Hedge Funds

Examining the Potential Benefits and Risks of Hedge Fund Investing

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Abstract

Hedge funds continue to interest investors, and investment in hedge funds has continued to grow. Institutional investors seeking enhanced returns and/or diversification often consider hedge funds as a potential vehicle for achieving these objectives. However, poor data, fees, lighter regulation and liquidity continue to be barriers. Even so, it is anticipated that institutional investment into hedge funds will continue to increase.

Historically, the flows into hedge funds have been fairly variable, but recently, flows have been substantial. This has caused certain investors to be concerned about the prospects for future returns, believing some opportunities may have been eroded. It is clear that, given the substantial level of fees, high gross information ratios will be required to generate attractive net of fee returns.

Academic work into hedge funds has been of mixed quality. Research has focused on a number of areas, including the distribution of hedge fund returns, biases in hedge fund data, and understanding the drivers of returns. Without exception it is concluded that returns are non-normal, and that the modelling of returns is non-trivial.

Investors can invest directly into hedge funds as well as through funds of hedge funds. There is also a wide range of structured and leveraged products available, which utilise hedge funds in part of their structure. Hedge funds can potentially also be used in the so-called "alpha transport" and "liability benchmark" products. Investors should note that many hedge funds have higher operational risk than more traditional investments, so additional due diligence in this area may be required.

Hedge fund performance can be measured against the stated objectives of the fund, an appropriate composite of market indices (which may simply be 100% cash), or a peer group hedge fund index. Of these, the composite of market indices is likely to best represent the neutral position of the manager, and hence be an appropriate comparison.

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Introduction

What are hedge funds?

Whilst there appears to be little consensus on an exact definition of the term "hedge fund", there has been increasing convergence of thought around the essential elements of any description of hedge funds. What is clear is that the term "hedge" is misleading since hedging, whilst common, is not a necessary feature of a hedge fund. What then are the key elements of the description? In our opinion, a current definition of hedge funds might cover the following key elements:

- organisation of the fund;
- pooled nature of the fund;
- primary underlying investments;
- investment objectives; and
- utilisation of leverage

Taking each of these in turn:

Organisation of the fund

Hedge funds are privately organised investment partnerships which usually include both general and limited partners. The distinction arises in that whilst both categories of partner will contribute capital, the liability of the limited partners is restricted to their capital outlay whilst the general partners can be held personally liable for liabilities arising out of trading and operating activities. In addition, involvement in daily trading and operating activities is usually the sole domain of the general partners.

Pooled nature

Investor monies are invested on a collective basis with investors owning units in the fund rather than the underlying investments.

Underlying investments vehicles

The primary investments are publicly traded securities and this may include derivatives. The use of derivatives, whilst not uncommon, is not a necessary feature of a hedge fund. However the utilisation of derivatives is relatively greater compared to traditional investment managers. Certain hedge funds may also invest in unquoted or over-the-counter securities. Hedge funds can typically go "short" as well as go long in a particular market or stock. For example, going "short" in the equity markets means that a hedge fund might borrow securities and sell them, hoping to buy them back at a later stage for a lower price.

Investment objectives

Hedge funds will usually express their return objective as a nominal return target thereby reflecting their "absolute return" nature and hence their aim of producing

positive returns irrespective of the direction of security market movements. Hedge funds are therefore typically reliant on investment manager skill to generate returns. Correspondingly, a hedge fund manager will typically view risk in terms of the loss of capital rather deviation of returns from an index or benchmark. It is also becoming more common for hedge funds to have "cash plus" type objectives.

Leverage

It is not uncommon for hedge fund managers to make significant use of leverage. However, leverage is not a necessary feature of a hedge fund.

What are the main issues for prospective investors?

Hedge fund investors focussing on the relative merits of investing in hedge funds will need to consider the characteristics of this investment carefully. To do so they will be keen to analyse available data on hedge funds and this is where the investor's challenges arise. The remainder of this section sets out some of the key challenges that a prospective hedge fund investor faces. Whilst not exhaustive, the reader should readily recognise that, when compared to traditional investing, the informed hedge fund investor must shift from their existing investment paradigm towards one which allows for greater interrogation of underlying assumptions, where the investor in traditional assets might be inclined to take these for granted.

Data

"Garbage in, garbage out" is a phrase that readily springs to mind in a discussion about data available to assess the relative merits of hedge fund investing. The relative infancy of the industry coupled with significantly reduced regulatory involvement means limited past data exists. Furthermore this data is often not readily available and when available tends to be prone to error. Data is also subject to distortion as a result of "survivorship bias" since hedge fund longevity tends to be positively correlated with fund performance. The implication for investors is clear, appropriate adjustments to the underlying data will usually be required together with appropriate caveats attached to the interpretation of results.

Return enhancement through manager skill

For a given strategy the generation of alpha (excess return from active management) is largely dependent on the unique skill of the fund manager. Given the extent to which this unique skill influences the ultimate level of return hedge fund, due diligence and selection must inevitably place relatively more emphasis on the manager's credentials, track record, trustworthiness as well as the extent of personal investment in the fund. Investors also need to consider that hedge funds often have lower liquidity and provide less transparency than other investment vehicles such as mutual funds, and typical fees are significantly higher than for more traditional vehicles.

Diversification and risk reduction

Analysis of available data does suggest that when added to an investment portfolio hedge funds can provide diversification benefits due to their low correlation with traditional long-only funds. However, the diversification merits of hedge funds cannot be generalised to all portfolios and all situations. Accompanying these diversification benefits are significant risks for the prudent investor to keep in mind. Key amongst these risks is the likelihood that the addition of hedge funds to a portfolio may lead to reduced skewness and increased kurtosis since hedge fund returns tend to be fat-tailed and negatively skewed. For an individual hedge fund, this would mean that one bad year could easily undo a number of good ones, whilst at portfolio level, the addition of a hedge fund increases the likelihood of a significant loss.

Regulatory considerations

In the UK, the Financial Services Authority (FSA) regulates hedge fund managers but does not regulate the funds themselves. With the majority of hedge funds manager based in the US, it is also important to note that the US Securities and Exchange Commission ("SEC") does not subject hedge funds managers to the usual regulations that apply to traditional investment vehicles but they are still subject to federal antifraud laws. Hedge funds themselves are often domiciled in offshore locations, and thus may provide less regulatory investor protection.

Recently, the SEC voted in favour of new regulations for hedge funds that will require the majority to register as investment advisors and make their books available for the regulators to review. In addition the new rule also calls upon hedge funds to appoint a compliance officer and implement fraud controls.

This freedom from some regulation requires increased emphasis on the due diligence aspects of picking and monitoring hedge fund managers because unlike traditional institutional investments, there is less of a "safety net" from regulatory supervision.

Literature Review

In the Appendix, there is a bibliography of several academic studies into hedge funds. The bibliography is comprehensive but unlikely to be incomplete, although it does cite at least one paper in each of the major fields of investigation. It also cites papers from each of the five major academic groupings conducting research on hedge funds and related topics. It is most important to note that the quality of the research published on the topic of hedge funds is unusually variable, and that much would not pass peer review for inclusion in better-known publications. Below there is a synopsis of generally accepted results and an outline of areas which remain contentious or for which there is conflicting evidence.

Hedge funds are notoriously secretive, although there is evidence that as the industry grows and matures, this is growing less generally true. There are two principal debates around this question of secrecy: Firstly over the completeness and accuracy of published returns data and indices based upon these, secondly over the desirability of transparency of security holdings. There are many hedge funds that do not report

returns to any database. The databases in existence show a great degree of heterogeneity and this is particularly evident in their published indices. The databases are a self-selected population and in some cases suffer from back-fill bias. There is no evidence that the time serial characteristics of indices and the cross-sectional behaviour of their constituents are ergodic (i.e. have predictive ability very far into the future). The indices are nearly all equal weighted with a simple arithmetic means being common, although in a few cases market capitalisation weights are used. In most cases the sub-indices and classifications are categorised by the declared style of the fund manager – in some a range of statistical classification techniques are employed to distinguish funds.

The descriptive statistics of hedge funds and their indices all show that these are far from normal – far further than is the case for equities or government bonds. Many styles, such as fixed income arbitrage, exhibit statistically significant (positive) serial auto-correlation. For most funds data is only available at monthly periods which makes detailed investigation of the short term dependence characteristics impractical. For traditional equities, the typical result is significant negative auto-correlation at daily returns level declining to marginal negative auto-correlation at weekly and insignificant results at monthly intervals.

For hedge funds, where auto-correlation is evident it usually persists through and beyond the monthly level. There is some debate as to cause as "marking to model" is a practice in use in many hedge fund strategies and this can be a cause. Strategies that effectively write options may also exhibit autocorrelation as premiums are collected often and exercise may be less frequent. Whatever the cause, the investment consequences of the statistical properties of hedge fund returns are far from unimportant. Part of the problem is that the strategies being employed are effectively the writing of financial insurance and the accounting has no provision or reserving. In other words, all premium is treated as if it were earned income and any subsequent claim is directly taken against capital. There are a number of researchers who adjust variance to reflect serial auto-correlation, which reduces the published mean-variance attractions materially.

It is important to realise that hedge funds are not an asset class in their own right. An asset class promises to deliver returns from a productive investment – the return is endogenous to it. Market prices for such asset classes are more complex as they are derived from market participants' valuations of these endogenous returns. Hedge funds by contrast promise to earn returns from their operations upon assets. To resort to analogy, the traditional fund manager seeks to find not just those assets that will generate the highest intrinsic returns but also those which will be most highly valued by the market place. The hedge fund manager by contrast is less concerned with the intrinsic value and any growth in it, and is principally concerned with a strategy for the buying and selling of assets. This is analogous to a retailer where the inventory may show little or no increase in value but the retailer by virtue of his strategy of opening hours and location can profit. This analogy raise doubts as to the efficacy of looking to actual security holdings in determining risk. It also suggests strongly that observed returns may be far from normally distributed.

A number of papers investigate published returns series and demonstrate non-linear relations with traditional asset classes and risk factors. These tend to conclude that the

strategies employed can be replicated by combinations of traditional assets and options. However, it should also be noted that the profit participation of the manager in a hedge fund is option-like in character and this alone would suggest such a relation. There are a number of papers which examine manager incentives and which usually claim results to the effect that new young funds outperform old established funds because of these incentives – the established manager effectively becomes risk averse as the fund size grows. This observed result could equally be a question of dis-economies of scale for strategies which are effectively saturated. The relative out-performance of new funds is also disputed.

The question of regulation of hedge funds, though topical, has received little academic attention, though Danielsson, Taylor and Zigrand (2004) is an important first step. One of the arguments frequently advanced for hedge funds is that they improve market liquidity. This argument is weak: although it is true that hedge funds tend to generate much trading activity, this is achieved with leverage granted by their prime broker banks or the repo markets. This is finance can be withdrawn at short notice, and the evidence for new finance from outside the established banking and investment system is scant.

There is a long established line of academic argument which questions the existence of the second moment, the variance, in traditional asset classes as represented by for example the S&P 500 – this school is populated by Fama, Samuelson and Mandelbrot among others. The calculated values of the stability coefficient in this stable distribution representation is far below that required for normality and existence (1.67 versus 2.00). The values of these coefficients for single stocks tend to cluster in the range 1.45 – 1.75. When these stability co-efficients are calculated for hedge fund styles the results are lower, an typically in the range 1.20 – 1.7.

Most funds of hedge funds appear not to use the standard Markowitz mean variance methods, and there are a number of studies which conclude that the optimal portfolio actually consists of fewer funds than the number of stocks we are accustomed to with equities, and far fewer than are observed in fund of funds. There are numerous studies which consider optimal portfolio construction of funds of funds and also portfolios of traditional assets and hedge funds: most attempt some form of expansion of the mean-variance approach to include skewness and kurtosis.

The question as to the existence of the variance is far more broadly concerning as an overwhelming majority of the studies of hedge funds are dependent upon this having a population finite value – for example those using multivariate regression to determine risk factor exposures and sensitivities.

It is difficult not to conclude that the analysis of hedge funds and the related funds of hedge funds is in its infancy.

Investor Activity

Total Asset Flows into hedge funds

The latest Hedge Fund Research (HFR) Quarterly Industry report shows asset flows and assets under management up to 31 March 2005 for each of the HFR hedge fund strategies, including fund of hedge funds.

Whilst the HFR database does not include all hedge funds that are said to exist, the HFR database is generally regarded to be one of the most comprehensive. As at 31 March 2005, according to the latest HFR industry report, the number of hedge funds in the database totalled over 8,000 single- and multi-strategy funds worldwide.

As Figure 1 below shows, investors have continued to allocate assets to hedge funds with estimated assets exceeding $1 trillion as at 31 March 2005. Note that these numbers exclude assets allocated to hedge fund funds to avoid double-counting.
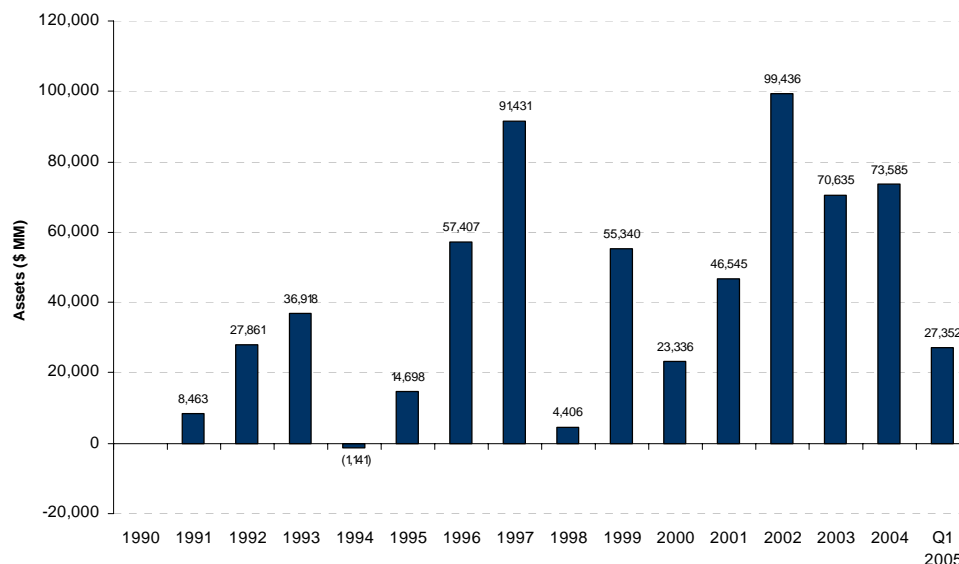
Figure 1
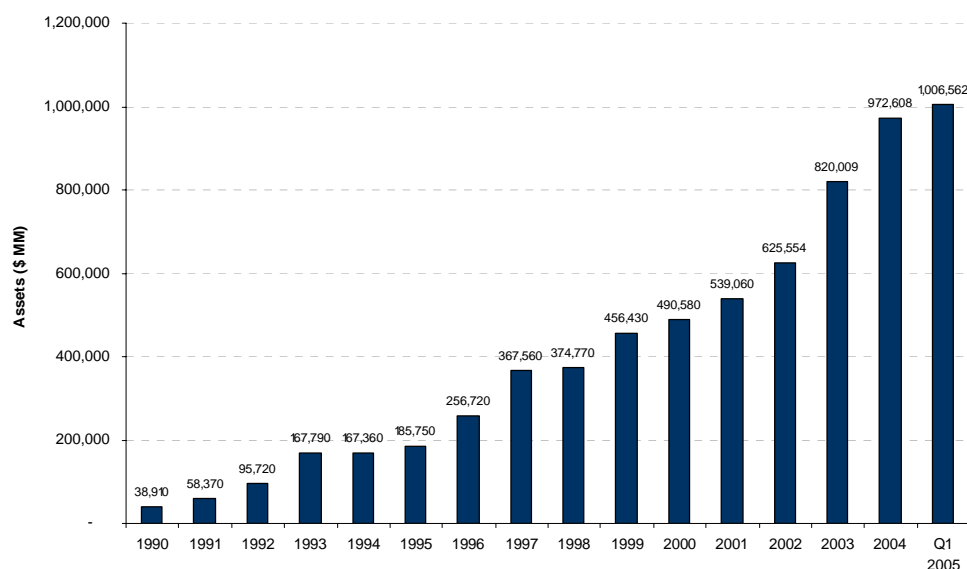
 Source: HFR Industry Reports

In the first quarter of 2005 alone, over $27bn was invested in hedge funds. Figure 2 below shows asset flows to hedge funds since 1990. The chart illustrates that asset flows into hedge funds are by no means stable. However, the last three years (2002-2004) have seen a doubling of asset flows over the prior three years (those immediately following the LTCM and emerging market crises). This period coincides the bear market in traditional asset classes.

It is worthwhile noting that whilst there is academic research into the factors investors consider before placing their money into mutual funds, little academic research has

been conducted into the determinants of asset flows into hedge funds[1]. The amount flowing into hedge funds in 2005 is already more than was allocated in the whole of 2000.

Figure 2

Source: HFR Industry Reports

Net Asset Flows 2002 to 2004

Figure 3 below shows net asset flows from 2002 to 2004. Relative value, event driven and hedge equity strategies appear to have seen the largest inflows in these strategies over this period. This period has also seen decreasing flows into convertible arbitrage strategies, which has been followed by significant outflows in Q1 2005 (see later).

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[1] A couple of notable papers on the subject include Goetzmann, Ingersoll, and Ross (2003) and Agarwal, Daniel and Naik (2004). Both papers arrive at different results, with the later concluding that money flows chase recent good performance. The former paper concludes that the best performers experience outflows. The differences in results come are due to different methodologies, as well as different regulatory and market environments in the different sample periods covered.

Figure 3
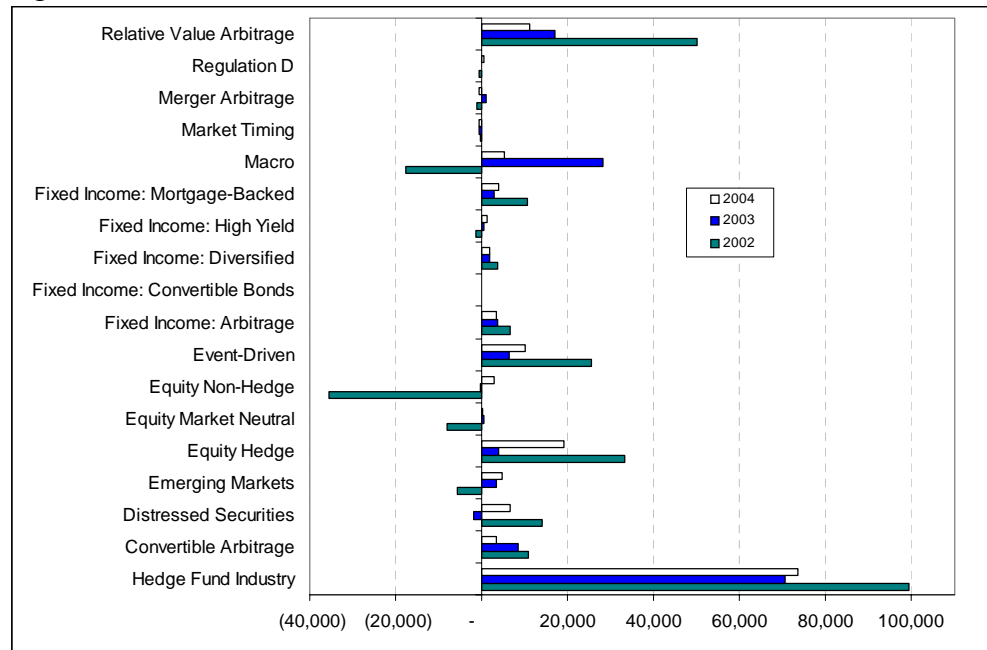
Source: HFR Industry Reports

What are institutions doing?

Much of the flow of assets in recent years has come from institutions. Data on the source of flows (i.e. institutions, individuals) is extremely difficult to forecast or estimate due to the lack of regulation of hedge funds. Much data relies on estimates provided by the hedge funds themselves, and surveys of institutional investors, brokers and investment consultants.

Recent reports in the financial press and results of surveys by investment consultants, do tend to suggest that institutional investors across the globe are increasing allocations to hedge funds. The Casey, Quirk & Acito/Bank of New York (2004) study provides an interesting analysis on the state of the hedge fund industry. The study was based on the views of "50 senior professionals from leading institutions, hedge funds, and other hedge fund related organisations", in the Spring of 2004. In addition, over 80 institutions were polled and asked various questions on current and planned allocations to hedge funds, how hedge funds fit in an institutional portfolio, the role of fund of hedge funds and so on. A database of 400 US institutions currently making hedge fund investments was created and the results synthesised.

As at the end of 2003, US institutions had invested approximately $66 billion in capital with hedge fund managers, primarily from around 400 institutions. Figure 3 below shows how endowments and foundations account for around 50% of institutional capital in hedge funds. The study reports that nearly 40% of all endowments and foundations with more than $100m have an average allocation of 12% to hedge funds, with some almost having 50% in hedge funds. In addition, the study reports that only 15% of pension funds currently invest in hedge funds with allocations of 3% on average.

Figure 3 - Institutional Capital Allocations to Hedge Funds: Year End 2003
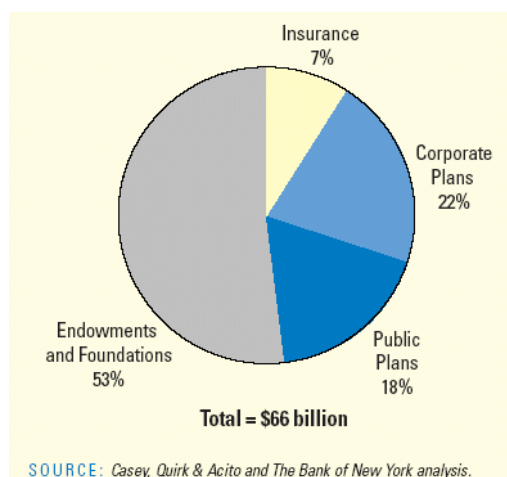
The study does report that pension funds are the fastest growing source of institutional capital. Many funds are amending their investment policies and sought approval for systematic investment in hedge funds. Insurance companies represent the least developed institutional market for hedge funds with less than 10% of all institutional hedge fund capital. This is primarily due to regulatory issues affecting statutory capital and insurance accounting rules.

The study estimates that by 2008, U.S. Institutions will have over $300 billion in capital invested in hedge funds (see Figure 4 below).

Figure 4 – Estimated Growth of U.S. Institutional Hedge Fund Capital
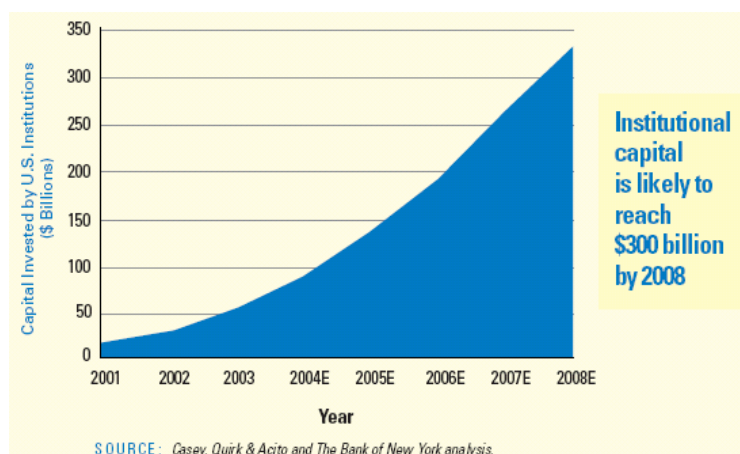
The above is based on the assumption of a market return of 7% per annum. The report claims that the increased capital flow will be driven disproportionately by defined benefit plans, with the pensions proportions reaching 65% of total institutional hedge fund allocations by 2008.

Another interesting aspect of the research is the predicted institutional share of total hedge fund capital flows (Figure 5 below). The report suggests that by 2008, U.S. institutions will account for almost 50% of all net asset flows into hedge funds. Once

European and Asian institutions are added the percentage could be even higher. It is worth noting that in 2001, the institutional share of asset flows was less that 10%.

Figure 5 - Institutional Share of Total Hedge Fund Capital Flows

SOURCE: Casey, Quirk & Acito and The Bank of New York analysis.

In January 2005, Pensions & Investments reported that the top 200 U.S. pension funds increased investments in hedge funds by 46.5% to $21.1 billion as at September 2004.

What are institutional investors' objectives of allocations to hedge funds?

The often mentioned benefits to investors' portfolios of allocations to hedge funds include their low correlation to traditional asset classes and their attractive risk-adjusted returns, leading to an upward shift in efficient frontiers.

State Street, in conjunction with the Global Absolute Return Congress (Global ARC) conducted a study of institutional investors at the 2004 Global ARC in Boston in October 2004. The participating institutions collectively managed more than $1.2 trillion in total assets in both hedge funds and non-hedge funds investment portfolios. Approximately 51% of the survey participants were government/public pension plans, 28% endowments, 9% were corporate pension plans, with 12% categorised as "other".

The results showed that over a third of participants currently had allocations to hedge funds of 10% or more with 42% expecting to have a 10% or more allocation within one year and 50% reaching that level within three years. State Street noted that 16% had not yet invested in the asset class and the largest percentage increase in hedge fund investing would come from public and government pension plans.

In addition, 42% of respondents said that they invested in hedge funds to improve returns on a risk-adjusted basis and 37% cited portfolio diversification as their chief motivation. Interestingly, 32% of respondents saw hedge funds as a way of maximizing profit, compared with 25% claiming it was to mitigate risk.

Comparison of single strategy allocations, fund-of-hedge funds and structured products

Investors building an exposure to hedge funds typically want to access a variety of different strategies, and funds of hedge funds allow this through one single

investment. Fund of hedge funds purport to offer efficient risk diversification, accessibility, affordability, professional management and built-in asset allocation. In a fund of funds arrangement, the investor delegates the time and effort required to research and complete due diligence on hedge fund managers, across a number of strategies. A number of fund of funds also claim to offer access to managers who are closed to most new investors. Fund of funds may offer better liquidity terms to investors than some single strategy funds. For example, strategies such as distressed debt and other event-driven styles or those in emerging markets often have long lock-up periods, sometimes up to a year or more. However, almost 80% of fund of funds offer either monthly or quarterly redemptions, and around 80% offer monthly subscriptions.

A major drawback of fund of hedge fund structures is the cost of their service. Typical charges include 1% of total assets under management and 5-10% performance fees. Some also have hurdle rates (which may sometimes have high watermarks). Surveys of institutional investors reveal that smaller investors or those new to the asset class typically start with fund of hedge funds. With some investors, as internal expertise, infrastructure and assets grow, assets are allocated to individual managers.

Product offerings

There are a wide range of products that can be built from single hedge funds. These can be broken down into two broad categories:

- Multi-manager funds of funds: These are products that combine several hedge funds within a particular investment style e.g. convertible arbitrage or hedge equities. The manager-specific risk is mitigated by combining managers.

- Multi-manager, multi-style fund of funds: Here funds are chosen to diversify across managers and style so that the portfolio also benefits from diversification across styles.

Single style funds give investors the option to decide on asset allocation. These funds can also be added as "satellites" to an existing core investment portfolio.

The blending of diversified strategies and asset classes within a single fund seeks to provide more stable returns than individual hedge funds. The levels of risk and return can be tailored to the investors' needs through the strategy allocation. For example, many fund of hedge fund managers now not only offer multi-strategy, multi-manager funds but multi-manager single strategy funds, to cater for investors desiring exposure to specific strategies.

Structured Products on hedge funds

Over the past number of years, there has been substantial growth in the use of structured products in alternative investments, notably with hedge funds. Many products featuring complex payoff options have been constructed. To some extent the development of structured products was driven by institutional and private investors

facing regulatory and tax restrictions when attempting to gain direct hedge fund exposure.

In some instances structured products are the only method to gain exposure to hedge funds. One of the main driving forces behind hedge fund structured products has been that investors are seeking alternative payoffs patterns not achievable from direct hedge fund exposure. Some of the more common structured products are principal protected and leveraged funds of funds, which are described in more detail below.

Principal Protected products

The demand for principal protection – particularly for those where the underlying asset is a fund of hedge funds - has been driven by a number of factors. For example, crises such as the collapse of the hedge fund, Long Term Capital Management, have meant that investors will only allocate to the class if some form of downside protection is in place. Capital protected products achieve this downside protection by guaranteeing the principal at maturity. Every principal protected product is different, though most of them combine some of the following features:

- Principal protection : repayment of 90-100% capital invested
- Minimum guaranteed return/coupon
- Formal capital guarantee
- Defined lifetime of product
- Exposure to hedge funds: between 0% and 100%, also dependent on whether leverage is provided
- Profit lock-in feature

There are three main techniques used for provided capital protection:

- Constant Proportion Portfolio Insurance (CPPI): dynamic rebalancing between the hedge fund portfolio and a zero-coupon bond portfolio
- Zero-coupon bonds with an embedded call option structure on hedge funds
- Total return swaps: deposits to meet the guarantee and a financing facility provided by a bank to gain hedge fund exposure

Investors need to consider a number of issues regarding a particular structured product on hedge funds, including the credit rating of the guarantor, the fact that the principal protection is typically only available if the product is held to maturity, and the fact that the portfolio manager may lose some control of the portfolio management to the guarantor.

Leveraged products

Fund of hedge fund portfolios can be leveraged, which is an approach used by investors who want a different risk/return profile than the underlying fund. It is important to note that the ratio between the return generated per unit of risk (or Sharpe Ratio) will decrease with increasing leverage as the fund risk increases linearly, while return is increases by the leverage factor minus financing cost.

Alpha Transport and Liability Benchmark Strategies

Recently, there has been an increase in the popularity of so-called liability benchmarks. This is due to the introduction of accounting standards like FRS17, which makes the short fall in the market value of assets relative pension liabilities more transparent in a sponsor's annual accounts. In addition, the recent bear market in equities has left many pension schemes with a large deficit. As a result, certain pension funds are considering setting benchmarks that take into account pension liabilities rather than being relative to a market index like the FTSE All Share.

A liability benchmarks can be defined as an investable benchmark that resembles the expected liability cashflows of a pension scheme as closely as possible. There are various types of benchmarks depending on whether a pension fund is simply duration matching or cashflow matching. The degree to which these benchmarks remove investment risks relative to liabilities depend on the types of instruments that are allowed. For example, swaps can provide a closer match than just using bonds.

Pension schemes that are currently in a deficit may prefer not to invest all their assets into liability matching portfolio since this would effectively be locking in the current deficit. A pension scheme may want to invest in strategies that aim to outperform liabilities by a predefined margin. This additional performance can come from two sources:

- Alpha – returns due to manager skill
- Beta – returns due to taking market exposure (e.g. investing in an equity index)

Traditionally, most pension funds aimed to outperform their liabilities by investing in equities. Today, pension funds are looking to diversify their sources of return, including finding better ways of accessing manager skill. This growing focus on alpha has led to an increase in the use of portable alpha strategies.

Most pension funds expect their manager to add value by using the same assets as in the benchmark given to them. For example, bond managers aimed to outperform a given bond index by investing in bonds. As the name suggests, portable alpha strategies allow the manager to generate alpha in the asset class of their choice and then transport this alpha to the relevant benchmark portfolio.

A more common example of portable alpha is active currency overlay strategies. Here the currency manager generates a return above cash by applying his skill in the currency markets. This alpha is then transported to another portfolio (usually equities).

Some providers are designing products that can add the alpha generated by hedge funds over a liability driven investment strategy. Due to the high level of manager specific risk associated with individual hedge funds, most providers prefer to use fund of hedge funds, or one of the increasing number of investable hedge fund indices, to deliver "cash + alpha" returns. As noted previously, hedge funds typically have some exposure to the markets and hence some of the returns will also be due to beta. The next step is to swap the cash element of the returns for a series of liability related

payments. The pension scheme is now left with a portfolio that targets a return of liabilities plus the assumed level of manager skill.

These liability-related payments can take on various forms depending on the scheme's requirements. The objective is usually to reduce both the interest rate and inflation risk of the assets relative to the liabilities.

A first order approximation to a portfolio that reduces interest rate risk would be to use a bond portfolio that has the same duration as the scheme's liabilities. If required, this can be improved upon by using a swap contract. The same approximation can be used to control inflation risk, where you would invest in a suitable bond portfolio that has the same split between fixed and inflation linked payouts as the liabilities.

One of the barriers to this approach is the requirement to use derivatives to implement it. There are several reasons why many pension funds find this problematic:

- Negative press and lack of familiarity of how derivatives work
- Potential legal complexity
- Initial costs involved (inflation swaps can be expensive)
- Cost and complexity of ongoing monitoring
- Minimum investment sizes can be quite large
- Managing collateral and rolling over positions from one year to the next.

Investment banks have been promoting liability driven investment and portable alpha strategies, in part due to their strong derivative capabilities. However, some traditional fund managers as well as fund of hedge fund providers have entered this market and are offering more "pension fund friendly" products e.g. pooled funds that remove the need for complex legal agreements and allow smaller schemes to participate. Generally, the take up of these products has been slow, but this may be set to change if providers can continue to improve the image and accessibility of derivative based products.

Expected returns from hedge funds

Notwithstanding the academic research that shows that hedge funds returns are significantly non-normal and difficult to model, it is useful to define simple model that can help assess the expected returns from hedge funds under different assumptions.

Defining the return from hedge funds in period t before any fees as g_t, and the return on asset i as r_{it}, we can model the return as:

$$g_t = x_1 r_{1t} + x_2 r_{2t} + x_3 r_{3t} + \ldots + e_t \text{ , where } \sum x_i = 1$$

Under the simplifying assumption that e_t is distributed normally with mean α and standard deviation σ, the gross "information ratio" can be defined as α / σ. Ignoring the complexity of high watermarks, we can then define net hedge fund returns (n_t) and net fund of hedge fund returns (nn_t) as follows:

$n_t = \max[(g_t - f_1)(1 - i_1), (g_t - f_1)]$, where f_1 is the base hedge fund fee and i_1 is the incentive fee.

$nn_t = \max[(n_t - f_2)(1 - i_2), (n_t - f_2)]$, where f_2 is the base fund of hedge fund fee and i_2 is the fund of hedge funds incentive fee.

The model above ignores the use of hurdle rates to calculate incentive fees, which some hedge funds and fund of funds use. Hennesee Group (2004) suggests values of 1.3% p.a. for f_1, and 19.3% for i_1. We are not aware of published fee surveys for funds of hedge funds, but values of 1% p.a. for f_2, and 5% for i_2 would seem reasonable.

As an example, if we consider only cash, equities and high yield bonds as explanatory variables for hedge fund returns, and using HFRI Diversified Fund of Hedge Fund Index (and the Merrill Lynch 3-month US Treasury Bill, MSCI AC World, and Merrll Lynch US High Yield Master for cash, equities and high yield bonds) over the period Jan 1990 to Apr 2005, a standard regression analysis estimates the following parameters:

$g_t = 67\%$ (cash return) + 19% (equity return) + 14% (high yield return) + e_t

The estimates for the mean and standard deviation of e_t are 10.0% and 6.4% respectively, resulting in a gross information ratio of 1.6. This clearly ignores any survivorship bias in the hedge fund data, although it can be argued that there is less survivorship bias in fund of fund data than underlying hedge fund data.

Given assumptions for future cash, equity and high yield returns, and for the gross information ratio, then it is possible to calculate the expected net returns from hedge funds (assuming that the fee basis remains unchanged). The table below illustrates expected net of fee fund of hedge fund returns in excess of cash, for various levels of cash return and information ratio. The table assumes an equity risk premium of 4.7% p.a. (which was the average equity risk premium for world equities over 1900-2004 as estimated by Elroy et al. (2005)), and a risk premium over cash of 2.2% p.a. (being simply the risk premium implied by CAPM based on past volatility for the assumed equity risk premium). The shaded column and row represent the average cash return and gross information over Jan 1990 to Apr 2005 respectively.

Expected Net Fund of Hedge Fund Return in Excess of Cash (p.a.)					
Gross Information Ratio	2.5% Cash Return	3.5% Cash Return	4.5% Cash Return	5.5% Cash Return	6.5% Cash Return
0	-1.6%	-1.8%	-2.1%	-2.3%	-2.5%
0.2	-0.6%	-0.8%	-1.1%	-1.3%	-1.5%
0.4	0.4%	0.1%	-0.1%	-0.3%	-0.6%
0.6	1.4%	1.1%	0.9%	0.7%	0.4%
0.8	2.4%	2.1%	1.9%	1.7%	1.4%
1	3.3%	3.1%	2.9%	2.6%	2.4%
1.2	4.3%	4.1%	3.9%	3.6%	3.4%
1.4	5.3%	5.1%	4.9%	4.6%	4.4%
1.6	6.3%	6.1%	5.8%	5.6%	5.4%
1.8	7.3%	7.1%	6.8%	6.6%	6.4%
2	8.3%	8.0%	7.8%	7.6%	7.3%

Given the significant drag from fees, it is clear that hedge funds need to deliver high information ratios in order to produce attractive returns to investors.

Non-Investment Risks

Fraud and administration risk

It is believed that few frauds start with the intention to defraud, but rather as result of administrative failure - someone tries to correct something by covering up, which ultimately leads to fraud.

Given fraud and administration risk, due diligence on individual hedge funds should consider operational risk as important as qualitative and quantitative risk. Some hedge funds are set up by charismatic entrepreneurs whose investment skills are often not correlated to their administrative capabilities. Consequently, these administration and operational skills are as important as investment ability.

Operational risk can be separated into three distinct areas:

- The risk of the fund manager and the management company.
- The risk within the fund.
- The risk of the third party providers, including administrator, custodian, trustees, prime brokers, directors etc.

Evaluation of Operational Risk

A number of possible steps to evaluate operational risk are described below. A number of investors, including fund of funds, use specialist individuals (e.g. accountants, auditors, lawyers and administrators) to conduct this evaluation.

- Validation of people - background checks on individuals can cover civil, criminal and regulatory history. In the United States this is easier than in Europe because access to information is readily available. The aim is to

ensure that fund managers are honest, decent and are what they say they are. Statements on biographies can also be checked, including verifying educational background.

- Validation of track record - if a track record exists, be it real or proforma, the current manager should demonstrate, with evidence, that they were responsible for it.

- Conflicts - conflicts of interest within a firm must be identified and preferably avoided. An example is a personal trading account.

- Infrastructure – Consider size and resources, and the roles of Chief Operating Officer, Director of Finance, Compliance Officer etc.

- Procedures - identify cash and trading controls and the separation of duties, back and front office. Internal checks and external relationships and the verification of orders and movement of money should be considered.

- Administration – where an external administrator is used (which is typical), their capabilities should also be considered. An important factors is the independent verification of prices

- Pricing – apart from the independent verification of prices, pricing complex holdings may need special attention, particularly when securities are not transparent or publicly priced. Such securities include private companies, complex derivatives, and illiquid foreign investments.

- Prime Broker – the capabilities of the prime broker should be evaluated, noting strengths and weaknesses, as well as any special terms or relationships extended.

- Structure of fund – the legal structure and regulation of the fund should be considered. Whereas the fund manager is typically onshore and regulated, the fund itself is often offshore, and therefore subject to a different (often lighter) level of regulation. The offering document and prospectus of the fund should specify the investment powers of the fund manager and the board of directors, as well as the lawyers, custodian and trustee. The independence of parties should be evaluated.

- Reporting – the frequency and nature of report to investors should be considered. Reporting can vary significantly from fund to fund, from a relatively opaque monthly newsletter to reporting on broad risk baskets, to detailed reporting of trades and holdings.

Benchmarking Hedge Fund Investments

Hedge funds that have a stated absolute return target or an outperformance target relative to cash provide at least some quantifiable measure against which to compare returns, but this alone does not measure how much risk the manager is taking to achieve returns. For those hedge funds with less defined objectives, investors may have difficulty determining whether a fund has performed well or not.

In traditional fund management, value added is usually measured by the outperformance over a market index, and risk is measured by the tracking error relative to the same index. Added value is typically commensurate with risk, although certain markets may offer better opportunities than others.

Performance measurement should aim to fairly and objectively quantify how much value a hedge fund adds (or subtracts) without constraining the manager. Both return and risk need to be assessed, as should the effect of fees, which are usually significant.

Benchmark indices

The measure against which performance is measured (the benchmark), should represent the neutral position of the manager i.e. the position they would hold if all of their positions had paid off and they no longer had any views. If the neutral position is cash, an appropriate benchmark is cash.

Cash is a natural benchmark for any hedge fund that aims to have no net exposure to broad equity and bond markets, i.e. to remain market neutral, but because the hedge fund universe is diverse, the benchmark index will be different for different hedge funds. For hedge funds that are not market neutral, a composite of cash and market indices can be used, such as 20% of an appropriate equity index plus 80% cash for a long-biased long/short equity fund that typically has 20% net long exposure to equities.

Comparing hedge fund returns, after fees, to a suitable composite of traditional market indices fairly and objectively shows the value added by the hedge fund through active management. It can also be used to help estimate the risk taken to achieve returns, for example by calculating the tracking error of relative returns.

Hedge fund indices

There are several hedge fund indices published, although they are better described as peer groups than indices as they are average returns for a range of hedge funds with various strategies. As noted previously, these peer groups may be subject to new entrant and survivorship biases. Also, the numbers from different providers can vary quite considerably because of differences in the mix of funds included in their databases.

There are also differences in how representative the indices are, and even those with the largest coverage typically only cover a relatively small proportion of the universe. If an index contains returns for funds closed to new investment (and many do), they cannot be replicated. "Investible" indices include only funds open to new investment and can therefore be replicated, but these indices are typically even less representative of the industry.

More importantly, it is difficult to argue that a hedge fund index represents the neutral position of a particular hedge fund manager. Therefore, together with the other issues described previously with such indices, it is difficult to conclude that they make appropriate benchmarks. This is not to say they do not provide very useful data, particularly if they are comprehensive and well-constructed.

References

Agarwal V, Daniel ND, and Naik NY (2004), *Flows, Performance, and Managerial Incentives in Hedge Funds*, JEL Classification

Casey, Quirk & Acito/Bank of New York (2004), *Institutional Demand for Hedge Funds: New Opportunities and New Standards*

Caslin JJ (2004), *Hedge Funds*, British Actuarial Journal Vol 10

Danielsson J, Taylor A and Zigrand J-P (2004), *Highwaymen or heroes: Should hedge funds be regulated?,* London School of Economics Financial Market Group Working paper

Elroy D et al. (2005), *Global Investment Returns Yearbook 2005*, London Business School

Goetzmann WN, Ingersoll J, and Ross SA (2003), *High-Water Marks and Hedge Fund Management Contracts*, Journal of Finance

Hennessee Group (2004), *10th Annual Manager Survey*

Howie RJ (2004), *Standard Setting*, Global Pensions

Howie RJ et al. (2003), *Absolute Return Funds and Institutional Investors*, Finance and Investment Conference

Kat H, (2003), *10 Things Investors Should Know About Hedge Funds*, Journal of Wealth Management

Appendix - Bibliography

Ackermann, C., R. McEnally, and D. Ravenscraft (1999), *The performance of hedge funds: Risk, return, and incentives,* The Journal of Finance 54, 833–874.

The authors analyze monthly return data for US and offshore funds, exploring data-conditioning, liquidation, sampling and self-selection biases, the last of which they claim offsets the effect of survivorship bias. They confirm that the superior hedge fund performance over mutual funds is linked to incentive fees, considering various causal relationships between fees and performance. The authors also conclude that hedge funds are more risky than mutual funds and examine the sources of this excess volatility.

Agarwal, V. and N. Y. Naik (2000a), *Multi-period performance persistence analysis of hedge funds,* Journal of Financial and Quantitative Analysis 35 327-342.

Agarwal and Naik investigate the persistence of hedge fund returns over many periods, both pre- and post-fee, at quarterly, half-yearly and yearly intervals, for ten different investment strategy groups. Using two quantities, alpha and the appraisal ratio, the authors regress these parameters from one period onto the previous one, build contingency tables judging alpha (appraisal ratio) of one period against alpha (appraisal ratio) of the previous period, and use a chi-squared test on each of these variables to uncover persistence. Their results over two periods indicate that longer return measurement intervals show less persistence in the fund performance, and that there is no visible relationship between directional/non-directional strategies and performance persistence. In the multi-period framework, they observe significantly lower levels of persistence than in the two-period framework and confirm the previous findings regarding investment strategy and length of return measurement interval. Whenever persistence is observed, they find it is likely that the fund is a loser continuing to lose.

Agarwal, V. and N. Y. Naik (2000), *Performance evaluation of hedge funds with option-based and buy-and-hold strategies*, London Business School Centre for Hedge Fund Research and Education, Working Paper HF-003.

Using the generalized asset class factor model, Agarwal and Naik evaluate the effect of trading strategy factors, location factors, and leverage factors for hedge funds grouped by investment style. They analyze 586 funds from the HFR database in six non-directional strategy groups and four directional strategy groups over one 106-month period and also two 53-month periods. The authors conclude that the total number of funds evaluated within a group did not significantly affect the number of factor exposures in the two sub-period analysis. In general, 93% of all hedge funds show significant exposure to five or fewer factors and these would be sufficient to account for most of the variation in returns. They claim that only 35% of funds added value (alpha above 0.3% survivorship bias) between Jan 1990 and Oct 1998 and 13% failed to add value (alpha below 0.3%). Lastly, they show that funds with leverage did not differ significantly in their performance from funds without leverage.

See also: Agarwal V. and N.Y. Naik (2000), *On taking the alternative route: risks, rewards and performance persistence of hedge funds*, Journal of Alternative Investments 2, 4, 6 - 23

Amenc, N., S. E. Bied, and L. Martellini (2002), *Evidence of predictability in hedge fund returns and multi-style multi-class tactical style allocation decisions*, USC FBE Working Paper No. 02-5.

The authors use the CSFB/Tremont indices to determine whether hedge fund returns are predictable. They find six factors that forecast the return and address the multi-collinearity of some of these factors. They investigate tactical style allocation and find that it generates as much return as in the equity universe, under the assumptions of perfect forecastability and no transaction costs. They compare style-timing portfolios in equity and fixed-income oriented universes and then incorporate transaction costs to their results.

See also: Amenc N., S. Curtis and L. Martinelli (2001), *The Alpha and Omega of hedge fund performance measurement*, EDHEC-Risk Working paper.

Amenc, N. and L. Martellini (2002), *The brave new world of hedge fund indices,* Edhec Publications.

The authors investigate the heterogeneity of existing hedge fund indices, discussing their failure to successfully represent the industry universe and the biases in their data. Putting data from twelve databases in one collection, they restructure the databases' strategy classifications, finding 25 to use in their work. Examining correlation and differences in reported returns, as well as exposure to different market risks, the authors show the heterogeneity of the current indices, justifying their search for a more representative one. Using principal components analysis and minimum variance analysis, they construct more representative, less biased (for diversifiable biases) 'pure style indices,' composed of competing indices.

See Also: Amenc N. and L. Martinelli (2002), *Portfolio optimization and hedge fund style allocation decisions*, Journal of Alternative Investments 5, 2 7-20

Amin, G. S. and H. M. Kat (2002), *Portfolios of hedge funds*, Alternative Investment Research Centre Working Paper Series, WP#0003

Amin and Kat investigate the properties of portfolios of baskets of hedge funds. Their method randomly collects the funds for each portfolio, numbering in members from 1 to 20. Working with mean, standard deviation, skewness, kurtosis, correlation with S&P 500, and correlation with Salomon Brothers Government Bond Index, the authors conclude that the basket of 15 funds sufficiently models the statistics of a basket of funds with more than 15 members. Their work assumes that all funds are weighted equally in each portfolio and that fund closure is dealt with by immediate rollover into a new fund without cost. They justify their random allocation of funds to each portfolio by stating that most funds with any history from which to make a non-random evaluation of value are no longer accepting investors, leaving investors to funds without performance data. They conclude that increasing the number of funds

will decrease skewness and standard deviation, while increasing the correlation with the stock market.

Asness C., R Krail and J. Liew (2001), *Do hedge funds hedge?*, AQR Capital Management working paper

The authors conclude that hedge fund do not hedge in any accepted sense of the word hedge. A finding mirrored subsequently in the rigorous market neutral style studies of Patton (see below).

Brooks, C. and H. M. Kat (2001), *The statistical properties of hedge fund index returns and their implications for investors*, Alternative Investment Research Centre Working Paper Series, WP #0004.

Brooks and Kat argue that mean-variance analysis (MVA) is inapplicable to hedge fund indices for two reasons: the indices have influential skewness and kurtosis unaccounted for by the analysis and there is no significant relationship between the distributions of different indices. In other words, MVA ignores essential characteristics of the indices' data. Moreover, an index representative of hedge funds as an investment class does not exist due to the lack of correlation, even when restricted to those hedge funds following the same strategy. After examining the statistics of a collection of hedge fund indices (including strategy based indices), Brooks and Kat conclude that the volatility will commonly be underestimated leading to an overestimation of the Sharpe ratio. Specifically, they cite an excess in the negative skewness and kurtosis in the distributions of the indices, unaccounted for by the Sharpe ratio, as the reason for the inadequacy of MVA.

See also: www.cass.city.ac.uk/airc/papers.html for the complete set of working papers of Amin and Kat

Brown, S. J. and W. N. Goetzmann (2001), *Hedge funds with style*, EFA 2001 Barcelona Meetings; Yale ICF Working Paper No.00-29

Brown and Goetzman question whether style of investment influences performance by comparing empirical results from TASS data. They explain that models used for mutual funds, which usually have high and positive correlations with asset class returns, do not capture the low and sometimes negative correlations of hedge funds with the same asset class returns. They cite their conclusion that linear risk models fail to account for the influence of active fund management on the performance of the fund. Brown and Goetzman conclude that funds' self classifications as determined by TASS questionnaires and fund disclosures are 'indeed reasonably descriptive' of the return-based classifications. They consider three methods of return-based classification: a generalized least squares procedure (GSC), Sharpe linear regression, and the method by Fung and Hsieh (1997) (see below). The authors conclude that across all three methods, strategy groupings of eight are better than groupings of five, that GSC stands out as most in line with self-classification, and that diversification across the styles is effective at reducing exposure to losing managers.

Brown S.J., W.N,Goetzmann and Bing Liang (2002), *Fees on Fees in Funds of Funds*, CISDM working paper

The authors consider the structure of charges and the benefits of diversification from funds of funds. They observe that under some circumstances the performance fee may exceed the realized return and also argue that the disappointing after-fee performance of some funds of funds is due to the fee structure. They suggest an alternate fee structure.

See also the following related group of studies: Brown S., W. Goetzmann and R. Ibbotson (1999), *Offshore hedge funds: survival and performance 1989 – 95,* Journal of Business 72, 91-117; Goetzmann W.N. Ingersoll J. and S. Ross 1997), *High water marks and hedge fund contracts*, Journal of Finance; Goetzmann W.N. Ingersoll J., Spiegel L. and I. Welch (2002), *Sharpening Sharpe ratios Yale*, ICF Working paper 02-08; and Spurgin R.B. (2001), *How to game your Sharpe ratio*, Journal Alternative Investments 4 (3) 38 – 46

Capital Market Risk Advisors (2002), *A guide to fund of hedge funds management and investment*, Commissioned by Alternative Investment Management Associsation (AIMA).

This booklet provides background information on the hedge fund and fund of funds industries. Articles included compare funds of funds to individual hedge funds, address issues and benefits of diversification, and discuss selecting benchmarking and monitoring of fund of funds investments. Portfolio construction, the effects of liquidity constraints, due diligence, and management fees are also covered.

Cvitanic J., Lazrak A., Martinelli L., and Fernando Zapatero (2003), *Optimal allocation to hedge funds: an empirical analysis*, EDHEC Risk Centre Working paper.

The paper addresses the question as to what percentage of their portfolio should investors allocate to hedge funds. The usual approach is set in a static mean-variance framework, with no explicit accounting for uncertainty over the active manager's ability to generate an abnormal return, with the usual result of high allocations to hedge funds. They find that the presence of model risk significantly decreases an investor's optimal allocation to hedge funds. Another finding of this paper is that low beta hedge funds may serve as natural substitutes for a significant portion of an investor's risk-free asset holdings.

Danielsson J., Taylor A. and J-P Zigrand (2004 November), *Highwaymen or heroes: Should hedge funds be regulated?,* London School of Economics Financial Market Group Working paper.

The authors consider the arguments for and against hedge fund regulation and find mixed outcomes.

Edwards F and J. Liew (1999), *Hedge Funds and managed futures as asset classes,* Journal of Derivatives 45-64

A study of the characteristics and differences between these strategies.

See also: Edwards F and M Caglayan (2001), *Hedge fund performance and manager skill*, Journal of Futures markets 21 11 1003-1028

Fung, W. and D. A. Hsieh (1997), *Empirical characteristics of dynamic trading strategies: The case of hedge funds*, Review of Financial Studies 10, 275 – 302.

Fung and Hsieh extend Sharpe's asset-class factor model to one with eight location/asset classes. Using this, they reconfirm Sharpe's results and then apply the model to hedge funds and commodity trading advisors. They discuss the difficulties of classifying strategy choices as location or trading-based. They find five mutually orthogonal principal components that explain 43% of the cross-sectional return variance and use these classifications as 'style genres' for hedge funds. Finally, the authors address the difficulty of measuring performance and survivorship bias when hedge funds are not required to report data in a consistent manner.

Fung, W. and D. A. Hsieh (1999), *Is mean variance analysis applicable to hedge funds?*, Economics Letters 62, 53 – 58.

Fung and Hsieh investigate the applicability of mean-variance analysis on hedge fund data for the ranking of funds by preference for investment. He builds off the work of Levy and Markowitz (1979) and Hlawitschka (1994), whose results indicated that a second order Taylor approximation of the utility function would be highly correlated with the power and exponential utility functions on mutual fund data. Fung and Hsieh aim to extend this conclusion to hedge fund data, as well as to examine the usefulness of approximation with the growth optimal criterion and the Sharpe ratio. They conclude that the quality of the quadratic approximation is best. The logarithmic utility, which corresponds to the growth optimal portfolio, is well approximated with low risk aversion, but not with high risk aversion. In contrast, the Sharpe ratio is an acceptable approximation only when risk aversion is high.

See Also: Fung, W. and D. Hsieh (2000), *Performance Characteristics of Hedge Funds and Commodity Funds: Natural vs. Spurious Biases*, Journal of Financial and Quantitative Analysis, Vol. 35, pp. 291-307; Fung, W., and D.A. Hsieh. (1999), *A Primer on Hedge Funds*, Journal of Empirical Finance, 6, 309-331; and Fung, W. and D.A. Hsieh. (2001), *The Risk in Hedge Fund Strategies: Theory and Evidence from Trend Followers*, Review of Financial Studies, 14, 313-341.

Hedge Fund Research, Inc. (2002), *Market neutral and hedged strategies*, CISDM Isenberg School of Management, University of Massachusetts (Revised)

Background reading on market neutral and hedged strategies which addresses specific characteristics and analysis of Convertible Arbitrage, Merger Arbitrage, Fixed Income Arbitrage, Equity Hedge, and Equity Market Neutral and Statistical Arbitrage strategy groups of hedge funds. For each of these investment strategy classes, the editors define different approaches to investment within the strategy category, address risks and risk control concerns, delineate sources of return, and discuss recent developments and growth.

Hodder JE and Jackwerth J (2005), *Incentive Contracts and Hedge Fund Management,* Working Paper WF 05 –230 ,Warwick Financial Research Centre.

The authors model the effects of incentive contracts in hedge fund mandates and show that these effects may include extreme risk taking, and performance "lock-in" behaviour. They demonstrate that the results are very sensitive to minor changes in the contract structure, and may even result in bimodal returns distributions.

Kat, H. M. (2002), *In search of the optimal fund of hedge funds*, Alternative Investment Research Centre Working Paper Series, WP #0013.

Kat examines the construction of a portfolio of hedge funds, elaborating on the conclusions from his earlier work that allocations of a small fraction of wealth to out-of-the-money stock index put options will reduce the negative effect on skewness that results from the inclusion of hedge funds in a portfolio. He first considers the case of investors who equally weight the stock and bond allocation in their portfolios, and then the case of investors who invest 1/3 of their assets in stocks and 2/3 in bonds. In the former case, Kat finds that hedge fund allocations of 5-20% have very similar results. In the latter case, the portfolio is more or less symmetric until hedge funds are added, at which time it becomes negatively skewed at a pace faster than that for the 50/50 investor. He also investigates skewness protection by the purchase of put options on the fund itself. The article concludes that the first strategy works for certain investor types, but not in general and that the second strategy works in general but may be costly and is less reliable.

Kat, H. M. (2003), *The dangers of mechanical investment decision-making: The case of hedge funds*, Alternative Investment Research Centre Working Paper Series, WP #0019

Kat measures various methods of quantitatively evaluating hedge fund performance, concluding that none of the traditional methods applied to stock and bond valuation satisfactorily capture the unique statistical features of hedge fund returns. He claims that mean variance analysis, effective on normally distributed data, underestimates the standard deviation (often 30% less than it should be) and fails to account for the key characteristics of negative skewness and high kurtosis. The Sharpe ratio, unable to discount for survivorship bias, backfill bias and autocorrelation, overestimates the mean and underestimates the standard deviation, thereby overstating risk-adjusted performance. Jensen's alpha measure depends on the relationship between the performance of the fund and the performance of portfolio replicating funds' sensitivities to the same return-generating factors. Here, the problem lies in whether all (or at least the most significant) return-generating factors can be identified or quantified and properly considered in the replicating portfolio. Kat finds that diversification lowers standard deviation but also lowers skewness and raises the correlation with the stock market. He concludes that there is a similar effect when hedge funds are added to portfolios of stocks and bonds.

Kat, H. M. and F. Menexe (2002), *Persistence in hedge fund performance: The true value of a track record,* Alternative Investment Research Centre Working Paper Series, WP #0007

Kat and Menexe explore whether hedge fund performance persists in either a fund's risk-adjusted returns or its over-all risk profile. They do find persistence in risk

profiles, but predicting future behaviour based on the risk history is more difficult from the absolute risk profile than from the relative risk profile. By means of contingency tables, the authors find that although mean performance of a hedge fund's risk profile does not show significant persistence in performance, the standard deviation and correlation with stocks do. Their regression analysis performed on six strategy groups confirm these results. Next, they differentiate between predictability relative to the mean performance of funds in a strategy grouping and predictability based on data independent of other funds' performance. The use of the former method would require predicting the mean, so they pursue prediction on absolute returns. The authors conclude that prediction on absolute returns is difficult.

L'Habitant F.S. and M. Learned de Piante Vicin (2004), *Finding the sweet spot of hedge fund diversification*, EDHEC-Risk Working paper

The paper addresses the question of the number of funds necessary to achieve the benefit of diversification and finds that from a pure market risk perspective, a small number of funds is sufficient to reap most of the diversification benefits, whatever the considered strategy. In addition, for some strategies, too much diversification results in undesirable side effects in the higher moments of the return distribution. Thus, while a fund of hedge funds may mitigate the negative effects of a hedge fund failure through diversification, too much diversification is also likely to result in diworsification (sic). These are important and reproducible results.

See also: Elton, E., and M. Gruber, *Risk Reduction and Portfolio Size: An Analytical Solution*, Journal of Business, 50 (1977), pp. 415-437; Evans, J.L., and S.H. Archer, *Diversification and the Reduction of Dispersion: An Empirical Analysis*, Journal of Finance, 23 (1968), pp. 761-767; Henker, T (1998), *Naive Diversification for Hedge Funds*, The Journal of Alternative Investments, pp. 33-38; Henker, T. and G. Martin (1998), *Naïve and Optimal Diversification for Managed Futures*, The Journal of Alternative Investments, Fall (1998), pp. 25-39; Johnson, K.H., and D.S. Shannon (1974), *A note on diversification and the reduction of dispersion*, Journal of Financial Economics, 4 (1974); Lhabitant, F.S. (2001), *Hedge funds investing: A quantitative look inside the black box*, The Journal of Financial Transformation 1 , pp. 82-90; and Lhabitant, F.S. (2002), *Hedge funds: myths and limits*, John Wiley & Sons: London.

L'Habitant F.S. (2005), *Pricing traditional versus alternative asset management services*, EDHEC-Risk working paper

L'Habitant argues that the delegation of asset management services is a source of potential agency problems between investors and their portfolio managers. Industry practice seems to show a clear pattern: mutual funds charge an asset-based fee, while hedge funds charge both an asset-based fee and a performance fee. The paper discusses the advantages and drawbacks of both types of fees.

Liang, B. (2000), *Hedge funds: The living and the dead*, The Journal of Financial and Quantitative Analysis 35, 309 – 326.

Liang observes that the conflicting results on survivorship bias are due (at least in part) to the variety of hedge fund data sources used in the research. He claims that the disagreement results from the different composition of the databases used. The Hedge

Fund Research (HFR) database is 9.5% dissolved funds, while the TASS database has 26.2% (as of 1998). TASS has more funds (most of which are different than those in HFR), a longer time history, and more return observations than HFR. The author calculates survivorship bias as the performance difference between surviving funds and all funds. He confirms that, on average, fund disappearance is due to dissolution, which on average is due to inferior performance. This, he claims, resolves the low bias determined by (Ackermann, McEnally, and Ravenscraft 1999), who used data with few dissolved funds. He also cites that onshore funds report only returns data while offshore funds often report NAV data as well. Liang finds that surviviorship bias by investment style is insignificant from the HFR data, but greater than 0.1% for 10 of the 15 styles delineated by TASS. These differences account for the variance of the biases reported by different researchers and he finds a bias of about 2% to be a good average of the data available.

Martellini, L. and N. Amenc (2003), *The brave new world of hedge fund indices: Desperately seeking pure style indices*, GAIM Fund of Funds Forum 2003
See also EDHEC Centre for Risk Management

The authors present problems with the representativeness of currently existing hedge fund indices. Their tables clearly show lack of transparency in many of the indices, and lack of standardisation in investment strategy classifications. They address timing, accuracy and independence of reporting, backfilling, and stability of indices as funds enter and exit. In their aim to construct a more representative and less biased index, they build an index of indices using a principal component analysis. Details of the EDHEC Alternative Indices structure are available at: www.EDHEC-Risk.com

Park J and J. Staum (1999), *Fund of fund diversification: How much is enough?,* Journal of Alternative Investments Winter 1999

The first of many studies which show diversification among hedge fund styles with remarkably few funds.

Patel, S. A. and P. A. Roffman (2003), *Standard & poor's hedge fund index: Structure, methodology, definitions and practices*, Technical report, Standard & Poor's.

This report is published by Standard & Poor's as the manual on the construction of the S&P hedge funds indices, including the sub-index structures.

Patton A (2004), *Are market-neutral hedge funds really market neutral?,* London School of Economics Financial Markets Group Working paper

The author looks beyond the traditional measure of market neutrality - correlation with the broad market - and expands the definition to include such risk sensitivities as variance neutrality, value at risk neutrality and tail neutrality as well as what he terms "complete neutrality", or a full disassociation with the markets. For 217 "market neutral" funds between April 1993 and April 2003, two-thirds fail at least one test of neutrality.

Posthuma, N. and P. J. Van der Sluis (2003), *A reality check on hedge fund returns,* ABP Investments Research Department .

In their work, Posthuma and Van der Sluis eliminate backfilled data for each individual fund from the TASS database to determine the exact backfill bias for this group of funds between 1996 and 2002. They find the average length of the backfill period to be 34 months and the non-backfilled returns per annum to be 4% lower than those that were backfilled. Moreover, more than 50% of the returns in the database they use are backfilled. The authors describe a collection of biases that affect hedge fund performance data, then compare two equally balanced index time series on net of fee hedge fund returns fom the TASS database, one of which includes backfilled data, the other of which does not. In more detail, the authors find that the bias is shrinking over time, and there are different biases by strategy.

Schneeweis, T. and G. Georgiev (2002), *The benefits of managed futures,* CISDM/Isenberg School of Management.

In this paper, the authors claim that the managed futures investment class reduces portfolio volatility risk, enhances portfolio returns where stocks and bonds are limited, and makes available markets and products not otherwise accessible to investors. They claim that adding managed futures to a widely diversified asset portfolio will increase the return to risk ratio of the portfolio. In general, they show that CTA strategy funds' correlations with traditional stock or bond indices are close to zero. Moreover, they say that managed futures are negatively correlated with negatively performing traditional asset classes, but positively correlated with positively performing stock or bond indices. In brief, the benefits are that managed futures managers invest in markets with as much integrity as the stock or bond markets, and are not more risky than traditional investments, yet allow for returns when these traditional markets do not.

Schneeweis, T., H. Kazemi, and G. Martin (2001), *Understanding hedge fund performance: Research results and rules of thumb for the institutional investor*, CISDM Isenberg School of Management, University of Massachusetts, Amhurst, MA.

This booklet introduces hedge funds as a defined type of investment vehicle and addresses concerns particular to this class. Briefly, they discuss performance persistence, benchmark determination, alpha determination, index construction, and biases that arise in data reporting. The authors then explain the general impact on performance of hedge fund characteristics including geographical (tax-wise) location, fees, lock-up, age and size. Finally, they provide multifactor performance analysis of strategy classes.