedge funds performance using various asset-pricing models including an extension form of Carhart's (1997) model, combined with Fama and French (1998), Agarwal and Naik (2000) models and an additional factor that take into account the fact that hedge funds may invest in Emerging Markets. Our results lead to the following comments.

First, we demonstrated that our combined model is able to explain a significant proportion of the variation in hedge fund returns over time. Compared to models used in other hedge fund performance studies, our combined model does a better job describing hedge funds behavior.

²⁴ Decile D9 has also a significant, and positive alpha, but only for the whole period.

It appears particularly good for the Event Driven, Global Macro, US Opportunistics, Equity non-Hedge and Sector funds.

Second, our performance analysis shows that one fourth of individual hedge funds deliver significant positive excess returns, that most of them seem to prefer smaller stocks, and that many hedge funds invest in Emerging Market Bonds. Analyzing each strategy individually lead to the additional conclusions that 9 out of 13 strategies offer significantly positive excess return. A sub-period analysis showed that over-performance ability is, in most cases, constant over time. But, according to our results, most funds suffered from the Asian crisis.

Third, the analysis of persistence in performance for our whole hedge funds database indicates 3 main findings that complete our results of the performance analysis. Firstly, best performing funds follow momentum strategies whereas worst performing ones may follow momentum contrarian one. Secondly, best performing funds do not significantly invest in Emerging Market Bond, whereas lower decile funds do. Thirdly, average return funds prefer high book-to-market stocks, whereas best and worst performing funds may prefer low book-to-market ones. Our main conclusion from this evidence is that there is no persistence in performance for best and worst performing funds, but persistence exists for middle decile funds. This suggests that, even if some hedge funds managers take a lot of risk, which lead them to have very high or low returns for short period of time, many hedge fund managers follow less risky strategies, that allow them to out-perform the market for longer period of time. A sub-period analysis indicates that the results obtained in the first part of the persistence analysis were mainly induced by the first sub-period (before 1994). The Asian crisis analysis suggests that top performing funds in the year before the crisis (1996) had significantly lower returns in the first year of the crisis. Moreover, they significantly under-performed the worst performing funds (of 1996) during the crisis period. The analysis of dissolution frequencies indicates, on the one hand, that bad performance may be a major factor for dissolution, and on the other, that very good performance is not a protection against dissolution.

Finally, we analyzed the persistence in returns for several hedge funds strategies. We showed for strategies that significantly out-perform the market that there is a persistence in positive excess returns, even if for the Market Neutral strategy, we found results very close to those obtained for all hedge funds. A further analysis of the results for this strategy indicates, however, that the differences in spread are not explained by the same factors for the whole hedge fund database as for the Market Neutral strategy. This stresses that funds in different

strategy are not influenced by the same factors, and that specific models could be developed for each investment style in the future.

All these results help in understanding the performance of hedge funds and the persistence in this performance over different time period, including a study of the Asian crisis. The next step in the development of model that describes hedge funds behavior, may be to include Trading Strategy (option writing/buying) factors, in order to take into account the fact that some hedge funds exhibit non-linear option-like exposures to standard asset-classes, as found by Fung and Hsieh (1997, 2000a). As mentioned above, our combined model may also be adapted to each hedge fund strategy.

References

- Agarwal, V., 2001. Intertemporal variation in the performance of hedge funds employing a contingent-claim-based benchmark. Working Paper, London School of Business.
- Agarwal, V., Naik, N.Y., 1999. Multi-period performance persistence analysis of hedge funds. Working Paper, London School of Business.
- Agarwal, V., Naik, N.Y., 2000. Performance evaluation of hedge funds with option-based and buy-and-hold strategies. Working Paper, London School of Business.
- Ackermann, C., McEnally, R., Ravenscraft, D. 1999. The performance of hedge funds: Risk, return, and incentives. *Journal of Finance* 54, 833-874.
- Ackermann, C., Ravenscraft, D., 1998. The impact of regulatory restrictions on fund performance: A comparative study of hedge funds and mutual funds. Working Paper, University of Notre-Dame.
- Allen, D. E., Soucik, V., 2000. In search of true performance : testing benchmark-model validity in managed funds context. Working Paper, Edith Cowan University.
- Amin, G.S., Kat, H.M., 2001. Hedge fund performance 1990-2000 : Do the 'money machine' really add value ?. Working Paper, ISMA Center, The University of Reading.
- Bams, D., Otten, R., 2000. European mutual fund performance : A survey. Working Paper, Maastricht University.
- Banz, R.W., 1981. The relationship between returns and market value of common stocks. *Journal of Financial Economics* 9, 3-18.
- Basu, S., 1983. The relationship between earnings yield, market value, and return for NYSE common stocks: Further evidence. *Journal of Financial Economics* 12, 129-156.
- Bhetari, L.C., 1988. Debt/equity ratio and expected common stocks returns: Empirical evidence. *Journal of Finance* 43, 507-528.
- Breeden, D.T., 1979. An intertemporal asset pricing model with stochastic consumption and investment opportunities. *Journal of Financial Economics* 7, 265-276.
- Breeden, D.T., Gibbons, M.R., Litzenberger, R.H., 1989. Empirical tests of the consumption-oriented CAPM. *Journal of Finance* 44, 231-296.
- Brown, S.J., Goetzmann, W.N., 1995. Performance persistence. *Journal of Finance* 50, 679-698.
- Brown S.J., Goetzmann, W.N., Hiraki, T., Otsuki, T., Shiraishi, N., 1998. The Japanese open-end fund puzzle, Working Paper.

- Brown S.J., Goetzmann, W.N., Ibbotson, R.G., 1999. Offshore hedge funds: Survival and performance 1989-1995. *Journal of Business* 72, 91-118.
- Brown S.J., Goetzmann, W.N., Park, J., 1997. Conditions for survival: changing risk and the performance of hedge fund managers and CTAs. Working Paper, Stern School of Business, New York University.
- Carhart, M.M., 1995. Survivor bias and mutual funds performance. Working Paper, School of Business Administration, University of Southern California.
- Carhart, M.M., 1997. On persistence in mutual fund performance. *Journal of Finance* 52, 57-82.
- Carhart, M.M., Carpenter, J.N., Lynch, A.W., Musto, D.K., 2000. Mutual fund survivorship, SSRN Electronic Working Paper.
- Chan, L.K., Jegadeesh, N., Lakonishok, J., 1996. Momentum strategies. *Journal of Finance* 51, 1681-1714.
- Daniel, K., Grinblatt, M., Titman, S., Wermers, R., 1997. Measuring mutual fund performance with characteristic-based Benchmark. *Journal of Finance* 7, 1035-1058.
- Elton, E., Gruber, M., Das, S., Blake, C., 1996. The persistence of risk-adjusted mutual fund performance. *Journal of Business* 69, 133-157.
- Elton, E., Gruber, M., Das, S., Hlavka, M., 1993. Efficiency with costly information: A re-interpretation of evidence from managed portfolios. *Review of Financial Studies* 6, 1-21.
- Fama, E.F., French, K.R., 1992. The cross-section of expected returns. *Journal of Finance* 47, 427-465.
- Fama, E.F., French, K.R., 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33, 3-56.
- Fama, E.F., French, K.R., 1996. Multifactor explanations of asset pricing anomalies. *Journal of Finance* 51, 55-84.
- Fama, E.F., French, K.R., 1998. Value versus growth : The international evidence. *Journal of Finance*, 1975-1999.
- Fama, E.F., French, K.R., 2000. Characteristics, covariances, and average returns : 1929-1997. *Journal of Finance* 55, 389-406.
- Fung, W., Hsieh, D.A., 1997, Empirical characteristics of dynamic trading strategies: The case of hedge funds. *Review of Financial Studies* 10, 275-302.

- Fung, W., Hsieh, D.A., 2000a. The risk of hedge funds strategies : Theory and evidence from trend followers. Working Paper, Paradigm Financial Products International LLC, and Fuqua School of Business, Duke University.
- Fung, W., Hsieh, D.A., 2000b. Performance characteristics of hedge funds and commodity funds: Natural vs spurious biases. Working Paper, Paradigm Financial Products International, LLC, and Fuqua School of Business, Duke University.
- Goetzmann, W.N., Ibbotson, R.G., 1994. Do winners repeat? Patterns in mutual performance. *Journal of Portfolio Management* 20, 9-18.
- Grinblatt, M., Titman, S., 1988. A comparison of measures of abnormal performance on a sample of monthly mutual fund returns. Finance Working Paper, University of California, Los Angeles.
- Grinblatt, M., Titman, S., 1989. Mutual fund performance: An analysis of quarterly portfolio holdings. *Journal of Business* 62, 393-416.
- Grinblatt, M., Titman, S. 1992. The persistence of mutual fund performance. *Journal of Finance* 42, 1977-1984.
- Grinblatt, M., Titman, S., Wermers, R., 1995. Momentum investment strategies, portfolio performance and herding: A study of mutual fund behaviour. *American Economic Review* 85.
- Gruber, M. J., 1996. Another puzzle: the growth in actively managed mutual funds. *Journal of Finance* 51, 783-810.
- Hendricks, D., Patel, J., Zeckhauser, R., 1993. Hot hands in mutual Funds: Short-run persistence of performance, 1974-88. *Journal of Finance* 48, 93-130.
- Ippolito, R. A., 1989. Efficiency with costly information: A study of mutual fund performance. *Quarterly Journal of Economics* 104, 1-24.
- Jegadeesh, N., Titman, S., 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance* 48, 93-130.
- Jensen, M.C., 1968. The performance of mutual funds in the period 1945-1964. *Journal of Finance* 23, 389-416.
- Jensen, M.C., 1969. Risk, the pricing of capital assets and evaluation of investment portfolios.- *Journal of Business* 42, 167-247.
- Kothari, S.P., Warner, J.B., 1998. Evaluating mutual fund performance. Working Paper, Massachusetts Institute of Technology and Simon School, University of Rochester.

- Lehmann, B.N., Modest, D.M., 1987. Mutual fund performance Evaluation: A comparison of benchmarks and benchmarks comparisons. *Journal of Finance* 42, 233-245.
- Liang, B., 1999. On the performance of hedge funds. *Financial Analysts Journal*, 72-85.
- Liang, B., 2000. Hedge funds : The living and the dead. *Journal of Financial and Quantitative Analysis* 35, 309-325.
- Liang, B., 2001. Hedge funds performance : 1990-1999. *Financial Analysts Journal*. January/February, 11-18.
- Lintner, J., 1965. The valuation of risk assets and the selection of risky investments in stock portfolio and capital budgets. *Review of Economics and Statistics* 47, 13-37.
- Litzenberger R. and Ramaswamy, K., 1979. The effects of personal taxes and dividends on capital asset prices : Theory and empirical evidence. *Journal of Financial Economics* 7, 163-195.
- Litzenberger R. and Ramaswamy, K., 1982. The effects of dividends on common stocks returns : Tax effects or information's effects ?. *Journal of Finance* 37, 429-443.
- Malkiel, B.G., 1995. Returns from investing in equity mutual funds 1971 to 1991. *Journal of Finance* 50, 549-572.
- Metrick E., 1998. Performance evaluation with transactions Data : The stock selection of investment newsletters. NBER Working Paper Nr.6648.
- Mitchell, M., Pulvino, T., 2000. Characteristics of risk and return in risk arbitrage. Working Paper, Harvard Business School, and Northwestern University.
- Newey, W., West, K., 1987. A simple positive-definite heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica* 55, 703-708.
- Park, J., 1995. Managed futures as an investment set. Ph.D. Dissertation, Columbia University.
- Reinganum, M.R., 1981. A new empirical perspective on the CAPM. *Journal of Financial and Quantitative Analysis* 16, 439-462.
- Rosenberg, B., Reid, K. Lanstein, R., 1985. Persuasive evidence of market inefficiency. *Journal of Portfolio Management* 11, 9-17.
- Schneeweis, T., Spurgin, R., 1997. Managed futures, hedge funds and mutual fund return estimation: A Multi-factor approach. CISDM Working Paper.
- Schneeweis, T., Spurgin, R., 1998. Multifactor analysis of hedge funds, managed futures and mutual fund return and risk characteristics. *Journal of Alternative Investments* 1, 1-24.

Sharpe, W.F., 1964. Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance* 19, 425-442.

Sharpe, W.F., 1992. Asset allocation: Management style and performance measurement. *Journal of Portfolio Management* 18, 7-19.

Sirri, E.R., Tufano, P., 1998. Costly search and mutual fund flows. *Journal of Finance* 53, 1589-1622.

Wermers, R., 1996. Momentum investment strategies of mutual funds, performance persistence, and survivorship bias. Working paper, Graduate School of Business and Administration, University of Colorado.

Zheng, L., 1999. Is money smart? A study of mutual fund Investor' fund selection ability. *Journal of Finance* 54, 901-933.

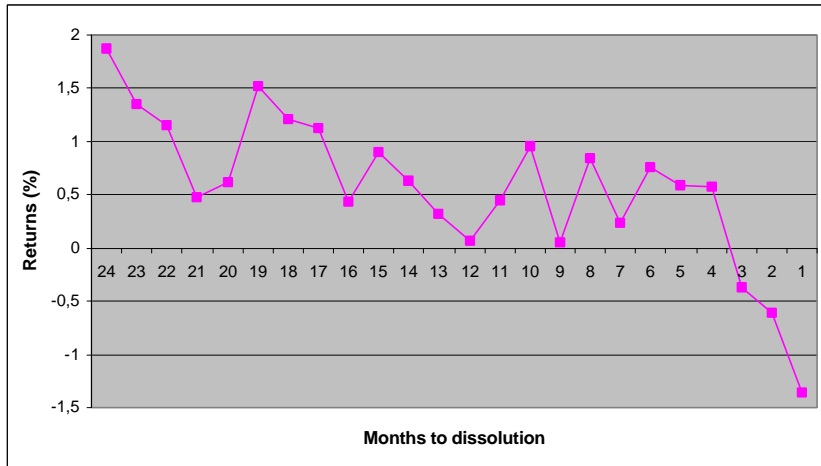


Figure 1

Monthly returns for dead funds towards the dissolution date. Monthly returns are computed on the MAR/HFR database over the 24-months period before their exit dates. Data are obtained on 801 individual hedge funds between January 1984 and June 2000.

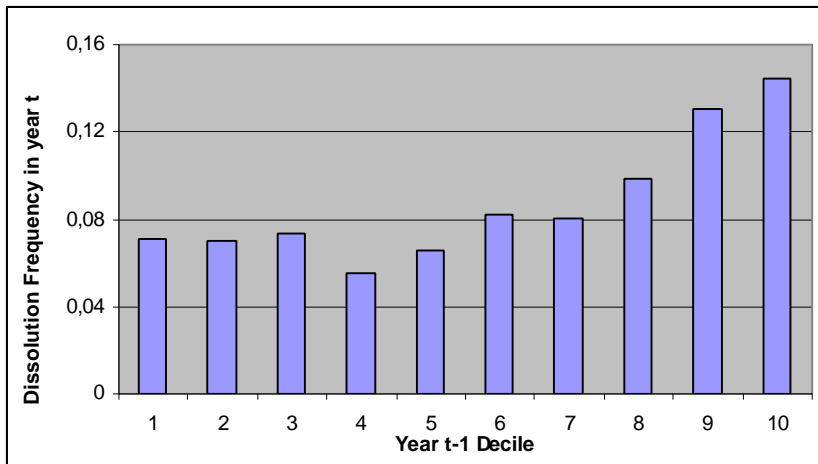


Figure 2

Hedge funds dissolution frequencies by year t as a function of year $t-1$ decile. At the beginning of year t , all funds are placed into decile rankings on the basis of their returns in year $t-1$. If a hedge fund ceases to report returns at any time before the end of year t , it is counted as dissolved.

Table 1

Descriptive Statistics from the Russel 3000 and from the Market Proxy used by Fama and French (1993)

	Mean	St. Dev.	Median	Min	Max	Mean Exc. Return	t-stat mean = 0	Sharpe ratio	Correlation
Russel 3000	1,39	4,32	1,68	-22,4	12,8	0,92	4,51	0,2119	0,9957
F&F Market Proxy	1,36	4,31	1,66	-22,5	12,8	0,88	4,42	0,2050	

This Table compares the descriptive statistics of the Russel 3000 and the value-weighted portfolio of all NYSE, Amex and Nasdaq used as market proxy by Fama and French (1993) for the 1/1984-6/2000 period.

Table 2

Descriptive Statistics of Hedge Funds Strategies and Passive Investment Strategies

Panel A : Hedge Funds strategies
Jan.1984-June .2000 (198 months)

<i>Hedge Fund Strategy</i>	No of Fds	Sub- strategy	Living Funds	Dead Funds	Inception Date	Mean Return	t(mean) = 0	Std. Dev.	Median	Min	Max	Mean Exc. return	t(mean exc.)=0	Sharpe ratio
<u>Event Driven</u>	108	100%	56	52	janv-84	1,29	5,27	3,43	1,08	-27,03	7,49	0,82	3,34	0,2375
Distressed Securities	49	45,4%	25	24	janv-90	1,23	4,94	3,51	1,38	-9,75	8,96	0,83	3,33	0,2363
Risk Arbitrage	50	46,3%	27	23	janv-84	1,31	5,16	3,56	1,07	-27,03	10,47	0,82	3,25	0,2307
No sub-strategy	9	8,3%	4	5	sept-89	1,24	7,54	2,31	1,36	-8,79	7,30	0,82	5,03	0,3575
<u>Global</u>	349	100%	184	165	août-85	1,58	3,55	6,26	1,24	-42,84	21,77	1,14	2,55	0,1816
International	62	17,8%	27	35	janv-90	1,43	3,49	5,75	1,19	-12,66	11,02	1,02	2,50	0,1779
Emerging	203	58,2%	123	80	août-85	1,60	3,52	6,41	1,22	-42,84	21,77	1,16	2,54	0,1805
Regional Established	84	24,1%	34	50	janv-88	1,61	5,25	4,31	1,50	-14,44	16,68	1,08	3,52	0,2500
<u>Global Macro</u>	319		259	60	janv-84	1,73	5,08	4,81	1,44	-14,05	9,93	1,26	3,70	0,2626
<u>Market Neutral</u>	711	100%	522	189	janv-84	1,27	4,81	3,73	1,04	-3,36	5,71	0,80	3,03	0,2154
Long/short	150	21,1%	83	67	janv-84	1,27	4,78	3,73	1,02	-4,40	7,33	0,79	3,00	0,2132
Convertible Arbitrage	44	6,2%	38	6	juil-88	0,98	10,02	1,38	0,95	-3,03	4,27	0,55	5,59	0,3971
Fixed Income	61	8,6%	50	11	mai-87	1,25	4,10	4,29	1,14	-42,50	9,55	0,82	2,68	0,1901
Stock Arbitrage	392	55,1%	309	83	janv-84	1,33	5,13	3,64	1,04	-4,59	6,45	0,86	3,31	0,2355
Mortgage-Backed Securities	56	7,9%	42	14	déc-85	0,96	4,81	2,80	0,78	-7,27	8,33	0,52	2,59	0,1844
Relative Value Arbitrage	8	1,1%	0	8	juil-94	1,20	5,94	2,84	1,24	-5,82	6,62	0,79	3,89	0,2766
<u>Short Sellers</u>	24		9	15	janv-88	0,80	2,20	5,11	0,93	-10,40	10,96	0,37	1,01	0,0716
<u>US Opportunistics</u>	212	100%	139	73	janv-84	1,75	4,64	5,30	1,71	-17,70	19,34	1,28	3,39	0,2409
Growth	88	41,5%	67	21	mars-86	1,84	5,14	5,05	1,70	-30,13	17,52	1,40	3,92	0,2785
Value	110	51,9%	61	49	janv-84	1,63	4,53	5,06	1,24	-15,92	19,98	1,16	3,22	0,2287
Small Caps	14	6,6%	11	3	oct-91	2,31	5,69	5,71	2,18	-10,74	18,15	1,94	4,77	0,3393
<u>Long Only Leveraged</u>	27		16	11	juil-92	2,68	5,07	7,45	2,27	-14,47	19,50	2,31	4,36	0,3101
<u>Market Timing</u>	49		40	9	janv-84	1,19	4,69	3,58	0,95	-6,52	10,38	0,72	2,84	0,2020
<u>Equity non-Hedge</u>	120		86	34	janv-84	1,77	4,59	5,43	1,48	-14,53	18,3	1,30	3,36	0,2391
<u>Foreign Exchange</u>	9		9	0	janv-84	0,73	10,91	0,94	0,72	-16,56	9,52	0,26	3,84	0,2728
<u>Sector</u>	186		132	54	janv-84	1,99	5,74	4,89	1,64	-32,62	13,09	1,52	4,38	0,3115
<u>Funds of Funds</u>	347		229	118	janv-84	1,06	5,97	2,50	1,01	-16,85	9,43	0,59	3,32	0,2360
<u>Non classified</u>	335		314	21	janv-84	1,58	4,56	4,88	1,19	-9,27	8,82	1,11	3,20	0,2276
<u>All funds</u>	2796		1995	801	janv-84	1,49	4,23	4,95	1,18	-11,95	8,22	1,02	2,89	0,2054

Table 2 (continued)

Descriptive Statistics of Hedge Funds Strategies and Passive Investment Strategies

Panel B : Passive Strategies

Jan.1984-June .2000 (198 month)

<i>Passive Strategy Index</i>	Inception Date	Mean Return	t(mean) = 0	Std. Dev.	Median	Min	Max	Mean excess return	t(excess mean) = 0	Sharpe ratio
<u>Equity</u>										
Market Proxy	01-janv-84	1,36	4,42	4,31	1,66	-22,49	12,84	0,88	2,88	0,2050
MSCI World Excluding US	01-janv-84	0,92	2,90	4,48	1,34	-17,05	14,18	0,45	1,41	0,1005
F&F SMB Factor	01-janv-84	-0,17	-0,70	3,47	-0,30	-16,69	21,49	-0,64	-2,61	-0,1857
F&F HML Factor	01-janv-84	0,22	1,03	2,98	0,15	-9,05	12,03	-0,25	-1,19	-0,0848
F&F HML International Factor	01-janv-84	0,41	1,88	3,09	0,30	-12,75	10,60	-0,06	-0,26	-0,0187
Momentum Factor	01-janv-84	1,14	4,24	3,78	1,41	-11,47	13,88	0,67	2,49	0,1768
<u>Bond</u>										
Lehman US Aggregate	01-janv-84	0,04	0,38	1,43	0,17	-4,34	4,40	-0,43	-4,25	-0,3019
Salomon World Government	01-janv-85	0,82	5,69	2,02	0,85	-3,98	6,73	0,37	2,55	0,1811
JPM Emerging Market Bond Index	01-févr-91	1,31	4,10	4,50	1,80	-21,98	10,55	0,93	2,92	0,2073
Lehman BAA Corp.	01-janv-84	0,85	7,49	1,59	0,87	-3,45	6,63	0,37	3,32	0,2357
<u>Commodity</u>										
Glodman Sachs Commodity	01-janv-84	0,90	2,72	4,65	1,00	-12,28	18,52	0,43	1,29	0,0920

This table shows the inception date, mean returns, t-stat for mean = 0, standard deviation, medians, minimum, maximum, mean excess returns, t-stat for mean excess return = 0, and Sharpe ratios for the individual hedge funds in our combined MAR/HFR database following 12 strategies

and 15 sub-strategies, and for 11 passive investment strategies for the 1/1984 and 6/2000 period. Sharpe ratio is the ratio of excess return and standard deviation. In panel A, No of Fds represent the number of funds following a particular strategy (or sub-strategy), Living Funds and Dead Funds represents the number of surviving and dead funds (in June 2000, without considering the new funds established in 6/2000). We calculate the Mean Excess Return and the Sharpe ratio considering Ibbotson Associates one-month T-bills. Numbers in the table are monthly percentage.

Table 3

Correlation between Hedge Funds, Hedge Funds and Passive Investment Strategies, and between Passive Investment Strategies.

Panel A : Correlation between Hedge Funds strategies

	EVT	GLB	MAC	MKN	SHS	OPP	LOL	MKT	ENH	FEX	SEC	FOF	NCL	ALL
EVT	1,00													
GLB	0,74	1,00												
MAC	0,82	0,72	1,00											
MKN	0,80	0,82	0,85	1,00										
SHS	-0,65	-0,45	-0,72	-0,55	1,00									
OPP	0,82	0,72	0,94	0,78	-0,79	1,00								
LOL	0,69	0,66	0,79	0,72	-0,61	0,77	1,00							
MKT	0,30	0,18	0,46	0,30	-0,23	0,41	0,28	1,00						
ENH	0,85	0,74	0,92	0,79	-0,76	0,96	0,75	0,45	1,00					
FEX	0,75	0,68	0,57	0,68	-0,45	0,58	0,54	0,16	0,62	1,00				
SEC	0,86	0,76	0,92	0,82	-0,76	0,94	0,75	0,43	0,94	0,64	1,00			
FOF	0,81	0,91	0,86	0,94	-0,54	0,79	0,77	0,27	0,80	0,68	0,83	1,00		
NCL	0,08	0,09	0,34	0,29	-0,28	0,34	0,15	0,25	0,25	-0,17	0,26	0,18	1,00	
ALL	0,88	0,86	0,95	0,93	-0,69	0,93	0,80	0,39	0,94	0,68	0,95	0,94	0,28	1,00

Panel B : Correlation between Hedge Funds strategies and Passive Investments strategies

	EVT	GLB	MAC	MKN	SHS	OPP	LOL	MKT	ENH	FEX	SEC	FOF	NCL	ALL
MKT	0,67	0,61	0,71	0,54	-0,54	0,78	0,55	0,40	0,81	0,53	0,70	0,60	0,12	0,72
WXU	0,12	0,26	0,07	0,20	0,05	0,04	0,12	-0,15	0,03	0,22	0,05	0,22	-0,08	0,13
SMB	0,51	0,35	0,57	0,52	-0,65	0,57	0,53	0,21	0,52	0,30	0,62	0,45	0,23	0,55
HML	-0,25	-0,27	-0,41	-0,24	0,50	-0,46	-0,28	-0,26	-0,48	-0,22	-0,44	-0,26	-0,03	-0,38
IHML	-0,07	-0,02	-0,27	-0,22	0,30	-0,28	-0,22	-0,11	-0,16	0,01	-0,24	-0,11	-0,27	-0,20
MOM	0,15	0,06	0,29	0,25	-0,33	0,25	0,28	0,29	0,20	0,02	0,26	0,19	0,19	0,24
LUS	0,07	-0,03	0,03	0,00	-0,05	0,04	0,13	0,03	0,04	0,02	0,03	-0,01	0,01	0,02
SWG	0,05	-0,18	-0,03	-0,06	-0,06	0,03	0,00	0,16	0,08	-0,03	0,04	-0,15	0,00	-0,04
MEM	0,19	0,30	0,12	0,23	0,02	0,06	0,18	-0,19	0,06	0,33	0,07	0,28	-0,17	0,17
BAA	0,38	0,20	0,30	0,34	-0,20	0,26	0,29	0,16	0,30	0,42	0,31	0,26	0,02	0,31
GSC	0,20	0,23	0,12	0,17	-0,25	0,20	0,11	-0,23	0,20	0,07	0,22	0,20	0,02	0,19

Panel C : Correlation between Passive Investment strategies

	MKT	WXU	SMB	HML	IHML	MOM	LUS	SWG	MEM	BAA	GSC
MKT	1,00										
WXU	-0,11	1,00									
SMB	0,02	0,09	1,00								
HML	-0,42	0,03	-0,27	1,00							
IHML	-0,05	0,26	-0,34	0,12	1,00						
MOM	0,09	-0,23	0,30	-0,11	-0,46	1,00					
LUS	0,09	0,00	-0,04	0,09	-0,07	0,05	1,00				
SWG	0,11	-0,27	-0,11	-0,01	0,02	0,13	0,40	1,00			
MEM	-0,04	0,45	0,05	0,07	0,13	-0,13	0,22	-0,10	1,00		
BAA	0,41	-0,05	-0,04	0,03	-0,10	0,22	0,19	0,42	0,01	1,00	
GSC	0,06	0,16	0,23	0,06	0,09	-0,09	0,10	0,06	0,14	0,01	1,00

This Table reports the correlation coefficient between hedge funds strategies (Panel A), between hedge funds strategies and passive investment strategies (Panel B) and between passive investment strategies for the January 1984-June 2000 period. EVT = Event Driven, GLB = Global, MAC =

Global Macro, MKN = Market Neutral, SHS = Short Selling, OPP = US Opportunistics, LOL = Long only Leveraged, MKT = Market Timing, ENH = Equity non-Hedge, FEX = Foreign Exchange, SEC = Sector, FOF = Funds of Funds, NCL = Non Classified, ALL = All hedge funds, MKT = Market Proxy, WXU = World excluding US, IHML = International HML, MOM = Momentum, LUS = Lehman US Aggregate Bond Index, SWG = Salomon World Government Bond Index, MEM = JP Morgan Emerging Market Bond Index, BAA = Lehman BAA Corporate Bond Index and GSC = Goldman Sachs Commodity Index.

Table 4

Survivorship Bias in Hedge Funds

Year	All Funds			Surviving Funds			Dissolved Funds		
	Return	St. Dev.	Obs.	Return	Std. Dev.	Obs.	Return	Std. Dev.	Obs.
1984	1,08	3,26	348	0,97	1,57	248	1,36	7,60	76
1985	2,55	1,44	501	2,83	1,61	356	1,87	1,34	121
1986	1,80	1,58	716	1,99	1,55	497	1,58	2,33	195
1987	1,50	4,16	1069	1,40	4,26	782	1,64	5,39	263
1988	1,72	1,54	1376	1,83	1,73	1020	1,44	1,03	332
1989	1,52	0,79	1931	1,65	0,87	1444	1,13	0,76	463
1990	0,74	1,16	2792	0,77	1,22	2063	0,61	1,32	705
1991	2,08	1,67	3880	2,07	1,96	2826	2,12	1,40	1030
1992	1,23	0,61	5280	1,24	0,74	3860	1,20	0,64	1396
1993	1,95	0,47	7245	1,91	0,48	5140	2,07	0,66	2081
1994	0,16	0,69	9856	0,16	0,79	6931	0,15	0,73	2901
1995	1,62	0,86	13528	1,68	1,14	9298	1,48	0,58	4206
1996	1,69	0,75	17654	1,66	0,77	11942	1,75	0,97	5688
1997	1,51	0,81	22454	1,60	0,75	15122	1,35	1,30	7308
1998	0,46	10,08	25735	0,78	11,94	18440	-0,36	3,72	7271
1999	2,46	2,12	25826	2,58	2,09	21712	1,79	2,92	4090
2000	1,15	2,23	12421	1,22	2,23	11880	-1,00	3,30	529
Mean 84-93	1.62			1.67			1.50		
Mean 94-00	1.29			1.38			0.74		
Mean 84-00	1.48			1.55			1.19		

<u>Panel A</u> : Living Funds - Dead Funds			<u>Panel B</u> : Living Funds - All Funds		
Bias 84-93	0,11	per Month	Bias 84-93	0,05	per Month
	1,36	per Year		0,60	per Year
Bias 94-00	0,56	per Month	Bias 94-00	0,09	per Month
	6,67	per Year		1,22	per Year
Bias 84-00	0,30	per Month	Bias 84-00	0,07	per Month
	3,60	per Year		0,89	per Year

This Table reports the survivorship bias of calculated from our database. Our combined HFR/TASS database contains 2796 hedge funds, including 1995 survived funds and 801 dissolved funds as of June 2000. In Panel A survivorship bias is calculated as the performance

difference between surviving funds and dissolved funds. In Panel B survivorship bias is calculated as the performance difference between surviving funds and all funds. All returns are net of fees and on a monthly basis. Number in the table are monthly percentage.

Table 5

Estimation of Instant Return History Bias

	1/84-6/00			1/84-12/93			1/94-6/00		
	Mean Annual Return	Difference	Av. Nb of Fds per Month	Mean Annual Return	Difference	Av. Nb of Fds per Month	Mean Annual Return	Difference	Av. Nb of Fds per Month
All	1,49%		768	1,62%		207	1,29%		1631
Without 12M	1,42%	0,08%	644	1,58%	0,04%	147	1,19%	0,10%	1308
Without 24M	1,26%	0,23%	527	1,35%	0,28%	103	1,16%	0,13%	1017
Without 36M	1,20%	0,29%	425	1,27%	0,35%	71	1,13%	0,16%	773
Without 60M	1,15%	0,35%	269	1,21%	0,41%	32	1,10%	0,19%	426

This Table reports the Instant History Bias calculated from our database. Our combined database contains 2796 hedge funds, including 1995 survived funds and 801 dissolved funds as of June 2000. 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 and 60 months of returns (the adjusted observable portfolio). All returns are net of fees and on a monthly basis. Number in the table are monthly percentage.

Table 6

Performance Measurement using the CAPM, Carhart's 4-factor model and the combined model.

	Panel A : Single index model							Panel B : Carhart's 4-factor model									
	Alpha	Mkt	R ² adj	No Fds	Alpha Distrib. + / 0 / -			Alpha	Mkt	SMB	HML	PR1YR	R ² adj	No Fds	Alpha Distrib. + / 0 / -		
Event Driven	0,40% *	0,47 ***	0,44	84	27%	70%	2%	0,38% *	0,50 ***	0,32 ***	0,23 **	0,00	0,57	84	30%	67%	4%
Distressed Sec.	0,45% **	0,39 ***	0,35	37	19%	81%	0%	0,52% ***	0,42 ***	0,30 ***	0,17 **	-0,11 ***	0,57	37	22%	73%	5%
Risk Arbitrage	0,41% *	0,48 ***	0,43	38	34%	61%	5%	0,36% *	0,51 ***	0,31 ***	0,22 **	0,02	0,54	38	37%	61%	3%
No sub-strategy	0,49% *	0,37 ***	0,24	9	33%	67%	0%	0,39%	0,36 ***	0,12 ***	0,06	0,11 **	0,28	9	33%	67%	0%
Global	0,55%	0,63 ***	0,22	258	16%	81%	3%	0,60%	0,65 ***	0,33 ***	0,19	-0,04	0,25	258	18%	80%	2%
International	0,58% *	0,46 ***	0,37	50	12%	88%	0%	0,66% **	0,45 ***	0,23 ***	0,05	-0,07 *	0,45	50	14%	86%	0%
Emerging	0,57%	0,63 ***	0,20	151	15%	81%	4%	0,65%	0,65 ***	0,36 ***	0,18	-0,05	0,24	151	15%	82%	3%
Regional Est.	0,58% ***	0,60 ***	0,38	57	23%	75%	2%	0,69% ***	0,58 ***	0,24 ***	0,00	-0,07	0,44	57	30%	68%	2%
Global Macro	0,79% ***	0,54 ***	0,66	252	30%	69%	1%	0,82% ***	0,50 ***	0,29 ***	-0,01	0,04 *	0,78	252	34%	65%	2%
Market Neutral	0,67% ***	0,15 ***	0,24	553	37%	62%	1%	0,69% ***	0,13 ***	0,12 ***	-0,01	0,02	0,34	553	41%	59%	1%
Long/short	0,64% ***	0,18 ***	0,23	102	38%	60%	2%	0,67% ***	0,16 ***	0,13 ***	0,01	0,00	0,30	102	39%	60%	1%
Convertible Arb.	0,42% ***	0,13 ***	0,24	39	77%	23%	0%	0,45% ***	0,16 ***	0,07 ***	0,08 ***	-0,05 ***	0,35	39	82%	18%	0%
Fixed Income	0,29%	0,63 ***	0,36	48	10%	90%	0%	0,25%	0,64 ***	0,25 **	0,17	0,02	0,40	48	13%	88%	0%
Stock Arbitrage	0,74% ***	0,13 ***	0,13	310	36%	63%	1%	0,76% ***	0,11 **	0,14 ***	-0,01	0,02	0,22	310	41%	58%	1%
Mortgage-Back.	0,52% ***	0,00	-0,01	46	28%	72%	0%	0,47% **	-0,03	-0,01	-0,07	0,07	0,00	46	30%	70%	0%
Rel. Value Arb.	0,51% *	0,20 ***	0,19	8	50%	50%	0%	0,59% **	0,24 ***	0,12	0,15 *	-0,05	0,21	8	50%	50%	0%
Short Sellers	0,62% ***	-0,27 ***	0,17	18	33%	67%	0%	0,57% ***	-0,18 **	-0,32 ***	0,12	-0,07	0,47	18	28%	72%	0%
US Opport.	0,59% ***	0,77 ***	0,62	180	20%	79%	1%	0,63% ***	0,73 ***	0,40 ***	0,03	0,06	0,73	180	33%	66%	1%
Growth	0,54% **	0,97 ***	0,66	68	22%	78%	0%	0,71% ***	0,86 ***	0,49 ***	-0,14	0,03	0,79	68	43%	56%	1%
Value	0,53% ***	0,71 ***	0,58	100	17%	82%	1%	0,53% ***	0,70 ***	0,31 ***	0,10	0,03	0,65	100	26%	73%	1%
Small Caps	1,19% ***	0,68 ***	0,27	12	33%	67%	0%	1,20% ***	0,67 ***	0,53 ***	0,14	-0,02	0,46	12	42%	58%	0%
Long Only Lev.	1,24% *	0,94 ***	0,37	18	11%	83%	6%	1,12%	0,90 ***	0,60 ***	0,21	0,10	0,57	18	17%	78%	6%
Market Timing	0,52% ***	0,23 ***	0,21	34	24%	76%	0%	0,52% ***	0,21 ***	0,03	-0,04	0,02	0,21	34	24%	76%	0%
Equity non-Hed.	0,70% ***	0,68 ***	0,58	112	13%	86%	1%	0,71% ***	0,65 ***	0,33 ***	0,05	0,05	0,66	112	21%	79%	1%
Foreign Exch.	0,03%	0,25 ***	0,22	9	11%	56%	33%	0,18%	0,28 ***	0,14 ***	0,12 *	-0,16 ***	0,34	9	33%	67%	0%
Sector	0,93% ***	0,67 ***	0,44	128	32%	66%	2%	0,95% ***	0,67 ***	0,53 ***	0,20 *	0,03	0,61	128	45%	55%	0%
Funds of Funds	0,20%	0,44 ***	0,58	278	16%	82%	2%	0,19%	0,44 ***	0,18 ***	0,08	0,02	0,63	278	21%	77%	2%
Non classified	4,45% ***	-0,04	0,00	230	16%	83%	0%	4,47% ***	-0,08	0,07	-0,07	0,03	0,01	230	45%	54%	1%
All funds	0,65% ***	0,41 ***	0,66	2154	29%	69%	2%	0,66% ***	0,40 ***	0,23 ***	0,05 *	0,03	0,78	2154	33%	66%	1%
		Mean R ² _{adj}	0,35	Mean	26%	71%	2%					Mean R ² _{adj}	0,44	Mean	32%	66%	1%

Table 6 (continued)

Panel C : The combined model

	Alpha	Mkt	Wd x US	SMB	HML	I HML	PR1YR	US Bd	World GV Bd	Emerg Bd	Default	Comm.	R ² adj	No Fds	Alpha Distrib. + / 0 / -		
Event Driven	0,26% *	0,43 ***	0,01	0,25 ***	0,13 ***	0,09 **	-0,01	-0,04	0,10	0,07 **	0,10	-0,02	0,78	84	30%	68%	2%
Distressed Sec.	0,10%	0,47 ***	0,03	0,30 ***	0,18 ***	0,11 *	-0,06	-0,05	0,01	0,08 *	0,18	-0,04	0,72	37	22%	78%	0%
Risk Arbitrage	0,46% ***	0,41 ***	0,00	0,22 ***	0,08 **	0,07	0,02	-0,02	0,01	0,05 *	0,12	0,00	0,61	38	42%	53%	5%
No sub-strategy	-0,07%	0,43 ***	-0,01	0,21 ***	0,13 **	0,12	0,08	-0,07	0,63 ***	0,08	-0,16	-0,03	0,50	9	11%	89%	0%
Global	0,17%	0,57 ***	0,01	0,21 ***	0,07	0,07	-0,02	-0,25	-0,28	0,21 ***	0,13	0,05	0,57	258	12%	78%	10%
International	0,41%	0,47 ***	0,03	0,21 ***	0,03	0,07	-0,04	-0,08	-0,12	0,13 **	0,11	0,03	0,52	50	10%	86%	4%
Emerging	0,10%	0,60 ***	0,01	0,23 ***	0,07	0,09	-0,02	-0,29	-0,37 **	0,26 ***	0,14	0,08	0,49	151	10%	74%	16%
Regional Est.	0,53% ***	0,53 ***	0,05	0,20 ***	0,09 *	-0,01	-0,05	-0,12	-0,04	0,05	-0,06	-0,06 *	0,70	57	18%	81%	2%
Global Macro	0,71% ***	0,50 ***	0,04	0,26 ***	0,03	-0,04	0,05 *	-0,07	-0,09	0,06 **	0,04	-0,02	0,82	252	25%	73%	2%
Market Neutral	0,40% ***	0,18 ***	0,04	0,11 ***	0,04 *	-0,02	0,04 *	-0,10	-0,03	0,04 *	0,11 *	0,00	0,58	553	32%	64%	4%
Long/short	0,66% ***	0,14 ***	0,00	0,14 ***	0,10 ***	-0,04	0,01	-0,10	-0,05	0,03 *	0,12	0,02	0,53	102	28%	70%	2%
Convertible Arb.	0,54% ***	0,06 ***	0,02	0,06 ***	0,03 *	0,02	-0,04 **	0,09 **	-0,06	0,05 **	0,19 ***	-0,01	0,49	39	67%	33%	0%
Fixed Income	0,17%	0,31 ***	0,00	0,18 ***	-0,03	0,13	0,03	-0,14	0,06	0,10 **	0,06	-0,01	0,45	48	10%	79%	10%
Stock Arbitrage	0,37% ***	0,21 ***	0,06	0,12 ***	0,05 *	-0,04	0,05 *	-0,12	-0,07	0,04	0,09	0,00	0,50	310	31%	65%	4%
Mortgage-Back.	0,15%	0,02	0,00	-0,01	0,00	0,00	0,06 **	-0,09	0,24 *	0,05 *	0,24	0,00	0,26	46	33%	61%	7%
Rel. Value Arb.	0,43%	0,21 ***	0,03	0,02	0,02	0,08	0,02	0,03	-0,23	0,10 *	0,05	0,05	0,36	8	50%	38%	13%
Short Sellers	0,66% ***	-0,32 ***	0,04	-0,33 ***	0,11	0,03	-0,05	-0,03	0,00	0,00	-0,01	-0,09 **	0,67	18	28%	67%	6%
US Opport.	0,59% ***	0,77 ***	0,06	0,34 ***	0,03	-0,11	0,01	-0,07	0,12	0,04 *	-0,23	0,02	0,92	180	24%	74%	2%
Growth	0,77% ***	0,84 ***	0,02	0,37 ***	-0,12	-0,25 **	-0,01	-0,05	0,02	0,08 **	-0,19	0,00	0,88	68	31%	69%	0%
Value	0,43% ***	0,72 ***	0,08 *	0,28 ***	0,12 ***	0,03	0,02	-0,02	0,18 **	0,01	-0,23 *	0,04 **	0,89	100	19%	78%	3%
Small Caps	0,85% *	0,79 ***	0,27 **	0,45 ***	0,23 **	-0,23 **	-0,02	-0,59	0,38	-0,07	-0,49 *	0,05	0,48	12	25%	75%	0%
Long Only Lev.	1,13%	0,87 ***	0,10	0,59 ***	0,16	0,01	0,13	0,45	-0,16	0,15	0,23	-0,09	0,59	18	6%	83%	11%
Market Timing	0,44% ***	0,18 ***	0,05	0,08 **	0,02	0,04	0,08 *	-0,02	0,16	-0,07	-0,12	-0,10 **	0,27	34	15%	85%	0%
Equity non-Hed.	0,31% ***	0,82 ***	0,07 *	0,34 ***	0,00	0,02	0,00	-0,14 *	0,18 **	0,03	-0,14	0,02	0,91	112	11%	87%	3%
Foreign Exch.	0,36% **	0,13 ***	-0,04	0,14 ***	0,01	0,06	-0,11 **	-0,01	-0,15	0,10 ***	0,44 ***	-0,05 **	0,53	9	22%	56%	22%
Sector	0,99% ***	0,54 ***	0,06	0,39 ***	0,00	-0,06	-0,01	-0,13	-0,04	0,03	0,18	0,05	0,80	128	34%	65%	2%
Funds of Funds	0,01%	0,32 ***	0,03	0,15 ***	0,06	0,02	0,06	-0,11	-0,16 *	0,10 ***	0,08	0,03	0,62	278	15%	76%	9%
Non classified	4,55% ***	0,15	0,10	0,08 *	0,10	-0,13	0,05	0,06	0,08	-0,13 **	-0,25	-0,04	0,09	230	37%	61%	3%
All funds	0,42% ***	0,40 ***	0,04	0,20 ***	0,04	-0,01	0,03	-0,11	-0,04	0,06 ***	0,04	0,00	0,83	2154	25%	71%	5%
												Mean R ² adj	0,60	Mean	25%	70%	5%

This Table presents the results of the estimation of the Single Index Model (Panel A), of Carhart's (1997) Model (Panel B) and of our Combined Model (Panel C) for the 1/1984-6/2000 period. We report the OLS estimators for equally weighted portfolio's per investment strategy, sub-strategy and for all funds. The last column gives the distribution of individually estimated monthly alphas for all funds with 24 monthly data or more in a specific investment style. We report the percentage of significantly positive alpha's (+), significantly negative alpha's (-) and alpha's that are insignificantly different from zero (0) at the 5% level. The next to last column reports the number of individual funds used for the individual estimation of the last column. T-stat are heteroskedasticity consistent. *** Significant at the 1% level, ** Significant at the 5% level and * Significant at the 10% level.

Table 7

Performance of Hedge Funds in different Sub-Periods

	2 Sub-periods			4 Sub-periods			Asian Crisis	
	1/84- 12/93	1/94-6/00	1/84-12/88	1/89-12/93	1/94-12/96	1/97-6/00	1/97-12/98	1/97-6/98
Event Driven	-0,21%	0,34% *	0,04%	-0,21%	0,41% *	0,08%	0,02%	-0,05%
Distressed Sec,	0,07%	0,09%	NA	0,07%	0,17%	-0,11%	0,19%	-0,07%
Risk Arbitrage	-0,29%	0,60% ***	0,04%	-0,29%	0,60% **	0,31% *	-0,13%	0,02%
No sub-strategy	-0,53% *	-0,05%	NA	-0,53% *	0,40%	-0,45%	-0,17%	-0,25%
Global	1,01% *	-0,50%	1,27% *	1,01% *	0,23%	-1,21% ***	-1,02%	-1,30% **
International	1,29% ***	-0,21%	NA	1,29% ***	-0,33%	-0,40%	-0,99% ***	-1,10% ***
Emerging	0,92%	-0,71%	1,27%	0,92%	0,47%	-1,70% ***	-1,18%	-1,55% **
Regional Est,	1,21% ***	0,27%	NA	1,21% ***	0,38% ***	-0,07%	-0,46%	-0,54%
Global Macro	0,85% ***	0,56% ***	0,44% *	0,85% ***	0,45% *	0,56% ***	0,46%	-0,07%
Market Neutral	0,63% ***	0,28% ***	1,00% ***	0,63% ***	0,20%	0,19% **	0,15%	-0,04%
Long/short	0,05%	0,67% ***	0,43%	0,05%	0,40% *	0,72% ***	0,66% ***	0,42% **
Convertible Arb,	0,55% ***	0,42% ***	NA	0,55% ***	0,46% ***	0,36% ***	0,40% ***	0,40% ***
Fixed Income	1,01% ***	-0,26%	NA	1,01% ***	-0,47%	-0,41%	-0,72%	-1,23% **
Stock Arbitrage	0,81% ***	0,22% *	1,38% ***	0,81% ***	0,16%	0,13%	0,08%	-0,11%
Mortgage-Back,	0,00%	0,23%	NA	0,00%	0,58% ***	-0,17%	-0,13%	-0,12%
Rel, Value Arb,	NA	0,43%	NA	NA	1,20% ***	0,26%	0,54%	1,20% ***
Short Sellers	0,13%	0,75% ***	NA	0,13%	0,70%	0,51%	0,66% **	0,48%
US Opport,	0,73% ***	0,46% ***	0,68%	0,73% ***	0,57% ***	0,41% **	0,40%	-0,05%
Growth	1,13% ***	0,74% ***	0,52%	1,13% ***	0,94% ***	0,64% **	0,65% **	0,19%
Value	0,47% **	0,20%	0,77%	0,47% **	0,26% *	0,19%	0,21%	-0,18%
Small Caps	1,70%	1,34% ***	NA	1,70%	2,56% ***	0,60% *	0,44%	-0,23%
Long Only Lev,	NA	0,00%	NA	NA	0,28%	-0,21%	-0,20%	-0,42%
Market Timing	0,22%	0,48% **	0,71% *	0,22%	0,10%	0,49%	0,22%	0,23%
Equity non-Hed,	0,06%	0,23% *	0,29%	0,06%	0,52% **	0,07%	0,04%	-0,33%
Foreign Exch,	0,83% ***	-0,02%	0,25%	0,83% ***	0,20%	-0,25%	0,13%	0,39% ***
Sector	1,10% **	0,69% ***	0,13%	1,10% **	0,77% ***	0,55% *	0,42% *	0,16%
Funds of Funds	0,61% ***	-0,28% *	0,26%	0,61% ***	-0,28%	-0,43% **	-0,33%	-0,48% **
Non classified	3,84% ***	4,86% ***	4,40% ***	3,84% ***	4,14% ***	5,57% ***	4,38% ***	3,79% ***
All funds	0,64% ***	0,25% **	0,62% ***	0,64% ***	0,29% *	0,10%	0,04%	-0,24%

This table reports a summary of the results for the estimation of the combined model for different time periods. We report monthly alphas for equally weighted portfolio's per investment strategies, sub-strategies, and for all funds. NA means that we could not make the estimation for the sub-period considered because the strategy has existed for less than 24 months in the sub-period considered. T-stat (not reported) are heteroskedasticity consistent.

*** Significant at the 1% level, ** Significant at the 5% level and * Significant at the 10% level.

Table 8

Hedge Funds Persistence based on 12 Month lagged Returns

	Monthly Exc. Return	Std. Dev.	Alpha	Mkt	Wd x US	SMB	HML	I HML	PR1YR	US Bd	World GV Bd	Emerg Bd	Default	Comm.	R ² adj
D 1a	2,03%	5,69%	0,56%	0,62 ***	-0,02	0,73 ***	-0,01	-0,20	0,21 *	-0,67 *	-0,32	0,14 *	0,59 *	0,11	0,64
D 1b	1,47%	4,84%	0,46%	0,55 ***	0,11	0,46 ***	-0,09	-0,17 *	0,18 ***	-0,28	-0,06	0,01	0,13	0,07	0,64
D 1c	1,29%	5,01%	0,45%	0,40 ***	0,09	0,39 ***	0,01	-0,11	0,18 *	-0,13	-0,26	-0,02	0,04	0,05	0,54
D 1	1,57%	4,40%	0,48%	0,52 ***	0,06	0,53 ***	-0,03	-0,16	0,19 **	-0,36	-0,21	0,04	0,24	0,08	0,67
D 2	1,19%	3,09%	0,28%	0,48 ***	0,04	0,36 ***	0,04	-0,07	0,10 **	-0,26 *	-0,10	0,09 *	0,07	0,04	0,79
D 3	1,06%	2,97%	0,26% **	0,46 ***	0,05	0,24 ***	0,11 ***	-0,04	0,04 *	-0,13	0,04	0,04	0,03	0,00	0,84
D 4	0,99%	2,64%	0,37% ***	0,42 ***	0,03	0,18 ***	0,08 ***	0,01	0,01	-0,06	-0,03	0,04 **	0,01	0,01	0,81
D 5	0,78%	2,15%	0,25% **	0,39 ***	0,04	0,15 ***	0,10 ***	0,02	0,01	-0,14 **	-0,05	0,07 ***	0,00	0,00	0,81
D 6	0,78%	1,91%	0,24% **	0,30 ***	0,03	0,14 ***	0,08 ***	0,04	0,00	-0,03	-0,02	0,06 ***	0,08	-0,01	0,74
D 7	0,69%	2,65%	0,33% ***	0,33 ***	0,04 *	0,12 ***	0,07 **	0,03	-0,02	0,03	0,00	0,04 **	0,05	-0,02	0,75
D 8	0,82%	2,05%	0,21%	0,35 ***	0,04	0,12 ***	0,04	0,05	-0,01	-0,06	0,01	0,07 ***	0,07	-0,02	0,70
D 9	0,91%	2,35%	0,45% ***	0,35 ***	0,04	0,08 **	-0,01	0,03	-0,05	-0,05	-0,03	0,05 *	-0,01	-0,01	0,61
D 10	1,00%	3,08%	0,41%	0,43 ***	0,05	0,03	-0,07	0,08	-0,03	-0,04	-0,04	0,10 **	-0,11	0,00	0,35
D 10a	1,03%	2,48%	0,37% **	0,39 ***	0,05	0,07 *	-0,09	0,10	-0,02	-0,06	-0,18 *	0,09 **	0,01	0,02	0,51
D 10b	0,86%	3,74%	0,24%	0,46 ***	0,00	0,03	-0,01	0,06	-0,01	-0,05	0,07	0,15 ***	-0,12	0,01	0,33
D 10c	1,08%	4,42%	0,62%	0,44 ***	0,12	-0,03	-0,11	0,08	-0,05	0,00	-0,01	0,05	-0,25	-0,03	0,16
1-10 spread	0,58% **	4,10%	0,07%	0,10	0,01	0,50 ***	0,04	-0,25 **	0,22	-0,32	-0,17	-0,06	0,35	0,08	0,41
1a-10c spread	0,95% **	6,44%	-0,06%	0,18	-0,14	0,76 ***	0,10	-0,28 *	0,26	-0,66	-0,30	0,09	0,84 **	0,14	0,42
1-2 spread	0,38% **	2,63%	0,20%	0,04	0,02	0,16 ***	-0,07	-0,09	0,09	-0,10	-0,11	-0,04	0,17	0,03	0,24
9-10 spread	-0,09%	1,83%	0,04%	-0,08	-0,01	0,05	0,06	-0,06	-0,02	-0,01	0,01	-0,05 *	0,10	-0,01	0,02

This Table reports results of the estimation of the combined model for the 1/85-6/00 period. Each year, all funds are ranked based on their previous year's return. Portfolios are equally weighted and weights are readjusted whenever a fund disappears. Funds with the highest previous year's return go into portfolio D1 and funds with the lowest go into portfolio D10. The high and low portfolios are further subdivided on the same measure. Monthly Exc Return is the Monthly Excess Return of the portfolio, Std. Dev. is the Standard Deviation of the Monthly Excess Return. Mkt is the excess return on the Market Proxy. SMB, HML, IHML, PR1YR, W x US, US Bd, W Gvt BD, Emerg Mkt BD, Default and Comm. are factors added to adjust for size, book-to-market, one-year return momentum and for the fact that some funds invest in other than US equity market, in bonds not picked up by the risk-free rate or in commodities. All numbers in the Table are monthly percentage. *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level.

Table 9

Hedge Funds Persistence based on 12 Month lagged Returns (2 sub-periods)

	1985-1993														
	Monthly Exc. Return	Std. Dev.	Alpha	Mkt	Wd x US	SMB	HML	I HML	PR1YR	US Bd	World GV Bd	Emerg Bd	Default	Comm.	R ² adj
D 1a	2,28%	4,85%	0,61%	-0,04	-0,23	1,13 **	0,02	0,08	0,59 *	-0,38	-0,80	0,26	1,34	0,01	0,02
D 1b	1,62%	4,85%	1,84% **	-0,11	0,23	0,56 **	-0,06	-0,04	0,39 **	-0,58	-0,10	-0,60	0,42	-0,30	0,16
D 1c	1,42%	5,65%	1,44% ***	-0,53 ***	0,12	0,59 **	0,16	0,03	0,53 ***	-0,04	-0,44	-0,49 **	0,53	-0,17	0,36
D 1	1,74%	3,84%	1,30% **	-0,23	0,05	0,76 ***	0,05	0,02	0,50 ***	-0,33	-0,44	-0,29	0,74	-0,16	0,20
D 2	1,41%	2,78%	1,03% ***	0,14 *	-0,05	0,47 ***	-0,01	0,04	0,25 ***	-0,22	-0,16	0,04	0,15	-0,03	0,43
D 3	1,23%	3,26%	0,55% *	0,24 ***	0,06	0,24 **	0,08	0,01	0,13 **	-0,12	-0,06	-0,02	0,30	-0,08	0,58
D 4	1,12%	2,93%	0,70% ***	0,20 ***	-0,04	0,26 ***	0,09 *	0,03	0,13 **	-0,06	-0,21 *	0,01	0,27 *	-0,01	0,60
D 5	0,84%	2,33%	0,52% ***	0,32 ***	0,03	0,27 ***	0,14 ***	0,01	0,13 ***	-0,01	-0,09	-0,01	0,10	-0,05 ***	0,85
D 6	0,92%	2,10%	0,37% **	0,18 **	-0,03	0,23 ***	0,06	0,11 **	0,12 ***	0,08	-0,04	0,08	0,13	-0,05	0,50
D 7	0,75%	3,22%	0,38% **	0,28 ***	0,05	0,22 **	0,07	0,07	0,14 ***	0,23	-0,11	0,03	0,21	-0,05	0,66
D 8	1,00%	2,21%	0,22%	0,31 ***	0,04	0,05	-0,02	0,05	0,07	0,10	-0,07	0,13	0,41	-0,07	0,64
D 9	0,99%	2,63%	0,43%	0,19 **	0,03	0,03	-0,11	0,09	0,01	0,15	-0,23	0,08	0,62	-0,04	0,40
D 10	1,07%	3,20%	0,12%	0,00	0,08	-0,21	-0,35 **	0,33 **	0,04	0,39	-0,56	0,19	1,48 **	-0,10	0,20
D 10a	1,18%	2,37%	0,47%	0,01	0,05	0,07	-0,25 **	0,18 *	0,14	0,23	-0,78 **	0,20	0,98 *	0,03	0,24
D 10b	0,87%	4,20%	-0,35%	-0,01	-0,07	-0,14	-0,27 *	0,28	0,06	0,27	-0,23	0,30	1,38 **	-0,14	0,13
D 10c	1,12%	4,83%	0,26%	-0,04	0,24	-0,55	-0,53 *	0,52 **	-0,06	0,66	-0,69	0,08	2,10 *	-0,18	0,15
1-10 spread	0,67%	3,70%	1,17%	-0,23	-0,03	0,97 **	0,40 *	-0,31	0,46 *	-0,72	0,12	-0,48	-0,74	-0,06	0,20
1a-10c spread	1,17%	6,10%	0,35%	0,00	-0,46	1,68 **	0,55	-0,43	0,65 **	-1,04	-0,11	0,18	-0,76	0,19	0,17
1-2 spread	0,33%	2,96%	0,26%	-0,37	0,09	0,29	0,06	-0,01	0,25 *	-0,11	-0,28	-0,33	0,59	-0,13	-0,03
9-10 spread	-0,08%	2,02%	0,31%	0,19 *	-0,05	0,24	0,24 ***	-0,24 ***	-0,03	-0,24	0,33	-0,11	-0,87 ***	0,06	0,09

Table 9 (continued)

	1994-2000														
	Monthly Exc. Return	Std. Dev.	Alpha	Mkt	Wd x US	SMB	HML	I HML	PR1YR	US Bd	World GV	Bd Emerg	Bd Default	Comm.	R ² adj
D 1a	1,68%	6,69%	0,08%	0,74 ***	0,05	0,66 ***	-0,03	-0,32	0,19	-0,93 **	-0,19	0,12	0,44	0,13	0,74
D 1b	1,26%	4,84%	0,15%	0,62 ***	0,12	0,40 ***	-0,14	-0,29 ***	0,14 *	-0,38	0,02	0,05	0,09	0,11 **	0,81
D 1c	1,11%	3,98%	0,22%	0,55 ***	0,08	0,39 ***	-0,02	-0,18	0,10	-0,30	-0,18	0,03	0,02	0,03	0,79
D 1	1,35%	5,09%	0,15%	0,64 ***	0,09	0,48 ***	-0,07	-0,26 *	0,14	-0,54 *	-0,12	0,07	0,18	0,09	0,79
D 2	0,89%	3,47%	-0,10%	0,55 ***	0,10	0,33 ***	0,05	-0,12 *	0,09 **	-0,38 **	-0,09	0,06	0,00	0,06 **	0,85
D 3	0,83%	2,52%	0,13%	0,50 ***	0,05	0,24 ***	0,10 **	-0,05	0,03	-0,14	0,03	0,03	-0,02	0,01	0,88
D 4	0,82%	2,18%	0,18%	0,47 ***	0,06 **	0,17 ***	0,09 ***	0,01	-0,01	-0,09	0,00	0,03	-0,06	0,01	0,87
D 5	0,71%	1,90%	0,08%	0,40 ***	0,05 *	0,13 ***	0,09 ***	-0,01	0,00	-0,22 ***	-0,07	0,07 ***	-0,04	0,01	0,84
D 6	0,57%	1,61%	0,11%	0,32 ***	0,06 **	0,13 ***	0,09 ***	0,01	-0,03	-0,11	-0,04	0,05 **	0,07	0,00	0,82
D 7	0,62%	1,58%	0,23% *	0,33 ***	0,03	0,12 ***	0,07 **	0,00	-0,05 *	-0,05	-0,01	0,05 **	0,04	-0,01	0,80
D 8	0,57%	1,78%	0,10%	0,36 ***	0,06 *	0,13 ***	0,04	0,06	-0,03	-0,06	-0,08	0,04	-0,02	-0,01	0,75
D 9	0,80%	1,92%	0,34% **	0,38 ***	0,06	0,09 ***	0,00	0,03	-0,05	-0,07	-0,07	0,03	-0,12	-0,01	0,65
D 10	0,89%	2,92%	0,24%	0,50 ***	0,07	0,04	-0,05	0,08	-0,02	-0,05	-0,09	0,06	-0,37 *	0,00	0,44
D 10a	0,82%	2,62%	0,13%	0,48 ***	0,03	0,09 **	-0,05	0,15	-0,02	-0,12	-0,11	0,09 *	-0,16	0,00	0,61
D 10b	0,84%	3,00%	0,15%	0,54 ***	0,05	0,05	0,01	0,07	-0,01	-0,02	-0,06	0,09 *	-0,34	0,01	0,44
D 10c	1,03%	3,80%	0,44%	0,51 ***	0,14	-0,03	-0,12	0,02	-0,04	-0,01	-0,11	0,01	-0,63 *	-0,01	0,22
1-10 spread	0,45%	4,62%	-0,09%	0,13	0,02	0,45 ***	-0,01	-0,35 **	0,16	-0,49	-0,03	0,00	0,55 *	0,09	0,52
1a-10c spread	0,65%	6,91%	-0,36%	0,24	-0,09	0,70 ***	0,09	-0,34	0,23	-0,92 *	-0,07	0,11	1,06 **	0,14	0,48
1-2 spread	0,46% **	2,09%	0,25%	0,08	-0,01	0,15 ***	-0,11 *	-0,14	0,05	-0,15	-0,03	0,01	0,18	0,03	0,43
9-10 spread	-0,10%	1,54%	0,10%	-0,12 *	-0,01	0,05	0,06	-0,05	-0,03	-0,01	0,02	-0,03	0,24 *	-0,01	0,04

This Table reports the result of the estimation of our combined model for the 1/85-12/93 and the 1/94-6/00 sub-periods. Each year, all funds are ranked based on their previous year's return. Portfolios are equally weighted and weights are readjusted whenever a fund disappears. Funds with the

highest previous year's return go into portfolio D1 and funds with the lowest go into portfolio D10. Monthly Exc Return is the Monthly Excess Return of the portfolio, Std. Dev. is the Standard Deviation of the Monthly Excess Return. Mkt is the excess return on the Market Proxy. SMB, HML, IHML, PR1YR, W x US, US Bd, W Gvt BD, Emerg Mkt BD, Default and Comm. are factors added to adjust for size, book-to-market, one-year return momentum and for the fact that some funds invest in other than US equity market, in bonds not picked up by the risk-free rate or in commodities. All numbers in the Table are monthly percentage. *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level.

Table 10

Hedge Funds Strategy Persistence based on 12 Month lagged Returns

Panel A : Global Macro															
	1987-2000			1987-1993			1994-2000			1997-6/1998			1996-1997		
	Mean excess Return	Std. Dev.	Alpha	Mean excess Return	Std. Dev.	Alpha	Mean excess Return	Std. Dev.	Alpha	Mean excess Return	Std. Dev.	Alpha	Mean excess Return	Std. Dev.	Alpha
D 1	1,60%	5,30%	0,86% *	1,64%	4,50%	0,91% **	1,55%	6,07%	0,71%	1,92%	3,15%	0,17%	1,98%	3,92%	-0,84%
D 2	1,52%	4,80%	0,89% ***	1,49%	5,03%	1,03%	1,55%	4,58%	0,63% *	2,01%	3,13%	0,12%	1,59%	2,98%	0,62%
D 3	1,27%	3,93%	0,53% *	1,14%	3,91%	0,57%	1,42%	3,97%	0,34%	1,37%	2,73%	0,46%	1,43%	3,12%	1,36% ***
D 4	1,39%	3,30%	0,87% ***	1,44%	3,23%	0,82% **	1,33%	3,38%	0,86% ***	1,04%	3,14%	-0,31%	1,39%	3,10%	0,51%
D 5	1,16%	4,29%	0,31% *	1,32%	5,14%	0,79%	0,99%	3,16%	0,06%	1,38%	3,07%	-0,24%	1,38%	3,19%	0,05%
D 6	0,86%	4,81%	0,63% ***	0,39%	6,14%	0,13%	1,36%	2,67%	0,58% ***	1,59%	2,88%	-0,13%	1,66%	2,33%	0,75% *
D 7	0,89%	3,23%	0,49% ***	0,89%	3,81%	0,93% *	0,88%	2,49%	0,40% **	0,76%	2,89%	-0,78%	0,84%	2,69%	-0,09%
D 8	1,06%	3,31%	0,66% ***	1,03%	3,98%	0,77% *	1,09%	2,43%	0,50% **	0,85%	2,66%	-0,62%	0,83%	2,36%	-0,49%
D 9	1,15%	3,07%	0,48% ***	1,43%	3,55%	0,57%	0,84%	2,43%	0,33%	0,93%	2,24%	0,21%	1,10%	2,02%	-0,28%
D 10	1,11%	4,22%	0,52% *	1,20%	4,98%	0,37%	1,01%	3,24%	0,22%	0,90%	2,08%	-0,61%	1,34%	2,06%	-0,49%
1-10 spread	0,49%	6,45%	0,34%	0,44%	6,48%	0,54%	0,54%	6,46%	0,49%	1,03% *	2,29%	0,78%	0,64%	2,95%	-0,35%

Table 10 (continued)

	Panel B : Market Neutral														
	1985-2000			1985-1993			1994-2000			1997-6/1998			1996-1997		
	Monthly Exc. Return	Std. Dev.	Alpha	Monthly Exc. Return	Std. Dev.	Alpha	Monthly Exc. Return	Std. Dev.	Alpha	Monthly Exc. Return	Std. Dev.	Alpha	Monthly Exc. Return	Std. Dev.	Alpha
D 1a	1,71%	4,17%	0,66%	1,94%	4,37%	0,16%	1,60%	4,10%	0,59% *	1,60%	3,28%	0,34%	2,16%	3,38%	-0,77%
D 1b	1,03%	3,33%	0,55% *	1,56%	3,06%	1,26% ***	0,79%	3,43%	0,24%	1,45%	2,05%	0,45%	1,06%	1,90%	0,93% ***
D 1c	0,98%	3,35%	0,50%	0,56%	3,86%	1,19%	1,17%	3,10%	0,59%	1,95%	1,81%	1,05% ***	1,82%	1,90%	0,20%
D 1	1,78%	5,83%	0,55% *	2,30%	7,27%	0,91%	1,15%	3,22%	0,45%	1,61%	1,98%	0,47% *	1,64%	1,95%	0,10%
D 2	0,88%	2,28%	0,38%	1,07%	2,22%	1,43% **	0,65%	2,36%	0,04%	1,15%	1,69%	0,06%	1,23%	1,60%	-0,09%
D 3	0,78%	2,00%	0,34% *	0,83%	2,05%	1,04% **	0,73%	1,95%	0,20%	0,98%	1,56%	0,02%	1,07%	1,23%	0,25%
D 4	0,65%	1,76%	0,26% *	0,70%	1,98%	0,15%	0,59%	1,45%	0,19%	0,65%	1,16%	-0,37% **	0,94%	0,80%	0,20%
D 5	0,70%	1,84%	0,30% **	0,86%	2,29%	0,27% *	0,52%	1,04%	0,25% **	0,67%	0,92%	0,01%	0,77%	0,71%	0,47% *
D 6	0,91%	2,25%	0,38% ***	1,21%	2,87%	0,65% ***	0,54%	0,99%	0,31% ***	0,61%	0,99%	-0,09%	0,82%	0,81%	0,18%
D 7	0,40%	2,33%	0,17%	0,42%	3,03%	0,23%	0,37%	0,94%	0,18%	0,48%	0,88%	-0,06%	0,65%	0,81%	0,21%
D 8	0,48%	1,68%	0,20%	0,59%	2,06%	0,07%	0,34%	1,04%	0,13%	0,19%	0,64%	-0,15%	0,38%	0,52%	-0,06%
D 9	0,58%	1,50%	0,31% **	0,59%	1,68%	0,31%	0,56%	1,25%	0,22%	0,26%	0,86%	-0,48%	0,52%	0,70%	-0,15%
D 10	0,64%	2,88%	0,33%	0,66%	3,45%	-0,04%	0,60%	1,97%	0,24%	0,22%	1,25%	-0,67% ***	0,43%	0,98%	-0,28%
D 10a	0,73%	3,28%	0,10%	1,12%	5,30%	-0,98%	0,55%	1,78%	0,15%	0,26%	0,70%	0,02%	0,31%	1,15%	-0,48%
D 10b	0,63%	2,60%	0,39%	0,04%	2,29%	0,00%	0,90%	2,70%	0,42%	0,34%	1,70%	-0,54%	0,72%	1,87%	-0,67%
D 10c	0,64%	3,81%	0,40%	1,11%	5,08%	0,63%	0,42%	3,10%	0,16%	0,31%	3,15%	-1,26% **	0,44%	2,30%	0,38%
1-10 spread	1,15% **	6,08%	0,22%	1,63% **	7,75%	0,95%	0,55% *	2,91%	0,21%	1,39% ***	1,56%	1,14% ***	1,21% ***	1,79%	0,38%
1a-10c spread	1,07% ***	5,07%	0,26%	0,83%	6,49%	-0,47%	1,18% **	4,33%	0,43%	1,29% *	3,13%	1,60% *	1,72% **	3,82%	-1,16%

Table 10 (continued)

		Panel C : Market Neutral spread comparison														
		Monthly Exc. Return	Std. Dev.	Alpha	Mkt	W x US	SMB	HML	I HML	PR1YR	US Bd	W GV Bd	Emer Bd	Default	Comm.	R ² adj
1985-2000	1-10 spread	1,15% **	6,08%	0,22%	0,14 **	0,03	0,21 **	0,12	0,16 **	0,14	-0,03	-0,07	-0,02	0,14	0,03	0,12
	1a-10c spread	1,07% ***	5,07%	0,26%	0,41 ***	0,07	0,29 ***	0,27 **	0,04	0,22	-0,17	-0,03	-0,06	0,16	0,00	0,12
1985-1993	1-10 spread	1,63% **	7,75%	0,95%	0,10	-0,15	1,03 **	0,85 **	0,31	0,41	-0,85 **	1,44 *	-0,39	-2,36 **	-0,12	0,34
	1a-10c spread	0,83%	6,49%	-0,47%	0,60	-0,04	1,09	1,31 ***	0,36	0,50	-0,85	2,48 **	-0,12	-3,39 **	-0,70 **	0,26
1994-2000	1-10 spread	0,55% *	2,91%	0,21%	0,17 *	0,09	0,16 ***	0,03	0,30 ***	0,03	-0,15	-0,24	0,01	0,54 **	0,05	0,43
	1a-10c spread	1,18% **	4,33%	0,43%	0,30 *	0,17	0,17 **	0,10	0,27 **	0,11	-0,37	-0,54 **	-0,09	0,72 **	0,16 **	0,35
1997-6/1998	1-10 spread	1,39% ***	1,56%	1,14% *	0,05	0,08	0,43 ***	0,02	0,38 **	-0,28 ***	-0,07	-0,74 ***	-0,19	1,45 ***	-0,23 ***	0,62
	1a-10c spread	1,29% *	3,13%	1,60% *	0,04	0,07	0,46	0,13	1,41 ***	-0,71 ***	1,41	-1,21 ***	-0,05	1,38 *	-0,67 ***	0,47
1996-1997	1-10 spread	1,21% ***	1,79%	0,38%	0,33 **	0,03	0,39 ***	0,26	0,16	-0,04	-0,42	-0,63 **	-0,08	0,67 *	-0,04	0,68
	1a-10c spread	1,72% **	3,82%	-1,16%	0,93 ***	0,06	0,52 *	0,84 **	0,66	0,03	-1,34 *	-0,99 *	-0,14	0,94	0,21 *	0,40

This Table reports the result of the estimation of our combined model. Panel A contains the results for the Global Macro funds for different time period. Panel B contains the results for the Market Neutral funds, and Panel C contains a comparison of Market Neutral spread. Each year, all funds are ranked based on their previous year's mean return. Portfolios are equally weighted and weights are readjusted whenever a fund disappears. Monthly Exc Return is the Monthly Excess Return of the portfolio, Std. Dev. is the Standard Deviation of the Monthly Excess Return. Mkt is the excess return on the Market Proxy. SMB, HML, IHML, PR1YR, W x US, US Bd, W Gvt BD, Emerg Mkt BD, Default and Comm. are factors added to adjust for size, book-to-market, one-year return momentum and for the fact that some funds invest in other than US equity market, in bonds not picked up by the risk-free rate or in commodities. All numbers in the Table are monthly percentage.