DO HEDGE FUNDS OUTPERFORM THE Market?

New approach might help investors answer a key question.

BY MAHER KOOLI

The early 1990s saw the explosive development of hedge funds. Even though the attraction of these funds was tempered by many huge losses suffered in 1994 and 1998, the hedge fund industry continued to prosper. According to VAN Hedge Fund Advisors International Inc., the hedge fund industry has been growing at an average rate of over 17% over the last decade and significant growth is expected to continue. For instance, VAN reports, for the year 2003, a total of 8,100 global hedge funds managed around $820 billion in capital. These funds are largely unregulated entities that cater to wealthy and institutional investors and they are gaining in popularity and performance, attracting new investors around the world.

The importance of the hedge fund industry justifies the growing body of research that attempts to evaluate the performance levels and persistence of these alternative assets. However, results of previous studies are controversial, with divergent results that can partly be explained by the limited access to individual fund data and the private characteristics of each hedge fund. This study extends previous works (Capocci and Hübner, 2004; Liang 1999) by using different approaches to measure hedge fund performance not previously used in the alternative investment context, as well as different statistical tests.

Data and Methodology

To represent the hedge fund universe, I choose to use data from Credit Suisse First Boston/Tremont (CSFB/Tremont). The CSFB/Tremont hedge fund indexes have been used in a variety of studies on hedge fund performance (Lhabitant, 2001; Amenc, El Bied and Martellini, 2003, among others). The CSFB/Tremont Hedge Fund Indexes are the largest asset-weighted hedge fund indexes. Starting from the TASS+ database, which tracks over 2,600 U.S. and offshore hedge funds, the indexes only retain hedge funds that have at least US$10 million under management and provide audited financial statements. Only about 300 funds pass the screening process. Funds are reselected quarterly as necessary and, in order to minimize the survivorship bias, they are not excluded until they liquidate or fail to meet the financial reporting requirements. This makes these indexes representative of the various hedge fund investment styles and useful for tracking and comparing hedge fund performance against other major asset classes.

The CSFB/Tremont indexes were launched in 1999 with data going back to 1994. They cover ten strategies: Convertible Arbitrage, Dedicated Short Bias, Emerging Markets, Equity Market-Neutral, Event-Driven, Fixed-Income Arbitrage, Global Macro, Long/Short Equity, Managed Futures, and Multi Strategy. To ensure that

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the results obtained are sufficiently robust, I have also tested a couple of other hedge fund index providers (HFR and Zurich Capital Markets) and find very similar evidence of performance.[1]

Following Fama and French (1993) and Capocci and Hübner (2004), I choose the value-weighted portfolio of all NYSE, Amex and NASDAQ stocks as a market index. Agarwal and Naik (2002) use the Russell 3000 instead. The comparison of descriptive statistics of the two indexes suggests that both market proxies are very similar. Thus, the results of the study should not be influenced by the market proxy chosen. I take the 1-month T-bill from Ibbotson Associates as the risk-free rate.

In hedge fund literature, different models have been used in performance evaluation. Capocci and Hübner (2004) note that it is necessary to realize performance studies based on multifactor models rather than simply using the well-known capital asset pricing model (CAPM). However, there exists no unanimously accepted model. In line with these researchers, among others, I use several specifications in order to compare the results obtained.

Market model: Assume that hedge fund returns follow the CAPM,

$$R_{jt} = \alpha_j + \beta_j R_{Mt} + \varepsilon_{jt} \qquad (1)$$

where R_{jt} is the rate of return of the hedge fund j on month t; R_{Mt} is the rate of return of a market index on month t; ε_{jt} is the error term. Define the out- or underperformance relative to the market proxy used (i.e., the abnormal return) for the fund on month t as:

$$Ajt = Rjt - (\hat{\alpha}_j + \hat{\beta}_j R_{Mt}) \qquad t = 1,2,\ldots,T \qquad (2)$$

The average abnormal return AARt is the sample mean:

$$AAR_t = \frac{\sum_{j=1}^{N} A_{jt}}{N} \qquad (3)$$

Over an interval of two or more trading months beginning with month T_1, and ending with T_2, the cumulative average abnormal return (CAAR) is:

$$CAAR(T_1,T_2) = \frac{1}{N} \sum_{j=1}^{N} \sum_{T_1}^{T_2} A_{jt} \qquad (4)$$

Market model with GARCH estimation: Fung and Hsieh (1997) report that hedge fund returns have fatter tails than those of standard asset classes such as stocks and bonds. Different explanations on this phenomenon have been put forward. Recently, Fung and Hsieh (2004) note that a plausible cause of the observed fat-tailed return distribution is that the moments of the return distribution are time-varying. Thus, I also measure the performance of hedge funds using CAPM with GARCH(1,1) errors:

$$R_{jt} - R_{Ft} = \alpha_j + \beta_j (R_{Mt} - R_{Ft}) + \epsilon_{jt} \qquad (5)$$

where $\epsilon_{jt} | \psi_{t-1} \sim (0, h_{jt})$ and ψ_{t-1} denotes all information available at time t–1. The conditional variance in the GARCH case is

$$h_{jt} = \omega_p + \delta_j h_{j\,t-1} + \gamma_j \epsilon^2 jt - 1 \qquad (6)$$

with $\omega_j > 0$, $\delta_j > 0$, $\gamma_j \geq 0$, and $\delta_j + \gamma_j < 1$.

The Fama and French (1993) three-factor model[2]: 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

$$R_{jt} - R_{Ft} = \alpha_j + \beta_{j1}(R_{Mt} - R_{Ft}) + \beta_{j2} SMB_t + \beta_{j3} HML_t + {}_{jt} \qquad (7)$$

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).

The Fama and French (1993) model with Ibbotson's (1975) "Returns Across Time and Securities" (RATS) procedure: The RATS technique requires that the first-month returns from all funds of a given portfolio be regressed on the concurrent market returns to produce a single beta estimate for all funds during the first month. This technique is repeated for each subsequent month to produce a time-series of

cross-sectional beta estimates. It allows the estimate of beta to vary during the returns window. In other words, it supposes that the betas of the portfolio should vary over time as new information becomes available.

The Fama and French (1993) model with RATS procedure:

$$R_{jt} - R_{Ft} = \alpha_j + \beta_{j1t}(R_{Mt} - R_{Ft}) + \beta_{j2}SMB_t + \beta_{j3}HML_t + {}_{jt} \quad (8)$$

Multifactor model: To account for the many dimensions of financial risk inherent in hedge funds, I consider the following factors: Fama and French's (1993) size and value, Carhart (1997) momentum factor[3], two factors to take into account the fact that hedge funds invest in bond indexes (Lehman US Aggregate Bond Index and JP Morgan Emerging Market Bond Index), and, finally, a commodity factor (Goldman Sachs Commodity Index).

I choose these variables for their natural influence on asset returns and on the basis of previous evidence of their explanatory power for hedge fund performance. Note that Capocci and Hübner and Agarwal and Naik (2002) consider several additional factors such as the MSCI World excluding U.S., the Fama and French (1998) international value, the Lehman BAA Corporate Bond Index, and the Salomon World Government Bond Index. Due to their high collinearity with other factors, I decide to not test these indexes further. I ran the following regression:

$$R_{jt} - R_{Ft} = \alpha_j + \beta_{j1}(R_{Mt} - R_{Ft}) + \beta_{j2}SMB_t + \beta_{j3}HML_t + \beta_{j4}PR1YR_t + \beta_{j5}(LBUSBI_t - R_{Ft}) + \beta_{j6}(JPMEMBI_t - R_{Ft}) + \beta_{j7}(GSCI_t - R_{Ft}) + {}_{jt} \quad (9)$$

where R_{Mt} = return of the Market Proxy on month t; R_{Ft} = risk-free return on month t; SMB_t = the factor-mimicking portfolio for size (small minus big); HML_t = the factor-mimicking portfolio for book-to-market equity (high minus low); $PR1YR_t$ = the factor-mimicking portfolio for the momentum effect; $LBUSBI_t$ = return of the Lehman Aggregate U.S. Bond Index; $JPMEMBI_t$ = return of the JP Morgan Emerging Market Bond Index; $GSCI_t$ = return of the Goldman Sachs Commodity Index. The regression is estimated for each hedge fund index, over the 1994-2004 period.

In this study, I employ the calendar-time method developed by Jaffe (1974) and Mandelker (1974). This approach controls for cross-correlation, and Lyon et al. (1999) show that it yields well-specified test statistics. It involves calculating average returns of rolling, calendar-time portfolios of event funds. Specifically, for each calendar month, I form an equally weighted τ-month portfolio set up to include any hedge fund index which has a return during the previous τ-months, for τ = 12, 24, 36, 48, 60, 72, 84, 96, and 120. The calendar time approach has the added advantage that it provides a direct measure of the opportunities available to investors attempting to exploit any abnormal performance.

To test the null hypothesis that the mean abnormal return is equal to zero for a sample of n hedge funds, I first employ a cross-sectional *t*-statistic. The standard error for this test for each month is computed across funds, not across time. To eliminate the skewness bias when long-run abnormal returns are calculated, I also use the bootstrapped skewness-adjusted *t*-statistic.

Results

Table 1 reports means, standard deviations, median Sharpe ratios, kurtosis and skewness, for the ten CSFB/Tremont hedge fund indexes based on monthly data for the 1994-2004 period. Table 1 shows that the highest mean return was achieved by the Global Macro Index (1.15%) followed by the Long/Short Equity Index (1%). The Dedicated Short Bias Index offers the lowest mean return (-0.18%). When standard deviation is taken into account through the Sharpe measure (the ratio of excess return and standard deviation), results are

TABLE 1: Descriptive statistics for the CSFB/Tremont hedge fund indexes, data for 1994-2004

Index/Statistic	Arithmetic Mean (%)	Standard Deviation	Median (%)	Sharpe ratio	Skewness	Kurtosis
Convertible Arbitrage	0.78	1.35	1.08	0.33	-1.45	3.81
Dedicated Short Bias	-0.18	5.1	-0.54	-0.10	0.91	2.18
Emerging Markets	0.73	4.92	1.3	0.08	-0.61	4.2
Equity Market Neutral	0.82	0.87	0.81	0.56	0.29	0.28
Event Driven	0.94	1.69	1.04	0.36	-3.47	23.96
Fixed Income Arbitrage	0.56	1.11	0.77	0.20	-3.25	17.03
Global Macro	1.15	3.35	1.19	0.24	0	2.39
Long/Short Equity	1	3.06	0.81	0.22	0.23	3.69
Managed Futures	0.62	3.52	0.22	0.08	0.03	0.44
Multi-Strategy	0.77	1.27	0.83	0.33	-1.31	3.71

somewhat different. Indexes offering the best trade-off between risk and return are the Equity Market Neutral Index (0.56), followed by the Event Driven Index (0.36). The worst Sharpe ratio is obtained by the Dedicated Short Bias Index (-0.10), which is also the worst performing index when risk is not taken into account. Table 1 also confirms the heterogeneity of the hedge fund universe: some hedge fund strategies have relatively high volatility while other hedge funds have lower volatility.

The discussion of performance models will be performed on the 1994-2004 period. The first performance model used is the CAPM-based single index model. Table 2 reports the results for the whole sample. I estimate each hedge fund portfolio individually using calendar time approach. In other words, hedge fund indexes are formed into portfolios by event date. A portfolio standard deviation is estimated from the time-series of portfolio-abnormal returns in the estimation period, and used to standardize the portfolio return.

Starting from 1994, I notice that all hedge fund indexes outperform the market. In all cases, the alphas are significant at the 1% confidence level. Moreover, there is only one fund that has negative adjusted returns after 10 years of the portfolio's construction. After 120 months, the cumulative abnormal return for the sample is 20.85% (bootstrapped skewness corrected *t*-statistic = 3.95) which corresponds to an abnormal return of 0.17% per month.

For a robustness check, I estimate abnormal performance using the GARCH extension. Panel B of Table 2 reports the result using CAPM with GARCH extension. It shows that the long-run performance of hedge fund portfolios is again significantly positive. For a period of 120 months, the cumulative abnormal return for the sample is 25.17% (bootstrapped skewness corrected *t*-statistic =

TABLE 2: Performance measurement using the CAPM, data for 1994-2004

Panel A: Performance measurement using the CAPM

Calendar months from portfolio's formation	Alpha	Positive:Negative	Bootstrapped Skewness Corrected *t*-statistic
12	4.51%	8:02	5.57***
24	17.12%	9:01	8.19***
36	24.52%	9:01	7.43***
48	14.12%	9:01	4.72***
60	18.58%	9:01	4.79***
72	19.67%	9:01	4.60***
84	16.50%	9:01	4.10***
96	12.94%	9:01	3.67***
108	14.60%	9:01	3.62***
120	20.85%	9:01	3.95***

Panel B: Performance measurement using the CAPM with GARCH estimation

Calendar months from portfolio's formation	Alpha	Positive:Negative	Bootstrapped Skewness Corrected *t*-statistic
12	4.85%	8:02	10.24***
24	17.70%	10:00	26.94***
36	25.77%	9:01	32.24***
48	16.16%	9:01	17.57***
60	21.20%	9:01	20.65***
72	22.69%	9:01	20.21***
84	19.94%	9:01	16.46***
96	16.71%	9:01	12.91***
108	18.82%	9:01	13.71***
120	25.17%	9:01	17.41***

***Significant at the 1% level.

TABLE 3: Performance measurement using the Fama and French (1993) three-factor model, data for 1994-2004

Panel A: Fama and French (1993) three-factor model (period of estimation: 120 months)

	Coefficient	Heteroscedasticity consistent *t*-statistic
Alpha (abnormal return)	0.0036	3.36***
$R_{Mt} - R_{Ft}$	0.0649	2.22**
SMB_t	0.0749	3.13***
HML_t	0.0595	1.83*
R^2	0.1072	

Panel B: Fama and French (1993) three-factor model with RATS procedure

Calendar months from portfolio's formation	Alpha	Positive:Negative	*t*-statistic
12	2.12%	8:02	0.64
24	13.02%	10:00	2.98***
36	23.46%	9:01	4.34***
48	18.11%	9:01	2.38***
60	27.28%	9:01	3.29***
72	30.97%	9:01	3.37***
84	33.87%	9:01	3.55***
96	40.14%	9:01	4.08***
108	48.48%	9:01	4.78***
120	48.48%	9:01	4.78***

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

17.41) which corresponds to an abnormal return of 0.20% per month.

In panel A of Table 3, I report the results for the Fama and French (1993) three-factor model applied to all hedge fund indexes. Table 4 reveals that the premia on the SMB and the HML factors are significantly positive. It seems that hedge fund managers prefer smaller stocks and those with high book-to-market ratios. On average, I find an alpha of 0.36% per month which is statistically significant at the 1% level. Panel B of Table 3 reports the result of the Fama and French (1993) three-factor model applied to all hedge fund indexes using RATS procedure. Again, I confirm that the hedge fund strategies outperform the market. Also, I find that the Fama and French (1993) three-factor model does a modest job in describing hedge fund behaviour (R2 = 0.10). Thus, other factors are needed to account for all possible investment strategies.

Table 4 reports the results of the multi-factor model. In 6 out of 10 hedge fund indexes, the premium on the SMB factor is significantly positive. However, in the Dedicated Short Bias index, the premium is significantly negative. The HML factor seems to add less explanatory power as only 1 out of 10 indexes of the factors is significantly at the 5% level. The Momentum factor does not prove to be a strong indicator of hedge fund behaviour. It is significant for only 2 out of 10 indexes. The U.S. bond factor adds explanatory power in 7 of the indexes considered, and the emergent bond and commodity factors add explanatory power in 30% and 20% of the cases, respectively. These results provide some insight into the preferences of hedge fund managers: (1) hedge fund managers seem to prefer smaller stocks; (2) Long/Short Equity managers prefer stocks with low book-to-market ratios, and Dedicated Short Bias and Event Driven managers prefer stocks with high book-to-market ratios; (3) Global Macro and Long/Short Equity managers follow a momentum strategy; (4) Multi- Strategy managers suffer from the U.S. bond market; (5) Long/Short Equity and Futures managers invest in commodities; (6) best-performing strategies do not significantly invest in emerging market bonds.

Overall, I find that taking more factors into account induces that fewer indexes significantly outperformed the market (4 out of 10 investment styles), and more indexes have positive but insignificant excess returns. Based on alpha, the best strategies are Equity Market Neutral (alpha = 0.43% per month), Event Driven (alpha = 0.35% per month), Multi-Strategy (alpha = 0.35% per month), and Convertible Arbitrage (alpha =

Table 4: Performance measurement using the multi-factor model, data for 1994-2004

Hedge Fund Index	*Alpha*	$R_{Mt} - R_{Ft}$	SMB_t	HML_t	$PR1YR_t$	$JPMEMBI_t - R_{Ft}$	$LAUSBI_t - R_{Ft}$	$GSCI_t - R_{Ft}$	R^2adjusted
Convertible Arbitrage	0.34%***	0.0172	0.0683**	0.0716*	-0.0217	0.0562	0.0704**	-0.0037	0.08
Dedicated Short Bias	0.07%	-0.8228***	-0.3145***	0.1371*	-0.0500	0.1402	-0.0841	0.0014	0.77
Emerging Markets	-0.12%	0.2456**	0.2668***	0.0330	0.0908	-0.6586**	0.5822***	-0.0114	0.53
Equity Market Neutral	0.43%***	0.0675*	0.0038	0.0024	-0.0065	0.0690	0.0063	0.0065	0.11
Event Driven	0.35%***	0.1834***	0.1583***	0.1116***	0.0135	-0.1258	0.1343***	0.0038	0.56
Fixed Income Arbitrage	0.14%	-0.0038	0.0497*	0.0354	0.0105	0.1023	0.0448*	0.0086	0.04
Global Macro	0.32%	0.1864**	0.0909	0.1241	0.1264**	0.5609**	0.1278*	-0.0034	0.16
Long/Short Equity	0.12%	0.4144***	0.2442***	-0.0780*	0.2105***	0.1452	0.0781**	0.0373*	0.79
Managed Futures	0.14%	-0.1098	0.0145	0.0083	0.0474	0.8896***	-0.0730	0.1399***	0.14
Multi-Strategy	0.35%***	0.0820**	0.0807**	0.0476	-0.0001	0.1293	-0.0739***	0.0105	0.04

TABLE 5: Performance of hedge funds using the multi-factor model in different subperiods

	Whole period	2 subperiods		Asian crisis
Hedge Fund Index	1994-2004	1994-1999	1999-2004	1/1997-6/1998
Convertible Arbitrage	0.34%***	0.16%	0.58%***	0.6%*
Dedicated Short Bias	0.07%	0.45%*	-0.40%	0.6%
Emerging Markets	-0.12%	-0.69%	0.39%	-1.7%
Equity Market Neutral	0.43%***	0.27%**	0.51%***	0.3%
Event Driven	0.35%***	0.14%	0.41%***	0.5%
Fixed Income Arbitrage	0.14%	0.05%	0.24%**	0.1%
Global Macro	0.32%	-0.26%	0.59%**	0.5%
Long/Short Equity	0.12%	0.03%	0.15%	-0.4%
Managed Futures	0.14%	-0.01%	-0.25%	-1.9%*
Multi-Strategy	0.35%***	0.24%	0.42%***	0.5%**

0.34% per month). The alpha of Emerging Markets strategy is negative but insignificant.

Overall, it seems that the multi-factor model does a good job in explaining hedge fund behaviour of various categories. It seems particularly adapted to Long/Short Equity (R^2adjusted = 0.79), Dedicated Short Bias (R^2adjusted = 0.77), Equity Market Neutral (R^2adjusted = 0.56) and Emerging Market funds (R^2adjusted = 0.53).

Table 5 reports the same analysis of performance over different subperiods. First, I subdivide the 1994-2004 period in two subperiods of equal lengths (1994-1999 and 2000-2004). Second, I consider the Asian crisis period. When the time period is divided in two, I notice that the significant performance for the 1994-2004 period is mainly due to the second subperiod, except for the Dedicated Short Bias strategy. Some hedge fund strategies even underperform the market in the first period (Emerging Markets, Global Macro, and Managed Futures). Moreover, during the Asian crisis, the Managed Futures strategy outperformed the market, while Convertible Arbitrage and Multi-Strategy took advantage of this period and earned significant positive excess return.

Conclusion

In this paper I have re-examined the performance of hedge funds over the period 1994 to 2004. I assess abnormal performance using a number of alternative benchmarks and an approach originally used in event studies. More specifically, the benchmarks employed allow for the standard CAPM, the GARCH extension, the Fama and French three-factor model, the RATS technique, and the multi-factor model. In addition, I use the calendar-time approach as developed by Jaffe (1974) and Mandelker (1974). This approach has the added advantage that it provides a direct measure of the opportunities available to investors attempting to exploit any abnormal performance. I find that, in line with the Capocci and Hübner (2004) conclusion, hedge fund strategies outperform the market. For example, with the Fama and French (1993) three-factor model, I find an abnormal performance of 0.36% per month (*t*-statistic = 3.36). However, taking more factors into account shows that fewer indexes significantly outperformed the market and more indexes have positive but insignificant excess returns. Further, in line with Fung and Hsieh (2004), I find that hedge fund managers seem to prefer smaller stocks. When I subdivide the 1994-2004 period in two subperiods of equal lengths (1994-1999 and 2000-2004), I notice that the significant performance for the 1994-2004 period is mainly due to the second subperiod.

As noted by several academics, research in hedge fund is still at the beginning of its history. Hedge funds address new challenges to financial theory and a lot remains to be done to identify hedge fund performance drivers. For instance, it will be interesting to re-examine the issue of performance in a calendar-time framework using hedge funds across different strategies rather than hedge fund indexes. Hedge funds typically exhibit nonlinear option-

like exposures to standard asset classes because they use derivatives and follow dynamic trading strategies. An interesting avenue for future research would be to develop models that account for these facts. ▮

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Endnotes

1. Results are available from the author upon request.
2. See Fama and French (1993) for a complete description of the factor returns.
3. See Carhart (1997) for a description of the construction of PY1YR.