ASSESSMENT AND SELECTION OF HEDGE FUNDS AND FUNDS OF HEDGE FUNDS

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Assessment and Selection of Hedge Funds and Funds of Hedge Funds

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Abstract

In this paper, we assess the challenges of analysing and selecting hedge funds and funds of funds. Alternative investment vehicles have taken an important role not only in the diversification of portfolios but also as standalone investments. Capturing the entire risk dimensions implied in hedge fund investment strategies is paramount in understanding alternative investments. We consider different quantitative and qualitative elements to have under consideration when performing an operational due diligence on hedge fund managers particularly in relation to the recent deceptive events during the credit crisis of 2007-2008. The following paper intends to be a small guide to investing in hedge funds or a guide to take into account when trying to understand the complexities of investing in hedge funds and funds of hedge funds.

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01| Introduction

Understanding hedge funds is not a very easy task. There are a number of complexities involved in investments related to hedge funds. Legal and compliance, operations, qualitative analysis and quantitative analysis, and technology related questions means that operational due diligence is a very important concept in the allocation to hedge funds.

In this paper, we briefly introduce the basic concepts about investment in hedge funds. We believe that by all means this is not a total or comprehensive guide to understand and invest in hedge funds. We aim to give a general overview of the field of alternative investments and to introduce its complexities, because investing in hedge funds is not at all a very simple task.

We present here the problems related to risk analysis in hedge funds and problems related to accounting or valuation of illiquid assets. Moreover, we introduce the various most common hedge fund strategies and their expected risks. Can we reach a market neutral investment strategy by investing in hedge funds? How can we build a diversified portfolio of hedge funds? How much will a portfolio of hedge funds end up costing? How can we measure risk adjusted returns and total risk in hedge funds? These are some of the questions to which we aim to respond in this paper.

We also analyse the problem of the lack of benchmarks. Should the performance of a hedge fund follow a benchmark? As absolute return vehicles, alternative investment organizations should not be benchmarked. However, investors need to compare returns with other assets in order to properly assess the cost of opportunity implied in hedge fund investing. We consider also benchmarking among peers as a new and latest strategy.

We believe that hedge fund consultants need to have an important role in investment allocation to hedge funds. The fiduciary obligations from institutional investors and managers and the complexities of hedge funds means that specialized investment advisors are required to analyse and assess all the dimensions of risk implied in hedge funds investing.

02| Absolute Returns: a very complex and difficult objective

1. Beta neutrality is an important attribute in alternative investments

One of the most important attributes of a hedge fund is the ability to perform above a certain hurdle rate at all times no matter what market conditions prevail. This attribute has been called market neutral, which under no circumstances should be considered as neutral to the markets. As the LTCM experience has demonstrated, there is no hedge fund that can be completely unaffected by a general adverse prevailing market condition. However, some managers are able to turn an adverse market condition into an opportunity, delivering extraordinary returns during market turmoil.

In general, it is considered that hedge funds have to be beta neutral or that the level of correlation with the performance benchmark of the market where the fund is involved should be as close to zero as possible. The principal function of the hedge fund in this conceptual frame would be of at least capital preservation in bear markets and capital appreciation in bullish markets.

Figure 1.1. Rolling 12 month correlation between the S&P 500 and the HFR Equity Hedge Index and the CSFB Tremont Long/Short Equity Index from the period 1993-2004

S&P 500 versus CSFB Tremont
S&P 500 versus HFR
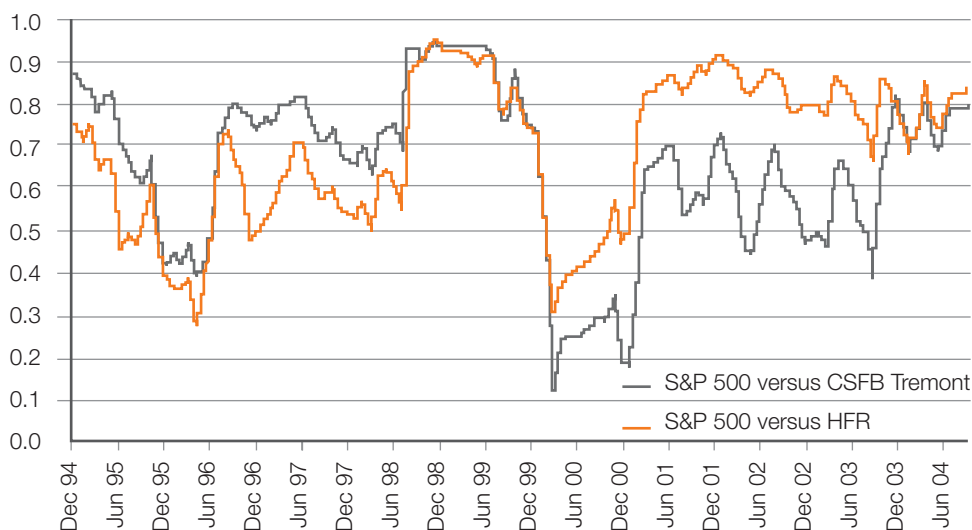
Source: Bloomberg

This definition calls for reviewing the concept of absolute returns, which have been in the area of investment since the inception of hedge funds into the arena of investment vehicles. Recent research (Waring and Siegel, 2006) explores the frontiers of alpha generation. It is considered that a portfolio manager is exposed to beta, but returns exceeding beta exposure can be attributed to manager's skills as measured by the alpha. However, as already mentioned, hedge fund managers are not always able to generate alpha and they are even sometimes not able to beat passively managed investment portfolios, such as index funds, which does not necessarily mean that they are not alpha generators given their non-directional investment style. As we know, beta can be obtained in the market to significantly cheaper prices than hedge fund fees, just by investing in an index replicating an investment portfolio or by using derivatives or, most recently ETFs, which are very liquid actively managed instruments and are able to provide a number of products for beta generation. Beyond the beta, the most important aspect in hedge fund selection is the manager's abilities to generate returns by his skills because, as demonstrated by the research mentioned above, there is no such thing as an absolute-return investor, but a relative return investor.

It is correct to assess that a well managed hedge fund is one that has a zero or nearly close to zero beta coefficient, as we can observe in the Figure 1.1., while enjoying a high degree of alpha in its portfolio returns.

The question is how an investor can be able to assess the level of alpha generation by a hedge fund manager. Analysing the track record of the fund is a possible answer. However, in doing so, investors should be aware that historical performance is not a guarantee of future returns. The consistencies between historical and future returns have to be carefully assessed considering a number of parameters that result in higher and consistent alpha creation. However, one should consider that linear factor models such as the ones developed by Markowitz or Sharpe are unable to capture hedge fund's nonlinear return features.

In line with this assessment, Fung and Hsie (2001) have developed a model based on asset-based style factors. These factors with statistical significance may not necessarily be associated to any strategy or specific investment style. The statistical clustering created by using principal component analysis (PCA) is able to group common risk and returns characteristics of the sample. This is very important because hedge funds are actively managed investment organizations, so timing and leverage are relevant influential factors of the investment style and strategy. The attractivity of the non-correlated returns generated by hedge funds bearing low or neutral beta and a high alpha should be assessed in the context of portfolio diversification. Kat (2005) established that the undesired effects of hedge funds that are attributable to negative skewness and high kurtosis can be eliminated through the use of out-of-the-money put options or by investing in other hedging strategies. In this context, it is clear that hedge fund returns are not "superior", but different than returns generated by other asset classes. Needless to mention, a diversified hedge fund portfolio has for a retail investor a prohibitive cost, given the fact that the minimal investment in an average hedge fund is in the order of USD 1 million and a diversified portfolio should have about 10 to 15 underlying vehicles.

2. Risk and returns in different hedge fund strategies in a beta neutral environment

From an investor's perspective, it is important to maintain a clear view of the risk exposure gained by a hedge fund investment in relation not only to the returns but also with the investment vehicle strategy. Different strategies yield not only different risk exposures but expose the investment to different risk classes. In this respect, it is important to conceptualize the risk. Some investors wrongly believe that by investing in bonds or in an investment fund, which invests in fixed income securities, they are only exposed to interest rate risk or credit risk. A brief list of possible risks that investors face in financial markets can be summarised as follows:

Figure 1.2. Partial listing of risk universe in relation to hedge funds

Accounting risk	Fiduciary risk	Political risk
Bankruptcy risk	Hedging risk	Prepayment risk
Basis risk	Horizon risk	Publicity risk
Call risk	Iceberg risk	Regulatory risk
Capital risk	Interest rate risk	Reinvestment risk
Collateral risk	Knowledge risk	Rollover risk
Commodity risk	Legal risk	Spread risk
Concentration risk	Limit risk	Systemic risk
Contract risk	Liquidity risk	Taxation risk
Currency risk	Market risk	Technology risk
Curve construction risk	Maverick risk	Time lag risk
Daylight risk	Modeling risk	Volatility risk
Equity risk	Netting risk	Yield curve risk
Extrapolation risk	Optional risk	

Source: Author based on CMRA

Institutional investors have traditionally used asset allocation as the core process in order to determine their investment strategy. The process of asset allocation is important; however, it does not take into account the dynamic changes in risk appetite and the changing dynamics of risk in the investment portfolio. Risk budget monitoring introduces a different dimension in the investment process as a function of volatility, correlation, and investment volume itself.

Figure 1.3. Asset allocation process
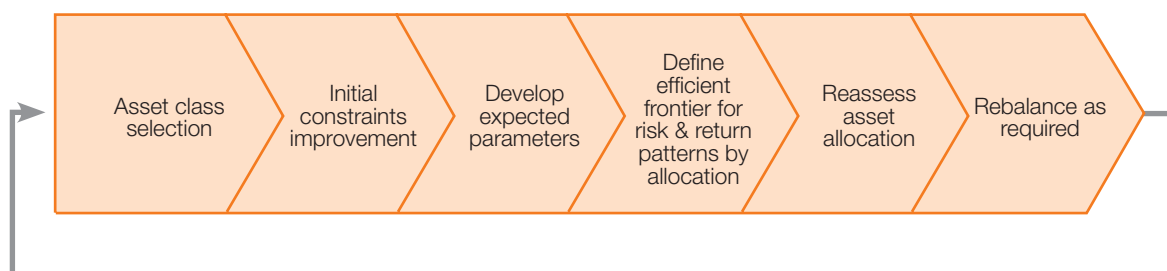
Risk budgeting is a tool that should not be seen as an optimization process, because the optimization process in asset allocation uses a traditional mean-variance approach to efficiently allocate assets in a trade-off process of risk and returns. The objective of optimal investment risk management has to be such that it allows the investor to acquire less risk for a larger return or more return in exchange for the current risk exposure.

Other than the universe of possible risks mentioned in Figure 1.2, hedge funds gain exposure through poor market liquidity, use of leverage, high turnover, heavy use of derivatives instruments, correlation to unrelated assets and transparency risk, to mention just a few. Risk measurement in traditional investment vehicles or asset classes seems to be a very straightforward exercise when compared with hedge funds.

Asset allocation is concerned with optimal asset combination, thus mathematically it is equivalent to a constrained optimization process. The process of asset allocation is much simpler than portfolio construction. Brinson et al. (1986, 1991) established that more than 90 percent of the variability of an investment portfolio is due to asset allocation. The advantage of the asset allocation process is that we resolve the optimization process at the asset class level instead of at the single security level. This is simpler because it is easier to estimate expected future returns at the asset class level than at the single security level and because the correlations are clearly established in order to build a diversified allocation. In this frame, we should consider investment in alternative funds as an asset class problem within the optimization process of asset allocation. Empirical research (Lintner, 1983) has robustly established the virtues of including alternative assets in the allocation process given the low and even negative correlations with traditional asset classes.

One of the main challenges for investors is the poor transparency of hedge funds, which allows for very important risk misspecifications. The non-stationarity of risk due to the dynamic asset allocation of hedge fund managers is another challenge in risk measurement. Under these circumstances, it is very difficult to reduce measurement error to near zero. Identifying risk in a dynamic investment environment requires high frequency assessment and great accuracy. Factor analysis can not only assist in identifying risk factors but also the rate of change of those factors. Factor analysis can determine the aggregate factors explaining investment returns. This analysis can be used either as forward risk modelling or as inverse modelling.

Forward risk modelling uses assumed pre-existing risk factors to assess the risk universe of the investment portfolio. If the investor has allocated investments to hedge funds using a convertible arbitrage strategy, we can assume risk factors correlated to fixed income securities as well as stocks, because such an investment strategy is exposed not only to risk factors related to the yield curve but also because when the hedge fund manager exercises his option in a convertible bond, he is automatically gaining exposure to stock market risks.

Static forward modelling (SFM) analyses the returns and finds the factors that can fit in the return's model. By definition, SFM is a replication strategy using future contracts or other trading assets. The modelling eliminates sequentially uncorrelated factors that assist in explaining the stream of returns. In practice, SFM is used as an early warning system for the fund of funds manager, because when the manager sees a new factor emerging which can affect the returns directly or indirectly, the manager should try to rebalance the portfolio eliminating the style drifting underlying position.

Inverse risk modelling uses principal component analysis (PCA) in order to analyse time series of returns and establishes all possible patterns with exposure to risk factors explaining the returns. Using the covariance matrix, the manager extracts the eigenvectors with maximum explanatory power in statistical terms, but because these eigenvectors are not the real economic variables such as actual gold price or the exchange parity of currencies, the manager must correlate the characteristics of those statistical factors to real factors. Interpretation is in this case absolutely critical but many times is not even possible.

Non-stationary or dynamic factor analysis takes into consideration relative changes of exposure along a time series of factors or combination of factors and their weights in explaining the returns of a portfolio. Managers have to take into account a sufficiently long horizon that explains the trade-off between risk and returns. When the factors and the returns converge in a time series, there is an alignment in the risk factors and the established strategy. Observation has to be maintained for a certain period of time because at a certain point the exposures could be subject to variations and diversions, letting the manager without knowledge of the new risk factors. The use of multi-scale correlation methods can assist portfolio managers in establishing the right time horizon for the analysis. Two significant risks in the analysis can be found. The first is that the time horizon of the assessment is too short and the point of divergence between the explaining factors and the portfolio return streams cannot be evaluated with a certain degree of accuracy, and the second is that the established time horizon is too long diluting the effects so much that the factors combination and the moment relation can hardly be visualized.

Detecting changes in correlations or non-stationarities across time is very useful for the investor because with assistance of this multi-scale correlation method, we can build an error map. If the error map becomes non-zero, it is because the correlation between the explaining factors and the returns has collapsed. Collapse in return attributions are a warning indicator that the fund manager has changed the strategy or is entering into a strategy shifting process that should trigger an immediate explanation by the fund manager to the investor about this change and the new risk factors implicated in such a strategy move. Another indicator of strategy shifting is sudden factor dispersion, which is given through introduction of new explanatory factors or alterations in the eigenvectors of the covariance matrix, which again we insist are statistical factors that have to be correlated to real economically relevant factors such as interest rate risk, volatility index (VIX), or gold price, to mention a few examples.

The practice of investment portfolio risk budgeting in the context of hedge fund management is to align risk budgeting with a coherent risk measurement methodology in order to obtain an appropriate risk amount. There are a number of variations of VaR methodologies of which the most utilized in the hedge fund industry is certainly CVaR (Rockefellar and Uryasev, 2000 and 2001). A key factor to successful risk management in the context of hedge fund investment management and monitoring is to include a stress test in the risk to be budgeted and allocated. In this context, it is important to remember that VaR does not capture all the essence of risk in hedge funds. An example is that VaR has failed to capture the risks of instability related to the euro-convergence during the 1990s. Stress analysis instead tries to resolve questions such as:

1   Which variables, given a certain variation, affect and to what degree the price of an asset

2   Which are the variables, given a rate of change, can affect the valuation of the portfolio and to what extend and for how long

3   How wide is the variance established by the fund manager for the relevant variables affecting the portfolio and how these divert from other portfolio managers

4   How accepted and valid is the approach used by the portfolio manager compared to other peers

Stress test results need to be integrated into the denominator of the risk adjusted reward equation. In stress testing results should be included not only variations in market moves but also assumptions underlying strategies, as well as the possible adverse effects on the portfolio of liquidity premium, on-the-run and off-the run differential credit spread sensitivities, haircut sensitivity, and sensitivity to correlations. Investment managers control risks by closely monitoring the variety and level of exposures to different risk categories. In hedge fund management, one of the most critical risks is liquidity risk. Managers and investors need to understand that valuing positions at mid-market when positions are large and market liquidity is poor can be very misleading. A natural reflex in market turmoil scenarios is always to liquidate the most liquid instruments in the portfolio to meet margin demands by prime brokerages. As we have seen in the case of LTCM, this is normally the equivalent of a death sentence because it constrains the portfolio to the most illiquid instruments leaving the managers in a very vulnerable position in a distressed market.

Different hedge fund strategies deliver not only different returns but also different risk exposures. Investors investing in a portfolio of hedge funds should visualize clearly their exposures and the level of concentration to those at any given time. As mentioned, there are a variety of hedge fund strategies that give investors different exposures to different risks. Lhabitant (2004) uses an adapted version of the Herfindahl-Hirschman index to assess the level of concentration to certain strategies by an investor:

$$HHI = \sum_{i=1}^{k} \left(\frac{\beta_i}{\sum_{j=1}^{k} \beta_j} \right)^2$$

(1.1)

In this case, the investor clearly understands the normalized sum of squared styles concentration. Moreover, as we know, investors have to visualize their exposure to different sets of risks, which are implied in each hedge fund strategy. Different data vendors providing style benchmarks have classified different hedge fund strategies, as described in Figure 1.4.

Figure 1.4. Different strategies according to different hedge fund index providers

Credit Suisse Tremont	Greenwich Alternative Investments	Hedge Fund Research	Barclay Hedge Fund Index
Convertible Arbitrage	Equity Market Neutral	Convertible Arbitrage	Convertible Arbitrage
Dedicated Short-Bias	Event Driven	Distressed Securities	Distressed Securities
Emerging Markets	Distressed Securities	Equity Hedge	Emerging Markets
Market neutral	Merger Arbitrage	Equity Market Neutral	Equity Long Bias
Event Driven:	Special Situations	Event Driven	Equity Long/Short
- Distressed	Market Neutral Arbitrage	Macro	Equity Market Neutral
- Multi-Strategy	Convertible Arbitrage	Merger Arbitrage	Equity Short Bias
- Risk Arbitrage	Fixed Income Arbitrage	Relative Value Arbitrage	European Equities
Fixed Income Arbitrage	Other Arbitrage		Event Driven
Global Macro	Statistical Arbitrage		Fixed Income Arbitrage
Long/Short Equity	Aggresive Growth		Fund of Funds
Managed Futures	Opportunistic		Global Macro
Multi-Strategy	Short Selling		Health Care & Biotechnology
	Value		Merger Arbitrage
	Futures		Multi-Strategy
	Macro		Pacific Rim Equities
	Market Timing		Technology
	Emerging Markets		
	Income		
	Multi-Strategy		

Source: Author

In this article, we consider that the one of the most reliable data sources is the one provided by Credit Suisse Tremont, Greenwich Alternative Investment (former Van Hedge), Hedge Fund Research, and Barclay Hedge Fund Index.

Moreover, EDHEC Business School has made an index of indexes using PCA in order to homogenize the strategy universe of hedge funds. Based on these strategies and considering the particularities from each hedge fund, investors can use the strategy definitions by the data vendors and correlate every strategy with the typical or specific risks factors of each strategy and according to the operational due diligence performed on the fund strategy.

The fundamental aspects to consider are the visualization of risk, qualification, and quantification of risk exposure. As described before, with the assistance of PCA investors can evaluate the relevant risk factors related to the fund's strategy and then correlate them with real economic risk factors.

Investors should consider that short positions are always at risk of liquidity squeeze. This kind of risk is entered when short positions are negatively affected by market prices development, generating potential or real losses in the portfolio and forcing the prime broker to place margin calls to increase collateral in form of cash or securities to cover for possible or effective losses or when the prime broker calls the loaned securities, forcing the fund manager to generate losses from the positions. This is the case when the prices of the short positions are rising above the collateral held by the prime broker in form of cash or cash equivalents. Short positions normally act as a hedging in a long portfolio segment instead or as a complement to derivative instruments, reducing significantly the cost of hedging but exposing the portfolio to its own set of risks.

Since is very difficult to generate ideas in bull markets about possible losers, some hedge funds either outsource to other funds the shorts or they hedge their position with the use of option derivatives of all sorts, which by all means is a more sophisticated hedging but sometimes a very expensive one. In general, it has been established in hedge funds to hedge long positions by shortening others.

Assessing two funds using the same general strategy, we can observe that the returns are very unequal. Therefore, we can also deduce that risks may be different or at least the risk factors would have different weightings. A hedge fund with the strategy equity long/short may be exposed to industrial sector risk because it concentrates its portfolio in certain sectors which could have seasonal variations in its returns. Following Lhabitant (2004) and expanding on the Hausmann Holdings example of radar visualization of strategy exposure, the following model can be developed:

Figure 1.5. Portfolios of hedge fund investment in different strategies and aggregated risk

Porfolio A Strategy: Equity L/S	Assets 1´500´000.00
Risk	**Exporsure %**
Market risk	10.00%
Liquidity risk	30.00%
Currency risk	20.00%
Credit risk	10.00%
Volatility risk	8.00%
Yield curve risk	0.00%
Commodity risk	0.00%
Sector risk	0.00%
Time lag risk	5.00%
Concentration risk	6.00%
Horizon risk	5.00%
Hedging risk	6.00%

Porfolio B Strategy: Convertible Arbitrage	Assets 1´300´000.00
Risk	**Exporsure %**
Market risk	10.00%
Liquidity risk	10.00%
Currency risk	10.00%
Credit risk	10.00%
Volatility risk	10.00%
Yield curve risk	20.00%
Commodity risk	0.00%
Sector risk	7.00%
Time lag risk	5.00%
Concentration risk	5.00%
Horizon risk	11.00%
Hedging risk	2.00%

Porfolio C Strategy: Distressed Securities	Assets 1′000′000.00		Aggregated Porfolio Strategy: Distressed Securities	Assets 3′800′000.00
Risk	**Exporsure %**		**Risk**	**Exporsure %**
Market risk	10.00%		Market risk	10.00%
Liquidity risk	55.00%		Liquidity risk	29.74%
Currency risk	0.00%		Currency risk	11.32%
Credit risk	10.00%		Credit risk	10.00%
Volatility risk	0.50%		Volatility risk	6.71%
Yield curve risk	0.00%		Yield curve risk	6.84%
Commodity risk	0.00%		Commodity risk	0.00%
Sector risk	7.00%		Sector risk	4.24%
Time lag risk	0.00%		Time lag risk	3.68%
Concentration risk	5.00%		Concentration risk	5.39%
Horizon risk	11.00%		Horizon risk	8.63%
Hedging risk	1.50%		Hedging risk	3.45%

Source: Author based on Lhabitant (2004)

The total strategy exposure can be expressed as a percentage of the total investment using Barclay's strategy classification:

Figure 1.6. Aggregated exposure to single strategy as a percentage of investment

Aggregated Strategy Exposure	Assets 3′800′000.00
Convertible Arbitrage	34.2%
Distressed Securities	26.3%
Emerging Markets	0.00%
Equity Long Bias	0.00%
Equity Long/Short	39.5%
Equity Market Neutral	0.0%
Equity Short Bias	0.0%
European Equities	0.0%
Event Driven	0.0%
Fixed Income Arbitrage	0.0%
Fund of Funds	0.0%
Global Macro	0.0%
Health Care & Biotechnology	0.0%
Merger Arbitrage	0.0%
Multi-Strategy	0.0%
Pacific Rim Equities	0.0%
Technology	0.0%

Source: Author

Now it is possible to visualize the stationary exposures at the single portfolio level and at aggregated level:

Figure 1.7. Portfolio A risk exposure to single risk factors
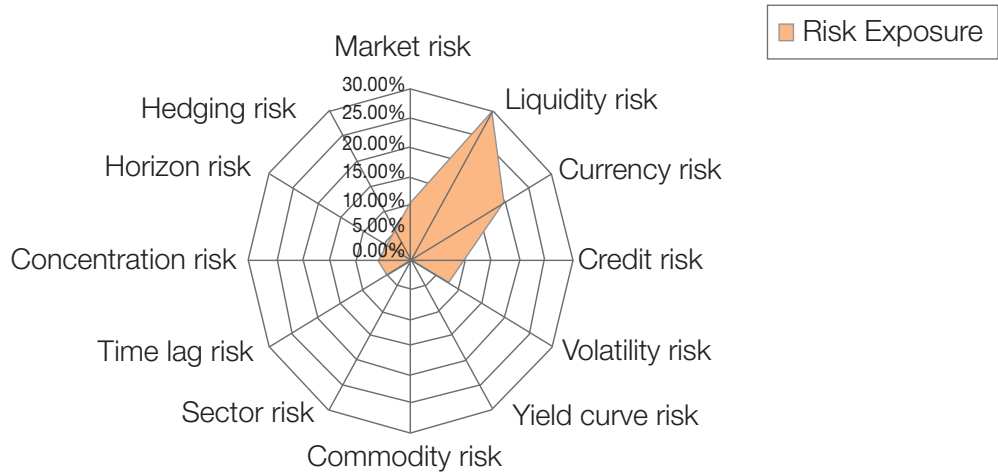
Source: Author based on Lhabitant (2004)

Figure 1.8. Portfolio B risk exposure to single risk factors
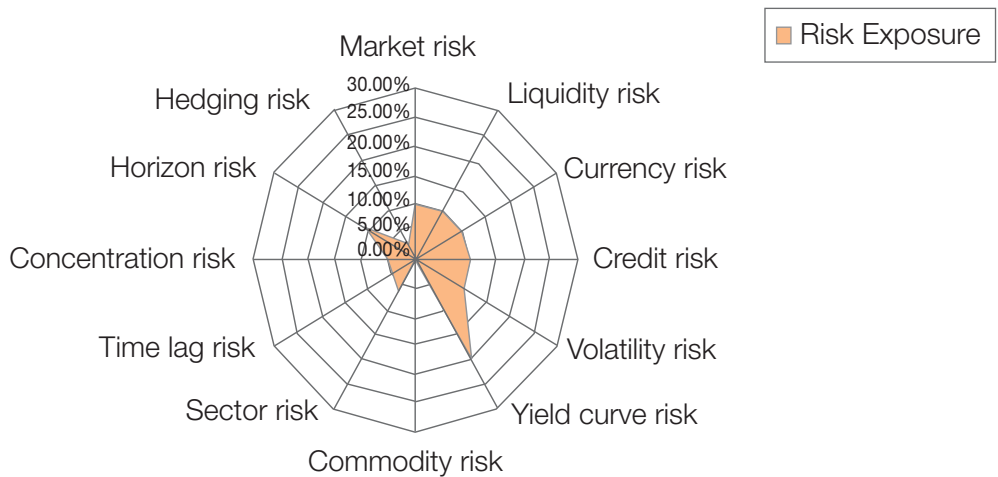
Source: Author based on Lhabitant (2004)

Figure 1.9. Portfolio C risk exposure to single risk factors
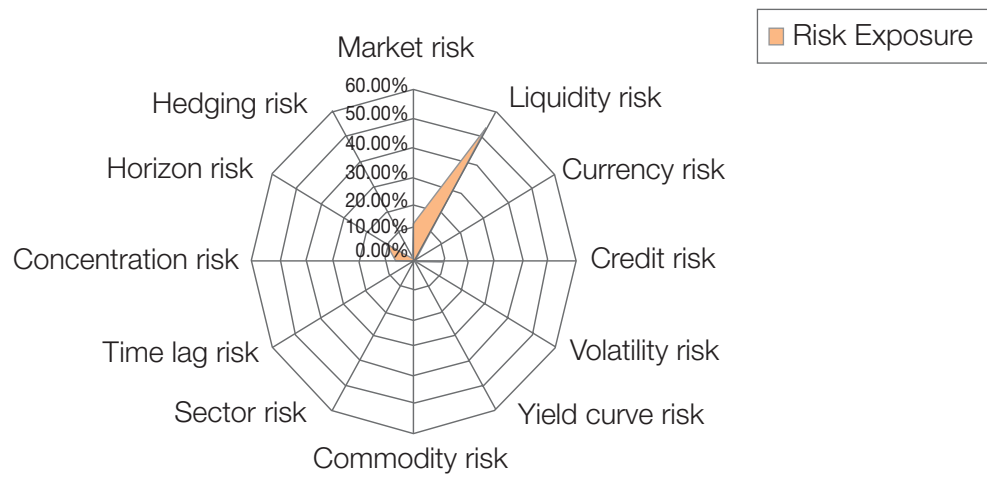
Source: Author based on Lhabitant (2004)

The risk exposure at aggregated portfolio level is as follows:

Figure 1.10. Aggregated portfolio single risk factors exposure

Source: Author based on Lhabitant (2004)

Then the strategy exposure of the whole investment in hedge funds can be visualized as follows:

Source: Author based on Lhabitant (2004)

This is an example using the case of 3 investment portfolios. In the optimal case, Funds of Hedge Funds (FOF) manage around 15 hedge funds in their investment portfolio (Lhabitant and Laporte, 2006); however, it i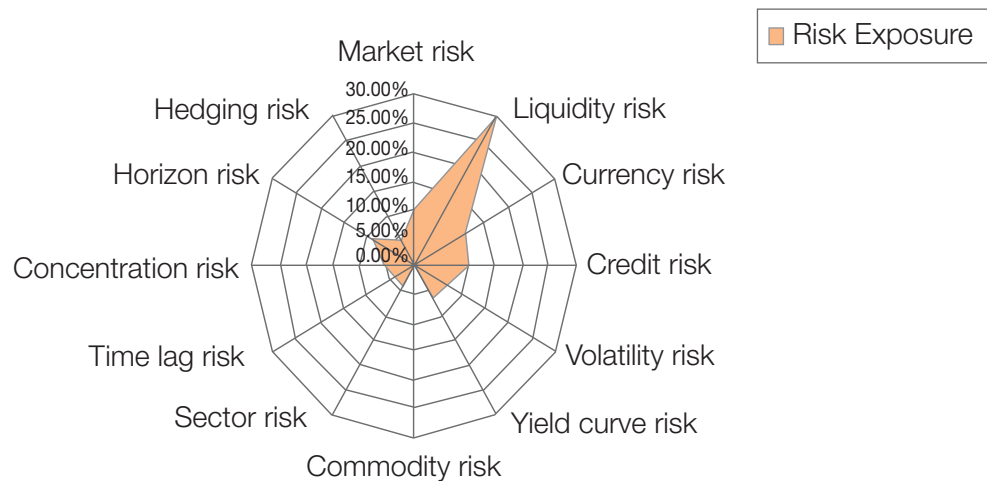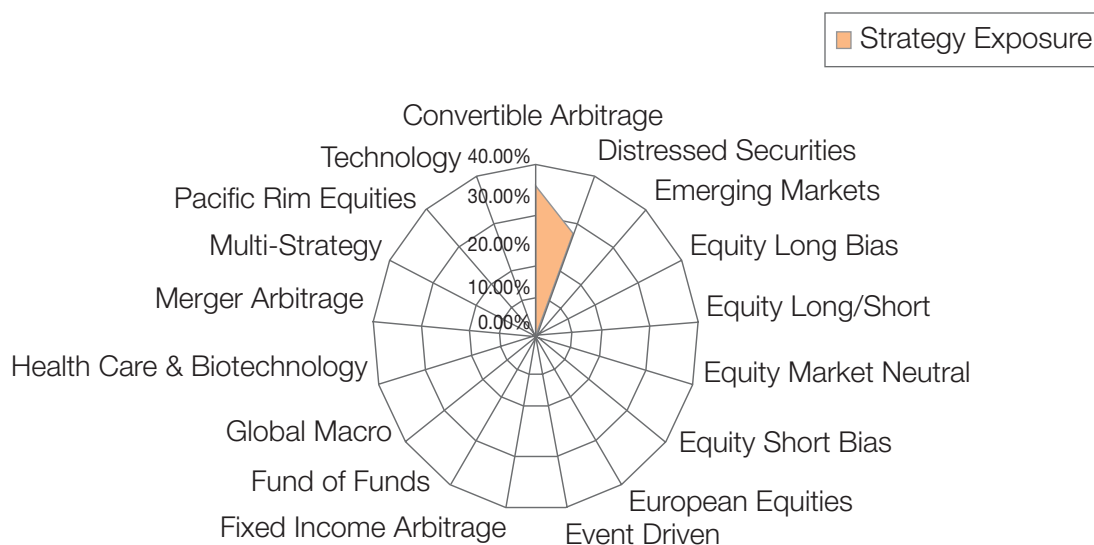s not uncommon to find FOF managers managing more than 50 and up to 110 managers through underlying constituent hedge funds in their portfolio, so it is easy to realize the level of complexity in different risk exposures and strategy shifting monitoring can be a very tedious task for a FOF manager.

Other than managing the inherent risk exposure to the specific strategy, the portfolio manager must have also a clear picture of the specific risk exposure that the specific fund targets. The most well known hedge fund strategies are Convertible Arbitrage, Distressed Securities, Equity Hedge or Long/Short Equity, Equity Market Neutral, Event Driven, Global Macro, Merger Arbitrage, and Relative Value Arbitrage. Their strategies and inherent risks are briefly described as follows:

Convertible Arbitrage: This is one of the most complex investment strategies in hedge funds. The fund buys convertible bonds and hedges part or all of the risk. The strategy is subject to equity risk, liquidity risk, volatility risk, and interest rate risk amongst others. Arbitraging convertibles is a strategy oriented to generate profits from selling short equities and buying long fixed income securities. The structures of the convertible assets have certain attributes that make them very attractive, such as convexity. The convertible is composed of a bond with a coupon that pays interest, which normally is higher than the dividends obtained for equity and includes at the same time a call option on the equity. This is because these kinds of securities have a built-in yield advantage targeted to retain the bond and not in conversion of the underlying equity. Their advantage is that as the underlying equity price climbs, so does the bond, while when the equity falls the bond does as well but at a slower rate and it contains an insurance given by the so-called "bond floor", which is the present value of the bond's cash flows. This is very well illustrated in Figure 1.12.

Figure 1.12. Convexity of convertible arbitrage strategy

Figure 1.12. Convexity of convertible arbitrage strategy
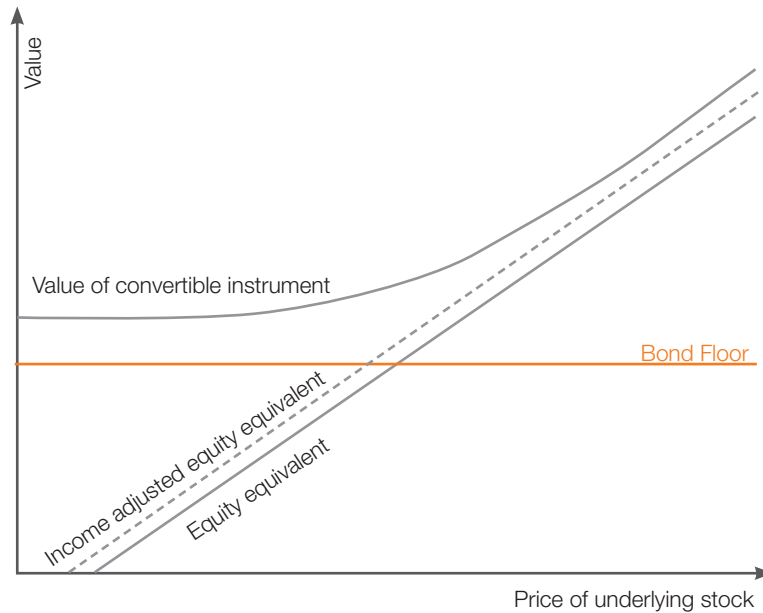
Source: Author

When the fund manager acquires the security, he must hedge the equity risk, which is given by the probability of a falling equity price below the exercise price of the embedded option. In order to hedge that risk, the manager sells short the stocks. If the underlying stock price increases above the exercise price, the manager may find himself no longer delta neutral and will have to buy stocks back that he sold short. If the underlying stock falls far below the exercise price, the manager makes a margin by the way of the securities that he has shortened. In order to hedge other risks, the manager has to make use of derivative instruments, reducing his margins. For this reason, this strategy is normally heavily leveraged, typically in a ratio of 6:1, or 1 dollar buys 6 dollars of convertible. Another hedging strategy in convertible arbitrage strategy is to implement synthetic calls with the embedded out-of-the-money option and then perform an asset swap. This happens by retaining the call option and selling the bond. The return sources of convertible arbitrage strategies in percent are summarised in Figure 1.13.

Figure 1.13. Return sources of convertible arbitrage strategies in percent
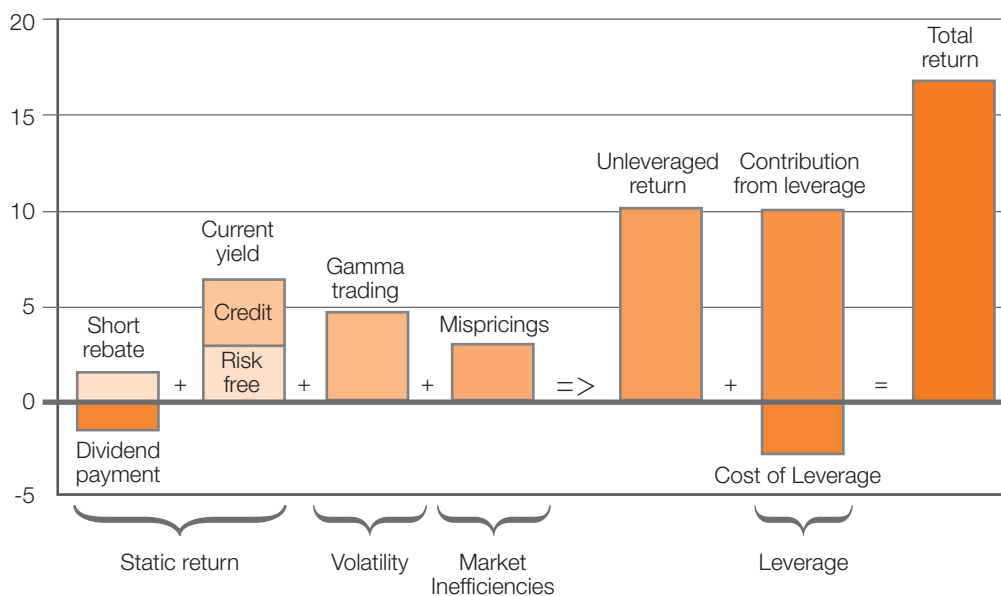
Source: Euroinvestor

Unfortunately, convertible bonds are junior securities and do not enjoy the covenant protection of more senior papers in term of guarantees and collaterals. To hedge away credit risk, managers have to monitor the credit rating of the issuer on a continuous basis and also have to actively diversify. On the other hand, corporate bonds are exposed to yield curve risk, because if the yield curve shifts upwards, the bond will lose value. In order to hedge the interest rate risk, managers in convertible arbitrage can sell short government bond positions, reducing their carry.

If there is a credit spread widening, the fund will lose in the government and in the corporate bond positions. On the asset swap option, the manager enjoys the possibility of focusing on gamma trading and the properties of the derivative instrument embedded in the bond, which has been sold out and leaves the fund's balance sheet, leaving only the call option. Normally in an asset swap transaction the fund manager has the right to reconstruct the convertible instrument to a prearranged credit spread but not to a prearranged yield, so if interest rates fall, the price of the bond will increase. Credit risk can also be hedged by shortening a credit index, protecting the entire portfolio from systemic credit default risk. Moreover, as it is very well known, corporate bond markets are not very developed and therefore liquidity is sometimes scarce. Some of the advantages of this strategy are the possibilities to remain equity market neutral because returns in this strategy are not very correlated to financial markets. The strategy is long of volatility and is therefore a perfect diversifier because normal assets suffer under market volatility.

As negative points, we can consider the necessity of leverage due to the cost of hedging. The market for convertibles is relative small and very illiquid so that under financial shocks, positions suffer enormously. Another problem related to this strategy is that issuers are normally relatively small companies and the availability of stocks to borrow for the purpose of short selling is very limited, increasing the cost of prime brokerage to arrange stocks.

Movements in the pricing of the underlying equity generate delta trading profits. The delta refers to the sensitivity of the option price to changes in the underlying equity. The rate of change of the delta is the gamma and is due to the convergence in price with the bond floor, producing its convexity or non-linear properties. The fund is said to be long of volatility and long of gamma when volatility induces an increase in the atonality of the convertible.

Distressed Securities: The hedge fund engages in a strategy of buying securities of distressed companies in order to participate in the restructuring process or to control a significant part of the corporate assets. This strategy is most widely implemented in the United States, given the specific legal framework of the bankruptcy and liquidation regulations provided by Chapter Eleven and other regulatory provisions. In Europe or in Asia, this strategy is very difficult to implement because in most of these countries, workers in the distressed companies have a significant priority over creditors.

Funds investing with this strategy find opportunities to buy the securities at a high discount because when companies enter into distress, their credit rating is downgraded triggering the selling by many institutional investors, which by mandate are not allowed to hold securities of distressed companies in their portfolio. This selling by institutional investors creates a stampede in the retail investor community, inducing downward pressure on the prices of bonds or stocks. Distressed securities hedge funds normally do not shorten securities of the target companies and it is therefore questionable if these funds may be considered as a hedge fund. However, some hedge funds following a distressed securities strategy are currently shortening stock of their target companies generating income also from this short selling. On the other hand, finding high yield securities to borrow in order to shorten the stock is not only very difficult but also an expensive task. A further constraint is given by the fact that for the fund, it is important to acquire senior debt instead of junior debt, because this gives the fund not only an increased safety margin but also more power if the fund takes an activist position and wants to lead the creditors committee in the bankruptcy and restructuring process. Their target universe are securities trading at significant yield spreads wider than high yield, in excess of 15 percent or, in the case of bonds, at spreads with over 1000 bp difference from Treasuries.

An interesting aspect of this type of investment is its countercyclicality because the targets are more readily available during times of economic distress. The complexity arising from not only the financial area but also in the legal and accounting areas means that investing in distressed securities is a business only for top analysts and legal partners and for large funds that have a significant level of funding.

Equity Hedge or Long/Short Equity: This type of fund engages in buying long securities considered undervalued speculating that they will appreciate and selling short securities consider overvalued. The shortening has a hedging function and the fund can be considered net long or net short. In bullish markets, generally the fund will take a net long position, while in bearish markets it would typically take a net short position. The shortening can also take the form of shortening the index instead of a stock or the fund could make use of derivatives to hedge their long exposure. However, derivative instruments targeted to hedge long exposure by hedge funds tend to be rather expensive because in most cases they are OTC derivatives, the products of complex financial engineering. However, shortening an index does not demonstrate superior analytical capabilities by the fund manager because the investor himself could also buy a long only portfolio and short sell the index. Actually, some investors consider that managers shortening an index future do not deserve to manage a hedge fund. Figure 1.14 illustrates the difference between the cumulative returns of two major long/short equity indices and the S&P 500 over a ten year period between 1994 and 2004.
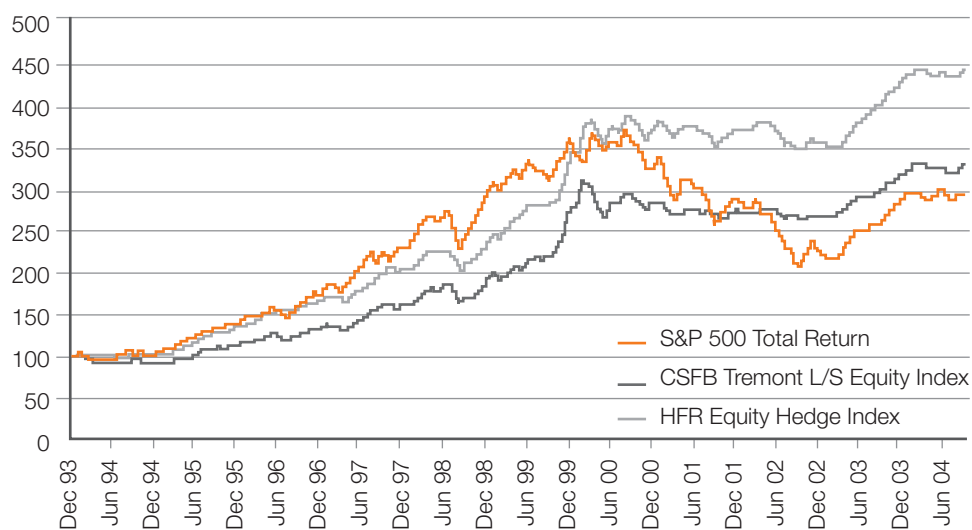
Source: Bloomberg

Another way to hedge long positions is by shortening Exchange-Traded Funds (ETF), because the liquidity, availability, and scope of this instrument as far as the sector is concerned is more appropriate for hedging long positions. Contract For Differences (CFD) is another tactic used to go long and/or short. CFDs offer the manager a cheaper, very liquid, and easy to execute option. Some managers may execute so-called cross-hedging strategies. Cross-hedging is a very controversial tactic because it can create a feeling of artificial safety. In this strategy, the manager of a fund holding a long position in a sector that is highly sensitive to foreign exchange fluctuations can hedge the long position by shortening positions in the affected currency.

Equity Market Neutral: In this strategy, the manager takes a so-called "dollar neutrality" position, which means that his portfolio is composed of same amount of long and short positions. The manager covers his long exposure to 100 percent with his short positions and the fund should generate alpha from both his long and short positions. Taking a neutral position is a very difficult strategy particularly because it is very difficult to generate negative ideas to assess which securities to short. Some managers outsource the shortening to managers specialized in shortening. However, short-only hedge funds are very rare and their life expectancy is below average.

Event Driven: This fund type takes advantage of different events that can affect the underlying securities in either direction. Some of these events affecting the securities price could be industrial sector consolidation, corporate restructuring or reorganization, management reshuffling, regulatory uncertainties or conflicts, and political risk crises in areas concerning the target company. The fund manager uses not only a long and short approach to stocks but also instruments such as bonds, warrants, options, and derivatives in general. The strategy is considered to suffer in market down cycles. In certain cases, these funds enter into competition with Merger Arbitrage funds. However, Event Driven funds manage larger amounts of funds and use more leverage than Merger Arbitrage.

Global Macro: This type of fund engages in directional speculative trading, taking advantage particularly of global trends using a high degree of leverage. Originally, these funds used to be the most important funds in the hedge fund universe. Managers such as George Soros and Julian Robertson used to be the stars of Global Macro. These funds are very similar to Commodity Trade Advisors (CTA), which in the beginning used to trade in commodities but today trade rather with derivative instruments. Global Macro hedge funds have a very broad mandate using all kind of instruments and operating in a wide variety of markets and geographical areas. They use political and economic analyses in order to assess international trends, focusing on global capital movements and flows acting to capitalize on the demand in these economies. Their asset allocation strategy is partly extremely concentrated and they assume high risk. For example, 100 percent of their AUM can be exposed on a currency fluctuation bet and they are still leveraged to 100 percent. While these funds are exposed to a variety of risks, their exposures are rarely efficiently hedged. For many of the risks, such as political turmoil risk, there might not be a hedging instrument.

Merger Arbitrage: This type of fund generates profits from buying and selling securities of companies involved in mergers, acquisitions, demerging, exchange offers, and leveraged buyouts. Normally, the fund will go long on securities of the target company while shortening securities of the acquiring company. The strategy demands a great effort in terms of qualitative analysis. Most of the risk is related to transaction timing and success of the event. If the event would become subject to obstructions by a regulatory authority or by activist shareholders, the losses for the fund could be significant. There is another approach to this strategy, which is the so-called "reversing". Reversing is when the fund considers that the likelihood of success of the transaction is very small and it then concentrates its bets on the failure of the transaction, shortening the target and going long on the acquiring company. Most funds use options in order to realize their bets to a very low cost. Entrenchment measures such as shark repellents or poison pills could significantly delay the transaction, which potentially reduce the spread of the arbitrageur, as illustrated in Figure 1.15.

Figure 1.15. Spread convergence in a successful merger deal over an unusually long period of one year
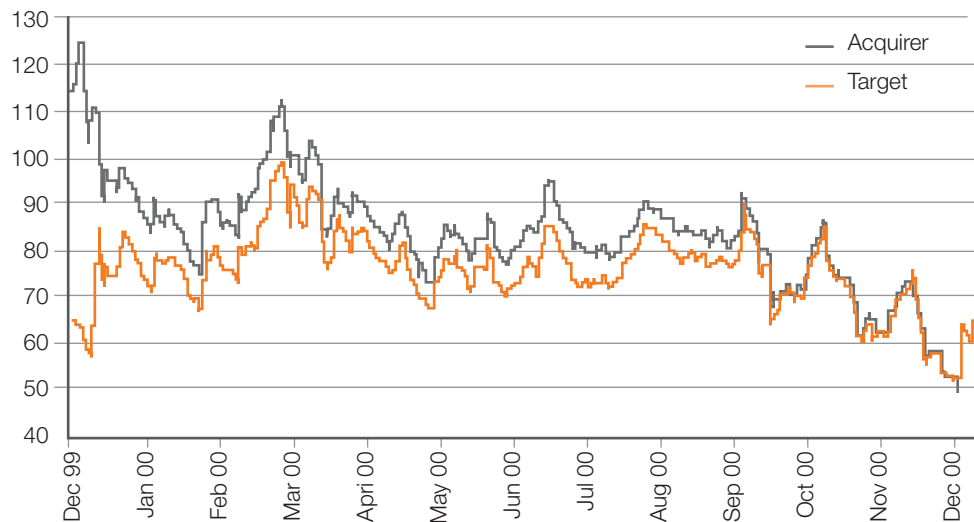
Recent research (Hu and Black, 2006) has uncovered an interesting and profitable angle in a merger arbitrage strategy. The hedge fund borrows shares with the intention to short them in the market but these shares also entitle the holders of the borrowed shares to participate in the shareholder meetings that may be taking a decision about a possible merger. Then the hedge fund blocks the transaction, producing a significant loss of value to the shares of the target company that they intended or did short and increasing the value of the shares of the acquiring company, where they are probably held long in the portfolio. It is questionable if the right to vote in this case has been used in the best interest of shareholders or just in best interest of the hedge fund. Best interest is always a relative judgement and therefore quite disputable.

Relative Value Arbitrage: This fund uses historical, statistical, or mathematical analyses to establish the occurrence of mispricing in certain securities. It takes long positions on securities expected to appreciate and short positions on similar securities with a mathematical or statistical argument of depreciation. Returns are made from spread trades between the related securities. The strategy can use derivatives as well as warrants, fixed income securities, and stocks. Risks related to market and price mis-evaluations as well as problems in the model specifications can be the source of large losses. The emphasis placed on quantitative and qualitative analyses demands very experienced analysts.

03 | How to benchmark hedge funds – Should they be benchmarkable?

1. Hedge Fund Indices: Are they a valid benchmark?

Over time, a number of database vendors have started to make their own index. The most important are those produced by: ABN Amro, Altvest (currently Morningstar), MAR (Managed Account Reports), Credit Suisse First Boston / Tremont, Hedge Fund Research, Hennessee Group, Morgan Stanley Capital Indices, Standard & Poor, Greenwich Alternative Investments, and Barclay Hedge Fund Index. In the majority of cases, these indices are equally weighted with few exceptions. The most important exception is Credit Suisse/Tremont, which is capitalization weighted. The debate about which index is more appropriate continues in the hedge fund community, which considers that a capitalization weighted index does not necessarily reflect the hedge fund industry because hot money normally flows in higher intensity into big hedge funds, making the results of these funds more relevant than the rest. However, capitalization indices are the norm in the universe of equity and bonds.

The importance of a well designed and functioning index is fundamental for investors. A well designed index can be subject to elaboration by financial products, such as an index fund, and opens the possibilities in future for hedge fund related derivative investable instruments. However, since hedge funds are a result of an entrepreneurial process in the financial industry, it is very difficult to group funds under a certain style or strategy that could ideally fit them. Another problem is standardizing asset sizes given that AUM reporting is on a voluntary basis and it is in the interest of the fund manager to inflate the AUM by consolidating offshore and onshore AUM.

Reporting to an index is one of the few marketing tools that hedge funds have in order to reach retail investors. Moreover, the problem of the low transparency of the alternative investment vehicle is not very compatible with an investable index and if the index demands a high degree of transparency, it risks developing a non-representative benchmark. The financial community, retail and institutional investors, as well as financial institutions need to have a well designed and dependable benchmark. Credit Suisse/Tremont has imposed a number of conditions to its index's constituent, such as transparency, a minimum AUM of USD 10 million, audited reports, and various other conditions with the result that their index has become an investable index, which is the most important one in the industry.

Nevertheless, hedge fund indices as well as other indices suffer the same statistical imperfections. The most important deficiencies originate from the fact that reporting is voluntary and in most cases the results are unaudited. In this frame, logically the worst managers do not report to the index but also funds that are closed to new investors do not report because they are not marketing to new investors. Thus, the indices probably do not represent the returns of the best and the worst managers. Some data vendors do not consider certain investment styles as hedge funds and therefore those funds are also not included. This is the case of funds implementing the style of managed futures, which are not included by some data vendors in their indices.

Another important issue is the so-called survivorship bias. Since the average lifespan of a hedge fund is 5.5 years, there are a large number of hedge funds included in the indices that have been reporting and that are defunct either because they went out of business or for consolidation reasons. This situation can create inaccuracies in the rankings because it distorts both the positioning and the average results. Considering an example explained by Lhabitant (2004), if we think about 10 marathon runners reaching the finish line out of the 100 that originally started the race, we would not know how to refer to runner number 10, since runner 10 could be the one placed last or one of the top 10 performers. Fortunately, most data vendors maintain defunct funds in their databases in a segregated manner. Moreover, the backfilled and instant history bias is related to hedge funds that now enter into the fund index and back report their historical results to the index, altering the past average returns of the index. Others deciding to not report historical returns also distort the overall picture.

There are a number of fundamental reasons why the financial community requires a purely dedicated and dependable hedge fund index. One of the most important is that non-dedicated indices are not a dependable benchmark that can be applied to the alternative investment universe, because hedge funds make extensive use of derivatives, short selling, and leverage while other asset classes do not present these characteristics. Moreover, we have seen that the universe of hedge funds is very heterogeneous and therefore styles are very mixed and hardly classifiable using a simplistic method. Because of routine trading in illiquid securities, many hedge funds

present smoothing appraisals similar to real estate valuation indices and therefore non-dedicated indices are fully inappropriate to benchmark hedge fund managers. Institutional investors need to provide investors and trustees with reference bearings on the portfolio returns of their assets under management. An index also serves the purpose of monitoring behaviour of hedge funds in relation to other funds. Following Bailey (1992), we can consider that the most important properties of an index are: simplicity and ease of understanding, replicability, comparability in terms of homogeneous open prices, taxes etc., and being representative of the investment vehicle's universe.

2. Index for Hedge Funds and Problems with Track Error

The problem with the benchmarks is that they normally operate with ratios that are more intuitive rather than being based on statistical or financial economic theory. Some of these statistical ratios are:

- Capture indicator: average of the captured performance.

- Up capture indicator: the fund average return divided by the benchmark average, considering only the periods when the market is up. The ratio is best when at its highest value.

- Down capture indicator: the fund average return divided by the benchmark average, considering only the periods when the market is down. The ratio is best when at its lowest value.

- Up number ratio: measures the number of periods when the fund was up, during the time when the benchmark was up. The larger the ratio, the better.

- Down number ratio: measures the number of periods when the fund was down, during the time when the benchmark was down. The lowest the ratio, the better.

- Up percentage ratio: measures the number of periods that the fund outperformed the benchmark when the market was up.

- Down percentage ratio: measures the number of periods that the fund outperformed the benchmark when the market was down.

- Percent gain ratio: the number of periods that the fund was up.

- Ratio of number of negative months over total month: indicator of downside risk of the fund.

In order to overcome all the problems inherent to hedge funds indices, some investors have started to benchmark managers according to their peers and reaching excellent results. The dynamic trading strategies, leverage, and non-market assets make benchmarking certain investment styles very difficult to assess. In this respect, recent research by Gregoriou and Zhu (2005) has implemented DEA (Data Envelopment Analysis) as a dependable statistical tool in benchmarking hedge funds and CTA to obtain ranking of funds according to different criteria. This system is ideal for benchmarking managers against their peers by visualising relative efficiency in the frame of the efficient frontier.

Hedge fund indices can be considered in general terms as valid approximation to benchmarks in the hedge fund industry despite the distortions induced by the lack of transparency and other factors. Moreover, investors should try to benchmark managers against peers under different criteria in order to obtain dependable rankings which could be used in efficient portfolio rebalancing or asset allocation.

04 | Assessment and Selection of Managers

1. Importance of hedge fund managers in the fund selection process

The most important element in the hedge fund as an investment organization is the manager. Normally in the start-up fund, the manager, trader, and risk officer are the same person. Unless the manager has previous experience in hedge funds, he will be specialized solely in building long only portfolios. The investment organization relies on the talent of the manager for its success. As compensation, managers receive a management fee on the AUM and a participation on the returns of the fund, the so-called performance fee, which normally compensates the manager for the performance of the investment above a certain hurdle rate, which could be the returns of a risk free asset or Libor, for example. Managers usually offer to investors a high watermark clause. This clause allows investors to refrain from paying a performance fee when their investment does not outperform the returns obtained during the last compensation period. It also acts as an incentive to avoid losses, because no bonus would be paid to the manager until the investor has recovered the losses experienced during the last compensation period, which normally is quarterly. High watermark provisions could negatively influence a manager's portfolio architecture because of the interaction of convex compensation and a long horizon instead of the convexity of the compensation scheme.

Research has established that convex payoff structures incentivates risk shifting in investment organisations (Carpenter, 2000 and Ross, 2004). Indeed, not penalizing the manager for his audacity or volatility acquired by the portfolio positions could be the result of the fee's structure in an investment company. However, empirical research conducted on a statistically significant sample of hedge funds (Panageas and Westerfield, 2005) has proven that hedge funds invest a constant fraction of the assets in risk free assets with the rest invested in a mean variance asset portfolio.

The process of wealth transfer from the investor to the manager has to be justified by the risk adjusted returns being in excess of a certain rate, such as returns on risk free assets or by the level of alpha generated by the manager. Some hedge fund managers charge a performance fee only for returns exceeding a certain hurdle rate, such as 90 days T-Bills. Contrary to mutual funds, a hedge fund manager's compensation scheme depends deeply on the strategies implemented in order to generate alpha. The high watermark acts as both an incentive for the investor not only to invest in the fund initially but also to retain the investor in the fund. However, investors must consider the timeframe mismatch between performance fees accruing on a monthly basis and high watermarks being set at the beginning of the year on an annualized basis.

Many investors have criticised the fee structure of hedge funds using variations of the following example. When a fund charges 20 percent performance fee and returns USD 100 in the first year, then the fee charged is USD 20. In the second year, the fund manager produces minus returns of USD 100, but then does not charge any fees under the high watermark clause. The net performance of the fund over these two years was zero percent and the total performance fee paid to the fund manager was USD 20. The high watermark is the principal reason why hedge funds voluntarily close. When a hedge fund manager carries forward a negative balance and in the next period generates a good performance, due to the high watermark clause, the manager is unable to charge a performance fee and therefore the usual practise is to close the investment company and create a new one.

According to several hedge fund databases, hedge fund managers charge management fees between 0 to 6 percent of the AUM and performance fees from 0 to 42.5 percent. The factors deciding what fees may apply are uncertain, as neither volatility nor past performance nor AUM are explanatory variables. The role of the high watermark is to lock-in underperformance in the fund because once the assets decrease to a significant level below the high watermark, the manager cannot provide to the investor the perception of excess returns, and therefore he redeems his shares in the fund. Therefore, the decision to liquidate the fund under these circumstances can be considered as endogenous. This aspect constitutes one of the most important to have under consideration while assessing the massive collapse of hedge funds during the credit crisis that inflicted severe unexpected losses to different hedge fund strategies as explained by López Pascual and Cuellar (2008).

An important difference between hedge fund managers and mutual fund managers is that in the mutual fund industry, the better performing the fund, the more funds this fund will manage to raise. Empirical research (Sirri and Tuffano, 1992, Chevalier and Ellison, 1995) has demonstrated that with the success of mutual funds, the flow of investment is directed to both top performers and bad performers alike. On the other hand, research made on hedge funds (Goetzman, Ingersoll and Ross, 2003) shows that top hedge fund performers are hesitant to accept

new funds. This management behaviour among hedge funds is explained by the capacity constraints imposed by limited arbitraged-in expectations of opportunities where from a certain funding level, more investment increases the systematic risk given a certain investment strategy. The aforementioned research has regressed the net fund growth on the lagged return in cross section and established that hedge fund management technology is not linear and therefore does not accept more investment at any given time. Hedge fund managers managing large funds grow slower than smaller hedge funds.

Another important aspect to consider while assessing hedge fund managers in a fund is to determine if and to what extent the managers invest in the fund themselves. In the past, it has been considered an important aspect if the managers in a fund are investors as well. In general, there is the perception among investors that a fund with investing managers underperforms funds with no investing managers. The inferred conclusion from this statistic is that when managers start a fund and invest for others, they increase risk using leverage because they know that in the event of a fund failure, they will find employment in a financial institution (however, this principle may no longer apply in a severe bear market). When the manager is wealthy and invests his own money in the fund, he becomes risk averse and conservative in his investment decisions, taking less risk than other peers and therefore limiting the returns of the fund. On the other hand, investors can also be averse to funds where the members of the management do not invest, alleging that if the managers are not putting money into their own strategy, then why should someone else do so.

2. Liquidity and duration mismatch problems as a contingency problem

Managers can establish liquidity gates and lockup periods for the fund. This is an important aspect when a fund is investing in illiquid securities or during periods when large volumes of so-called hot money is flowing in the industry as well as in order to prevent the devastating effects of massive redemptions as experienced during the 2007-2008 credit crisis. The main problem related to hot money is that some strategies demand a certain time to produce returns, while hot money is only interested in short term performance while on the other side, panic scenarios are only interested in the flight to quality. Another of the principal mistakes made by money managers is to allocate short term liquid assets to long term strategies, which induces hedge fund managers to provision for eventual redemptions reducing the amount of total investment or increasing leverage and therefore risk in order to accommodate the demands of hot money.

Some strategies using derivative or fixed income instruments require certain maturity terms and permitting some investors to redeem before maturity of the investment could affect severely the NAV calculation, which could result in benefiting short term investors at the cost of long term investors. In the event of collective simultaneous redemptions, hedge fund managers impose liquidity gates where if certain quantities of investors wish to redeem, they can only obtain a certain percentage of their investment, having to wait for a certain time for the remainder, which is subject to the end calculation of the NAV or the audited balance sheet. Excepted from the reminder are investments in illiquid assets that the manager can allocate within his discretionary mandate and segregate from the portfolio in a sidepocket or private equity like structure, which allows for protection from massive redemptions during a period that can last up to 8 years and represents normally between 5-10 percent of the total assets under management. However, reporting on such positions allocated to private equity like structures normally lacks the kind of transparency for the investor that private equity fund managers provide to their investors. In the same way, funds of hedge funds managers are forced to impose or pass along the same redemption conditions of their constituent underlying funds to their investors in order to be able to not dislocate investments. In the context of duration of the investment and lock-up periods, we have to consider recent research (López Pascual and Cuellar, 2007), where hedge funds establishing longer lock-up periods perform significantly better than funds offering none or shorter lock-up periods.

3. Quantitative performance evaluation and selection of hedge funds and funds of hedge funds - An innovative method using DEA (Data Envelopment Analysis)

Investors seeking to assess hedge fund performances refer traditionally to the absolute returns of the investment on an annualized basis. However, this approach to performance assessment can be considered as naïve, because it does not take into consideration the total dimension of the risk implied in the investment. For this reason, in finance the principle of performance analysis according to the mean and variance has been established. The importance of considering risk adjusted returns in the performance assessment of investment funds allows investors and funds of funds managers to better establish their asset allocation policies in the short as well as in the long term. The concept of risk adjusted returns refers to the returns of the investment fund in relation to a risk free asset, which in financial literature is usually referred to as the T-Bond or 90 days T-Bill and has a volatility of 0 percent, and in relation to the volatility of the investment fund as measured by the standard deviation.

The ratio capturing the adjusted return in one numeric value is the Sharpe ratio, formulated by William Sharpe (1966) and already presented earlier in the introduction. However, the practical applicability of the Sharpe ratio to alternative investments is widely disputed in practitioner as well as in financial academic circles. First of all, to consider a risk-free asset as a benchmark to assess a hedge fund investing in a variety of asset classes with non-normal return distributions using leverage, instrument derivatives, and short selling seems inappropriate when assessing an investment portfolio with different asset classes and hedging strategies. Secondly, we cannot consider it as a strong measure that can be decisive in asset allocation or portfolio rebalancing. It is not because of the high simplicity implicated in the Sharpe ratio, but a complex asset allocation requires a deeper assessment of risk than the one expressed by the Sharpe ratio. Consider for instance a multistrategy fund of hedge funds assessing its rebalancing strategy and exposure of a portfolio of 30 underlying constituent hedge funds with different investment styles and investing in different markets using different instruments and different hedging strategies, and we can consider that the task of assessing returns in relation to the risk is vastly more complex than using one benchmark and the risk implied by the volatility of the investment vehicle.

We consider the different ratios that have been established in the industry and others that will probably arrive as a matter of discussion about possible performance measurement tools. The Information ratio allows the investor to assess the risk adjusted return in relation to another benchmark than the risk-free asset, such as a structured product with guaranteed capital or an index fund or another passively or actively managed portfolio that better represents the cost of opportunity for the investor. Investors should always choose the asset that yields the highest Information ratio. Considering the information ratio as:

$$Ir = \frac{R_p - R_b}{TE_p}$$

(1.2)

Where Rp represents the return of the investment portfolio and Rb is the return of the benchmark. TEp is the tracking error or deviation of the investment portfolio from the benchmark.

The tracking error has been commonly used in fund management to assess comparability of funds or in relation with actively or passively managed investments or other assets. In research about comparability of investment funds (Hwang and Satchel, 2001), it is considered that if the tracking error is positive, the investment portfolio is outperforming the benchmark in linear form based on the following formula:

$$TE = \left(\frac{1}{T} \sum_{t=1}^{T} (R_{t-1\,t} - R^{benchmark}_{t-1\,t}) \right)^{\frac{1}{2}}$$

(1.3)

Another way to express tracking error would be in a quadratic form:

$$TE = \left(\frac{1}{T-1} \sum_{t=1}^{T} (R_{t\text{-}1\,t} - R^{benchmark}_{t\text{-}1\,t})^2 \right)^{\frac{1}{2}}$$

(1.4)

However, it is very questionable if investors would easily interpret the results in the quadratic form. As a matter of fact, research (Rudolf et al., 1999) considers that investors are oriented towards lineal results, preferring then the expression in (1.3), but suggest a version incorporating mean absolute deviation (MAD):

$$TE_{MAD} = \frac{1}{T-1} \sum_{t=1}^{T} \left| R_{t\text{-}1,t} - R^{benchmark}_{t\text{-}1,t} \right|$$

(1.5)

It should be considered that neither the information ratio nor the tracking error ratio are generally in use to assess risk adjusted returns in the context of hedge funds. However, some researchers consider that assessing performance of hedge funds in relation to a cost of opportunity such as the risk-free asset does not express accurately the cost of opportunity of the investor in relation with the asset allocation policy. Moreover, if we consider the importance of quantitative and qualitative performance assessment in relation with a portfolio of hedge funds (FOF), the measures discussed remain short of being able to provide the investment manager with the tools necessary to rebalance his portfolio and dynamically allocate the assets using all the financial instruments required to maximize performance.

4. Forward looking portfolio rotation strategies in FOF

Portfolio managers are not only looking to maximize returns and minimize risk based on historical performance, but they are also looking to allocate in function of sectors or investment styles or asset classes to which they wish to minimize or maximize exposure. Investors in hedge funds wish to gain exposure to hot sectors increasing returns but limiting risks. The objective of diversification within the hedge fund portfolio is also a fundamental aspect in FOF management. FOF managers focus on identifying significant macro trends or strategy selectors or rotators, and then once those factors are identified, the FOF manager will proceed with the process of manager selection.

Multiple dimension assessment remains a challenging task for quantitative assessment of hedge funds or in general for alternative investment vehicles. The same exercise is also implemented by multi-strategy hedge funds that have to allocate dynamically to strategies or sectors that are more likely to realize higher returns. Hedging strategies of the portfolio manager should be taken under consideration because certain hedging instruments such as OTC derivative instruments or futures and option contracts can have a cost in relation to the investment that can adversely affect the allocation, reducing the expected returns and increasing the volatility and this without considering the implied cost of hedging counterparty risk, which may not be hedgeable.

For the risk management desk, the use of a statistical tool that is capable of assessing hedge funds based on multiple dimensions implies the possibility of limiting the exposures in accordance to the risk budget, policies, and according to the assessment of contingent and potential risk, while at the same time optimizing the allocation based on expected returns given by the opportunities that the market offers or is expected to offer. Since hedge funds are investment vehicles that are able to capture short term opportunities under certain situations, portfolio managers have to be able to rank exposures and limit them in accordance to their risk management policies.

Simplistic models are unable to respond to the needs of the money managing industry allocating resources, subscribing and redeeming subscriptions according to new opportunities and threats. In this frame, the portfolio manager uses the statistical tool and should:

1   Develop specific procedures for rebalancing

2   Have a defined operational methodology

3   Understand clearly how the allocation or the trading works

4   Establish the desired risk exposure with the quantitative analyst and risk manager

The methodology that this thesis introduces is related to a statistical method used particularly in the area of production management to rank for instance production facilities in accordance to different optimization criteria.

Data Envelopment Analysis (DEA) has been recently implemented in performance analysis of hedge funds and Commodity Trade Advisors (CTA), particularly by Gregoriou (2003), Gregoriou, Zedzro and Zhu, (2005) and Gregoriou and Zhu (2005). In this paper, a different angle in the research of DEA and its application to hedge funds management is taken by applying the multicriteria selection based on risk management for the risk management desk. Furthermore, DEA is applied as a tool in the rebalancing decision either for multi-strategy hedge funds using dynamic asset allocation and hedging exposures with forwards and futures instruments and for portfolio management of hedge funds or FOF minimizing exposures to undesired assets, sectors, currencies, or styles and/ or maximizing exposures to others.

05 | Investment monitoring, ranking, and portfolio re-deployment strategies

1. Selection, risk management, and monitoring in FOF using DEA - an innovative application

Analysing hedge funds in order to build a portfolio of hedge funds is not an easy task for a FOF manager. The challenges of selecting the constituent underlying funds is about disclosing all the relevant variables of a hedge fund that can be critical to meet the expected returns. As mentioned before, many of the best managers may not be open to new investment. In this frame, there are two closing criteria to consider: soft close and hard close. Soft close means that the fund is generally closed to new investments but open to high quality investors with the level of sophistication that allows for a long term investment horizon or investors that have already invested in the fund. Hard close is when the manager does not allow any kind of new investment.

FOF managers are not generally considered high quality investors because of their constraints related to liquidity, while a large pension fund having a long term horizon is thought to be a quality investor for a hedge fund manager. In this frame, the FOF manager must match the duration of the assets (participations in the underlying funds) with the liabilities (assets under management from OPM – other people's money). This is normally handled in probabilistic terms of redemptions and subscriptions. The recent credit crisis of 2007 – 2008 and the massive redemptions by investors to hedge funds have exposed the relevance of the illiquidity risk in the context of allocation / redemption mismatch.

The value added by FOF is provided to investors for a price, the so-called fees on fees or double fee structure which FOF managers demand from investors. The objective of the FOF is to design a portfolio architecture that allows for efficient diversification, while maximizing returns and minimizing risk exposures. The cost of information in an industry with a low degree of transparency is high, and therefore FOF managers deserve their fees on fees given their experience in the sector and their ability to select and perform due diligence on the underlying constituent funds. Nevertheless, it important to consider the proven enforcement capabilities of the FOF manager in relation with covenants and other specific provisions expressed for instance in side letters with the underlying vehicles that can provide the FOF investor with comfort in relation to possible undesired exposures to allocation / redemption mismatch generating redemption gates and / or illiquidity issues such as allocations to sidepockets.

Another aspect is the liquidity that FOF managers provide to investors while the constituent funds may not be so generous with liquidity. Hedge funds normally invest in markets presenting mispricing opportunities. The nature of the instruments in those markets are mostly illiquid, so when a hedge fund provides high degree of liquidity it may eventually be investing in highly liquid securities, which do not offer the level of returns that illiquid securities do. Investments in traditional directional strategies offer low returns and normal levels of volatility but high liquidity. The value added by FOF managers is in fund selection, management, and monitoring of the underlying constituent funds particularly in relation with enforcement of the conditions of the allocation. However, hedge fund portfolio construction is a challenging area for FOF managers.

The selection of an investment vehicle has been traditionally derived either by naïve selection, where the manager allocates investment with random criteria or 1/n formula (equally weighted portfolio), where n represents the number of funds in the fund of hedge funds, or by rather more quantitative and qualitative portfolio selection criteria. The selection of the investable universe is based on basic criteria such as:

1   Restrict the areas or strategies in the FOF

2   Assets under management currently in the hedge fund

3   Track record of the manager and transparency levels

4   Liquidity and redemption policies

5   Risk management policy

6   Ratios analysis of historic performance

7   Benchmark risk adjusted returns to peers or a benchmark

8   8 Ps analysis:

- People: Background, integrity, level of own wealth invested

- Product: Return objectives, volatility targeted, financial instruments involved, diversification, leverage, fees structure

- Investment process: What is the philosophy behind decisions in the investment committee

- Performance: Qualitative analysis of past performance and attributes

- Partnership: Cohesion between managers as partners and the organisation

- Portfolio: Asset classes, concentration of positions, risk allotment policy

- Peers: Assess the uniqueness of the strategy to avoid capacity constraint effects

- Potential: Scalability of the investment strategy

After performing due diligence, the FOF will proceed with the allocation of the investment among the constituent funds. This means from the investable universe, the underlying funds will receive investment according to two possible criteria: naïve discretionary allocation as discussed before or a quantitative approach based on Markowitz mean-variance analysis (MV), assessing the trade off structure between risk and returns. Here the challenge is to forecast the possible returns of the fund. The generation of rank probabilities of returns is made using optimization functions in order to calculate the portfolio weights for each fund strategy and each constituent. This optimization process traditionally is made using historical data and standard quadratic programming techniques. As we have seen, the use of MV analysis in portfolio selection of hedge funds will not consider the asymmetric returns and should not be the preferred analytical tool in selection analysis and rebalancing of the portfolio.

We would like to introduce another concept in the allocation of funds by the FOF manager or the investor allocating or rebalancing the investment portfolio. The investor who has already selected the most appropriate investment funds must select the desired exposure before continuing the allocation process. Data envelopment analysis is the tool we would like to introduce for this process. The money manager has to select the funds from the investable universe based on a number of different criteria which are beyond MV or skewness and kurtosis considerations. FOF managers applying top-down analysis could consider given a certain environment or a chain of events on a macro or micro scale that they want to gain exposure to a certain strategy, industrial sector, markets or assets. They could as well wish to avoid certain risk exposures. For instance, these criteria could be expectancy of change in interest rates, which can negatively affect exporters but positively affect importers, negatively affect the real estate financial sector and MBS strategies or positively certain currency correlations.

In this case, with the help of the performed PCA the investment manager can assess based on the return attributes of the underlying constituent funds the variables that he wants to minimize (input) and the variables to maximize (output). Those variables which PCA has established as statistical variables have to be associated with performance attributes of the underlying constituent funds of the portfolio. Moreover, the investment manager can establish with the assistance of DEA a rank of investable funds which best match the multidimensional selection criteria and integrate inputs such as proportion of returns attributable to certain factors. In this context, we come back to the risk radars we discussed before and which resulted from factors decomposition from the PCA of each fund.

Using a non-parametric statistical system such as DEA can allow the portfolio manager to better allocate the risk according to risk assessment once the portfolio manager has established the inputs and outputs according to his exposure preferences, which in order to achieve maximum statistical explanatory power should be as different as possible from each other. Misspecifications in the model could occur when irrelevant variables are included or relevant variables are excluded in the specification (Smith, 1997). In the frame of FOF management, we consider that the utilization of DEA in this context with PCA factors allows for a more efficient allocation than the model presented by Davies, Kat, Lu (2004) using Polynomial Goal Programming (PGP). However, after ranking funds according to multiple criteria with DEA, the selection can be submitted to further analysis, such as minimum variance portfolio optimization, which is based on the covariance matrix, although following Amenc and Martellini (2002) who suggest the matrix should be submitted to some "cleaning" before proceeding with the optimization. Caution has to be taken when using statistical linear models in order to rank funds after their "alpha" because they can generate very different estimates and therefore their ranking would highly disputable (Amenc and Martellini, 2003).

Portfolio rebalancing in FOF is a complicated exercise and has to be developed according to risk exposure parameters that are specific to the options like profile of hedge fund returns. FOF architecture has to be designed in order to avoid that strategies bet against each other. Alpha selection has been considered the preferential strategy

in selecting and rebalancing a portfolio despite empirical research demonstrating its low efficiency. One of the other factors not found in traditional portfolio analysis such as MV is the hedge fund's diversity and complexity of cost structure, because there is not homogeneity in the redemption and subscription provisions from fund to fund. However, it is possible to include the fees as a constraint or input to minimize in DEA in order to assess the cost of rebalancing.

Moreover, FOF managers are also expected to spot emerging talents and invest in their ventures. Investing in emerging talents allows the FOF manager to reserve capacity for future star managers, which at a certain time when closing their fund for new investors will certainly allow further investment from investors that were part of the seed process of their fund. Also, thanks to their excellent network and knowledge of the sector, FOF managers are expected to be able to allocate to funds which are closed to new investors. This particular ability means that even other FOF would invest in a FOF given the ability to invest in a star manager. However, the impact of a triple fee structure for investors has to be carefully assessed. The relevance in this particular case has to be made on alpha generation and risk adjusted returns for justifying a triple fee structure.

2. Importance of contingency planning in hedge funds investing

The contingency planning for FOF or investors allocating to hedge funds is very important. This is because many hedge funds, despite their name, are not hedged and therefore are exposed to a number of risks. While assessing the investment vehicle for the FOF manager, it is important to monitor the risk concentration of the underlying constituent funds. Particularly risky are multistrategy funds because their investment mandate allows for shifting strategies as opportunities arise and increasing the exposure into a single strategy or even in a single asset. The radar system discussed earlier offers possibilities to monitor risk positions at the single fund and at an aggregated level. It is important to maintain the level of correlation so that diversification is also maintained. The level of correlation among the funds should be considered as a trigger that starts the portfolio rebalancing given that correlation can implicate risk concentration. However, this is only possible when the manager offers a good level of granularity in the visibility of the allocation and clear specification in the assets held.

Another important aspect in hedge fund monitoring is the AUM and the track record. Empirical research (Goetzman, Ingersoll and Ross, 2003) has demonstrated that the larger the AUM the lower the return, and the older the fund the smaller the returns, while on the other hand, AUM size is seen by investors as a forward-looking indicator of stability and respectability. This can be related to the fact that on one side, many strategies have capacity constraints and on the other, at the beginning of a fund the manager is pursuing an original opportunity in the market, then other funds detect such an opportunity and follow the initiator, reducing the size and returns of the original opportunity. When the investment was initially made, the returns were in line with the forecast estimations but as the AUM grew or the fund practised the same strategy for a certain period, the returns can be dramatically reduced and/or volatility increased. This situation can be at the origin of strategy shifting in an underlying constituent fund presenting threats that an inexperienced manager in the new strategy is unable to handle, but also strategy shift is in many cases at the origin of a high degree of risk concentration. However, as returns in the fund increases, so does the AUM because a fund presenting higher returns attracts more funds. In the case of private equity funds, Kaplan and Shoar (2003) have established that the relationship between fund flows and returns is concave and positive; therefore, although an increase in returns triggers an increase in funds flow, it does not occur at the same rate. The same performance has been manifested across the hedge fund universe as in the case of private equity funds. Strategy shifting can disrupt the established diversified allocation within the FOF and can lead to severe consequences for the risk management desk.

The way to identify strategy shifting for the FOF manager is to perform PCA on a regular basis on the returns of the portfolio. The statistical factors can be associated to the investment factors and then a comparison with strategy factors on a time scale can be made. Strategy shifting should lead to a reassessment of the position by the FOF manager. In reality, the FOF manager would call a meeting with the concerned underlying fund to discuss the opportunity offered by the new strategy, the experience, the risk management issues, and hedging strategy implemented. According to this briefing, the FOF manager should either realign his positions in the FOF rebalancing the portfolio or close the position, altering the original strategy.

As a diversified investment vehicle, a FOF should always maintain a hedged position on the strategies of their underlying constituent funds in order to limit losses generated by suboptimal strategies. Important aspects to have under permanent control by the FOF are the variables that are relevant to assess the risk adjusted returns. The trade off structure of the risk versus rewards scenario should be such that the highest possible return should be generated in the frame of the lowest possible volatility.

The contingency measures implemented by the FOF are very different and especially include the use of derivatives in order to hedge the exposures generated by possible contingencies by the underlying fund. In this context, it is important to consider the use of CVaR as an important tool in assessing risks resulting from dynamic asset allocation. It is possible to perform portfolio rebalancing based on CVaR obtaining an optimal portfolio of hedge funds in agreement with the risk desired and limiting the level of exposure to undesired risk. Once the investment vehicle has entered in the area of maximal risk, the investor or the FOF has to eliminate that position and rebalance the portfolio. In financial economics, 3 different horizons have been widely accepted:

1 Trading horizon: Minimum time between transactions

2 Decision horizon: Minimum time interval between rebalancing decisions

3 Planning horizon: Holding period that the investor intends to keep the position

If we consider that hedge fund allocations are active dynamically managed investment positions, this could imply that the three horizons would not necessarily converge. Continuous time dynamic asset allocation has been the subject of a number of research projects (Merton, 1969, 1971). In this frame, we consider that asset allocation in hedge funds or funds of hedge funds is highly efficient given the dynamic instance of the allocation provided it complies with alpha generation. The investor or FOF manager redeeming his shares in a fund for the purpose of rebalancing the portfolio or closing the position has to carefully assess the immediate negative impact on the valuation of the positions that can result from his redemption decision and the consequences for shifting of the entire aggregated portfolio risk exposure structure. Also, the indirect impact of disinvesting collectively by a group of investors in a certain strategy can have significant consequences for the rest of the portfolio because there is a possibility of nested investments among hedge funds negatively affecting the other strategies in the fund and the diversification map of the portfolio. Another option currently very much in use among FOF managers is the trading of the undesired positions in question in the secondary market for hedge fund participations avoiding at cost of a discount the possibility of being forced into liquidity gates or sidepockets. However, the secondary market for hedge fund participations is an emerging sector and pricing of the assets is highly constrained as far as efficient prices by the limited quantity of participants in the market that makes the bid/ask spread very wide, and which since the credit crisis has been increased by the strong presence of opportunistic investors such as vulture funds looking for opportunities of distressed investors in search for liquidity at any price.

The portfolio rotation, in line not only with negative risk exposure but also with optimal risk preferences allocation, calls also for prudent decisions in redemption policies as part of the side agreements with the hedge fund manager. In this context, unlike traditional asset classes or other actively or passively managed investment vehicles, portfolio rebalancing must consider the overall risk concentration and loss of liquidity that a redemption policy can generate in the overall investment portfolio. Considering that hedge funds are normally added to the investment portfolio as risk diversifiers, one of the important factors to consider by portfolio rebalancing is the shifting in the correlations. Very little research is existing quantifying and modelling correlations and more has been done to analyze the sources of time-varying parameters.

One of the few research studies made to model econometrically the correlations shift in hedge funds is the model proposed by Spurgin, Martin and Schneeweis (2000):

$$Corr_{H,I} = a + bR_I$$

This model assists assessment of the correlation shifts of a hedge fund (H) in relation to an (I) index, where a and b are coefficient estimators from historical data.

06| Conclusions

Hedge funds are very complex instruments and investors looking to diversify have to consider advice by a professional advisor in the area of hedge funds. But are the benefits of diversification well obtained by investing in hedge funds? The diversification effects of hedge funds in the frame of portfolio investment have been recently seriously disputed by Kat (2006), amongst others, who demonstrate the high degree of correlation of hedge funds with a portfolio containing 50 percent S&P 500 and 50 percent T-Bonds, where in 2001 the correlation represented 0.83 and in 1998, it was 0.84. The same research presents the terrifying correlation of the returns of hedge funds with the S&P 500 being 0.93 in 1998, 0.84 in 2003, and 0.81 in 2004. In this context, as a result of that research, a passive synthetic derivative instrument replicating the returns of hedge funds has been proposed, avoiding the significant fees charged by their managers.

On the other hand, it is well known that in the hedge fund universe, only a small proportion of these vehicles are alpha generators and therefore it is logical to assume that a large quantity of hedge fund managers are trend followers and not alpha generators. A synthetic derivative instrument can hardly be considered as a perfect substitute for the manager's skills, if that manager is truly an alpha generator. The most important criteria for allocating to hedge funds are alpha generation and long term view.

The importance of a professionally performed operational due diligence cannot be understated. Most hedge fund failures have operational failures as their cause. The managing of a portfolio of hedge funds has to be clearly specified and continuously monitored in order to maintain the specified expected risk and return profile of the portfolio. In this sense, a total visualization of the risk is paramount in order to deploy portfolio rotation strategies that allow for an optimal opportunity capture and risk reduction.

Traditional quantitative analysis has exhibited its constraints in hedge fund applications. More specific measurements have to be implemented when assessing risk and performance of hedge funds. Furthermore, when assessing emerging managers qualitative models have to be developed in order to understand the potential of the emerging talent. Investors have to understand the importance of investing in new ventures and have to work together with consultants or internal fully dedicated task groups to screen and select new managers.

As mentioned, investors should take investments in hedge funds with a long term view and seriously understand the opportunities that certain strategies offer in this new asset class. The focus should not be on short term performance but in persistent alpha generation, which is responsible for sustainable gains. Alternative investments are indeed very difficult to benchmark. Hedge fund indexes exhibit a high degree of tracking error and are very inappropriate for benchmarking. As a solution to the problem, peer performance comparison has presented excellent results and is currently performed by major professional investors and consultants in hedge funds.

The credit crisis of 2007-2008 has particularly exposed a large number of Ponzi schemes developed in the hedge fund industry that makes professional selection and management of hedge fund an absolute requirement for hedge fund investors. FOF managers and consultants need to maintain a clear visibility on liquidity and returns requirement of their investors as well as direct and indirect exposure to other external vehicles that could be subject to operational inefficiencies and legal compliance problems. In this frame, not only quantitative but qualitative assessment of hedge funds is the most relevant aspect in the allocation to alternative investments.

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References

- Amenc, N. and L. Martellini, (2002): "Portfolio Optimization and Hedge Fund Style Allocation Decisions", Journal of Alternative Investments, vol. 5 (2), pp. 7-20

- Amenc, N. and L. Martellini, (2003): "The Alpha and Omega of Hedge Fund Performance Measurement", discussion paper, EDHEC Business School

- Bailey, J.V. (1992): "Are manager universes acceptable benchmarks?", Journal of Portfolio Management, vol. 18, pp. 9-13

- Brinson G.P., L. R. Hood, G.L. Beebower (1986): "Determinants of portfolio performance II: an update", Financial Analysts Journal, July-August

- Brinson G.P., B. D. Singer, G.L. Beebower (1991): "Determinants of portfolio performance II: an update", Financial Analysts Journal, May-June

- Carpenter, Jennifer (2000): "Does option compensation increase managerial risk appetite?", Journal of Finance, vol. 21, pp. 2311-31

- Chevalier, J. and G. Ellison, (1995): "Risk-taking by mutual funds as a response to incentives", NBER Working Paper No. 5234

- Davies, R., H. Kat, S. Lu (2004): „Fund of Hedge Funds Portfolio Selection: A Multiple-Objective Approach", Working Paper, ISMA Centre

- Fung, W. and D. A. Hsieh (2001):"The risk in hedge fund strategies: theory and evidence of trend follower", Review of Financial Studies, vol. 41, pp. 313-41

- Goetzmann W., J. Ingersoll, Jr., and S. Ross (2003): "High-Water Marks and Hedge Fund Management Contracts", Journal of Finance, vol. LVIII, No. 4, August

- Hu, H.T.C. and B. Black, (2007): "Empty Voting and Hidden (Morphable) Ownership: Taxonomy, Implications, and Reforms", The Business Lawyer, vol. 61, May 2006

- Hwang S. and S. E. Satchel, (2001): "Tracking error: ex-ante versus ex-post measures", Working Paper, City University Business School, London

- Gregoriou, G. (2003): "Performance Appraisal of Fund of Hedge Funds Using Data Envelopment Analysis", Journal of Wealth Management, 5(4), pp. 88-95

- Gregoriou, G., N.K. Sedzro and J. Zhu (2005): "Hedge Fund Performance Appraisal Using Data Envelopment Analysis", European Journal of Operational Research, 164(2), pp. 555-571

- Gregoriou, G. and J. Zhu (2005): "Evaluating Hedge Fund and CTA Performance, Data Envelopment Analysis Approach", John Wiley & Sons, Inc.

- Kaplan, Steven N. and Schoar, Antoinette (2003): "Private Equity Performance: Returns, Persistence and Capital" (June 2003). NBER Working Paper No. W9807. Available at SSRN: http://ssrn.com/abstract=420321

- Kat, H.M. (2005): "Integrating hedge funds into the traditional portfolio", Journal of Wealth Management, Spring 2005

- Kat, H.M. (2006): "Alternative Routes to Hedge Fund Replication: A Note", Working Paper, Cass Business School, London, December 2006

- Lhabitant, Francois-Serge (2004): "Hedge Funds: Quantitative Insights," John Willey & Sons, Ltd.

- Lhabitant, Francois-Serge, N. Laporte (2006): "Funds of funds of hedge funds: welcome to diworsification", in G. Gregoriou, Ed. Funds of Hedge Funds, Performance, Assessment, Diversification, and Statistical Properties, Elsevier Finance

- Lintner, J. (1983): "The potential role of managed commodity-financial futures accounts (and/or funds) in portfolios of stocks and bonds". Presentation at the Financial Analysts Federation

- López Pascual, J. and R. D. R. Cuellar (2007): "The Challenges of Launching, Rating, and Regulating Funds of Hedge Funds", Journal of Derivatives and Hedge Funds, vol. 13 (3)

- López Pascual, J. and R. D. R. Cuellar (2008): "Puede la Regulación de Hedge Funds Limitar el Impacto Negativo de una Crisis Sistémica – Evidencia Empírica", (Can the Hedge Funds Regulation Limit the Negative Impact of a Systemic Crisis? – Empirical Evidence) . Universia Business Review, vol. 4, pp 42-53

- Merton, R. (1969): "Lifetime portfolio selection under uncertainty: the continuous time case", Review of Economics and Statistics, vol. 51, pp. 247-57

- Merton, R. (1971): "Optimum consumption and portfolio rules in a continuous time model", Journal of Economic Theory, vol. 3, pp. 373-413

- Panageas, S. and M. M. Westerfield (2005): "High-Water Marks: High Risk Appetites? Convex Compensation, Long Horizons and Portfolio Choice", Working Paper 03-06, The Rodney L. White Center for Financial Research, The Wharton School, University of Pennsylvania

- Rockefellar, R.T. and S. Uryasev (2000): "Optimization of Conditional Value-at-Risk", Journal of Risk, vol. 2, pp. 21-41

- Rockefellar, R.T. and S. Uryasev (2001): "Conditional Value-at-Risk for General Loss Distributions", Research Report 2001-5. ISE Dept. University of Florida

- Ross, S. A. (2004): "Compensation, incentives, and the duality of risk aversion and riskiness", Journal of Finance, vol. 59, pp. 207-25

- Rudolf, M., H. Wolter and H. Zimmermann (1999): "A Linear model for tracking error minimization", Journal of Banking and Finance, 23, pp. 85-103

- Sharpe, William (1966): "Mutual fund performance", in Journal of Business, 39, pp. 119-38

- Sharpe, William (1994): "The Sharpe Ratio", in Journal of Portfolio Management, 21, pp. 49-58

- Sirri, E. and P. Tuffano, (1992): "The demand for mutual fund services by individual investors", Working Paper, Harvard Business School

- Smith, P. (1997): "Model Misspecification in Data Envelopment Analysis", Annals of Operation Research, vol. 71 (1), pp. 233-52

- Spurgin, R. G. Martin and T. Schneeweis (2000): „A method of estimating changes of correlation between assets and its application to hedge fund investment", Working Paper, CISDM

- Waring, M.B. and L.B. Siegel (2006): "The Myth of the Absolute-Return Investor", Financial Analysts Journal, 62 (2), pp. 14-21

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