

An Edhec Risk and Asset Management Research Centre Publication

Discussion Paper

Fund of Hedge Fund Reporting

A Return-Based Approach to Fund of Hedge Fund Reporting



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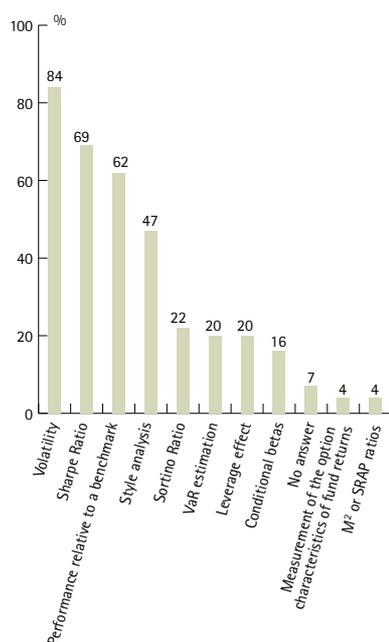
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Preamble

Graph 1
Which indicators and information do European FoHF use for reporting to their clients?



Source: Edhec European Alternative Multimangement Practices Survey, 2003

Alternative investment has experienced a two-stage development process in the past fifty years. Initially, there was a long period of incubation, during which only a few wealthy private investors bought shares in hedge funds in a search for absolute performance. The bursting of the Internet bubble then broadened the range of subscribers. Since all investors were looking for investments that were liable to improve the diversification of their portfolio, they naturally turned to hedge funds. The massive arrival of institutional investors and the diversification of the risk profiles of final investors allowed an in-depth examination of the management practices in the alternative universe to take place, highlighting risk control in particular. The initial work that aimed to rationalise and, above all, to standardise these management practices, was carried out under the impetus of the Investor Risk Committee (IRC), set up by the International Association of Financial Engineers.

This work is all the more important in that the risk-taking and control that should result from it form, essentially, the basis of alternative investment. Even the so-called non-directional alternative strategies, i.e. those that are not directly subject to market risk, are exposed to multiple risk factors such as volatility risk, credit risk, liquidity risk, etc. (cf. Amenc et al. (2003)¹). It is therefore true to say that correct assessment and rigorous monitoring of risks are requisite conditions for a hedge fund to function well. It is thus vital for investors to ensure that the funds in which they have invested or in which they wish to invest (again) have adequate control over the risks being run. However, in spite of this obvious

fact, investors are rarely in a position to implement satisfactory risk monitoring and control. The main reason put forward relates to the low level of information generally provided by hedge funds. A study carried out recently by Edhec involving 61 European multimangers (cf. Edhec (2003)²) shows that, while 84% of the firms questioned include a volatility calculation in their monthly activity report (69% also include a Sharpe ratio, 22% a Sortino ratio and 20% a Value-at-Risk calculation), none provides a truly robust measure of the extreme risks, even though this is a measure that represents an element of information that is capital for all investors. (See graph 1)

Besides, the inadequacies of the monthly activity reports published by funds of hedge funds (hereafter FoHF in the text) do not stop there. Numerous studies have posed the question of the relative performance of hedge funds compared to traditional asset classes. Many have concluded that there was conditional and unconditional outperformance from strategies, thereby feeding the myth of "absolute return strategies." On the basis of this observation, researchers and investors have tried to highlight the eventual persistence of hedge fund performance so as to justify the usefulness of stock picking. Paradoxically, the results obtained are largely favourable for the allocation and risk management process. While no study has been able to produce tangible proof with regard to the persistence of hedge fund performance beyond a 6-month horizon, some have underlined the stability of the funds' risk profile (cf. Kat and Menexe (2003)³ or Mozes and Herzberg (2003)⁴),

1 - Amenc, N., Martellini, L. and Vaissie, M., 2003, Benefits and Risks of Alternative Investment Strategies, *Journal of Asset Management*, Vol.4, N°2, p.96-118.

2 - Cf. Edhec European Alternative Multimangement Practices Survey, 2003

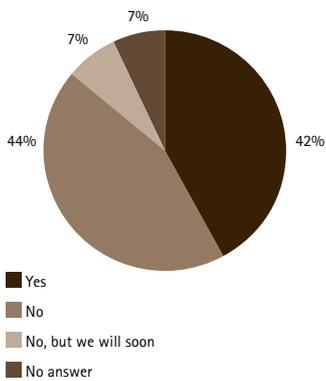
3 - Kat, H. and Menexe, F., 2003, Persistence in Hedge Fund Performance: The True Value of Track Record, *Journal of Alternative Investments*, Spring 2003, Vol.5, N°4, p.66-72

4 - Mozes, H. A. and Herzberg, M., 2003, The Persistence of Hedge Fund Risk: Evidence and Implications for Investors, *Journal of Alternative Investments*, Fall 2003, Vol.6, N°2, p.22-42

Preamble

Graph 2

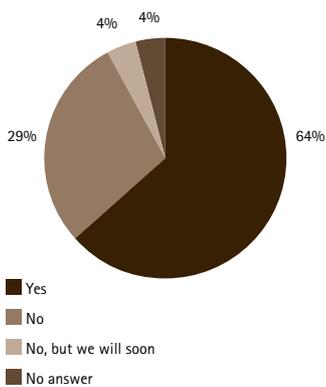
Do you offer FoHF with specific behaviours or diversification objectives in relation to other asset classes?



Source: Edhec European Alternative Multimangement Practices Survey, 2003

Graph 3

Do you offer FoHF or manager pure funds by strategy?



Source: Edhec European Alternative Multimangement Practices Survey, 2003

thereby justifying the investors' transfer of interest from the alphas (i.e. absolute performance logic) to the betas (i.e. diversification logic) of alternative strategies. To adapt to this evolution, multimangers have offered investors FoHF that are specialised by strategy and FoHF that provide particular diversification objectives. Unfortunately, the reporting from these FoHF has not satisfied the new needs of investors. None of the respondents to the Edhec survey (2003)⁵ provides, for example, the exposure of their funds to the principal risk factors. This is obviously in total contradiction with the fact that 95% of the FoHF consider that the quality of reporting and of risk control is the second most important criterion when they select a fund (with the most important criterion being the coherence and the quality of the explanations given by the managers on the subject of their investment strategy). (See graphs 2 & 3)

The objective of this discussion paper is to contribute to the debate on the relevant information to transmit to investors that hold shares in FoHF. As such, it provides a recapitulative list of the figures that it would be desirable to include in the reports sent out to investors by the FoHF, in conformity with the recommendations of the IRC, and more particularly with those presented by the working group responsible for examining the specific problems posed by FoHF (cf. Minimum Transparency Requirements for Fund-of-Hedge Funds - IRC Meeting Findings Amsterdam, June 2002, Hedge Fund Disclosure for Institutional Investors, July 2001). We also provide, in light of recent research on the theme of evaluating the performance and risk factors of hedge funds, a series of indicators that are appropriate for the specific characteristics of alternative strategies.

5 - Cf. Edhec European Alternative Multimangement Practices Survey, 2003 - Opus Cit.2

The specific characteristics of hedge fund performance

Hedge funds employ dynamic investment strategies and enjoy a high degree of freedom with regard to the instruments that they can hold in their portfolio (stocks, bonds, derivative instruments, real estate, works of art, etc.). To that can be added the possibility of engaging in short selling of securities and using the leverage effect. As stressed by Fung & Hsieh (1997)⁶, alternative strategies are infinitely more complex than those of traditional funds (i.e. generally of buy-and-hold type) because it is no longer sufficient to identify the markets in which the funds are present (location factor), it is also necessary to identify their net exposure and leverage (strategy factor).

Whether it involves the strategic and/or tactical portfolio allocation process, risk-adjusted performance measurement or performance attribution, it is essential to be able to avail of both performance and risk indicators that are reliable. The opaque nature of hedge funds, and also the technical complexity of the strategies that they employ, make this difficult. On this subject, numerous articles have highlighted the weaknesses of the traditional risk and performance measurement indicators within the framework of evaluating the performance of hedge funds (cf. Lo (2001)⁷, Spurgin (2001)⁸ or Brooks and Kat (2002)⁹, etc.).

Biases in hedge fund performance measurement

The measurement of hedge fund performance is made difficult by the presence of various biases. As Fung and Hsieh (2000)^{10&11} underline, some biases, such as the survivorship and selection biases, relate to the very nature of the alternative universe (natural biases), others, such as the backfilling or multi-period sampling biases, relate to the way in which the main hedge fund databases are constructed or the way in which the data is used (spurious biases). All these biases tend to artificially and significantly overestimate the performance of hedge funds (e.g. Fung and Hsieh (2000 & 2002)¹² value the survivorship and instant history biases at 4.4% per year¹³) and to underestimate the risks (i.e. mean risk and extreme risk). It is therefore difficult, for investors, to obtain accurate information with tools that are based on biased estimators of the risk and return. However, this is the case for traditional performance measurement tools such as the Sharpe/Treynor/Sortino ratios or traditional risk measurement tools such as volatility / Value-at-Risk (VaR). We should note, on this topic, that in order to solve the bias problems and also, above all, to provide a solution to the lack of representativity with which the various hedge fund indices available on the market are confronted, the Edhec Risk and Asset Management Research Centre launched indices of hedge fund indices at the beginning of 2003¹⁴.

6 - Fung, W. and Hsieh, D. A., 1997, Empirical Characteristics of Dynamic Trading Strategies: The Case of Hedge Funds, *Review of Financial Studies*, Summer 1997, Vol.10, N°2, p.275-302.

7 - Lo, A., 2001, Risk Management for Hedge Funds: Introduction and Overview, *Financial Analysts Journal*, Nov/Dec 2001, Vol. 57, Issue 6, p.16-33.

8 - Spurgin, R., 2001, How to Game your Sharpe Ratio, *Journal of Alternative Investments*, Winter 2001, Vol. 4, N°3, p.38-46.

9 - Brooks, C. and Kat, H., 2002, The Statistical Properties of Hedge Fund Returns and Their Implications for Investors, *Journal of Alternative Investments*, Fall 2002, Vol.5, N°2, p.26-44.

10 - Fung, W. and Hsieh, D. A., 2000, Performance Characteristics of Hedge Funds and Commodity Funds: Natural versus Spurious Biases, *Journal of Financial and Quantitative Analysis*, Vol.35, Issue 3, p.291-307.

11 - Fung, W. and Hsieh, D. A., 2002, Benchmark of Hedge Fund Performance, Information Content and Measurement Biases, *Financial Analysts Journal*, Jan/Feb 2002, Vol.58, N°1, p.22-34.

12 - Cf. Fung and Hsieh (2000 & 2002) - Opus Cit. 10 & 11

13 - It is interesting to note that a working paper by Posthuma and van der Sluis, *A Reality Check on Hedge Fund Returns* (2003), values the instant history bias alone at 4.35% for the whole TASS database, and at 6.34% for the long short equity funds.

14 - Thanks to an original construction method based on principal component analysis (PCA), the Edhec indices allow both the representativity dimension to be maximised and the biases to be minimised. They therefore provide investors with better quality information.

The specific characteristics of hedge fund performance

For want of reliable data, it is necessary to correct the estimation of the hedge fund performance and risk ex-post to account for the impact of the different biases mentioned above.

Liquidity and credit risks

Hedge funds are exposed to a large number of risk factors. Among all these sources of risk, the liquidity and credit risks should be considered with care. These two sources of risks are very closely related in the minds of investors, especially since the LTCM affair. Taking the interdependence between the credit and liquidity risks into account should notably lead to a modelling of the consequences of using the leverage effect in arbitrage operations. Today, however, with the exception of highly academic research, such as that on the application of mathematical network theory to the construction of systemic measures of credit and liquidity risks¹⁵, professionals do not have robust and simple microeconomic results at their disposal in this area. It will nevertheless be necessary to attempt to take the interdependence of these two risk factors into account in extreme risk calculations (scenarios, stress tests, etc.).

Some authors (cf. Asness, Krail and Liew (2000)¹⁶, Brooks and Kat (2002)¹⁷, Lo (2001)¹⁸, Okunev and White (2002)¹⁹, Getmansky, Lo and Makarov (2003)²⁰, etc.) have highlighted the fact that hedge funds tend to invest in instruments that are fairly illiquid. Consequently, when there is no market price available, the

calculation of a fund's net asset value can pose a problem. The choice of the method for valuing illiquid positions then comes down to the hedge fund managers. They can therefore take advantage of this leeway to manipulate the prices so as to smooth the performance of their fund. If that is the case, the auto-correlation coefficient of the return series will be significant and the analysis will yet again be biased. The volatility of the fund performance will be underestimated (by up to 100% according to Okunev and White (2002)²¹). In the same way, the correlation coefficient of the performances of the fund and traditional assets, and the exposure to certain risk factors, will tend to be underestimated. Investors then overestimate the diversification potential and the level of performance that the fund provides. Lo (2001)²² therefore suggests the use of a significance test for the auto-correlation coefficients, the Ljung-Box test, to estimate the liquidity risk. When the latter is significant, it is necessary to correct the return series of the fund or the index before estimating its performance and risk. To this end, Geltner (1991²³, 1993²⁴) proposes a method that is widely used in the real estate sector, which allows the first order auto-correlation to be eliminated. Okunev and White (2002)²⁵ recently proposed a method that is more general, and much more sophisticated, which aims to correct the auto-correlation coefficients up to the n^{th} order.

An alternative solution involves no longer correcting the return series directly, but modifying

15 - Notably Watts, D. and Strogatz, S., June 1998, Collective dynamics of 'small-world' network, *Nature*, Vol. 393, n° 6, p.440-442, and Watts, D., 1999, *Small worlds: the dynamics of networks between order and randomness*, Princeton University Press.

16 - Asness, C., Krail, R. and Liew, J., 2000, Do Hedge Funds Hedge?, *Journal of Portfolio Management*, Fall 2001, Vol.28, N°1, p.6-19.

17 - Brooks and Kat (2002) – Opus Cit. 9

18 - Cf. Lo (2001) – Opus Cit. 7

19 - Okunev, J. and White, D., 2002, Smooth Returns and Hedge Fund Risk Factors, Working Paper.

20 - Getmansky, M., Lo, A. and Makarov, I., 2003, An Econometric Model of Serial Correlation and Illiquidity in Hedge Funds Returns, 2003, Working Paper 4288-03, MIT.

21 - Cf. Okunev and White (2002) – Opus Cit. 19

22 - Cf. Lo (2001) – Opus Cit. 7

23 - Geltner, D., 1991, Smoothing in Appraisal-Based Returns, *Journal of Real Estate Finance and Economics*, Vol.4, p.327-345.

24 - Geltner, D., 1993, Estimating Market Values from Appraised Values without Assuming an Efficient Market, *Journal of Real Estate Research*, Vol.8, p.325-345.

25 - Cf. Okunev and White (2002) – Opus Cit. 19

The specific characteristics of hedge fund performance

the measurement tool itself, as proposed, for example, by Asness et al. (2000)²⁶, Lo (2002)²⁷ or Getmansky et al. (2003)²⁸ with their extensions to the Sharpe ratio.

Non-linear exposures to risk factors

Most of the performance evaluation methods that are currently used are based on mono- or multi-factor linear models (cf. the CAPM, the Fama/French 3-factor model, the Carhart 4-factor model, APT, etc.). The effectiveness of these models depends, amongst other things, on the linearity of the relationships between the dependent variable and the explanatory variables. Unfortunately, three factors contribute to the non-linearity of the exposure of hedge fund performance to the various risk factors:

- First of all, most hedge funds use market timing or risk factor timing. The hedge funds take up a position in a given market or take a long position on a particular risk factor if they anticipate a rise for that factor, and unwind their positions or take a short position when they anticipate a fall. Their exposure is therefore sensitive to the evolution of the factors.
- In addition, hedge funds hold assets in their portfolio whose exposures to the different risk factors are not linear. This is the case for the derivative instruments that they hold for either leverage effect reasons or hedging purposes. As a result, their exposure to certain risk factors (market, volatility, raw materials,

interest rates, etc.) is non-linear.

- Finally, the remuneration system for hedge funds is made up of a fixed part (i.e. management fees) and a variable part (i.e. incentive fees). It is therefore an asymmetric form of remuneration because the variable part presents a profile that is similar to that of a call option on the fund performance (with the strike price being equal to the "hurdle rate" specified in the contract). Since the performances of hedge funds are published net of fees by the databases, this introduces, de facto, a non-linear component.

Since the exposures to the risk factors are not linear, it is important, in measuring the sensitivity of fund performance to the different risk factors identified, to analyse at the same time the unconditional and conditional correlations (cf. Amenc et al. (2003)²⁹). This will allow the diversification potential that the fund provides during normal and volatile market phases to be evaluated. Unfortunately, only 16% of the fund managers questioned include information of that kind in their reporting (cf. Edhec (2003)³⁰).

Numerous authors have explored the non-linearity of the exposure of hedge fund performance to risk factors and have underlined the problems that it leads to within the framework of multi-factor analysis (Fung and Hsieh (1997 & 2000)³¹, Edwards and Caglayan (2001)³², Lo (2001)³³, Dor and Jagannathan (2002)³⁴, Amin and Kat (2003)³⁵, Liang (2003)³⁶ and

26 - Cf. Asness et al. (2000) – Opus Cit. 16

27 - Lo, A., The Statistics of Sharpe Ratio, *Financial Analysts Journal*, Vol.58, Issue 4, p.36-50.

28 - Cf. Getmansky et al. (2003) – Opus Cit. 20

29 - Cf. Amenc et al. (2003) – Opus Cit. 1

30 - Cf. Edhec (2003) – Opus Cit. 2

31 - Cf. Fung and Hsieh (1997 & 2000) – Opus Cit. 6 & 10

32 - Edwards, F. and Caglayan, M., 2001, Hedge Fund and Commodity Fund Investment Styles in Bull and Bear Markets, *Journal of Portfolio Management*, Vol. 27, N°4, p. 97-108.

33 - Cf. Lo (2001) – Opus Cit. 7

34 - Dor, A. and Jagannathan, R., 2002, Understanding Mutual Fund and Hedge Fund Styles Using Return Based Style Analysis, Working Paper, NBER.

35 - Amin, G. and Kat, H., 2003, Hedge Fund Performance 1990 – 2000: Do the Money Machines Really Add Value?, *Journal of Financial and Quantitative Analysis*, Vol.38, N°2, June 2003.

36 - Liang, B., 2003, On the Performance of Alternative Investments: CTAs, Hedge Funds, and FoHF, Working Paper.

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Agarwal and Naik (2003)³⁷). They have come up with different suggestions for capturing the share of non-linearity, i.e. the strategy factor, of hedge fund returns. To this end, some propose introducing implicit factors (Fung and Hsieh (1997)³⁸) or option strategies (Agarwal and Naik (2003)³⁹); others suggest using hedge fund indices in order to adapt Sharpe's (1992)⁴⁰ style analysis to the alternative universe (cf. Agarwal (2000)⁴¹, Lhabitant (2001)⁴² and Dor and Jagannathan (2002)⁴³). Finally, there are those who suggest using models that are capable of taking the so-called "phase locking" phenomena into account (cf. Lo (2001)⁴⁴).

Extreme risks

Most traditional performance and risk measurement tools are based on a common assumption: that the return distribution function of the asset being evaluated is normal. In that case, the risk of an asset is only characterised by the second order moment of its return distribution function (i.e. the standard deviation or volatility). However, numerous studies have highlighted the significance of the third and fourth order moments of the hedge fund return distribution functions (respectively, the skewness and kurtosis coefficients). In view of the sensitivity of investors to the third and fourth order moments (cf. Scott and Horvath (1980)⁴⁵), hedge fund performance cannot be analysed within a

mean/variance framework. Based on that observation, tools such as the Sharpe ratio or the VaR (unless the VaR is calculated on the basis of historical data or with Monte Carlo simulations based on non-normal distributions) only partially integrate the risk to which investors are exposed. However, as the Edhec study (2003)⁴⁶ shows, most European multimangers only use those kinds of indicators in their reporting. The Bera Jarque test (1987)⁴⁷ allows for an evaluation of the extent to which the distribution function observed is removed from a normal distribution. It therefore indirectly evaluates the investors' risk of being wrong when they use a traditional performance measurement tool in their investment management process. To make up for that, it is essential to integrate the third and fourth order moments of the distribution function in the risk analysis. That is the case for certain performance and/or risk indicators such as the Cornish-Fisher VaR, the Sharpe-Omega ratio (cf. Kazemi et al. (2003)⁴⁸), Keating and Shadwick's Omega (2002)⁴⁹ or the ASRAP presented in the present document. Unfortunately, the study carried out by Edhec shows that only 4% of multimangers give any importance to the Omega (and only 2% to the BVaR) when they select a fund.

37 - Agarwal, V., Naik, N., 2003, Risks and Portfolio Decisions Involving Hedge Funds, Review of Financial Studies, Forthcoming.

38 - Cf. Fung and Hsieh (1997) - Opus Cit. 6

39 - Cf. Agarwal and Naik (2003) - Opus Cit. 37

40 - Sharpe, W., 1992, Asset Allocation: Management Style and Performance Measurement, Journal of Portfolio Management, Winter 1992, Vol. 18, p.7-19.

41 - Agarwal, V., 2000, Generalized Style Analysis of Hedge-funds, Journal of Asset Management, July 2000, Vol.1, N°1, p.93-109.

42 - Lhabitant, F.S., 2001, Assessing Market Risk for Hedge Funds and Hedge Funds Portfolios, Journal of Risk Finance, Spring 2001, p.1-17.

43 - Dor and Jagannathan (2002) - Opus Cit. 34

44 - Cf. Lo (2001) - Opus Cit. 7

45 - Scott, R. and Horvath, P.A., 1980, On the Direction of Preference for Moments of Higher Orders than the Variance, Journal of Finance, Sept80, Vol.35, Issue, p.915-919

46 - Cf. Edhec (2003) - Opus Cit. 2

47 - Bera, A.K. and Jarque, C.M., 1981, An Efficient Large Sample Test for Normality of Observations and Regression Residuals, Australian National University, Working Papers in Econometrics 40, Canberra.

48 - Kazemi, H., Schneweis, T. and Gupta, R., 2003, Omega as a Performance Measure, Working Paper, CISDM.

49 - Keating, C. and Shadwick, W., 2002, A Universal Performance Measure, Journal of Performance Measurement, Spring 2002, Vol.6, N°3, p.59-84.

The specific characteristics of hedge fund performance

Dynamic exposures to risk factors

Hedge funds invest in a wide variety of instruments. They are therefore exposed to different risk factors (market, volatility, liquidity, credit, etc.). If we consider that for each alternative strategy there is a corresponding set of underlying risk factors, the best funds, for a given strategy, are those that successfully manage to over- or underweight their exposure to the different risk factors in accordance with market conditions. As a result of this tactical factor allocation strategy, the hedge funds' exposure to the risk factors evolves over time. In addition, since the markets are relatively efficient, there is not an infinite number of arbitrage opportunities. To maintain their performance, therefore, some hedge funds tend to grab opportunities that arise, even if this makes them deviate from the strategy that they claim to follow. This occasional change in style, which is called "style drift" (cf. Lhabitant (2001)⁵⁰) by investors, also leads to a variation in the exposures to the risk factors. As a result, the exposure of hedge funds to risk factors is doubly dynamic (cf. Brealey and Kaplanis (2001)⁵¹ and Lo (2001)⁵²).

The standard multi-factor models do not allow the dynamics of the exposures to risk factors to be taken into account, because the stability of the coefficients is one of the central assumptions of these models. They restrict themselves to measuring the average exposure to the different risk factors during the analysis period. This naturally distorts the evaluation of the risk-adjusted performance of hedge funds. A natural solution is to divide the return series being analysed into various sub-periods and to use the factor model on those different sub-samples to study the dynamics of the exposures to the risk factors. The paradox with this method is that it seeks to capture dynamics with a model that includes an assumption on the stability of the coefficients. A more elegant solution is to use models that allow the coefficients of the model to vary over time. The use of conditional beta evaluation models that aim to resolve this problem is currently being examined in numerous research studies (cf. Kat and Miffre (2002)⁵³, Schneeweis and Kazemi (2003)⁵⁴, Gupta et al. (2003)⁵⁵ and Gregoriou (2003)⁵⁶).

50 - Cf. Lhabitant (2001) – Opus Cit. 42

51 - Brealey, R., Kaplanis, E., 2001, Hedge Funds and Financial Stability: An Analysis of their Factor Exposures, *International Finance*, Vol. 4, N°2, 2001, p.161-187.

52 - Cf. Lo (2001) – Opus Cit. 7

53 - Kat, H., and Miffre, J., 2002, Performance Evaluation and Conditioning Information: The Case of Hedge Funds, Working Paper, The Alternative Investment Research Centre.

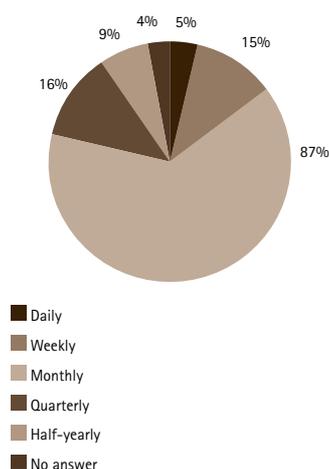
54 - Kazemi, H. and Schneeweis, T., 2003, Conditional Performance of Hedge Funds, Working Paper, CISDM.

55 - Gupta, B., Cerrahoglu, B. and Daglioglu, A., 2003, Hedge Fund Strategy Performance: Using Conditional Approaches, *Journal of Alternative Investments*, Forthcoming.

56 - Gregoriou, G., 2003, Performance Evaluation of Funds of Hedge Funds Using Conditional Alphas and Betas, *Derivatives Use, Trading & Regulation*, Vol.8, N°4, p.324-344.

Edhec recommendations for fund of hedge fund reporting

Graph 4
How frequently is reporting carried out?



Source: Edhec European Alternative Multimanagerment Practices Survey, 2003

The lack of transparency of hedge funds is widely regarded as the last major obstacle to the industrialisation of alternative investment. In that respect, the following questions come up again and again: what should the granularity of hedge funds' reporting be? What publication frequency is appropriate? These questions are certainly relevant, but the debate on the transparency of hedge funds often fails to emphasise the right issue. One has to bear in mind that transparency is not an objective per se, it is simply a means. The aim is to reach a level of information that is sufficient to allow investors to feel comfortable when investing in a hedge fund. It does not involve wondering about the metaphysics of transparency but is simply a response to a practical problem: "What is the minimum level of information that investors require in order to evaluate the risk-adjusted performance of hedge funds?" If we can answer this question, we will know whether a compromise between the constraints of hedge funds and the requirements of investors can be envisaged.

The frequency of publication

The frequency of publication generally depends on the portfolio turnover and the difficulties in pricing the positions held. With regard to FoHFs, monthly periodicity seems technically possible and commercially acceptable, as is confirmed by 87% of the multimanagerment who participated in the Edhec survey (2003)⁵⁷. While high turnover trading strategies such as CTAs' discretionary active strategies can value their positions on a daily basis, the same is not true of medium/long-term strategies like distressed debt, which hold less liquid assets. Therefore

monthly periodicity for reporting may be a good trade-off. In its June 2002 report on the minimal transparency requirements for FoHF, the IRC specifies the data that it is appropriate to publish on a monthly basis. The data that could or should be included in a monthly report is enumerated below and the data that has been given a special mention by the IRC is indicated. (See graph 4)

The granularity of the monthly activity report

The data that is generally disclosed by hedge funds does not allow investors to manage the risks to which they are exposed. All investors, especially institutional investors, therefore agree that greater transparency is necessary. However, one question remains to be answered: can hedge funds provide investors with a sufficient level of information without putting themselves in danger? To answer that, it is necessary to know the minimal level of information required by institutional investors to implement risk control tools. Investors must be able to assess the level of risk and performance of the fund at time t , but also follow its evolution through time and under varying market conditions. For that purpose, do investors need full disclosure of the hedge fund's positions (portfolio-based approach) or can they make do with data aggregated by strategy, by asset class or by sector (return-based approach)?

As far as the disclosure of individual fund positions is concerned, the opinions are fairly clear-cut because the members of the IRC all agree that they can only be revealed when the

57 - Cf. Edhec (2003) – Opus Cit. 2

Edhec recommendations for fund of hedge fund reporting

positions are no longer held. Besides, they add that any information for which disclosure could potentially have a negative impact on the fund does not have to be revealed by the manager, even to the investors who receive the reports. Indeed, full disclosure would appear to be the ultimate inefficient solution since most investors would not have enough time to process a large amount of information and, at the same time, the costs implied by such reports would significantly reduce the funds' performance.

On the other hand, there is no argument that could justify the non-disclosure of the FoHF allocation (weights by type of strategy and by hedge fund with a full weighting history from the start). The IRC working group on FoHFs specifies that information of that kind should be communicated to investors every month.

On the subject of risk and return indicators, the IRC also suggests completing the aggregate results obtained at the FoHF level through an analytical presentation:

- at the strategy type (relative value, event driven, etc.) and/or sub-strategy level (market neutral, fixed-income arbitrage, convertible arbitrage, deal arbitrage, distressed, long/short equity hedged/non-hedged, etc.);
- at the asset group level (sector, country, currency, management style, etc.) or by any combination of analysis criteria that is relevant with regard to the FoHF's sources of return.

Risk and return indicators

The indicators that we shall now present will complete the basic information that is usually communicated by the FoHF each time a report is published, whatever its frequency (net asset value per share*, net assets* (allows redemption/subscription flows, which are rarely disclosed outside of the annual report, to be monitored) and strategic allocation (weight of each strategy and each fund relative to the FoHF's net assets)).

*N.B. - *As far as the problems posed by the pricing of positions are concerned, FoHFs have to make sure that the pricing rules defined by each single hedge fund in which they invest are compliant with the SEC's recommendations (see guidance on fair value pricing for funds) and that they are applied correctly. In that respect, procedures aimed at checking that pricing rules are actually applied should be mentioned in a special section of the client report.*

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Risk and return analysis

N.B. Exponent^M mentioned with some indicators means that the IRC considers the data to be indispensable and the minimal publication frequency of the data should be monthly.

Traditional performance measurement tools	<ul style="list-style-type: none"> - history of FoHF's monthly returns (net of fees^{**})^M, - history of monthly returns (net of fees^{**}) for each strategy and each fund in which the FoHF invests^M, - FoHF's annualised return (net of fees^{**})^M, - annualised return (net of fees^{**}) for each strategy and each fund in which the FoHF invests^M, - FoHF's year-to-date return (net of fees^{**})^M, - year-to-date return for each strategy and each fund in which the FoHF invests^M, - FoHF's cumulative return since inception (net of fees^{**}) compared with a composite index of hedge funds, traditional equity and bond indices and the risk-free rate, - analysis of the contribution of each strategy and each fund to the FoHF's return^M, - performance attribution (analysis of excess return with a composite index: asset allocation, fund picking).
Basic extreme risk measure	<ul style="list-style-type: none"> - minimum/maximum returns for the period, maximum drawdown (peak to valley) and uninterrupted loss since the FOHF was launched with both time to recovery and drawdown time.
Analysis of the (non) linearity of returns	<ul style="list-style-type: none"> - percentage of positive/negative months, - up months in up market, - down months in down market, - outperformance in up market, - outperformance in down market.
Analysis of the distribution function of the returns	<ul style="list-style-type: none"> - analysis of the distribution of returns for the period: Bera Jarque test for the assumption of normality to be tested, then: <ul style="list-style-type: none"> • calculation of the annualised standard deviation and the semi-variance or downside risk to account for asymmetrical distributions^M, • calculation of the skewness to measure the asymmetry of the distribution^M, • and calculation of the kurtosis to verify the fatness of the distribution tails^M.
Analysis of the interaction between leverage and both credit and liquidity risks	<ul style="list-style-type: none"> - gross and net leverage analysed at the FoHF level (with breakdown by sector, management style, country, currency, etc.), and also by strategy and by hedge fund held, simply because an apparently low risk at the portfolio level may mask an unreasonable long or short bet on one or more strategies or asset groups^M, - calculation of the effective duration and spread duration (credit risk) for interest rate products^M,

Edhec recommendations for fund of hedge fund reporting

- | | |
|--------------------------|--|
| Analysis of extreme risk | <ul style="list-style-type: none"> - liquidity risk evidenced by the auto-correlation coefficient, for which the degree of significance is measured by the Ljung-Box⁵⁸ statistical test, - evaluation of the liquidity risk through the Herfindahl index (cf. Getmansky et al. (2003)⁵⁹), - liquidity ratio (cash/equity or cash+borrowing capacity, VaR/equity or cash+borrowing capacity, worst historical drawdown/equity or cash+borrowing capacity, scenario derived market risk measure/equity or cash+borrowing capacity)^M. |
| | <ul style="list-style-type: none"> - stress test^M to assess the impact on the FoHF's NAV of a sudden and sharp change in market prices (requires the application of identical stress scenarios to each hedge fund held), - calculation of Style-VaR^M (Lhabitant – Opus cit. 22), which provides a relevant measure of the risks of extreme losses. This method is also particularly useful within the framework of a FoHF because it allows the investment style of a fund to be clearly determined, dynamically and over time, irrespective of what the manager claims⁶⁰, - calculation of Cornish-Fisher VaR, together with Incremental and Component Cornish-Fisher VaR, to assess the contribution of each strategy or asset group to the portfolio's extreme risk, - calculation of BVaR to estimate the mean value of the losses that exceed the VaR. |

*NB. - **Disclosure of gross and net FoHF returns should also be an opportunity to clarify the arrangements for applying incentive fees (the notion of equalisation). Experience shows that, due to the number of equalisation methods and their complexity, few investors genuinely understand how this mechanism works, even though it is implemented by 75% of the funds administered in Europe with the aim of ensuring that performance commissions are spread equitably between all the investors.*

Risk-adjusted return analysis

The following performance indicators should be calculated both at the FoHF level and for each type of strategy and fund in which the FoHF invests:

- Sortino ratio: more relevant than the Sharpe ratio when the return distribution is skewed, particularly when it is left-skewed. Even though it is defined from the same principles, except that the risk-free rate is replaced

by the minimum acceptable return (MAR) targeted by the FoHF and the denominator is the standard deviation of the returns that are below that return, the Sortino ratio takes skewed distributions into account^M.

- the Omega: this indicator was proposed recently by Keating and Shadwick (2002)⁶¹. It allows all the moments of the return distribution function of the asset being evaluated to be taken into account in a very simple way.

58 - Ljung, G.M. and Box, G.E.P., 1978, On a Measure of Lack of Fit in Time Series Models, *Biometrika*, Vol. 65, N°2, p.297-303

59 - Cf. Getmansky et al. (2003) – Opus Cit. 20

60 - An improvement to the calculation proposed by F.-S. Lhabitant would be a two-stage process (style analysis, extreme risk analysis) which, in the 2nd stage, allows for the removal of the portfolio constraints and recovery of the independent nature of the residuals, which are essential for the reliability of the analysis.

61 - Cf. Keating and Shadwick (2002) – Opus Cit. 49

Edhec recommendations for fund of hedge fund reporting

New Indicators

- Sharpe – Omega ratio: this indicator was proposed recently by Kazemi et al. (2003)⁶². It is an extension to the Sharpe ratio and Keating and Shadwick's Omega (2002)⁶³. It presents the advantage of taking all the moments of the return distribution function into account and providing an intuitive measure of the risk-adjusted performance of a fund.
- Alternative-Style-Risk Adjusted Performance (ASRAP): this performance measure is an adaptation of the SRAP to performance measurement in the alternative universe. The risk is no longer adjusted by the volatility but by the Cornish-Fisher extension to the VaR.

Note that it is advisable for all of these indicators to correct the return series first for the auto-correlation problems mentioned above. Please see below for more details on the method used.

- Calmar and Sterling Ratios: the original feature of these two risk-adjusted performance indicators is to use the maximum drawdown to define the risk dimension. The Calmar ratio is equal to the fund's return divided by its maximum drawdown while the Sterling ratio is equal to the fund's return divided by 10% plus the average drawdown (generally calculated over the last three years).

Beta and correlation analysis

Since the exposure of hedge funds to the different risk factors is dynamic and, in certain cases, non-linear, it is essential to carry out the following analyses, both at the FoHF level and for each type of strategy and each type of fund in which the FoHF invests:

- static and dynamic style analysis, notably using pure style indices (cf. the Edhec alternative indices⁶⁴). This analysis presents the par-

ticular advantage of highlighting any eventual style drift;

- analysis of correlations and conditional / unconditional betas with traditional equity and bond indices^M,

- analysis of correlations and conditional / unconditional betas with risk factors that are appropriate for the strategy of the fund or FoHF;

- dynamic factor analysis to track the evolution of the exposure to the risk factors selected for the strategy followed.

This analysis gives investors a better understanding of the risks to which they are exposed, which in turn gives them a more accurate measurement of the risk-adjusted performance of the fund and the genuine diversification potential that it offers.

For more demanding investors, one can attempt to enhance reports by attempting to assess the alpha generated by the FoHF through multi-factor/multi-index models (peer groups [cluster], implementation of

62 - Kazemi et al. (2003) – Opus Cit. 48

63 - Cf. Keating et Shadwick (2002) – Opus Cit. 49

64 - The Edhec indices are composite portfolios of competing indices that provide good representativity and minimise the problems of purity. A detailed presentation of the construction method for the Edhec indices, together with their performance history, can be downloaded from www.edhec-risk.com.

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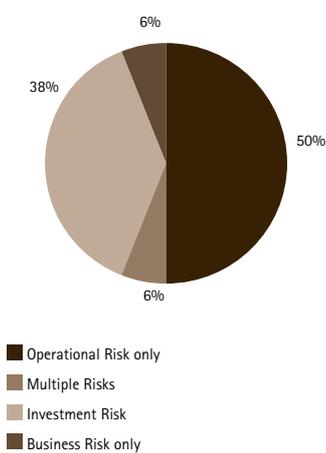
implicit and explicit multi-factor methods, Amenc-Curtis-Martellini's implicit/explicit multi-index model).

All the above-mentioned indicators provide exhaustive information in the area of applied quantitative analysis and enable the FoHF to build quality reports for final investors. In line with the expectations of the IRC, such reports measure the risks of a FoHF and check on their evolution without the need for details on the positions. Nonetheless, as relevant as it might or might not be, the client report alone does not suffice. It should never replace the classic due diligence process (questionnaires, on-site visits, discussions with the manager, etc.). Thorough knowledge of the fund is essential to make up for any eventual weaknesses in the quantitative analysis (no tool, for example, allows the impact of off-balance sheet operations to be measured. These operations are not taken into account at all by 27% of the respondents to the Edhec survey (2003)⁶⁵). According to a study by Capco (2003)⁶⁶, 50% of hedge

fund failures are due to operational risk, rather than financial risk. However, operational risk is not integrated by the various indicators mentioned above. It requires an in-depth qualitative analysis which complements the quantitative analysis that appears in the client report. As such, due diligence presents the advantage of giving investors a more qualitative side of the risk, which allows them to assess the short-term evolution of the risk more accurately. The strategic importance of these audits is justification for the fact that only 20% of European multimangers outsource the activity (cf. Edhec (2003)⁶⁷). (See graph 5)

We note that it would be interesting to draw up quality standards that would be comparable to the ISO 9000 standards used in the industry. This would allow for certification of the quality of the investment management process and risk control implemented by a fund, which would considerably reduce the operational risks. Institutional investors could thus invest unreservedly in alternative investments.

Graph 5
Analysis of Hedge Fund Failures



Source: Capco Research and Working Paper, "Understanding and Mitigating Operational Risk in Hedge Fund Investments", 2003

65 - Cf. Edhec (2003) – Opus Cit. 2

66- Capco, Understanding and Mitigating Operational Risk in Hedge Fund Investments, 2003

67 - Cf. Edhec (2003) – Opus Cit. 2

Presentation of the principal indicators

Analysis of the distribution function

The analysis of the distribution function should never be limited to the first order (mean) and second order (standard deviation) moments. As we mentioned previously, hedge fund returns are not normally distributed. It is therefore essential to analyse the third order (skewness) and fourth order (kurtosis) moments.

Skewness

The skewness indicator measures the return distribution function's asymmetry coefficient. For an exhaustive series of N returns, the skewness is equal to:

$$S = \sum_i \frac{(r_i - \bar{r})^3}{N \cdot \sigma^3}$$

where r_i corresponds to the i^{th} return of the observed series of N returns, \bar{r} is the mean of the returns, and σ the standard deviation.

Applied to a normal distribution, the skewness would be equal to 0.

Kurtosis

The kurtosis allows the fatness of the distribution tails to be assessed. A high level of kurtosis therefore means that there are extreme returns (outliers).

The kurtosis is calculated as follows:

$$K = \sum_i \frac{(r_i - \bar{r})^4}{N \cdot \sigma^4}$$

with r_i the i^{th} of the observed series of N returns, \bar{r} the mean of the returns, and σ the standard deviation.

Applied to a normal distribution, the kurtosis would

be equal to 3. That is why we more commonly use the excess kurtosis, i.e. the differential obtained compared to a normal distribution, or:

$$\sum_i \frac{(r_i - \bar{r})^4}{N \cdot \sigma^4} - 3$$

The Bera Jarque test

This indicator tests the normality of a distribution function. It presents the advantage of simultaneously analysing the third and fourth order moments of the distribution function.

$$BJ = N \left[\frac{S^2}{6} + \frac{(K - 3)^2}{24} \right]$$

where N is the number of observations. Under the assumption of normality, the BJ statistic follows a Chi-squared distribution with 2 degrees of freedom.

Analysis of the auto-correlation coefficients

The Ljung-Box test

Given that hedge funds take positions on assets that are sometimes illiquid, their returns are liable to be auto-correlated. In that case, it becomes difficult to measure the real exposure of hedge funds to the different risk factors (market, volatility, credit, etc.). The Ljung-Box test (1978)⁶⁸ can be used to assess the level of auto-correlation:

$$Q = N(N + 2) \sum_{k=1}^m \frac{\theta_k^2}{N - k}$$

where N is the number of observations and θ_k the k^{th} order auto-correlation coefficient. Under the assumption that the auto-correlation coefficients of order 1 to m are null, the Q statistic follows a Chi-squared distribution with m degrees of freedom.

68 - Cf. Ljung and Box (1978) - Opus Cit. 58

Presentation of the principal indicators

The Herfindahl index

Taking the following system:

$$\left\{ \begin{array}{l} R_t^0 = \sum_{i=0}^k \theta_i R_{t-i} , \\ \theta_j \in [0,1], j = 0, \dots, k , \\ I = \sum_{i=0}^k \theta_i . \end{array} \right.$$

where R_t^0 is the observed return of an asset, R_t the real return of this fund and θ_i the auto-correlation coefficient of order i .

The auto-correlation coefficient of order m is written as follows:

$$\text{Corr} [R_t^0, R_{t-m}^0] = \begin{cases} \frac{\sum_{j=0}^{k-m} \theta_j \theta_{j+m}}{\sum_{j=0}^k \theta_j^2} & \text{if } 0 \leq m \leq k \\ 0 & \text{if } m > k \end{cases}$$

with $\text{Herfindahl Index} = \sum_{j=0}^k \theta_j^2$

The Herfindahl index is between 0 and 1. When it tends towards 1, the auto-correlation (i.e. the liquidity risk) is low. The auto-correlation is maximal when it tends towards 0.

Method for correcting auto-correlation coefficients

Numerous methodologies have been proposed to solve the problem of the auto-correlation of the return series of certain assets: Blundell and Ward (1987)⁶⁹, Ross and Zisler (1991)⁷⁰,

Geltner (1991 & 1993)⁷¹, Barkham and Geltner (1994)⁷², Fisher et al. (1994)⁷³, Brown and Matysiak (1998)⁷⁴, Cho et al. (2001)⁷⁵ and Okunev and White (2002)⁷⁶.

In their analysis, Okunev and White (2002)⁷⁷ show that only the first order auto-correlation coefficients are systematically significant in the case of alternative strategies (the second order coefficients are only significant for some of the indices that represent the convertible arbitrage and fixed-income arbitrage strategies). For simplicity purposes, we therefore suggest correcting the first order auto-correlation only, using the Geltner method (1991)⁷⁸. To do so, we simply consider that the return observed at time t is equal to a linear combination of the real return recorded at t and the return observed at $t-1$. It is thus easy to calculate the real series of returns, because we have:

$$R_t = \frac{R_t^* - \alpha R_{t-1}^*}{1 - \alpha}$$

where R_t^* is the return observed at t , R_t the return that was really recorded at t , R_{t-1}^* the return observed at $(t-1)$ and α the first order auto-correlation

We note that the evaluation of the risk-adjusted performance of an asset for which the return series is auto-correlated is liable to be strongly biased. The same goes for the evaluation of the exposures to the various risk factors. We therefore suggest applying the Geltner method (1991)⁷⁹ presented above before calculating the different performance and risk indicators presented in this document.

69 - Blundell, D. and Ward, C.W.R., 1987, Property Portfolio Allocation: A Multi Factor Model, Journal of Development Studies, N°4, p.145-156.

70 - Ross, S.A. and Zisler, R., 1991, Risk and Return in Real Estate, Journal of Real Estate Finance and Economics, Vol.4, N°2, p.175-190.

71 - Cf. Geltner (1991 & 1993) - Opus Cit. 23 & 24

72 - Barkham, R. and Geltner, D., 1994, Unsmoothing British Valuation Based Returns without Assuming an Efficient Market, Journal of Property Research, N°11, p.81-95.

73 - Fisher, J.D., Geltner, D.M. and Webb R.B., 1994, Value Indices of Commercial Real Estate: A Comparison of Index Construction Methods, Journal of Real Estate Finance and Economics, N°9, p.137-164.

74 - Brown, G.R. and Matysiak G.A., 1998, Valuation Smoothing without Temporal Aggregation, Journal of Property Research, N°15, p.89-103.

75 - Cho, H., Kawaguchi, Y. and Shilling J.D., 2001, Unsmoothing Commercial Property Returns: A Revision to Fisher Geltner Webb's Unsmoothing Methodology, Working Paper.

76 - Cf. Okunev and White (2002) - Opus Cit. 19

77 - Cf. Okunev and White (2002) - Opus Cit. 19

78 - Cf. Geltner (1991) - Opus Cit. 23

79 - Cf. Geltner (1991) - Opus Cit. 23

Presentation of the principal indicators

The Omega

Since hedge fund returns are not normally distributed, it is not appropriate to evaluate their performance within a mean-variance framework. The investor requires a performance measurement tool that takes the first to fourth order moments of the distribution function into account. The Omega is therefore perfectly suitable for evaluating the performance of hedge funds because it considers the whole distribution function of the asset that is being evaluated. The main weakness of the Omega is its sensitivity to the size of the sample because at least 40-50 observations are necessary to obtain relatively stable results.

$$\Omega(MAR) = \frac{\int_a^b [1 - F(x)] dx}{\int_a^b [F(x)] dx}$$

where x is a random variable and F is the cumulative return distribution function of the asset that is being evaluated. The constants a and b respectively represent the lower and upper boundaries of the distribution function. MAR corresponds to the minimal acceptable return.

We note that the choice of the MAR has particular importance in the calculation of the Omega, because as Keating and Shadwick (2002)⁸⁰ stress, the classification of an asset depends on this choice. Unfortunately there is no absolute rule in this area. One thing is certain: the choice of the MAR has to be consistent with the investors' preferences.

The latter invest in FoHF for two reasons: to improve their portfolio diversification (i.e. exposure to various risk factors) and to limit the risk of loss by taking advantage of the

manager's skill in selecting the right funds (i.e. preservation of capital). As a result, the MAR can be set to the level of the risk-free rate.

In view of the lock-up periods imposed by hedge funds and FoHF, investors are forced to take their decisions in a multi-period framework. Consequently, since they cannot redeem their money whenever they want, they must be sure that the current success of a fund is not obtained at the expense of its future performance. The success of a fund greatly depends on its capacity to attract talented managers. Given that managers' remuneration primarily depends on incentive fees, all the returns below the hurdle rate (i.e. the point above which funds are entitled to incentive fees) tend to increase the probability that the best managers will quit (i.e. diminishes the fund's future profit potential). It can therefore be useful to account for the hurdle rate and the high watermark provisions when setting the MAR. We suggest integrating them into the computation of the MAR as follows⁸¹:

$$MAR_t = \max(0; CMGR) * \delta + \text{Hurdle Rate}$$

where

$$CMGR = 12 \sqrt[\text{Inception Date} \leq t]{\frac{\max(NAV_i - NAV_t)}{NAV_t}} - 1$$

where t corresponds to the month in which the MAR is computed, d is a dummy variable equal to 0 when the remuneration clause in the fund contract does not include a high watermark provision and 1 otherwise. $\text{Max } NAV_t$ is the highest historical level of the NAV that served as a reference for calculating the incentive fees. $CMGR$ (Compounded Monthly Growth Rate) is the actuarial growth rate enabling $\text{Max } NAV_t$ to be reached between the MAR calculation date (i.e. t) and the year end (i.e. 12). "Hurdle Rate" is the threshold above which the hedge fund is entitled to incentive fees.

Nonetheless, in order for each investor to be able to compare, for a level of MAR that corresponds to their own objectives, the Omega ratio

80 - Cf. Keating and Shadwick (2002) – Opus Cit. 49

81 - We assume that the incentive fees are calculated at the end of the year (i.e. once a year).

Presentation of the principal indicators

of the FoHF with that of the reference indices (for example, an equity index, a fixed-income index and a portfolio corresponding to the investor's strategic allocation), we suggest that the Omega function (i.e. the evolution of the Omega ratio according to the level of the MAR) be included in the FoHF's monthly activity report⁸². It would then be up to each investor to identify the weight that corresponds to their risk profile on the curve. It might also be interesting to highlight the point that corresponds to the value of the ratio that is calculated by default, i.e. with a MAR obtained according to the method presented above.

From the Sharpe ratio to the Sharpe-Omega ratio

The Sharpe ratio

The Sharpe ratio intuitively measures the risk-adjusted performance of an asset. It involves measuring the excess return – or risk premium – of a portfolio in relation to the risk-free rate, compared to the total risk of the portfolio measured by its standard deviation.

$$S_p = \frac{E(R_p) - R_f}{\sigma(R_p)}$$

where $E(R_p)$ denotes the portfolio's expected return
 R_f denotes the return of the risk-free asset
 $\sigma(R_p)$ denotes the standard deviation of the portfolio's returns

The main weakness of the Sharpe ratio is that it takes the volatility as a measure of risk. Since the hedge funds' return distribution function is asymmetrical, it is essential to take the loss aversion of investors into account.

The Sortino ratio

As a response to this criticism, Sortino proposed his own ratio. It is defined like the Sharpe ratio, but also allows the asymmetry of the return distribution to be taken into account by calling on the semi-variance. It measures the excess return of a portfolio in relation to a level of minimal acceptable return (MAR), compared to the risk that is situated below the MAR only:

$$Sortino = \frac{E(R_p) - MAR}{SV}$$

$$SV = \frac{E(R_p) - MAR}{\sqrt{\frac{1}{T} \sum_{t=0}^T (R_{Pt} - MAR)^2}}$$

with $R_{Pt} < MAR$ (MAR = monthly average minimal acceptable return), $t = 1$ to T (T being the total number of months for which the monthly return is situated below the MAR).

The Sortino ratio is perfectly suited to an asymmetrical return distribution because, contrary to the measures that are based on the standard deviation, the use of the semi-variance avoids one having to make an assumption on the shape of the return distribution function. Having said that, the measurement of the downside risk (or the risk situated below the MAR) is not problem-free. The main source of error relates to the estimation of what Sortino calls the location point. Given that the MAR is determined in relation to this point, if the location point is underestimated, then we underestimate the downside risk and if the location point is overestimated, we overestimate the downside risk. The ratio is then

82 - On this topic, we thank Con Keating for his astute advice and remarks.

Presentation of the principal indicators

biased and does not allow the performance of the portfolio to be measured efficiently. For that reason, we suggest, like for the Omega ratio, the inclusion of the evolution of the Sortino ratio according to the level of the MAR. Moreover, we note that the practical application of this ratio requires the portfolio's return distribution function to be determined. It is thus necessary to turn to the historical data, which can be biased if it is reported wrongly.

The Sharpe – Omega ratio

This ratio, which preserves the simplicity of the Sharpe ratio and takes all the moments of the distribution function into account, was proposed recently by Kazemi et al. (2003)⁸³. The advantage of this indicator is that it provides the investor with the same information as the Omega indicator while preserving the spirit of the Sharpe ratio, hence the name, the Sharpe – Omega ratio:

$$\text{Sharpe – Omega} = \frac{E(R_p) - MAR}{P(MAR)}$$

where $P(MAR)$ represents the price of a European put option on the asset evaluated, with a maturity of 1 month and a strike price equal to the MAR.

We note that this means that the option pricing method takes the fatness of the distribution tails of the hedge funds' return distribution function into consideration. The Black & Scholes method cannot therefore be applied.

From M^2 to Alternative Style Risk Adjusted Performance (ASRAP)

M^2 (cf. Modigliani and Modigliani (1997)⁸⁴) is an indicator that allows the performance of all funds

to be measured in relation to the market portfolio. An extension to this indicator, the Style Risk Adjusted Performance, was proposed by Lobosco (1999)⁸⁵ to take the impact of the management style of the asset being evaluated into account.

In M^2 and the SRAP, the level of risk is fitted with the volatility. However, as we have stressed on several occasions, hedge fund risk is not limited to the second order moment of their return distribution function; it is imperative to take the extreme risks into account (i.e. third and fourth order moments of the return distribution function).

To integrate the higher order moments, one solution is to take the Cornish-Fisher VaR (see below for a definition of the Cornish-Fisher VaR) as a risk indicator. We obtain the following indicator:

$$ARAP = \frac{VaR_{\text{CornishFisher}}(I_{\text{FoHF}})}{VaR_{\text{CornishFisher}}(HF)} (R_{\text{HF}} - R_f) + R_f$$

where I_{FoHF} is a FoHF index and HF the hedge fund being analysed. As Fung and Hsieh (2002)⁸⁶ suggest, the FoHF index offers the best possible approximation of the hedge fund universe. R_{HF} and R_f are respectively the mean return of the hedge fund and the risk-free rate. $VaR_{\text{Cornish-Fisher}}(HF)$ and $VaR_{\text{Cornish-Fisher}}(I_{\text{FoHF}})$ are respectively the VaR calculated according to the Cornish-Fisher extension of the fund being analysed and the FoHF index.

The ARAP thereby allows two funds that follow the same strategy to be compared. If the two funds follow different strategies, one simply adapts the SRAP as follows:

$$ASRAP = ARAP(\text{fund}) - ARAP(\text{style index}).$$

The Alternative Style Risk Adjusted Performance or ASRAP thus allows the RAP and the SRAP to be adapted to performance measurement in the alternative universe.

83 - Kazemi et al. (2003) – Opus Cit. 48

84 - Modigliani, F. and Modigliani, L., 1997, Risk Adjusted Performance, Journal of Portfolio Management, Winter 1997, Vol.23, Issue 2, p.45-54.

85 - Lobosco, A., 1999, Style Risk Adjusted Performance, Journal of Portfolio Management, Vol.25, N°3, Spring 1999, p.65-68.

86 - Cf. Fung and Hsieh (2002) – Opus Cit. 11

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From Maximum Drawdown to the Style VaR

Maximum drawdown

Since hedge fund returns are not normally distributed, it is important to measure the extreme risks. The simplest measure involves calculating the maximal loss recorded by the fund during the period of analysis or the maximum drawdown, i.e. the biggest loss recorded in comparison with the highest level reached by the fund during the period.

$$\text{Maximum Drawdown} = \min_{0 \leq t \leq T} \left[\frac{NAV_t}{\max_{0 \leq i \leq t} (NAV_i)} - 1 \right]$$

It is also interesting to calculate the maximum uninterrupted loss, i.e. the maximal consecutive loss recorded by the fund.

$$\text{Maximum Uninterrupted Loss} = \min_{1 \leq i \leq n} \prod_{t=1}^i (1 + \min(0; r_t)) - 1$$

with i the date on which the analysis is carried out and r_t the monthly returns of the fund observed at date t .

This measure is generally accompanied by the number of months for which the loss was realised and the number of months required to compensate for the loss.

Value-at-Risk (VaR)

These indicators do not, however, allow the "average" extreme risks of a fund to be characterised. In order to measure the extreme risks more accurately, it is essential to use instruments such as the VaR.

Within the Gaussian framework, the VaR can be calculated explicitly by using the following formula:

$$P(dW \leq -VaR) = 1 - \alpha$$

$$VaR = n\sigma W dt^{0.5}$$

where n = number of standard deviations at $(1-\alpha)$
 σ = standard deviation
 W = present value of the portfolio
 dt = year fraction
 dW = variation in the value of the portfolio

The limitations of the VaR and the measures required to adapt it to alternative investment have been largely commented upon in the literature⁸⁷:

The VaR measures potential losses that arise habitually or regularly; it does not mention the consequences of exceptional events;

Taking exceptional events into account exacerbates the problem of statistical estimation. In the case of a VaR that is calculated from the distribution of past returns, it is necessary to have a very large amount of data to obtain a significant sample of "historical" VaR events. This problem, which already exists in the traditional universe, is exacerbated in the alternative universe because of the frequency of the data, which is often monthly;

The so-called "parametric" approach involves explicitly assuming that the returns are normally distributed (or distributed according to a given law) in order to calculate the VaR. As such, it is not appropriate for the alternative universe.

One solution to the criticism addressed at the parametric and historical VaR has been proposed, with the VaR based on simulations

87 - We could notably cite Chung (2000)

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using the Monte-Carlo method. This VaR itself has been subject to criticism, both because of the considerable size of the simulations implemented, and therefore the amount of calculation involved, and because it often uses a normal distribution of the risk factor returns (semi-parametric VaR). The resulting simplification of the Monte-Carlo simulations contradicts the goal of going beyond the unrealistic initial framework of the parametric VaR.

Faced with these difficulties, investors and managers have come up with interesting solutions (stress testing, scenario analysis, more complex modelling of the distribution tails with extreme value theory). These "variations" on the management and measurement of extreme risks should, in our opinion, be popularised and generalised and thereby permit a relative appreciation of the parametric risk and return measures. The latter are totally inappropriate for the alternative universe and this approach would allow for better management of the benefits of alternative diversification.

Cornish-Fisher VaR

The Cornish-Fisher VaR is a pragmatic application of the VaR calculation in a fat tail distribution environment (cf. Favre and Galeano (2002)⁸⁸). This method initially consists of calculating a VaR using a normal distribution formula and then a Cornish-Fisher expansion to take the skewness and excess kurtosis into account:

$$z = Z_c + \frac{1}{6}(Z_c^2 - 1)S + \frac{1}{24}(Z_c^3 - 3Z_c)K - \frac{1}{36}(2Z_c^3 - 5Z_c)S^2$$

where Z_c = the critical value of the probability $(1 - \alpha)$
 S = the skewness
 K = the excess kurtosis (i.e. kurtosis minus 3)

The adjusted VaR is therefore equal to:

$$VaR = W(\mu - z\sigma)$$

It should be noted that if the distribution is normal, S and K are equal to zero and consequently, $z=Z_c$, and we come back to the Gaussian VaR.

Incremental and component Cornish-Fisher VaR

The principle behind the incremental VaR is the same as that of the marginal VaR. It involves measuring the effect on the portfolio's VaR of a variation in the weight of asset i in the composition of that portfolio. However, in the case of the Marginal VaR, the goal is to measure the impact of a marginal variation in the weight of one of the instruments held in the portfolio, while for the Incremental VaR it involves assessing the impact of introducing a new instrument into the portfolio. The relative variation in the weight is therefore liable to be much more significant in the case of the Incremental VaR and thereby lead to a non-linear variation in the portfolio's VaR. The following formula gives an approximate value for the Incremental VaR (IVaR)⁸⁹:

88 - Favre, L. and Galeano J. A., 2002, Mean Modified Value-at-Risk Optimization with Hedge Funds, The Journal of Alternative Investments, Fall, Vol.5, N°2, p.21-25

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$$IVaR = VaR_{p+a} - VaR_p \approx (\Delta VaR)^T * a$$

with

$$\Delta VaR_i = \frac{\partial VaR_p}{\partial w_i} * W_i$$

where p corresponds to the vector of the initial weights of the portfolio and a to the vector of the new positions. VaR_{p+a} is the VaR of the portfolio after introducing new instruments and VaR_p the VaR of the initial portfolio. Finally, $(\Delta VaR)^T$ is the transpose of the vector of the marginal VaRs, which are defined as the partial derivatives of the VaR of the portfolio in relation to the variations in weights caused by the introduction of new instruments.

Once the Incremental VaR has been calculated, one simply multiplies by the weight that asset i represents in the portfolio to obtain the Component VaR. This Component VaR gives us the contribution of asset i to the total VaR of the portfolio. This tool is particularly useful for gaining a good understanding of the risks of a portfolio and therefore for managing them better. For example, in a fund of funds, it allows the strategy that increases or diminishes the VaR to be determined; one just needs to know the share allocated to each of the strategies.

$$VaR_p = \sum_{i=1}^n IVaR_i$$

We note an interesting property: the sum of the Incremental VaRs is equal to the total VaR of the portfolio (cf. formula above). Finally, the VaR calculation method proposed by Cornish-Fisher should be used to integrate the third and fourth order moments of the distribution function.

Beyond VaR

Unlike the VaR, which merely gives an indication of the frequency of occurrence of a loss that exceeds a certain fixed amount for a given confidence

interval, BVaR informs us on the frequency and also the amount of the maximal loss beyond the VaR (hence the name). It therefore involves calculating, for a given time horizon and confidence threshold, the average loss that an investor is liable to record beyond the VaR threshold. As shown by Longin (2001)⁹⁰, BVaR is applied both to portfolios that include option instruments and those that have fat distribution tails. From a statistical point of view, this calculation is subject to very strong statistical risk, given that it is only based on a very small number of observations. On the other hand, it is a risk measure that satisfies the property of sub-additivity, i.e. that the risk of a portfolio is lower than or equal to the sum of the risks of the different positions that make up the portfolio (cf. Artzner et al. (1999)⁹¹). Basak and Shapiro (1999)⁹² have shown that taking into account the first order moment of the distribution of the losses beyond the VaR was sufficient to obtain a satisfactory loss profile. They conclude that taking BVaR into account as a constraint in the allocation process allows one to obtain strategies for which the range of extreme risks is limited.

BVaR is especially useful when the return distribution function of a strategy has fat distribution tails. In that case, the higher the VaR, the more the losses beyond the VaR are dispersed. The difference between the BVaR and the VaR tends towards infinity. As a result, calculating the VaR alone is not sufficient. Calculating the BVaR allows the dispersion to be taken into account and thus provides a genuine measure of the risk of extreme losses.

In the case of a strategy that integrates option instruments, i.e. with a non-linear return profile, Vorst (2000)⁹³ has shown that under certain conditions the VaR calculated for linear positions could be equal to the VaR calculated for

89 - Refer to Jorion, 2001, Value at Risk, McGraw Hill, for more detailed information on the Incremental VaR.

90 - Longin, F., 2001, Beyond the VaR, Journal of Derivatives, Summer 2001, Vol. 8, Issue 4, p.36.

91 - Artzner, P., F. Delbean, Eber, J.-M and Heath, D., 1999, Coherent Measures of Risk, Mathematical Finance, July 1999, Vol. 9, Issue 3, p.203-228.

92 - Basak, S., and Shapiro, A., 1999, Value-at-Risk Based Risk Management: Optimal Policies and Asset Prices, Working Paper, New York University.

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non-linear positions, even though the distribution profiles of the two types of positions are completely different beyond the VaR. The non-linear positions are characterised by a wide dispersion of extreme events and the greater the leverage effect, the wider the dispersion.

Alternative strategies are characterised by fat return distribution tails and the use of option products that involve considerable leverage. These characteristics make the use of BVaR indispensable within the framework of estimating extreme events.

Style VaR⁹⁴

This firstly involves calculating the exposure of the FoHF to a set of N alternative indices representing the risk factors (if possible, choose pure indices: composite indices drawn from the various competing alternative indices), as illustrated in the multi-factor model below:

$R_p = \alpha + \sum_i \beta_i X_i + \epsilon$, the X_i ($i = 1$ to N) corresponding to the returns of the N alternative indices (one index for each type of strategy: fixed-income arbitrage, convertible arbitrage, market neutral, event driven, long/short, etc.).

The original feature of this model compared to that of Sharpe (1992)⁹⁵ can be found at the level of the constraints imposed on the coefficients. To take into account the fact that hedge funds use leverage, the portfolio constraint is removed (i.e. the sum of the coefficients can exceed 1). We note that in Lhabitant (Opus cit. 22), the weight positivity constraint is maintained because the author considers that it is difficult, from an economic point of view, to interpret a negative coefficient on a style index. We also note that this

weight constraint causes the property of orthogonality between the regressors and the residuals to be lost, in such a way that the decomposition between specific and systematic risk is not exact (a residual correlation term remains). Fortunately, we can imagine removing the weight positivity constraint to account for the fact that hedge funds can sell securities short.

We then simultaneously apply to each index its worst variation in order to analyse the impact on the fund. We can thereby deduce the Value at Market Risk:

$$VaMR_p = \sqrt{\sum_{i=1}^N \sum_{j=1}^N \rho_{ij} \beta_i \Phi_i^* \beta_j \Phi_j^*}$$

Φ_i being in this equation the extreme quantile (percentile) of the performance of the alternative index i during a month, ρ_{ij} the correlation coefficient between the indices (covariance relative to the product of their standard deviations)

Since the market risk (systematic risk due to the styles) is evaluated in that way, we can deduce the specific risk from this through the difference with the total risk of the fund (σ_p^2), or:

$$\sigma_\epsilon^2 = \sigma_p^2 - \sum_{i=1}^N \sum_{j=1}^N \rho_{ij} \beta_i \Phi_i \beta_j \Phi_j$$

The percentile of the specific risk (VaSR_p) can be estimated, for a confidence interval set at 99%, at $2.33 * \sigma_\epsilon$ if we assume that the residuals are normally distributed⁹⁶.

From there, we can calculate the VaR of the fund:

$$VaR_p = \sqrt{VaMR_p^2 + VaSR_p^2}$$

93 - Vorst, T. 2000, Optimal Portfolios under a Value-at-Risk Constraint, Report 2001, Erasmus University, Rotterdam.

94 - Cf. Lhabitant (Opus Cit. 42) for more detailed information on the method.

95 - Cf. Sharpe (1992) - Opus Cit. 40

96 - We note that this does not mean that the returns are normally distributed.

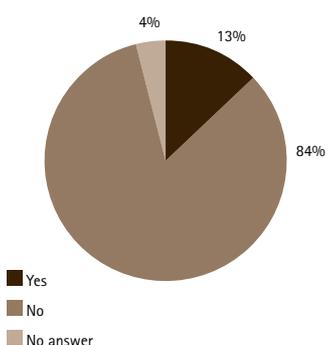
Conclusion

The debate on fund of hedge fund reporting poses the question of investor information. As such, it is very much a part of the process of the "industrialisation" of alternative investment. What is the information that investors absolutely must possess in order to measure and manage the risks to which they are exposed in a satisfactory way? The degree of transparency necessary to obtain this relevant information is the subject of considerable debate. On the one hand there are those who, on the pretext of better investor protection, plead for the absolute transparency of hedge funds, and on the other hand, those for whom alternative investment, by its very nature, cannot accommodate any transparency. Our position is more nuanced.

In the present document we propose a series of risk-adjusted performance and risk indicators that allow the specific characteristics of the performance of alternative strategies to be taken into account without necessitating the disclosure of individual positions. Nonetheless, to allow investors to measure and manage the risks to which they are exposed, it is essential for the funds of hedge funds to communicate details on their returns by asset group, by management style, by sector, by country, or by any other criterion that is considered to be relevant with regard to the sources of return. That is not systematically the case today. In the interest of investors (i.e. for better risk management), but also in the interest of the funds of hedge funds themselves (i.e. to attract institutional investors), it is necessary for the latter to make a move towards greater transparency.

As such, this discussion paper proposes a pragmatic solution that allows final investors to be offered relevant information without simultaneously placing the FoHF in danger. Our objective is to establish, at the end of the consultation period, a standard monthly report (or possibly one standard report for diversified FoHF and another for specialised FoHF). Alongside this think-tank that we have set up on the standardisation of the content of FoHFs' monthly activity reports, numerous actors from the hedge fund industry are working on standards for hedge fund position pricing methods (notably for exotic derivative instruments and non-quoted assets). May all this work allow multimangers to improve their reporting (only 13% of European multimangers today affirm that their reporting is certified by a third party⁹⁷) and thereby help final investors to obtain reliable and relevant data on FoHF, so that they can approach alternatives strategies as confidently as they approach the so-called traditional asset classes (i.e. stocks, bonds, etc.). (See graph 6)

Graph 6
Is European FoHF' reporting certified by a third party?



Source: Edhec European Alternative
Multimangement Practices Survey, 2003

97 - Cf. Edhec (2003) - Opus Cit.2

Edhec Risk and Asset Management Research Centre

Edhec Business School 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, which the school has been developing since it was established in 1906.

Edhec 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 implements an active policy in the field of finance. Its "Risk and Asset Management Research Centre" carries out numerous research programmes in the areas of asset allocation and risk management in both the traditional and alternative investment universes.

The "Edhec Risk and Asset Management Research Centre" structures all of its research work around asset allocation. This issue corresponds to a genuine expectation from the market. In a desire to ensure that the research it carries out is truly applicable in practice, Edhec has implemented a dual validation system for the work of the centre. All research work must be part of a research programme, the relevance and goals of which have been validated from both an academic and a business viewpoint by the centre's advisory board. This board is composed of both internationally recognised researchers and the centre's business partners. To date, the centre has implemented six research programmes:

- **Multistyle/multiclass risk allocation**

This research programme has received the support of Misys Asset Management Systems and FIMAT Global Fund Services. The research carried out focuses on the benefits, risks and integration methods of the alternative class in asset allocation.

- **Performance and style analysis**

The scientific goal of the research is to adapt the portfolio performance and style analysis models and methods to tactical allocation. This programme is part of a business partnership with the firm Euro-Performance (part of the Fininfo group). Edhec is also providing scientific support for the production of manager rankings by the specialised French daily L'Agefi.

- **Indexes and benchmarking**

Edhec proposes an original style index construction methodology for both the tradition-

al and alternative universes. These indexes are intended to be a response to the critiques relating to the lack of representativity of the style indexes that are available on the market. The indexes and benchmarking research programme is supported by Alteram and Euronext.

- **Asset allocation and extreme risks**

This research programme relates to a significant concern for institutional investors and their managers, that of minimising extreme risks. This programme has been designed in cooperation with Inria's Omega laboratory to allow for better measurement and modelling of extreme risks in order to take them into consideration as part of the portfolio allocation process.

- **Asset allocation and derivative instruments**

This research programme focuses on the usefulness of employing derivative instruments in the area of portfolio construction, whether it involves implementing active portfolio allocation or replicating indexes. "Passive" replication of "active" hedge fund indexes through portfolios of derivative instruments is a key area in the research carried out by Edhec. This programme is supported by Eurex.

- **Tactical allocation and the econometrics of financial markets**

This programme concentrates on the application, through tactical allocation, of recent research in the area of behavioural finance. It involves analysing the conditions for producing alphas from the systematic component of a stock (sector or style timing) rather than its specific component (pure stock picking).

In order to facilitate dialogue between the academic and business worlds, the centre opened, in 2003, a web site that is entirely devoted to the activity of international research into asset management: www.edhec-risk.com.



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