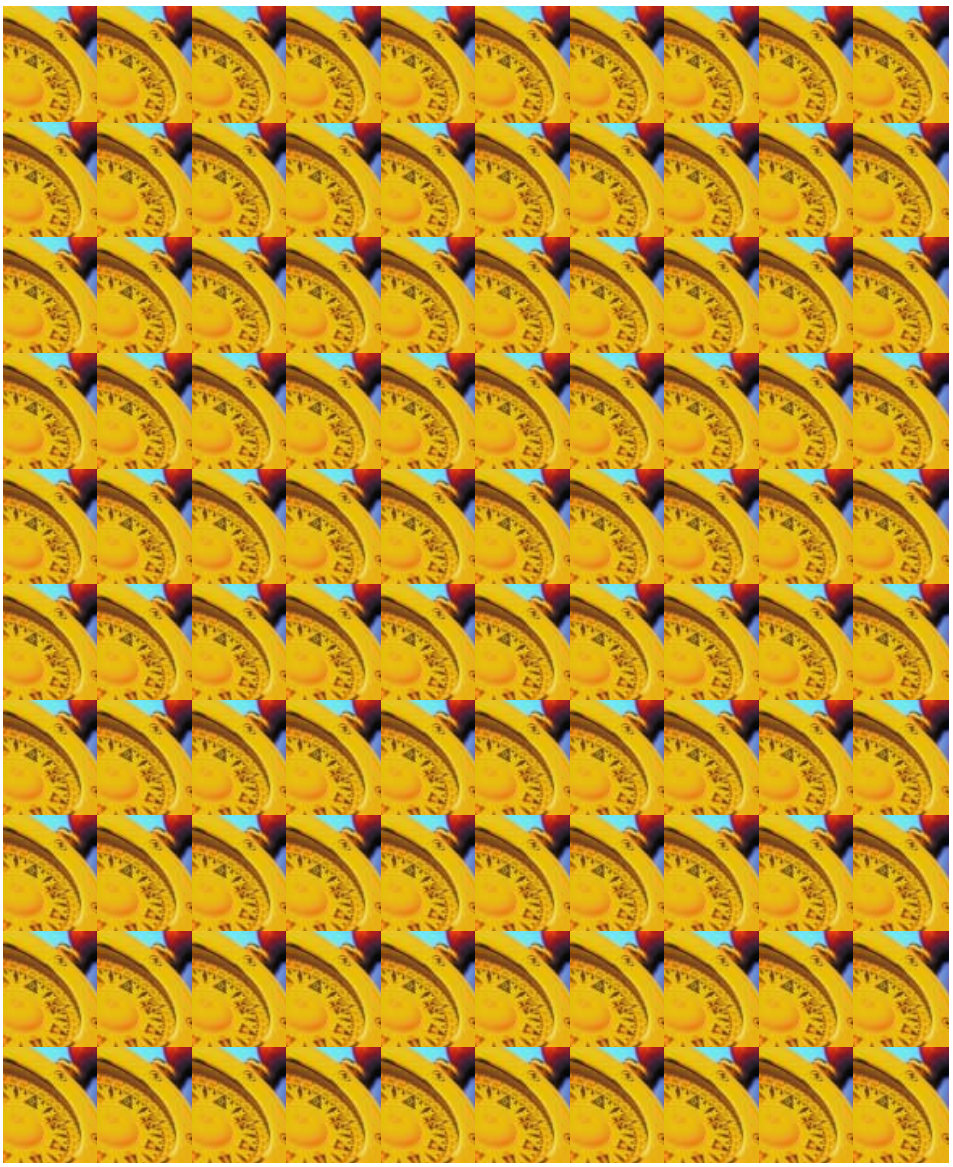
Global Equity Research

The Search for Alpha Continues



Do Fund of Hedge Funds Managers Add Value?

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Executive Summary

- To some, hedge fund investing is a bubble, to others absolute return strategies is a New Paradigm in asset management. Reality is probably somewhere in between.

- Expectations with respect to future hedge fund returns are probably too high. An adjustment of expectations back towards reality is desirable. Such an adjustment could strengthen the business case for fund of funds managers. If the alpha in the hedge fund universe can only be unlocked through market participants with a competitive advantage – but not by simply being long or random selection – then the case for funds of funds is strengthened.

- Alpha-generating strategies are normally skill-based strategies. If the flexibility of the manager is reduced to zero, the ex-ante alpha is zero as a result. However, as with every other industry, asset management as well as the hedge fund industry will most likely transform over time. A possible future scenario is that those asset managers with a competitive advantage operating in an inefficient market will be offering skill-based strategies.

- The dispersion of returns with skill-based strategies is much higher than with market-based strategies. A wide dispersion means that the worst performing will do much worse than the best performing. To an investor with no edge, this is a risk. To an active investor with a competitive advantage, this is an opportunity.

- An active long-only strategy stems from a time where markets were less efficient than today and there were few or no alternatives to get exposure to a market in order to diversify systematic risk. It also stems from a time where there were fewer investment style opportunities and the degree of complexity in financial instruments was lower. We believe that the market is migrating to the view that it does not make much sense to attempt to get an information advantage in an informationally efficient market. If this is the case, flows to specialists adopting an active approach in markets where there is no passive alternative and information is not efficiently disseminated might continue to flourish. Given that fund of hedge funds managers operate in a market as inefficient and opaque as the hedge fund industry, we believe they have a strong value proposition.

We believe an investor investing in a fund of funds should search for the following attributes when investing in a manager selecting hedge funds. The manager should:

- understand all hedge fund strategies,
- understand all instruments used by hedge funds,
- emphasise qualitative aspects relative to quantitative variables,
- be in the ‘information loop’ and have extensive proprietary data,
- be of the highest integrity, as there is little regulation or reputational risk of large corporates to assist investors.
- Ideally, the interests of the managers are aligned with those of their investors.

Overview and Structure

"If you think education is expensive, try ignorance."
Derek Bok (former Harvard President)

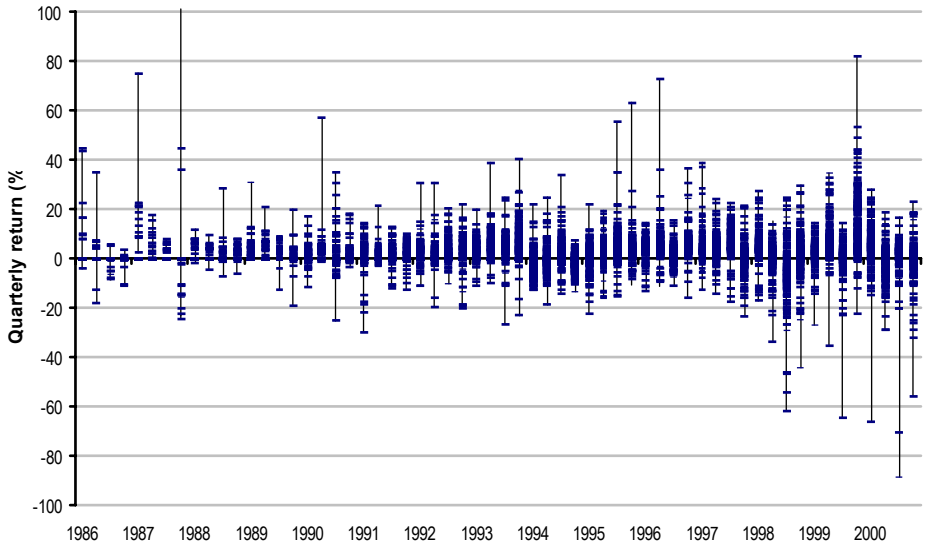
Overview

All hedge funds are not created equal. A poorly chosen portfolio of hedge funds can produce disappointing results. All fund of funds managers are not created equal, either. A poor choice of fund of funds managers can yield disappointing results. This report is designed to help institutional investors select fund of funds managers.

Implementation follows strategic orientation

Given the current hype surrounding investing in hedge funds, we assume that most investors by now will agree that investing in hedge funds can make sense when viewed not in isolation but in a portfolio context.[1] The next step, therefore, is implementation. Chart 1 shows the dispersion of quarterly returns from a selection of funds of funds. At each point in time, the chart shows the range of outcomes that funds of funds experienced. We believe the chart demonstrates the importance of evaluating individual fund of funds managers.

Chart 1: Dispersion of Fund of Funds Returns (1986-2000, Quarterly Returns)



Source: Quellos
Data used for graph is discussed on page 81.

The dispersion of returns among fund of hedge funds managers has been increasing

The dispersion of returns of funds of funds has increased – primarily on the downside. This could be function of a widening gap between talented and less talented fund of funds managers. It probably also is a function of an increased number of fund of funds managers having a bias towards investing in hedge funds with a long bias towards technology. In 1999 funds of funds suddenly appeared that invested solely in technology or internet-related hedge funds. Some of these funds of funds probably shared a similar faith as did the Nasdaq. In other words, the

[1] If someone does not agree that Tiger Woods or Michael Schumacher are the best of their generation in their fields (and potentially beyond) – he or she probably never will.

increase in dispersion could be either a longer-term trend due to erosion of skill or an anomaly associated with the bursting of the internet bubble or a combination of both.

Target audience of this report are investors investing in hedge funds

This report is targeted at institutional investors who are in the process of investing in hedge funds and are evaluating fund of funds managers. This report provides some insight into questions such as:

- Do fund of funds managers add value?
- How do fund of funds managers add value?
- Why is it necessary to have a fund of funds manager rather than simply choose a few hedge funds at random?
- How can we identify fund of funds managers with an edge?

We will be focusing on investors who already have decided to take the fund of funds route. However it is not our intention to favour the fund of funds approach over other routes such as advisory or direct investment. Given the broad and subjective nature of evaluating fund of funds managers, we recommend viewing this report as a collection of thoughts as opposed to a definite guide to picking a fund of funds manager. We do not believe that there is one right way for a fund of hedge funds manager to do business. However, given the recent hype in the industry, we believe there are many potentially dangerous (from the investor's perspective) or incomplete ways to approach the business. Recent negative outliers in Chart 1 are an indication that this might be the case.

Structure of Report

Starting on page 7 we discuss whether the current flows into hedge funds are short or long term, ie is it a bubble about to burst or are we witnessing the making of a new paradigm in asset management? We conclude that it probably has elements of both and acknowledge that the term *new paradigm* is probably used too often in investment management. On page 24 we update some hedge fund performance figures. We also discuss supply and demand issues from institutional as well as private investors.

On page 26 we start elaboration on the main theme, ie fund of funds. We contrast advantages with disadvantages. We also analyse a proprietary database on fund of funds which allowed us to describe and discuss fund of funds specific industry characteristics. On page 48 we briefly show one way of describing the investment process of a fund of hedge funds manager.

On page 60 we isolate and analyse the key variables a fund of funds manager has to bring to the table, ie edge. Although fund of funds manager evaluation is subjective, we hope to be able to point an institutional investor currently evaluating fund of funds managers in the direction of the managers with a competitive advantage.

Last but not least, we discuss performance of funds of funds starting page 81. We analysed a database of 926 funds of funds between 1986 and 2000. In addition, at the risk of being repetitive, we elaborate on the correlation characteristics with

traditional asset classes of alternative investment strategies (AIS) in general and hedge funds in particular.

We have added some essays on the subject of hedge funds starting on page 100. These articles appeared in research which was only available to a geographically limited list of investors.

The author would like to thank William Kennedy, Rob Kirkwood, Alan Scowcroft, Paddy Dear, Scott Mixon, and Simon Ibbitson from UBS Warburg, Mike Welch and Daniel Edelman from UBS O'Connor, David Smith from GAM, and Bryan White and Phillip Vitale from Quellos for their invaluable contributions to this report. The author is solely responsible for any errors, omissions and ambiguities.

Investment Case for Investing in Hedge Funds Revisited

"I do not feel obliged to believe that the same God who has endowed us with sense, reason, and intellect has intended us to forgo their use."
Galileo Galilei

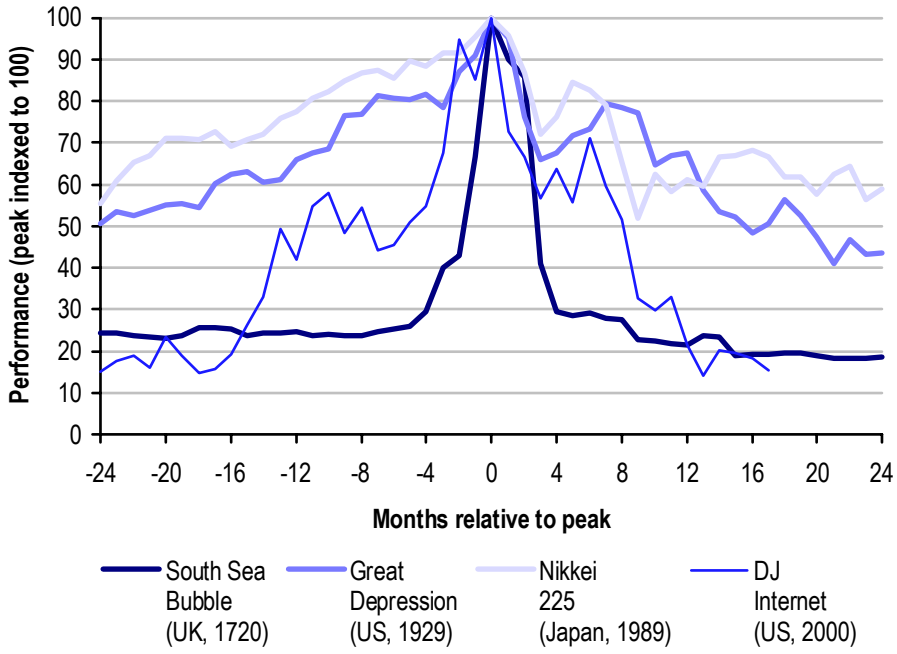
New Paradigm or Bubble?

Bubble Theory

Some market observers view the increasing allocation to hedge funds as a bubble

It feels like a bubble, does it not? More and more authors, experts and analysts expect the hedge fund euphoria to end in tears.[1] What we find most disturbing is that they – at the most general level – are probably right.

Chart 2: Financial Bubbles



Source: Global Financial Data, Datastream, UBS Warburg
South Sea Bubble based on reconstructed FT All-Share index, Great Depression based on S&P Composite.

A bubble occurs when fundamental research is de-emphasised

A bubble exists when investment horizons expand, expectations skyrocket, and everyone does the same thing at the same time. In other words, bubbles occur when the consensus view with respect to expected returns increases and investors cuddle in the comfort of the consensus view and de-emphasise sound research, due diligence and logical economic reasoning. The South Sea Bubble, Tulip Mania and the Internet Bubble were good examples of this pattern. In all cases expectations

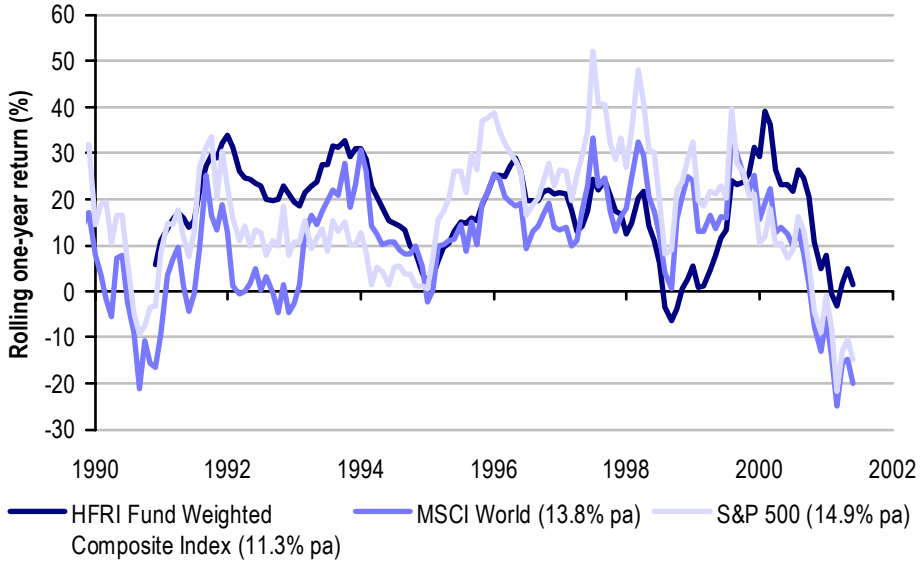
[1] See for example 'Hedge Funds – The latest bubble?' *The Economist*, 1 September 2001; 'SEC's Paul Roye Issues a Warning About a Hedge Fund 'Craze', Bloomberg News, 23 July 2001; 'The $500 Billion Hedge Fund Folly,' *Forbes*, 8 June 2001; 'The Hedge Fund Bubble,' *Financial Times*, 9 July 2001; 'Hedge Funds May Become the Next Investment Bubble,' Bloomberg News, 30 May 2001. Not all articles are equal in terms of substance (assuming we are in a position to judge).

slowly diverged from fundamentals. The bubble bursts when expectations converge with reality.

New wine in old wineskins?

One of the main arguments for investing in hedge funds, next to superior long-term risk-adjusted returns, is portfolio diversification. This, in essence, means reducing the expected volatility of portfolio returns without compromising expected returns. Adding asset classes with expected returns that have low correlation with traditional asset classes increases the efficiency of the portfolio. To some this might be like new wine in old wineskins. A few decades ago, investing in emerging markets was marketed as a new asset class with low correlation to assets in the developed world. Experiences in the 1990s have aligned the hype with reality. The obvious question is whether investing in hedge funds will suffer a similar fate.[1] It is possible that diversification benefits are currently overestimated. Only a small segment of the hedge fund universe has low correlation with equities. It is debatable whether the industry as a whole can decouple completely from trends in equity markets or the whole economy.

Chart 3: Rolling One-year Returns



Source: HFR, Datastream, UBS Warburg
Based on total US dollar returns: January 1990 – July 2001

Chart 3 shows the rolling one-year return for two equity indices and one composite hedge funds indices. The chart illustrates that picking hedge funds at random is likely to have high correlation with the equity market and little diversification benefit.

Short-termism – a red herring?

Every evolving industry goes through times of rapid change and innovation. Increased specialisation seems to be one of the constant variables in the field of investment management. In the early stages of the asset management industry, a single manager managed a balanced portfolio. Then equities and bonds were separated. Then equities were split into value and growth, or active and passive, or

[1] To some extent financial history has a tendency to repeat itself. In the 1960s companies saw great demand for their shares by adding '–ionics' to their name. In the late 1990s it was '.com'. Same fad, similar ending.

domestic and non-domestic, or developed and non-developed markets. The increased acceptance and current institutionalisation of hedge funds could be viewed as a further specialisation of the asset management industry between skill-based and market-based strategies.[1] However, we do not believe that all of the recent developments are positive. Any investment that is fashionable has a tendency to attract short-term investors. Short-term investors have a tendency to buy last year's winners and have a less disciplined and rigorous investment process. This could have a negative impact on the industry if there is a sudden and unexpected mismatch between expectations and reality.

A gap is potentially opening between expectations and reality

Given the strong inflow of assets to hedge funds, some market observers are asking whether the inflows into hedge funds are decoupling from realistic expectations, ie whether there is a pattern of a bubble in progress.

Dispersion of returns is likely to continue widening

If it is a bubble, it probably would not be comparable with the bursting of the internet bubble, where losses were in the region of 80-100%. The first step could be an increase in dispersion of hedge fund returns. This is probably already happening. Chart 1 on page 4 shows an increase in dispersion among fund of funds managers in recent quarters. Admittedly this is, to some extent, a function of the increase in the number of funds of funds (or hedge funds for that matter). The increase of the number of hedge funds or funds of funds, however, is part of the problem. We believe the increase in supply and demand is resulting in an absolute reduction of quality, especially among lower quartile funds or funds of funds. Consequently, the dispersion between top and low quartile hedge funds or funds of funds widens.

Expectations and reality will converge – either gradually or with a bang

In addition, the hedge fund industry as a whole has a long bias. The absolute returns of the 1990s are unlikely to be matched in the 2000s when equity markets compound at 0-5% in the 2000s instead of 10-15% as in the 1990s. In addition, volatility has been relatively high over the past five years. Lower volatility would mean fewer exploitable inefficiencies and fewer opportunities. Lower hedge fund performance in the 2000s, therefore, could potentially also realign expectations with reality. This realignment could happen gradually or instantaneously. A number of catalysts could be found for an instantaneous correction, ie a crash. These catalysts might include market dislocation, regulatory change, corporate governance breakdown or any other extreme event. However, these events are, by definition, not foreseeable. We, therefore, regard a gradual realignment of expectations with reality as the more likely scenario than a bubble bursting à la internet.

Expectations in private equity have already adjusted

Private equity has recently experienced such a realignment of expectations. Since the internet bubble has burst, exit strategies have become much more difficult. Many late 1990s vintages have single-digit IRRs to date. The vintages of 1999 and 2000 (peak of the TMT frenzy) for venture capital funds could turn out to become what 1998 was for hedge funds. High demand led to a dispersion of performance. We believe that today the consensus view is that private equity only yields high risk-adjusted returns if one invests with the first or second quartile managers. Just being long the asset class is not enough.

[1] The performance of skill-based strategies is attributable to the manager's skill. The performance of market-based strategies is attributable to the return of the market.

Some fund of funds managers could benefit from a realignment of expectations

This could happen to the hedge funds industry. Not a collapse as in Chart 2 on page 7 but a realignment of expectations with reality. In the long-term, such an adjustment is desirable. More importantly, we believe that an adjustment could strengthen the business case for fund of funds managers. If the alpha in the hedge fund universe can only be unlocked through market participants with a competitive advantage, but not by simply being long or through random selection, then the case for funds of funds is strengthened.

What is a New Paradigm?

The opposite view of the current trend of hedge fund investing being a fad ending in the bubble bursting is the view that absolute return strategies involving risk management techniques is a new paradigm in asset management.

The emperor has no clothes

We believe that paradigm shifts happen when there are anomalies – disparate odd results that cannot be explained away by inadequate methodology alone. When sufficient anomalies occur, any street-smart individual, we could postulate, must begin to consider that the paradigm under which they are doing their work is no longer of use or is actually dysfunctional. We have found a definition of a paradigm shift from Thomas Kuhn (1962):

> *"[Individuals who break through by inventing a new paradigm are] almost always…either very young or very new to the field whose paradigm they change…These are the men who, being little committed by prior practice to the traditional rules of normal science, are particularly likely to see that those rules no longer define a playable game and to conceive another set that can replace them."*

"We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten"
Bill Gates

Although Thomas Kuhn's quote fits with the young, energetic, unconventional median hedge fund manager, declaring hedge funds as new paradigm might be stretched. However, the investment management industry is a continuum and subject to change. Two changes in recent years are particularly worth pointing out. First, we believe market participants have begun to examine and analyse the downside tail of the return distribution more closely. This is a departure from being satisfied with mere statistical variance of returns as a measure for risk. Second, portfolio management is mutating into risk management. Long-held methodologies and investment styles are gradually being replaced with more scientific approaches and tools to manage money, assets and risk.

Perception of Risk

Since 1987, the far left-hand side of the return distribution has been getting more attention

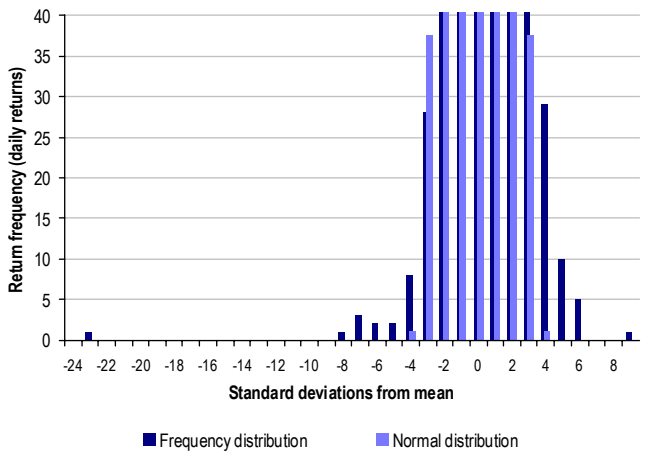
The October 1987 crash was probably the main catalyst for investors to start observing and modelling the far left-hand side of the return distribution more carefully. The following two graphs show the distribution of returns of the S&P 500 index on a daily (Chart 4 on page 11) and monthly basis (Chart 5).

Since 1969 there have been four occasions when the daily S&P 500 returns were larger than seven standard deviations from the mean.[1] Assuming the sun continues

[1] 23 standard deviations on 19 October 1987, eight standard deviations on 26 October 1987, and seven standard deviations on 8 January 1988, 26 October 1997 and 31 August 1998.

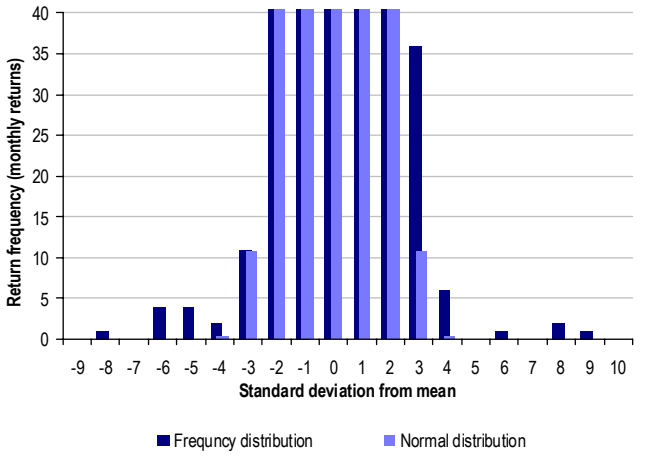
to produce high-energy gamma radiation by transforming hydrogen into helium for another 1.1bn years and assuming the normal distribution is an indication of probability, chances are that there will never be such daily price movements again.[1] Note that there are outliers on both sides of the mean.

Chart 4: Frequency Distribution Based on Daily Returns



Source: Datastream, UBS Warburg calculations
Based on daily log returns from January 1969 to 20 July 2001
Note that *y*-axis has been capped to visualise the outliers.

Chart 5: Frequency Distribution Based on Monthly Returns



Source: Global Financial Data, Datastream, UBS Warburg calculations
Based on monthly log returns from January 1800 to June 2001
Note that *y*-axis has been capped to visualise the outliers.

"It would be foolish, in forming our expectations, to attach great weight to matters which are very uncertain."
John Maynard Keynes

Outliers have a great influence on the risk of the venture, in this case investing in equities. These outliers, by definition, are not foreseeable. Any argument to the contrary must derive from a model with an R^2 of 1.00 (Bernstein 1999). However, there is no such thing. Decision making with respect to the future will always involve uncertainty regardless of the approach used (fundamental economics, technical analysis, market psychology, astrology, etc). What we know for sure about equity markets and their volatility is uncertainty itself. There will always be uncertainty.

Banks and insurers manage risk not return

The above statement is not as fatuous as it may sound. It raises the question of what a money manager should focus on in the long term: expected return or risk. Looking at the world from the view of a risk manager it is obvious: risk. A risk manager would argue that one cannot manage expected return, but one can manage risk. Return is the byproduct of taking risk. Banks today do not manage portfolios, they manage risk. Their long-term investment strategy is to define the risk they want to be exposed to and manage that exposure accordingly. This implies that banks have an absolute-return focus as opposed to a relative-return focus. The same can be said for insurance companies. Insurance companies do not manage their assets according to whether they are bullish or bearish but with respect to their pre-defined risk parameters such as average duration of insured agent or object and asset-liability

[1] In the next 1.1 billion years, the sun's brightness is expected to increase by 10%. This will super-heat our planet as a result of a severe greenhouse effect. All of the oceans on earth will boil away and all life will be destroyed. In about 6.5 billion years, our sun is expected to double in brightness and use up all of its supply of hydrogen fuel in its core. This will cause the sun to begin swelling as it uses hydrogen from the layers surrounding the core. In about 8 billion years the sun is expected to swell to 166 times its present size. This giant star will then swallow up Mercury, Venus, and maybe the Earth. After all the hydrogen fuel is used, the sun will begin to use helium as its fuel. This fuel will burn very quickly and only last about 100 million years. In about 12 billion years, the sun will eject much of its outer layers and become a smouldering, collapsed core. Lord Keynes might, after all, have had a point with his famous assessment of the 'long-term'.

mix. Potentially, asset management could be in the process of moving in the direction of banks, insurers, and hedge funds, ie defining risk in absolute terms rather than relative terms. One could also argue that the asset management industry is moving *back* to an absolute return orientation and that the passion with market benchmarks was only a brief blip in the industry's evolution, driven perhaps by an increasing involvement of consultants and trustees.

Is the Asset Manager's Business Model Changing?

Contrast business models A and B in Table 1.

Table 1: Two Different Business Models in Asset Management

	Business Model A (market-based)	Business Model B (skill-based)
Return objective	Relative to benchmark	Absolute, positive return
This means:	***Capture asset class premium***	***Add value***
Risk management	Tracking risk	Preserve capital
This means:	***Capture asset class premium***	***Avoid destroying value***

Source: UBS Warburg

"Serious investors avoid timing markets."
David Swensen[1]

We are inclined to argue that anything that survived the wars, turbulence, crises and market volatility of the 1990s has a high probability of sustainability. What might disappear is the term 'hedge fund.' The term 'hedge fund' is, to some extent, a misnomer. Not all hedge funds are 'hedged.'[2] However, the first hedge fund managers did not want their professional destiny and wealth to be dependent on chance, ie market risk.[3] That is the reason why the first hedge funds hedged market risk in the first place. Their goal was to hedge their exposure to chance and volatility and to ensure that performance was attributable to skill (stock picking). In addition, the term hedge fund is also, to some extent, contaminated.[4]

Hedge funds are already in the process of being institutionalised

The traditional asset management industry has already started to offer what can best be described as absolute return strategies. The main characteristic of absolute return strategies is that the benchmark is cash. The more successful ventures have proven to be highly profitable for the launching asset management firm. In other words, the

[1] Swensen (2000), p. 55. David Swensen is chief investment officer of Yale University's endowment fund.

[2] See UBS Warburg research (2000) for details on risks of the widely different hedge fund strategies.

[3] Whether market timing is skill or chance is an open debate. Swensen (2000) argues that market timing causes portfolio characteristics to deviate from those embodied in the policy portfolio, producing inevitable differences in risk and return attributes. If market timing involves betting against the stock market by reducing equity holdings and increasing cash positions, long-run expected portfolio returns decline as the market timer's position decreases risk levels. Because such activity lowers anticipated returns, market timers must succeed substantially more than 50% of the time to post a winning record. Although Keynes has been renowned (among other things) as a great speculator, he probably would have been sceptical about market timing strategies. In *The General Theory of Employment, Interest, and Money* he states with respect to expectations and state of confidence: *"Our knowledge of the factors which will govern the yield of an investment some years hence is usually very slight and often negligible. If we speak frankly, we have to admit that our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patent medicine, an Atlantic liner, a building in the City of London amounts to little and sometimes to nothing; or even five years hence."*

[4] The term 'hedge fund' suffers from a similar fate as 'derivatives' due to a mixture of myth, misrepresentation, negative press and high-profile casualties in the 1990s. The reputation of derivatives has improved because parts of the writing guild have found a new product to demonise: hedge funds. We attempted to demystify derivatives in our report in 1999 and hedge funds in 2000.

separation between skill-based and market-based strategies in the asset management industry has already begun.

Skill-based strategies are active while market-based strategies are passive approaches to money management

We believe that institutional investing in skill-based strategies will continue to gain momentum due to these two trends. First, the focus on absolute returns and the fact that failure is defined as destroying value causes some strategies utilised by hedge funds to perform significantly better than traditional strategies in falling capital markets. With investors accepting the fact that returns are not normally distributed (ie have fat tails) and the fact that negative utility from falling markets is higher than positive utility from rising markets, we expect an increasing number of institutional as well as private investors to acknowledge the benefits from investing in skill-based strategies.

"The best way to lose your shirt is to think that you have discovered a pattern in a game of chance."
Warren Waver

Second, trying to beat an informationally efficient market, in what Charles Ellis (1998) calls 'The Loser's Game', might prove too mundane a strategy in the competitive environment of institutional asset management.[1] A move away from traditional views and strategies should enlarge the scope for alternative views and strategies. We expect a departure from simple capital markets indices to more tailored benchmarks that take into account idiosyncratic asset and liability characteristics. This could flatten any hurdles in the path of investing in what today are referred to as 'hedge funds.'

There seems to be a certain risk of picking the wrong benchmark

The focus on absolute returns is intuitive to a majority of investors but unacceptable to a minority of predominantly institutional investors. Let's take an example where plan sponsors, trustees and consultants need a benchmark. Their decision-making process is a function of ex-ante evaluation and ex-post examination. Having no benchmark, at the most general level, means essentially skipping the ex-post examination of the manager. While there might be similarities in ex-ante evaluation of a long-only manager or a hedge fund manager, the ex-post examination is different. We are tempted to argue that a sophisticated fund of funds manager would not sack a long-only manager using a value approach after two or three years' underperformance where the performance was measured against a market benchmark index and the market environment was growth-driven. But exactly that has happened in the traditional investment management arena. The 'tolerable' number of underperforming years seems to be around three years. We, however, argue that in the aforementioned example either the benchmark was wrong or the sponsor of the manager did not understand the investment approach and philosophy of the manager. Ex-post examination probably adds little value if ex-ante evaluation is built on false assumptions. We will discuss this phenomenon in more detail later in this document.

[1] Ellis (1998) bemoans the fact that decision makers spend too much time on the relatively exciting trading and tactical decisions at the expense of the more powerful, yet more mundane policy decisions. *"There is no evidence of any large institutions having anything like consistent ability to get in when the market is low and get out when the market is high. Attempts to switch between stocks and bonds, or between stocks and cash, in anticipation of market moves have been unsuccessful much more often than they have been successful."*

A market benchmark changes the incentives of the manager to become diametrically opposed to those of the investor

We believe that the majority of investors see the disadvantages of limiting alpha generation by constraining a manager with a benchmark. Introducing a benchmark caused a lemming-like effect with indexation and what some refer to as *closet indexation*.[1] Closet indexation or 'hugging' the benchmark means that most positions in an active portfolio are held to track the benchmark – often referred to as dead weight. Dead weight in a portfolio results from securities owned into which the manager has no insight. The proportion of the portfolio that is held to control residual volatility (volatility relative to the benchmark) is the proportion that will add no value.

Hedge funds carry less dead weight and therefore manage invested capital more efficiently

In a hedge fund, in general, only positions about which the manager has conviction will be held or sold short. Portfolio volatility and higher-moment and residual risks are controlled with risk management instruments or other hedging techniques, most of which require less capital than holding dead weight positions in the cash market. Consequently, a higher proportion of the hedge fund manager's capital is invested in positions about which the manager has convictions. Hedge fund managers, therefore, should be able to provide higher alphas, since relative outperformance against a benchmark is not the primary objective.

Absolute-return strategies are unlikely to replace relative-return strategies

We believe one can view benchmarking as protection against unskilled managers. A relative-return manager might be more suitable than an absolute-return manager if an investor has little time, inclination or ability to distinguish skill from luck from a portfolio manager. Benchmarking means that the manager cannot make investments that go horribly wrong – either by lack of skill or by bad luck. By defining a market benchmark and a tracking error band, the plan sponsor gives the manager a risk budget in which he is expected to operate.

Benchmarking is essentially the art of investing passively while charging an active fee

Indexation and its modified variants have many followers. One of the main advantages of indexation is its lower cost and subsequently superior performance.[2] Fees are generally lower with passive investments. If 80% of an active manager's positions are dead weight, then the portfolio is essentially 80% passive and 20% active.[3] This means that a 1% fee of funds under management is actually 5% of the active portion. Hedge funds typically charge higher fees than long-only managers.[4] However, the difference is not as extreme once the dead weight is taken into consideration. In other words, indexation (index funds, total return swaps) are the most cost-efficient form of getting exposure to a market. The ex-ante alpha is zero.

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[1] Closet, quasi or semi-indexation refers to a manager with an active mandate investing similar to a passive manager, ie replicating the benchmark index by keeping the tracking error below, say, 2%.

[2] Here we use the term 'passive investing' and 'indexation' interchangeably. However, passive investing and indexation differ. Indexation in the narrowest sense means replicating a benchmark by minimising tracking error. However, in various occasions in the recent past (Yahoo, Dimension Data) religiously following a benchmark came at a high cost. Passive investing or enhanced passive management loosens the tight tracking error constraints of indexation. So passive investing is a looser variant of indexation. Put differently, indexation is the extreme subcategory of passive approaches. Given the rather small price impact of the current MSCI index rebalancing exercise so far (September 2001), we sense that the market has started to abandon the extreme form of indexation. This, as a result, reduces the opportunities for absolute-return managers such as hedge funds. The irony is that, for example, a pension fund investing in pure index funds as well as in hedge funds benefited through hedge funds from the inefficiencies caused by indexation.

[3] See Chart 26 on page 44. Fung and Hsieh (1997a) estimated performance attribution to replicable asset classes for mutual funds as well as hedge funds. The authors found that with more than half of the mutual funds, 75% of performance or more was attributed to the asset class. With hedge funds, nearly half (48%) of the hedge funds had 25% or less of their performance attributed to the traditional asset classes.

[4] Hence the exodus of long-only managers to start a hedge funds either internally or externally.

Investing in hedge funds is, in theory, about getting (and paying for) alpha without getting beta (market exposure) that can be obtained elsewhere more cost efficiently. In other words, long-only asset management with a benchmark is a hybrid of the two extreme forms of asset management. Other hybrid forms are 'enhanced indexing' or 'indexation plus'.

Some take these arguments a step further. David Swensen argues:

> *"If markets present no mispricings for active managers to exploit, good results stem from luck, not skill. Over time, managers in efficient markets gravitate toward closet indexing, structuring portfolios with only modest deviations from the market, ensuring both mediocrity and survival.*
>
> *In contrast, active managers in less efficient markets exhibit greater variability in returns. In fact, many private markets lack benchmarks for managers to hug, eliminating the problem of closet indexing. Inefficiencies in pricing allow managers with great skill to achieve great success, while unskilled managers post commensurately poor results."*[1]

On the most general level, investing in hedge funds is about alpha, investing in long-only funds is mixing alpha and beta (with a limit on tracking error), and indexation is all about beta.

Skill can be assessed in advance, the path of the market cannot

Alpha-generating strategies are normally skill-based strategies. If the flexibility of the manager is reduced to zero, the ex-ante alpha is zero as a result. However, as with every other industry, the asset management as well as the hedge fund industry will most likely transform (or converge) over time. A possible future scenario is that those asset managers with a competitive advantage will be offering skill-based strategies.[2] One of the pillars supporting this belief is that a competitive advantage, to some extent, is determinable in advance whereas the path of a market is not.[3] A firm with prudent, intelligent, experienced and hardworking managers will have an advantage over a firm with fraudulent, uneducated hooligans.[4]

Manager's active management skill as product differentiation

In Chart 6 below we have tried to classify the most active and most passive investment styles into a two-dimensional grid, where the vertical axis is the level of fees and the horizontal axis the performance attribution. Absolute-return strategies are in quadrant I: fees are high and performance is, in theory and to some extent practice, determined by the manager's skill. The other extreme is quadrant III, where margins are low and performance is attributed to the market.

---

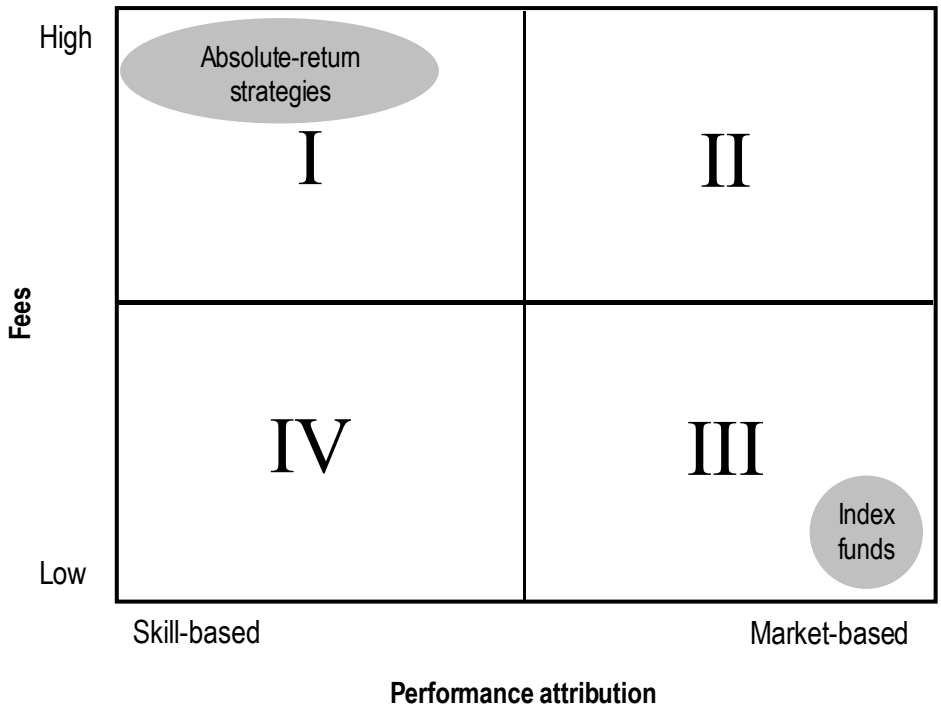
[1] Swensen (2000), p. 75.

[2] Note that the subindustry for indexed investment products is oligopolistic, ie there are only a few but large organisations dominating the market. These companies, today, most likely have a competitive advantage over other asset managers. In the UK, some traditionally active managers have already departed the passive investment arena. This could mean that the positioning of asset managers into separate quadrants in Chart 6 on page 16 is in the process of unfolding. In other words, the specialisation in investment management mentioned earlier is simply continuing.

[3] We assumed here that the future is uncertain and that there are no market participants with a model with an R^2 of 1.0. We apologise to all those readers who know the level at which the Nasdaq will end the year.

[4] However, if both are long-only, the latter can outperform the former due to luck.

Chart 6: Different Business Models

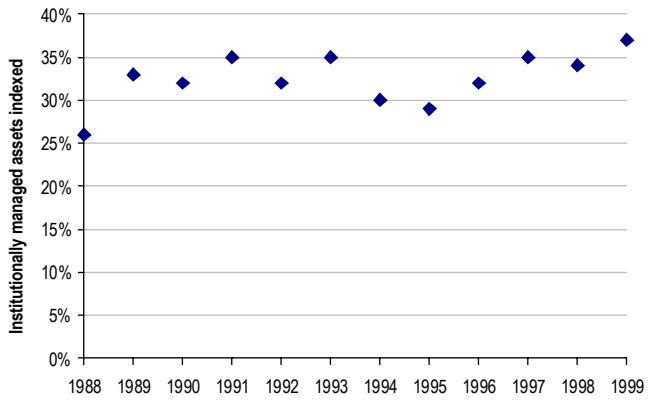


Source: UBS Warburg

High-margin as well as low-margin business models see capital inflows

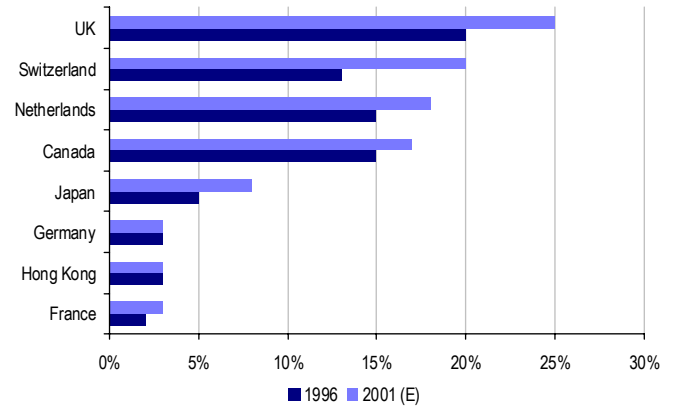
Not only is there a trend for specialist strategies in quadrant I but also for passive forms of investing (quadrant III). Greenwich Associates estimates that 38% of institutionally held assets in the US are indexed.[1] Watson Wyatt estimates that the degree of indexation is 25% for the UK, 20% for Switzerland and 18% in the Netherlands, with the rest of the world in the process of closing the gap.

Chart 7: Share of US Institutionally Managed Assets Indexed



Source: Greenwich Associates

Chart 8: Share of Non-US Managed Assets Indexed



Source: Watson Wyatt

[1] From Malkiel and Radisich (2001)

Passive asset management has a higher degree of cost efficiency

The reason for the increase in passive investment alternatives is primarily cost and, ultimately, performance. In price-efficient markets, passive strategies are cost-efficient. A cost-efficient investment vehicle is, *ceteris paribus*, superior to a cost-inefficient alternative. Passive strategies[1] have become available outside the US only in the past couple of years as the liquidity in equities outside the US has increased. Increasing liquidity reduces the cost of execution and therefore increases the number of alternatives to get market exposure.

Strategies in quadrant II might be facing tough times ahead. Those strategies stem from a time when there was no passive, ie cost-efficient, alternative. Today even retail investors can participate in developed markets on a cost-efficient basis through ETFs or market-replicating delta-one investment vehicles. We believe a point could be made that asset managers currently in quadrant II will have to migrate either into quadrant I or III. Remaining in quadrant II might not be a sustainable option.

Skill-based strategies might end up as satellite mandates in a core-satellite approach

In the Anglo-Saxon biased investor universe this is already happening through the core-satellite approach, where the core is passive and active satellites are added. These satellites are mandates given to managers operating in areas where the market is less price-efficient and there is no cost-efficient passive alternative.

Conclusion

The search for alpha continues

Whether bubble or new paradigm, we believe it is difficult to imagine that what today is referred to as a 'hedge fund' – searching for alpha while managing risk – will not be part of these trends.

This, for the time being, concludes our remarks on bubbles, fads, trends and new paradigms in the financial industry. Whether our expressed view makes more sense than those proselytised by the increasing number of bubble-prophets and permabears is, obviously, in the eye of the beholder.

On page 18 we provide an industry update where we try to quantify recent changes in demand for hedge funds. On page 24 we examine recent performance of hedge funds. Starting on page 26, we begin elaborating on the main theme of this report, ie funds of hedge funds.

[1] This includes index funds and delta-one derivatives such as certificates, notes, total return swaps, etc.

Industry Update

Demand from Institutional Investors

As we have elaborated above, the buck is rolling fast, ie demand is high and pushing capacity to its limit – and potentially beyond. In this section we attempt to put some numbers behind the anecdotal evidence.

The following table shows global asset flows from TASS for Q1 and Q2 this year. The last column shows the sum for the first half of 2001 for net asset flows.

Table 2: Asset Flows and Assets under Management as of Q1 and Q2 01

Category	Net asset flows Q1 01 (US$ m)	Total assets Q1 01 (%)	Net asset flows Q2 01 (US$ m)	Total assets Q2 01 (%)	Net asset flows H2 01 (US$ m)
All funds	6,910.4	100.0	8,483.1	100.0	15,393.4
Long/short equity	3,030.3	47.5	2,484.0	46.9	5,514.4
Event-driven	1,370.6	19.4	2,494.9	21.4	3,865.5
Convertible arbitrage	1,018.5	5.7	2,427.5	6.9	3,446.1
Equity market-neutral	940.7	6.4	1,183.5	6.7	2,124.2
Fixed income arbitrage	49.6	5.2	461.4	3.9	511.0
Managed futures	-15.6	2.6	276.2	1.8	260.6
Other	163.3	0.4	96.9	0.4	260.2
Emerging markets	-64.3	4.2	249.0	4.0	184.7
Short seller	84.7	0.4	-39.0	0.2	45.7
Global macro	332.4	8.3	-1,151.3	7.8	-818.9

Source: TASS (2001a,b), UBS Warburg calculations

- According to TASS (2001a) the first quarter of 2001 saw the largest net flow of assets into hedge funds since the first quarter of 1998. During the first quarter of 2001, US$6.9bn flowed in. This compares with a net flow of US$8bn for the whole of 2000 according to TASS data.
- The net flow for the second quarter of 2001 saw the record of Q1 01 increase by 23.8% to US$8.5bn (TASS 2001b).
- Long/short equity saw the largest inflow of US$5.8bn in the first half of 2001, compared to US$3.9bn and US$3.5bn in event-driven and convertible arbitrage respectively. According to TASS, nearly 50% of the hedge fund industry is long/short equity.

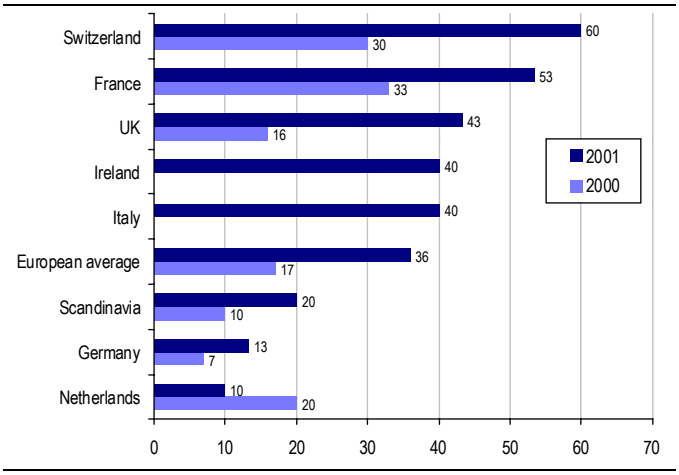
Institutional investors have not been investing in hedge funds for a long time. At conferences and general industry commentary there are only a handful of institutional investors which are regularly mentioned in the context of being long-term investors in the hedge fund industry.[1] In our view, they have pioneer-status, as we believe investing in skill-based strategies complementing market-based, passive core exposures is a long-term trend, not a fad. However, we would argue that only in recent history (more or less since the Nasdaq peaked) have institutional investors seriously thought about investing in hedge funds on a large scale.

[1] 'CalPers' is probably the most often quoted acronym at any hedge fund conference.

Situation in Europe

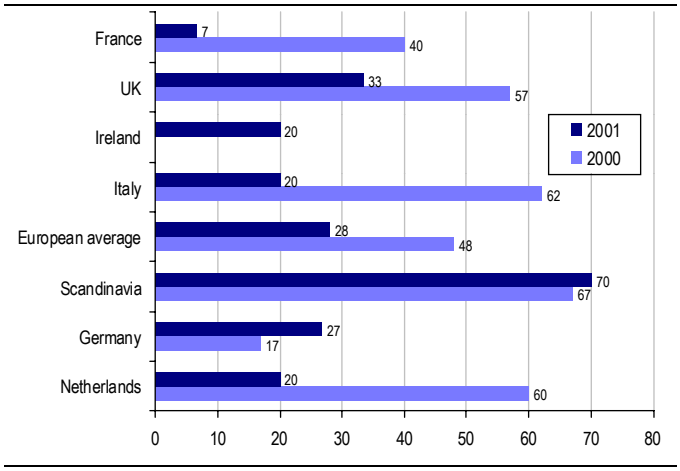
Golin/Harris Ludgate (2001) commissioned Fulcrum Research to carry out a survey of European investing institutions regarding their sentiment towards institutional investment in hedge funds. The total sample of respondents institutions accounted for US$9.6tr (£6.7tr) of assets under management, equivalent to approximately 67.6% of total European assets under management. The interviews took place in January 2001. Chart 9 shows institutional investors invested in hedge funds by 2001 and 2000 respectively. Chart 10 shows respondents planning to invest in hedge funds.

Chart 9: Currently Invested in Hedge Funds (%)



Source: Golin/Harris Ludgate (2001), Ludgate (2000)
Ireland was not part of the 2000 survey. The allocation of Italy in 2000 was 0%.
Insert shows sum of currently invested and planning to invest in hedge funds.

Chart 10: Planning to Invest in Hedge Funds (%)



Source: Golin/Harris Ludgate (2001), Ludgate (2000)
Ireland was not part of the 2000 survey.

- 36% of European institutions surveyed confirmed that they were currently investing institutional money into hedge funds. This has more than doubled from last year when only 17% confirmed that they were doing so. Only institutional investors in the Netherlands, according to the survey, invested less than in the previous year. This is counterintuitive and is not consistent with the flows into hedge funds that pass through our desks. The reasons for Dutch investors not investing in hedge funds were quoted as conservatism, hence preference for long-only, uncertainty with respect to sustainable source of return, and 'too risky'.[1]

- 28% of the European institutions surveyed were intending to invest into hedge funds before 2005, with the vast majority planning this for 2001 or 2002 (39%). There were fewer institutions planning to invest into hedge funds in this year's findings. This was largely due to the increase of actual investors, illustrating the growing acceptance of the hedge fund industry by institutional investors.

[1] To some extent the Dutch responses in the survey are contradictory. When asked whether their view on institutional investments in hedge funds has changed over the past 12 months, three of the sample of ten answered that they were more positive whereas seven respondents thought their view was unchanged (see Table 3 on page 20). All European respondents either became more positive or their view was unchanged. Golin/Harris Ludgate (2001), p42. Note that the number of respondents was very small relative to the whole market. The 2001 survey was based on only 100 investors, of which 10 were in the Netherlands. The survey, therefore, is indicative rather than representative.

- Swiss institutions had the highest allocation to hedge funds.
- The UK, French and Italian market best demonstrated the move from intending to invest last year to actually investing this year.
- The German market best illustrates the shift from previously not considering hedge funds to aiming to invest into them in the next few years.
- Scandinavia – which had a high proportion of institutions with hedge funds on their agenda last year – still had a high proportion this year.
- Falling stock prices was the most often quoted reason to invest in hedge funds. Efficiency gains through diversification were also mentioned.[1]

Table 3 are the responses to the question 'Has your view on institutional investments in hedge funds changed over the past twelve months?'

Table 3: Change in Sentiment Over Past Twelve Months

Country	Total respondents	More positive	More negative	Unchanged	Main reason
Total*	100	43	0	55	
Germany	15	5	0	10	Weak equity market
France	15	4	0	11	Diversification
UK	30	15	0	13	Diversification
Switzerland	10	4	0	6	Diversification
Netherlands	10	3	0	7	Weak equity market
Scandinavia	10	7	0	3	Diversification
Ireland	5	2	0	3	Weak equity market
Italy	5	3	0	2	Change in regulation

Source: Golin/Harris Ludgate (2001), p42-45.
* Does not add up to 100 because only 28 of 30 UK survey participants responded.

- 43 of 98 investors who bothered to answer the question were more positive and 55 had not changed their (positive *or* negative) view. No one seemed more negative than a year ago.

[1] Demand for efficient portfolios seems to be disproportionally higher in bear markets. This, if true, would be completely contrary to modern investment principles. Potentially this could be explained by 'cognitive dissonance,' a psychological concept which, in economics, is used by empiricists and behaviourists, ie the less orthodox end of the spectrum. Cognitive dissonance is the mental conflict that people experience when they are presented with evidence that their beliefs or assumptions are wrong; as such, it might be classified as a sort of pain of regret, regret over mistaken beliefs (Festinger 1957). The theory of cognitive dissonance asserts that there is a tendency for people to take actions to reduce cognitive dissonance that would not normally be considered fully rational: the person may ignore new information or develop contorted arguments to maintain their beliefs or assumptions. There is empirical support that people often make the errors represented by the theory of cognitive dissonance. McFadden (1974), for example, modelled the effect of cognitive dissonance in terms of a probability of forgetting contrary evidence, and showed how this probability will ultimately distort subjective probabilities. Goetzmann and Peles (1997) argue that cognitive dissonance can explain the observed phenomenon that money flows more rapidly to mutual funds that have performed extremely well than flows out of funds that have performed extremely poorly, ie investors are unwilling to confront evidence. We believe a point could be made that investors need some time to confront the fact that equities can also fall, especially after an exceptionally long bull market.

In Table 4 the sample population was asked: 'How do you see the European institutional use of hedge funds developing and why?'

Table 4: Perception with Respect to Future Development in Europe

Country	Total respondents	Answered question	Continuous high growth	Continuous growth	Moderate growth	Concerns, reservations
Total	100	86	11	46	20	9
Germany	15	8	0	4	4	0
France	15	15	1	6	0	8
UK	30	25	3	15	6	1
Switzerland*	10	9	3	3	3	0
Netherlands	10	10	1	5	4	0
Scandinavia*	10	9	3	3	3	0
Ireland	5	5	0	5	0	0
Italy	5	5	0	5	0	0

Source: Golin/Harris Ludgate (2001), p92-99.
* All responses were positive. We applied equal weighting.
Note that the responses to the question were in prose.

- 77 investors out of 86 (89.5%) of the surveyed investors saw growth continuing.
- The most pronounced reservations in the 2001 came from France. In the 2000 survey they came from east of the Rhine, where one institutional investors was quoted as saying:

  "No, we don't (currently invest in hedge funds)! It is completely obvious that hedge funds don't work. We are not a casino."

- In France, all fifteen companies surveyed responded to this question, with six predicting a favourable future for hedge funds in the institutional market due to the diversification benefits and good returns that they offer. Two also saw increasing demand from clients as a significant factor in the likely growth of the hedge fund market, whilst another saw asset allocation to hedge funds increasing. However, five respondents expressed concern regarding the risk posed to institutions if allocations to hedge funds were too heavily weighted in the event of a market crash. Two others thought the risk posed by hedge funds was too excessive, whilst one company believed that there would be less investment into hedge funds in the future. Two investors were quoted as follows:

  "What we see is just a fashion favouring hedge funds, but it will not continue very much longer."

  "Hedge funds are not really viable for large institutions, even if they use the low-risk market-neutral strategy. They are too big a risk because hedge funds use leverage usually, which influences the volatility of the asset and the investment house risks losing its entire investment. It's also hard to find a good hedge fund manager, which adds to the unpredictability that large institutions are keen to avoid."

An Irish investor took the diametrically opposite view by arguing:

> "*Yes, institutions will diversify. This is partly due to the idiocy of having index-driven benchmarking. Hedge funds use absolute return benchmarking and are consequently more attractive.*"

One UK investor increased the entertainment value of the survey by saying:

> *"Having been deeply conservative over equities, the continentals are hardly likely to suddenly leap to the other end of the spectrum."*[1]

"No hedge funds, please, we're British"[2]

Our fund coverage department conducted a telephone survey among 25 UK institutional investors in January this year of which 22 (88%) responded (Table 5). By comparison, Table 6 shows a survey among 25 retail brokers where 75 have been contacted. The response rate was 33%.

Table 5: Survey among 22 Institutional Investors in January 2001

Question	Yes	No	Undecided
Are you currently invested in HFs?	15 (68.2%)	7 (31.8%)	0 (0.0%)
Are HFs within your remit?	12 (54.5%)	9 (40.9%)	1 (4.5%)
Are you considering making an investment?	8 (36.4%)	11 (50.0%)	3 (13.6%)
Would you be willing to hear more about HFs?	13 (59.1%)	6 (27.3%)	3 (13.6%)

Source: UBS Warburg

- Note that in three out of the six negative replies to the fourth question, the company contacted does use hedge funds but the manager contacted did not.
- 68% of the respondents said they were invested in hedge funds. This is more or less consistent with the Golin/Harris Ludgate (2001) survey.
- The 40.9% outright 'no' answers were also consistent with the Golin/Harris Ludgate (2001) survey where the European average of institutional investors not in hedge funds and no intention to invest was 40%. The range was from 70% (Netherlands) to 10% (Scandinavia and Switzerland). The negative responses in Germany were also high at 60%.

Table 6: Survey among 25 Retail Brokers in January 2001

Question	Yes	No	Undecided
Are you currently invested in HFs?	7 (28.0%)	18 (72.0%)	0 (0.0%)
Are HFs within your remit?	23 (92.0%)	1 (4.0%)	1 (4.0%)
Are you considering making an investment?	14 (56.0%)	6 (24.0%)	5 (20.0%)
Would you be willing to hear more about HFs?	22 (88.0%)	2 (8.0%)	1 (4.0%)

Source: UBS Warburg

- Retail investors, eventually, could also largely be investing in hedge funds.

[1] This statement implies that the investor considers a balanced exposure to 20 hedge funds as more risky than, say, an equity portfolio with 20 constituents. There is the possibility that the investor is lead by what we call a 'risk illusion' on page 115. We believe risk illusion is a form of false security. This false security is derived from expected diversification benefits of securities which are highly correlated with each other.

[2] EuroHedge, 31 July 2000

Demand from Private Investors

PricewaterhouseCoopers (2001) surveyed private banks in Europe with respect to the status quo and their expectations of AIS and the importance to their franchise.

Table 7: Private Banks Offering AIS Now and in Three Years

	Hedge funds			Private equity		
	2000 (%)	2003E (%)	Change (%)	2000 (%)	2003E (%)	Change (%)
Switzerland	71	82	15	68	82	21
Spain	50	80	60	30	80	167
UK	41	59	44	21	41	95
Luxembourg	35	46	31	27	58	115
Belgium	33	83	152	33	50	52
France	33	58	76	50	67	34
Germany	33	67	103	78	89	14
Netherlands	25	25	0	25	50	100
Austria	17	33	94	50	67	34
Italy	13	75	477	25	88	252

Source: PricewaterhouseCoopers (2001)

- The main message from the survey is that AIS are gaining acceptance and popularity. However, there is probably a situation bias. We assume that had the survey been conducted at the peak of the internet boom in early 2000, the responses would have been less favourable for alternatives.
- Switzerland has been and continues to be the epicentre for private banking assets invested in hedge funds.

Table 8 shows the differences by liquid assets of the different investor bands.

Table 8: Product Offerings to Different Investor Bands

	Liquid, investable Assets (US$ m)	Invested in Hedge funds (%)*	Invested in private equity (%)*
Ultra HNWI	>50	49	50
Very high HNWI	5-50	56	55
High Net Worth Individual (HNWI)	0.5-5	47	41
Affluent investor	0.1-0.5	18	17

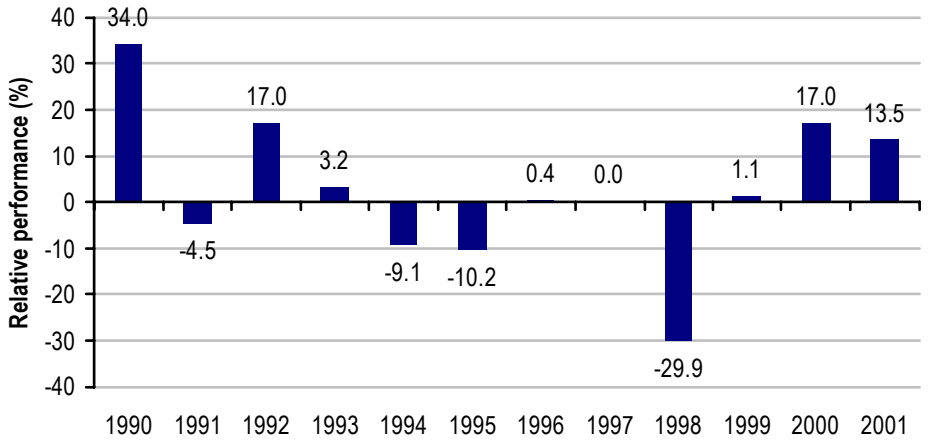
Source: PricewaterhouseCoopers (2001)

- Note that there seems to be a huge gap between affluent and high net worth investors with respect to allocating assets to hedge funds and private equity.
- Ultra HNWI seem to have less appetite for hedge funds than very HNWI.

Performance Update

On the next two pages we provide a brief performance update of the various hedge funds styles. Chart 11 shows the relative performance of a composite hedge fund index against the MSCI World index since 1990. Although our faith in hedge fund indices is only limited, the graph gives an indication as to how hedge funds are performing relative to cash equity.

Chart 11: Performance of Hedge Funds Relative to MSCI World



Source: HFR, Datastream
Based on annual total returns in US$ as of July 2001.

- At the end of June it seems the year 2001 could be the second consecutive year where hedge funds as a group outperform equities by a wide margin.

- From 1990 to June 2001 hedge funds have outperformed equity with half its volatility.

- The substantial recent outperformance on an absolute as well as risk-adjusted return basis might partially explain the increasing gap between wishful thinking and fundamentally realistic expected returns referred to earlier in this document.

Table 9 shows some performance figures for a selection of hedge funds indices from Hedge Fund Research (HFR) from January 1990 to July 2001.

Table 9: Performance Statistics For a Selection of HFR Indices and Traditional Asset Class Indices

	Annual return (%)	Return -12M (%)	Volatility (%)	Sharpe ratio*	Highest 1M loss (%)	Negative months (%)	Worst 1Y return (%)	Correl. MSCI World	Correl. JPM Bonds
S&P 500 (Total return)	14.5	-14.3	14.3	0.67	-14.5	35	-21.7	0.83	0.21
MSCI World (Total return)	8.2	-18.8	14.4	0.22	-13.3	40	-24.9	1.00	0.34
MSCI EAFE (Total return)	3.7	-21.4	17.0	-0.08	-13.9	43	-25.7	0.94	0.38
MSCI Europe (Total return)	9.8	-19.9	15.0	0.32	-12.6	37	-22.5	0.86	0.38
JPM Global Bond Index (Total return)	6.9	1.6	5.9	0.32	-3.3	41	-6.2	0.34	1.00
HFRI Convertible Arbitrage Index	12.0	11.9	3.5	2.02	-3.2	13	-3.8	0.31	-0.03
HFRI Fixed Income: Arbitrage Index	8.8	6.6	4.8	0.78	-6.5	20	-10.8	0.00	-0.29
HFRI Equity Market-Neutral Index	11.5	11.2	3.5	1.87	-1.7	16	1.6	0.16	0.13
HFRI Statistical Arbitrage Index	10.9	3.1	3.8	1.54	-2.0	24	-1.3	0.42	0.22
HFRI Relative Value Arbitrage Index	14.0	9.1	3.9	2.30	-5.8	12	1.1	0.34	-0.08
HFRI Event-Driven Index	16.2	9.9	6.7	1.68	-8.9	17	-1.5	0.53	-0.03
HFRI Merger Arbitrage Index	12.7	8.7	4.5	1.71	-6.5	10	0.4	0.36	0.05
HFRI Distressed Securities Index	15.5	7.6	6.5	1.62	-8.5	19	-6.4	0.34	-0.16
HFRI Regulation D Index	23.6	-8.5	7.3	2.56	-4.0	12	-6.4	0.30	-0.11
HFRI Macro Index	17.7	4.1	9.0	1.42	-6.4	30	-7.1	0.45	0.09
HFRI Equity Hedge Index	21.2	1.0	9.3	1.75	-7.7	27	-4.8	0.59	0.06
HFRI Equity Non-Hedge Index	18.1	-7.4	14.7	0.89	-13.3	34	-21.7	0.68	0.06
HFRI Emerging Markets (Total) Index	14.0	-8.2	16.4	0.55	-21.0	35	-42.5	0.61	-0.05
HFRI Sector: Technology Index	24.1	-27.3	20.7	0.93	-15.2	37	-36.2	0.59	0.02
HFRI Short Selling Index	1.3	28.0	23.2	-0.16	-21.2	50	-38.0	-0.63	-0.07
HFRI Fund Weighted Composite Index	11.3	1.5	6.1	1.03	-7.5	25	-7.4	0.41	-0.07
HFRI Fund of Funds Index	16.3	1.5	7.3	1.55	-8.7	26	-6.4	0.65	0.01

Source: HFR, Datastream, UBS Warburg calculations
*assuming 5% risk-free rate

An Introduction to Funds of Hedge Funds

"Either you understand your risk or you don't play the game."
Arthur Ashe[1]

Introduction

Definition

A fund of funds is a fund that mixes and matches hedge funds and other pooled investment vehicles, spreading investments among many different funds or investment vehicles. A fund of funds simplifies the process of choosing hedge funds, blending together funds to meet a range of investor risk/return objectives while generally spreading the risks over a variety of funds. This blending of different strategies and asset classes aims to deliver a more consistent return than any of the individual funds.

Diversification still makes sense as long as assets are not perfectly correlated

A fund of hedge funds is a diversified portfolio of hedge funds. Most often the constituents are uncorrelated. However, a fund of funds can be widely diversified, as well as have a focus on a particular style, sector of geographical region. The fund of funds approach has been the preferred investment form for many pension funds, endowment funds, insurance companies, private banks, family offices and high-net-worth individuals.

Fund of Funds Ain't That Simple

The operation of a fund of funds manager is complex and its process iterative

Table 10 on page 27 is one way of looking at the tasks and risks of a fund of funds managers. We believe that selecting and monitoring hedge fund managers and monitoring and managing hedge fund exposures is complex. Although conceptually simple, the implementation is difficult. It – the fund of funds operation – involves quantitative as well as (and more importantly) qualitative processes and projections. In addition it requires the knowledge, insight and experience of getting a qualitative interpretation of the quantitative analysis. The whole process is iterative because there is no beginning or end to the process of manager selection, portfolio construction, risk monitoring and portfolio rebalancing.

The heterogeneity of skill sets of a fund of funds operation might be a first, crude indication of its competitive strength

By assessing and selecting a fund of funds manager, the investor will have to judge whether the fund of funds manager has fundamental skill and, ideally, an edge in all variables. Obviously, there will be differences in fund of funds operations as every manager might have different objectives, strengths and weaknesses. The point we would like to highlight here is that a fund of funds operation is a business which will include huge diversity in individual skill sets.

[1] From Barra advertisement

Table 10: Investment Risk Matrix

Investment activity	Potential areas of risk		
Asset allocation	Selection of asset classes/proxies	Market shocks	Underlying models
(strategic/tactical)	Return/correlation projections	Market structures	Long term versus short term
	Sufficient diversification	Economic assumptions	Costs when changing policy
	Liquidity	Tax	Cash flows
			Liability projection
Benchmark	Selection - weight bias	Costs	Rebalancing
determination	updates/changes		
Manager selection	Style - past, present, future	Guidelines	Concentration
	Misfit to benchmark	Trading instruments	Performance
	People	Philosophy	Process
	Compliance	Controls	Separation of functions
			(Trading/back office)
Manager monitoring	Guidelines/controls	Models	Data
	Systems		
Performance reporting	Calculation	Presentation	
Custody	Independence	Subcustodian	Capital
Accounting	Methodology	Separation of duties	
Valuation	Modelling risk	Process	Pricing source
	Size of position	Seasonality	
Operations	Business interruption	Staffing	Internal controls
	Record-keeping	External relationships	Technology
	Insurance	Systems	Legal/regulatory
Business/event	Currency convertibility	Reputation	Legal/regulatory
	Credit rating shifts	Taxation	Disaster
	Market disruptions		

Source: Miller II (2000), p. 55

Fund of Funds Industry Characteristics

Size and Market Share

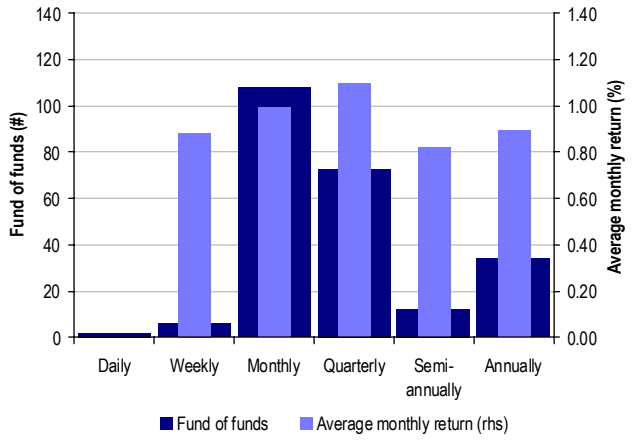
Soon to be a multi-US$100bn industry

Based on data from Quellos there were 444 funds of funds officially or unofficially reporting returns as of December 2000.[1] We estimate that funds of hedge funds manage around 20-25% of the whole hedge funds universe of cUS$500bn assets under management.

Liquidity

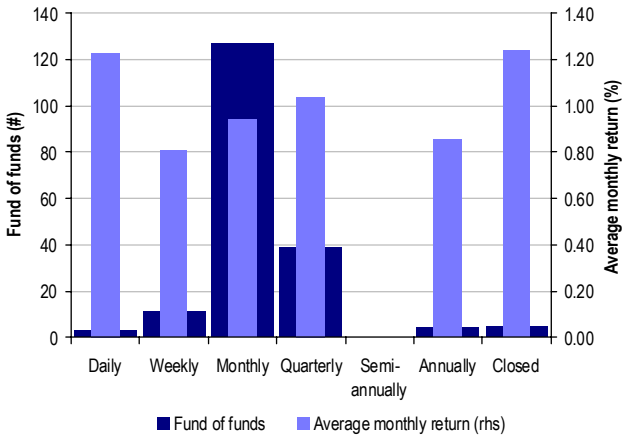
Chart 12 shows the distribution of funds of funds by withdrawals (left axis). We found withdrawal information on 235 funds of funds. The right axis of the graph shows the average monthly return by withdrawal for the 96 fund of funds that were in existence during January 1996 and December 2000. Chart 13 shows the distribution by contribution. The sample size for Chart 13 was 189 funds of funds. The average monthly return was drawn from 78 funds of funds in existence over the five-year period ending in 2000. The overlapping sample size was 177 funds of funds (information on withdrawals as well as contributions).

Chart 12: Withdrawals



Source: Quellos, UBS Warburg calculations
Return (rhs) only shown for funds of funds in existence between January 1996 and December 2000.

Chart 13: Contributions



Source: Quellos, UBS Warburg calculations
Return (rhs) only shown for funds of funds in existence between January 1996 and December 2000.

- 77% of the funds of funds had a withdrawal period of either monthly or quarterly (Chart 12). 88% took monthly or quarterly contributions (Chart 13).

- 69% of 177 funds of funds where we had information on withdrawals as well as contributions had a match between withdrawals and contributions. 17.5% took monthly contributions and had a longer withdrawal period. 28% had longer withdrawal period than contribution period. No fund of funds had a shorter withdrawal period than contribution period.

[1] For description of data please refer to page 81.

Relationship between Liquidity And Performance

Liquidity is a theoretical concept with little practical value

Whether there is correlation between liquidity and performance on a fund of funds level[1] and whether a fund of funds manager can have a duration mismatch between his investors (liabilities) and his investments in individual hedge funds (assets) is open to debate. In addition, liquidity on a single fund or fund of funds level is to some extent a theoretical issue. Most managers will have provisions to extend redemptions, either buried in the fine print of the offering memorandum or via some other legal recourse. In other words, liquidity is not necessarily as it appears at first sight.[2]

Liquidity terms of skilful hedge fund and fund of funds managers will probably get tougher

Since the hedge funds with the greatest skills will generate returns in less efficient markets, and demand going into hedge funds is expected to increase at a pace faster than new skilled managers can supply new capacity, skilled managers potentially will continue to be in the position to tighten (and dictate) liquidity terms. Thus we might expect more 2+20 fee structures for single hedge funds, tougher liquidity terms, and more lockup provisions. Potentially some managers may face a moral hazard of opening their doors to new money once having closed. Nevertheless, one could argue that the truly skilled managers would not add capacity beyond what is optimal in their field of expertise and with their operational setup.

Liquidity has a tendency to disappear exactly then when most demanded

Assuming that fund of funds managers must match the duration of their assets with their liabilities, they will have to tighten their liquidity terms as a result of the above. A counterargument to this view is that the fund of funds manager need only manage weighted average terms and probabilistic redemptions. This would be similar to a bank that only needs fractional reserves since a run on the banking industry is seen as unlikely. In addition, funds of funds, as banks or hedge funds themselves, in such catastrophic situations could refuse to pay redemptions. Nevertheless, in the long run, funds of funds will have to tighten their weighted average liquidity terms by either replacing old investors with new investors facing lockups or adding new vehicles with tougher terms.

Flight-to-quality scenarios such as in autumn 1998 do not happen often. In other words, a duration mismatch between assets and liabilities will not be a problem in most market situations. However, shocks to the system do happen. We believe that sound funding and matching asset/liability duration are advisable.

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[1] Liquidity on a single hedge fund level is a different matter. For example, currencies, interest rate and equity index instruments are the most liquid and also the most efficiently priced. Thus, funds specialising in these instruments could easily offer weekly liquidity. Distressed and convertible bonds are relatively illiquid. Managers focusing here need quarterly redemptions if not longer. In general, the efficiency of an asset is highly correlated to its liquidity. Since we are trying for inefficient markets, this necessitates less liquid investments.

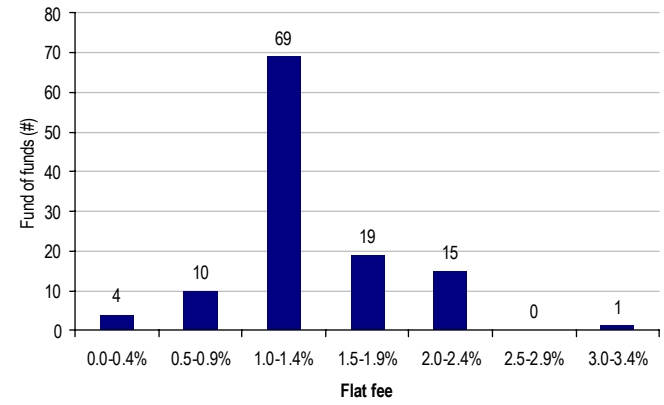
[2] One could argue that liquidity in itself is a theoretical or at least ephemeral concept. Liquidity tends to evaporate when most needed. For example, there was no liquidity during the 19 October 1987 crash. According to the *Report of the Presidential Task Force on Market Mechanisms,* market makers possessed neither the resources nor the willingness to absorb the extraordinary volume of selling demand that materialised. (Swensen (2000), p. 93) Just when investors most needed liquidity, it disappeared. Swensen (2000) quotes Keynes (1936) who argued that *"of the maxims of orthodox finance none, surely, is more anti-social than the fetish of liquidity, the doctrine that it is a positive virtue on the part of investment institutions to concentrate their resources upon the holding of 'liquid' securities. It forgets that there is no such thing as liquidity of investment for the community as a whole."* Swensen (2000) suggests that investors should purse success, not liquidity, ie fear failure, not illiquidity. If private, illiquid investments succeed, liquidity follows as investors gain interest. In public markets, as once-illiquid stocks perform well, liquidity increases as investors recognise progress. In contrast, if public, liquid investments fail, illiquidity follows as interest dries up. Recent trading turnover patterns in telecom stocks might be an example of the latter point.

Fee Structure

In this section we examine the fee structures of some of the funds of hedge fund on which we have information. One caveat of this analysis is that we are not necessarily comparing them on a like-for-like basis. A fund of funds specialising in constant absolute returns will most likely have different fee structure than a fund of funds shooting for the moon, ie with a strong directional bias. In addition, we have no information on trail fees, kickbacks and retrocessions.[1]

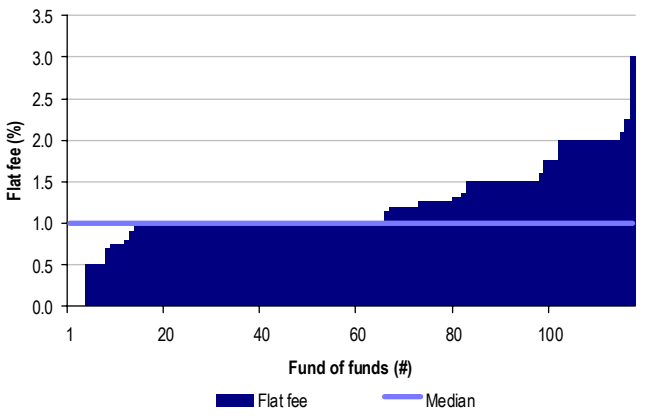
From the whole sample of funds of funds data available to us, we found information on base fee, hurdle rate and performance fee for 118 funds, of which 51 were in operation as of December 2000. Chart 14 and Chart 15 (cumulative) show the distribution by flat fee.

Chart 14: Distribution by Flat Fee



Source: Quellos

Chart 15: Flat Fee of Funds of Funds



Source: Quellos

- 58% of the funds had a flat fee between 1% and 1.4%. 75% of the flat fees were between 1% and 1.9%. From the 118 funds of funds the median manager had a flat fee of 1% where the average was 1.2%. The range was between 0% (four funds) and 3% (one fund).

- Of the 88 funds with a flat fee between 1% and 1.9%, only eight (9.1%) did not have an incentive fee. The incentive fee varied between 2% and 25%. 20 funds of funds (22.7%) had a hurdle rate[2] of some sort in place.

- Of the 88 funds with flat fee between 1% and 1.9%, the median incentive fee was 10% and the average 12%. The hurdle rate varied from 0% to S&P 500

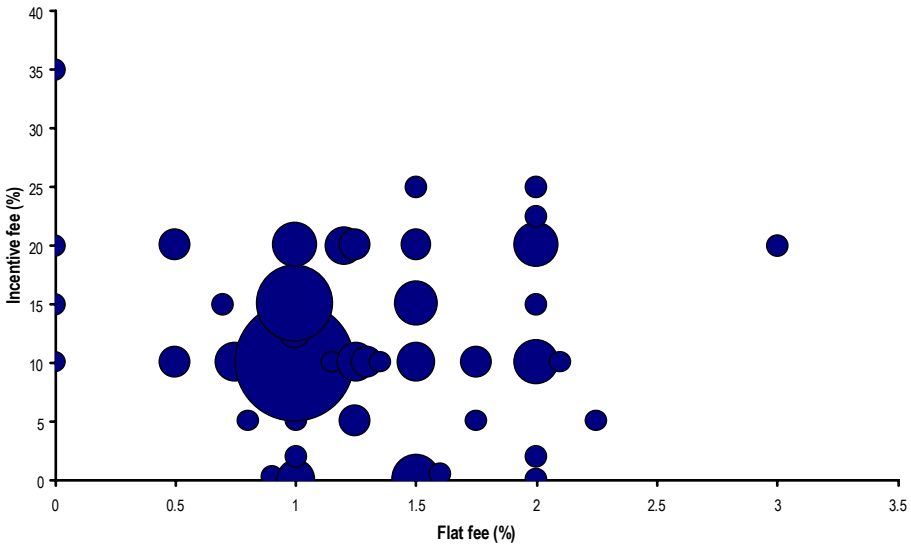
[1] Kickback: Some fund of funds get a fee from the hedge fund's clearing broker, eg a fund of funds manager insisting that a hedge fund clears with a broker of their choosing and that broker then gives a percentage back to the fund of funds. Another kick back idea is for the hedge fund to give a percentage of their total fee income and a percentage of their hedge fund business for being an initial investor. Both of these things are rarely announced. A trail fee is usually payable on mutual funds and seen as a payment to an intermediary for ongoing client servicing and monitoring on the fund. Retrocession is a fee-sharing arrangement whereby a portion of the fees charged by the hedge fund or fund of funds is given back either to marketers or other agents in consideration for their efforts in raising money for the product, or given back directly to the client as a form of compensation (mainly true of retail-distributed products).

[2] The return above which a hedge fund manager begins taking incentive fees. For example, if a fund has a hurdle rate of 10%, and the fund returns 25% for the year, the fund will only take incentive fees on the 15% return above the hurdle rate.

returns. Chart 16 below shows flat fee in relation to incentive fee from the whole universe of 118 funds of funds.

- The most common structure is a flat fee of 1% and incentive fee of 10%. 28 (21.5%) funds of funds had this structure. Of these 28, nine had a hurdle rate of 10%, six had no hurdle rate and five had a hurdle rate associated with T-bills or other short-term interest rate benchmark. From the remaining eight funds of funds with a 1+10 structure, three had a hurdle rate of 8%, two of S&P 500 returns, and the remaining three had hurdle rates of 7%, 7.5% and 8% respectively.

Chart 16: Flat Fee versus Incentive Fee

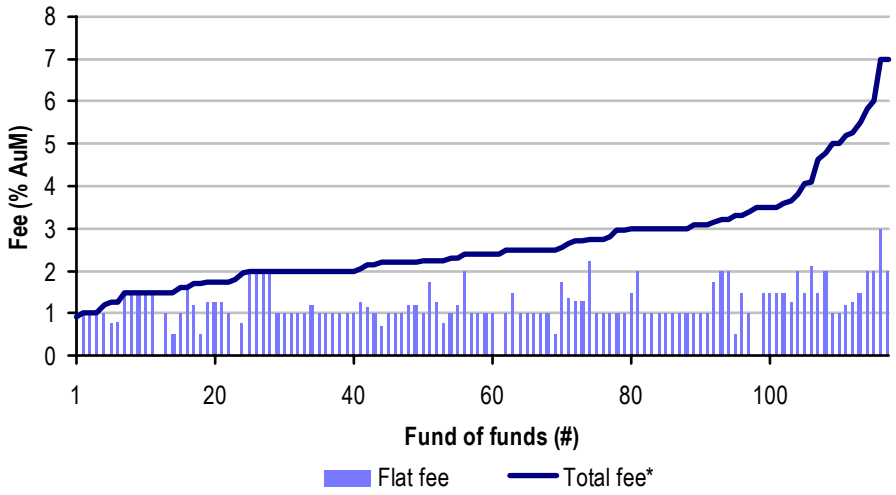


Source: Quellos
Bubble size measures number of funds of funds with same fee structure.

- The second most common structure was a 1% flat fee and a 15% incentive fee. 12 funds had this structure. However, all of these 12 funds had a hurdle rate ranging from T-bills to S&P 500 returns. Four funds had 1% plus 20%.

Chart 17 below estimates the total fee from the universe of 118 funds of funds. The graph has been sorted by ascending total fees. We assumed a hedge fund gross return of 20%. For the benchmarked hurdle rate, we assumed a three-month rate of 6% and an equity return of 10%. The equity hurdle benchmark rate was either the S&P 500 or MSCI World.

Chart 17: Total Fee Structure



Source: Quellos, UBS Warburg estimates and calculations

* Assumptions: Hedge fund gross return of 20%, 3-month rate 6%, equity hurdle was set 10%.

- For the total fee the median was 2.4% and the average was 2.7%. The range was from a total fee of 0.935% to 7.0% given our assumptions outlined above.

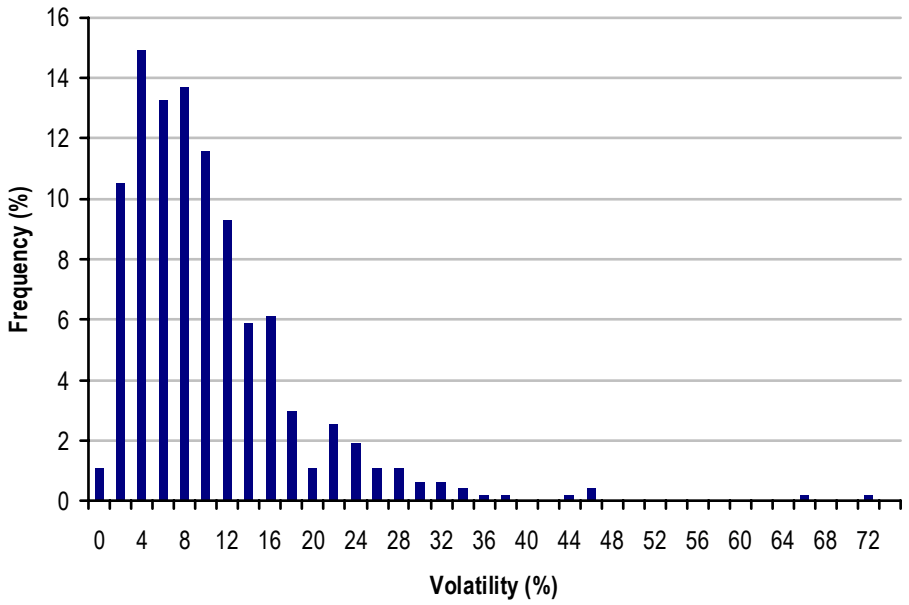
- The lowest total fee was in a fund of funds with a flat fee of 0.9% and an incentive fee of 0.25% above a hurdle rate of two-year T-notes. The highest fee structure was 2% flat fee and 25% incentive fee with no hurdle rate.

Volatility of Funds of Funds

Different funds of funds have different volatility targets

Different funds of funds have different objectives and, as a result, different portfolios with different volatilities. Chart 18 shows the dispersion of volatility for 475 funds of funds where we had at least 36 months of continuous monthly returns. A chart with only 286 funds of funds with at least 60 months of returns (not shown) looks nearly the same as Chart 18. The two extreme outliers on the right-hand side of the volatility distribution were missing, if we only look at funds of funds with 60 months of returns. This, in theory, could be a function of a smaller sample size.

Chart 18: Volatility of Funds of Funds



Source: Quellos, UBS Warburg calculations

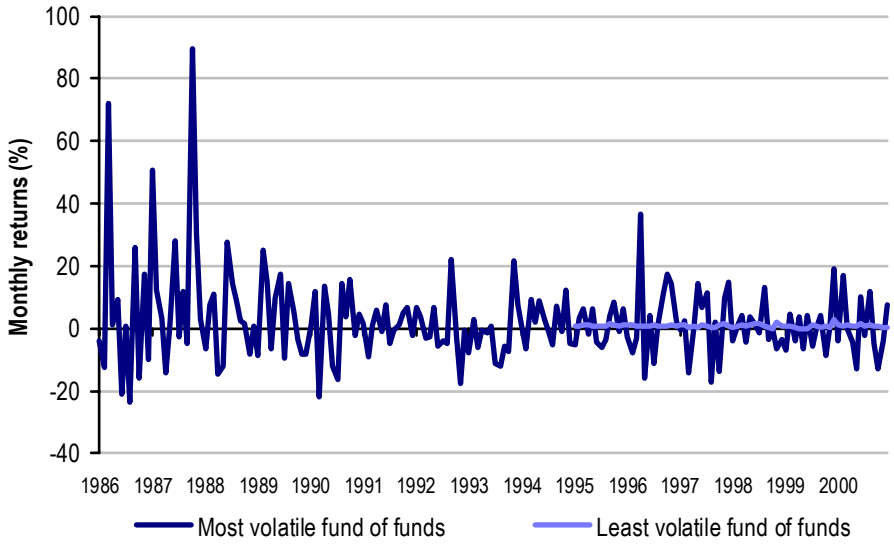
- 19.4% of funds of funds had volatilities that were 5% or lower, 34.1% were between 5% and 10%, 24.6% were between 10% and 15%, and 11.2% were between 15% and 20%. 10.7% of the funds of funds had annual volatilities higher than 20%.

- Five funds of funds (1.1% of sample size) had a volatility lower than 2%. The lowest volatility was 1.17% (based on 48 monthly returns to December 2000).

- Five funds of funds had volatilities above 45%. The two most volatile funds had volatilities of 72.7% and 66.3% respectively (based on 36 and 48 monthly returns, respectively).

Chart 19 below shows the most volatile compared with the least volatile funds of funds. We only screened funds with continuous monthly returns of five years or more. The fund with the highest volatility had an annual standard deviation of monthly returns (volatility) equal to 47.6% (based on 180 returns to December 2000) whereas the lowest was 1.72% (based on 72 returns to December 2000).

Chart 19: Most and Least Volatile Funds of Funds

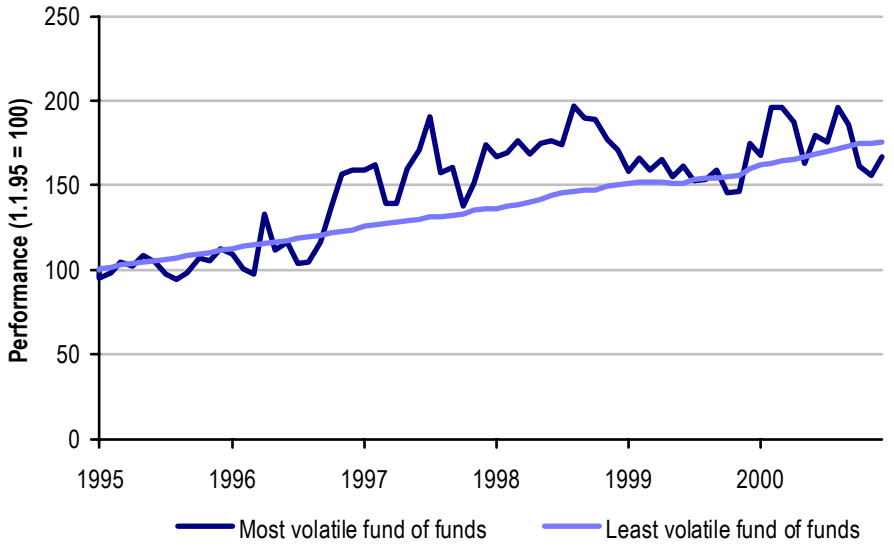


Source: Quellos, UBS Warburg calculations

- The conclusion we draw from Chart 18 and Chart 19 is that the fund of hedge funds industry is probably as heterogeneous as is the hedge fund industry.

Occasionally our hedge fund research is criticised for being biased towards the non-directional spectrum of the hedge fund industry, for which, obviously, we apologise. Our at times agnostic remarks and digressions on market timing do not go down well all the time. Therefore, for the time being we leave it to the reader to judge which of the following two investments in Chart 20 is superior.

Chart 20: Cumulative Return for Most and Least Volatile Funds of Funds

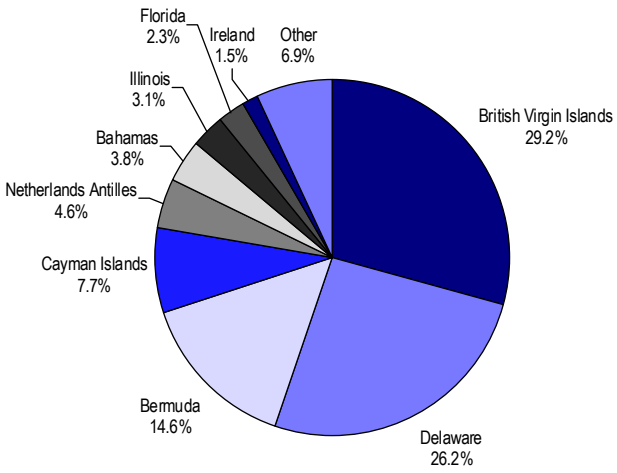


Source: Quellos, UBS Warburg calculations

Domicile

Chart 21 looks at fund of funds domicile. The chart is based on 130 funds of funds in operation in the two-year period from 1999 to 2000.

Chart 21: Fund of Funds Domicile



Source: Quellos
Other: One fund each in British West Indies, California, Connecticut, Curaçao, Guernsey, Isle of Man, Luxembourg, Pennsylvania, and Texas

- 63% of the 130 funds of funds universe are in domiciles renowned as tax havens and boast a fair amount of sunny days per year.

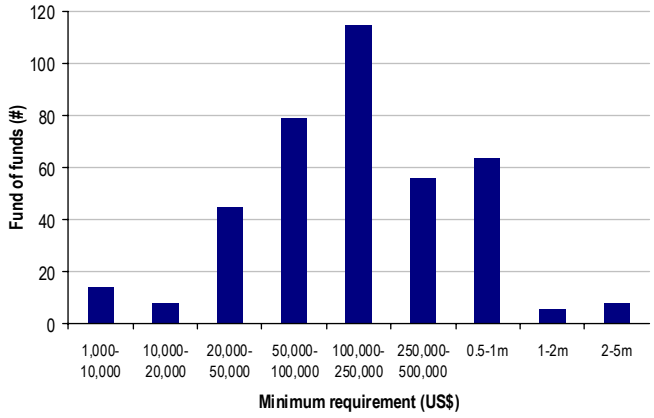
- Many funds of funds are registered in Delaware. There are some advantages to registering in Delaware:

  - No minimum capital is required to form a Delaware corporation.
  - There is no corporate income tax on companies formed in Delaware and not doing business in the state.
  - Corporate records can be kept anywhere in the world.
  - No formal meetings are required and shareholders need not be US citizens.
  - Any legal business may be conducted in Delaware.
  - Ownership of a Delaware corporation is strictly confidential.
  - One person can act as the sole officer, director and shareholder of a corporation.
  - It is inexpensive.

Minimum Investment

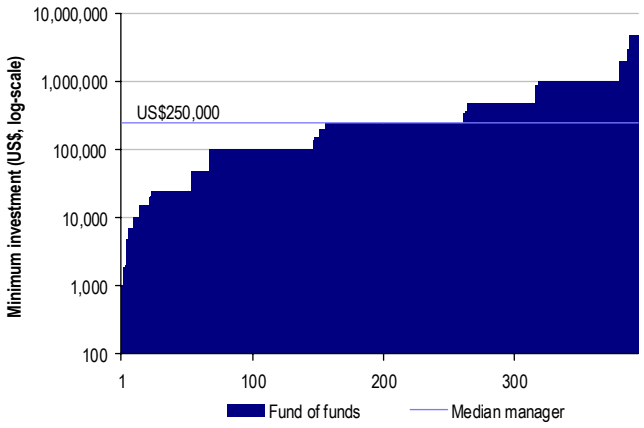
The following charts show the distribution of fund of hedge funds by minimum investment requirement. From a universe of 929 existing and distinct funds of funds we have minimum investment information on 395 funds of funds.

Chart 22: Distribution by Minimum Investment



Source: Quellos

Chart 23: Minimum Investment of Funds of Funds



Source: Quellos

- The median fund of funds had a minimum requirement of US$250,000. The range varies from US$1,000 to US$5m.

- 66.1% of the funds of funds had a minimum investment requirement of US$250,000 or less and 37.0% of US$100,000 or less. Only 3.5% of the funds of funds had a requirement of more than US$1m.

- We believe that Chart 22 could have a slight bias to the left as some requirements of older funds of funds might not have been updated.

This concludes our brief analysis on fund of funds industry characteristics. Performance is discussed on page 81. In the following two sections we will contrast what we believe are the advantages of investing in funds of funds, with some obvious and less obvious disadvantages.

Advantages and Disadvantages of Investing in Funds of Funds

"The man who does not read good books has no advantage over the man who cannot read them."
Mark Twain

Summary

- We believe that all investors without a competitive advantage in the inefficient hedge fund industry should invest with funds of funds.
- The main advantage of investing in a fund of funds with an edge is that the manager is able to add value through manager selection, portfolio construction and monitoring investments and managers.
- The main disadvantage is that most fund of funds managers are not purely charitable organisations, ie they most often charge a fee on top of the fees of the individual hedge funds.

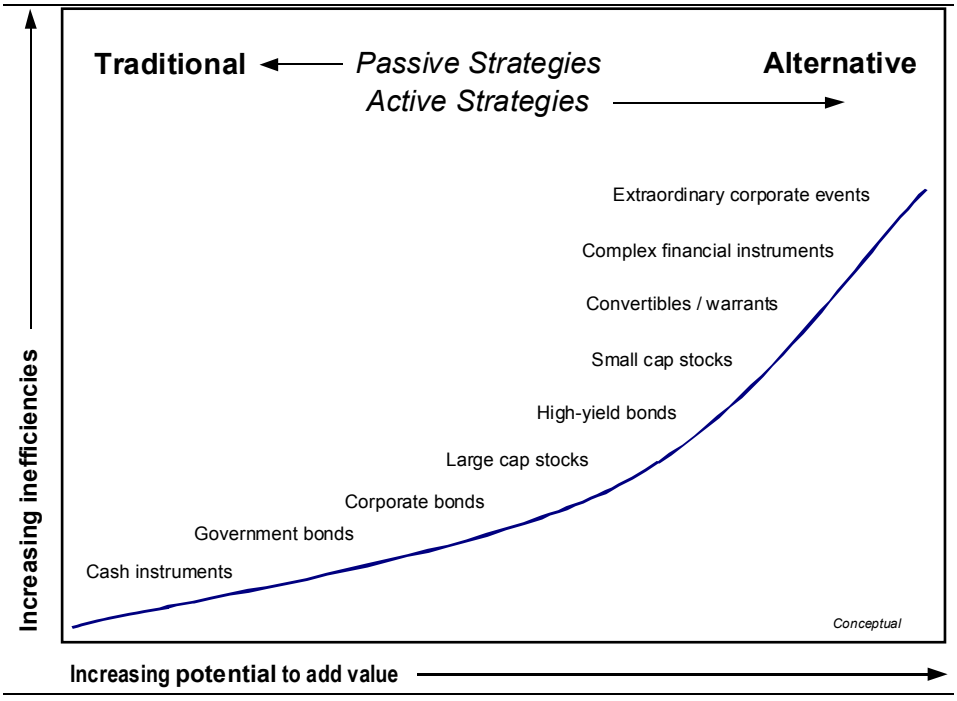
Advantages

Value-added

Alpha potential is inversely related to efficiency

We believe that the potential to add value, ie generate alpha, is somewhat inversely proportional to the efficiency and/or liquidity of the underlying instruments. We elaborated this point in our report from last October.[1]

Chart 24: Potential Alpha Generation



Source: Quellos

[1] UBS Warburg research (2000), pages 54-56 and 156-157.

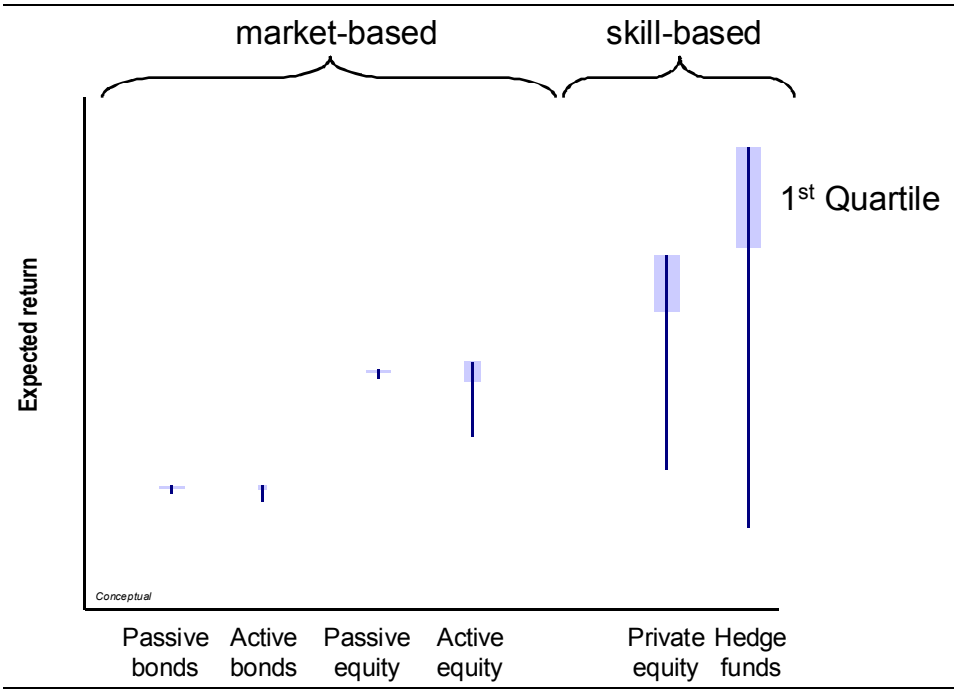
- Chart 24 shows conceptually what we referred to earlier as two trends in asset management. Where markets are price-efficient, more and more investors adopt a passive approach since the potential for an active manager to add value is limited.

- The greatest potential for adding value is where information is not freely available, ie in inefficient markets. There, we believe, the potential for active management is larger. Note that there is a difference between adding value in an *informationally inefficient* market through achieving an informational advantage or adding value by picking up a premium for liquidity in an *informationally efficient* market. Absolute return managers are involved in both.

Hedge fund selection is value-added

Given that the hedge fund industry is opaque, ie inefficient, the more experienced and skilled fund of funds managers should have an edge over the less experienced and skilled. Given the high dispersion of returns between managers (Chart 1 on page 4), hedge fund selection is most likely a value-added proposition. Investing with the first quartile of hedge fund managers differs widely from investing with the lowest quartile. In Chart 25 below we show conceptually the expected dispersion of market-based strategies in contrast with skill-based strategies.

Chart 25: Expected Return Dispersion of Market-based and Skill-based Strategies



Source: UBS Warburg
Private equity is probably a hybrid between market- and skill-based strategies as the performance of private equity is very dependent on the risk appetite for Nasdaq-like investments.

Wide dispersion is an opportunity for some and a risk to others

The dispersion of returns with skill-based strategies is much higher than with market-based strategies where tracking error constraints drives the range of dispersion. The dispersion for passive bond funds, for example, with the same benchmark is probably minimal. Also, actively managed equity funds on, say, the

FTSE All-Share index will have a relatively low dispersion.[1] A wide dispersion means that the lower quartile will do much worse than the upper quartile. To an investor with no edge this is a risk. To an active investor with a competitive advantage this is an opportunity to add value.

Picking a fund of funds manager is becoming more difficult

As the number of hedge funds increases, the number of fund of funds managers is also increasing as a result of increasing demand for exposure to hedge funds. The lack of longevity of some of the newer funds of funds is a risk to the investor as is the low level of experience relative to fees by those fund of funds managers. We therefore believe that the selection of a fund of hedge funds manager will become more difficult and costly over time.

Differing growth rates

The accepted wisdom in the hedge fund industry is that it is a demand-led business. But 'quality hedge funds' – ie those with superior business models, investment philosophies and risk management capabilities – are actually driven by supply (capacity) rather than demand. We believe there is an imbalance between the demand for hedge fund exposure in general (increasing fast) and the supply of quality hedge funds (increasing slowly).

Some hedge funds close rapidly to new investors

Quality hedge fund managers are making their funds less attractive to new investors either by increasing fees, increasing redemption periods or simply closing to new money. It seems to us that these hedge funds close at a continuously faster pace than normal hedge funds.[2]

Returns in the hedge fund industry might fall

One possible outcome of this supply and demand imbalance it that the quality of the median manager falls. If the current acceleration of demand for hedge funds should quicken, the deterioration of quality could accelerate and those investors last to jump on the bandwagon will likely invest with the least talented hedge fund managers.[3] An experienced and established fund of funds manager, however, is probably more likely to invest with the most talented managers. This, we believe, is a strong value proposition.

[1] There is a strong incentive not to deviate too widely from the benchmark, as those asset managers who were following the wrong investment style (and/or were measured against the wrong benchmark) and lost business as a result during the late 1990s will know.

[2] There is the distinction between hard and soft close. Hard close means that a fund is officially as well as unofficially temporarily not taking new funds from any investors. Soft close means that the fund is 'officially' not open to new money. However, an allocation by a large long-term investor is still possible. Note that quality hedge funds are in a position to 'manage' their client base, ie not all investors are treated equally. Sophisticated long-term investors are preferred over unsophisticated short-term investors.

[3] One interesting aspect of the LTCM period is that initial investors had an 18% annual return over the life of the firm because LTCM returned more funds back to investors in 1997 than it initially had invested. Investors who were paid out fully had an even higher return. However, investors who entered last, ie at the peak, lost money. See Lowenstein (2000), p224.

Diversification

Diversification reduces idiosyncratic risk

Portfolio diversification is probably the main reason why institutional investors invest in AIS in general and hedge funds in particular.[1] The main reason for investing in a portfolio of hedge funds instead of a single hedge fund is diversification. Investing in a portfolio of hedge funds significantly reduces individual fund and manager risk.

Schneeweis and Spurgin (2000) differentiate between different degrees of diversification, as shown in Table 11.

Table 11: Classification of Hedge Funds by Diversification Characteristics

Classification	Characteristics	Examples
Return Enhancer	High return, high correlation with stock/bond portfolio	Equity market-neutral, CB arbitrage
Risk Reducer	Lower return, low correlation with stock/bond portfolio	Merger arbitrage, distressed securities, long/short equity
Total Diversifier	High return and low correlation with stock/bond portfolio	Global asset allocation
Pure Diversifier	Low or negative return with high negative correlation with stock/bond portfolio	Short seller

Source: Schneeweis and Spurgin (2000)

Diversification is probably the main reason to invest in hedge funds

A fund of funds is normally not a random composition of hedge fund strategies. The fund of funds manager aims to deliver more stable returns under most market conditions through portfolio construction, ie combining the various hedge strategies. Most often hedge fund portfolios are constructed in a way to reduce the volatility of traditional asset classes such as equities and bonds.[2]

Efficient Exposure

Due diligence is important, laborious, important, costly, and important

Analysing hedge funds is laborious. Once the information is collected, which in itself is difficult, due diligence begins. What are the annual net returns of the fund? How consistent are the returns, year-on-year? Are audited returns available? What reputation does the principal have and what objective references (investors, not friends) can the manager provide? How much of the managers' money is at risk in the fund? Are any investor complaints on file with local or national authorities? Does the investing style make sense? Has the fund performed well in relative as well as absolute terms? What is the risk of losing the principal? How leveraged is the fund?

[1] After hedge funds have become mainstream and institutionalised there will be new forms of alternative investments. The goal of this search will be positive returns with low correlation to equities and bonds. The future of AIS, therefore, could include exposure to, for example, Bordeaux wine. Euronext is in the process of launching futures on a basket of clarets (launch was scheduled for June 2001 but postponed to 14 September 2001 because of its IPO). As the connoisseur will know, the 2000 vintage achieved high prices which were, therefore, negatively correlated to the Nasdaq. The reason Bordeaux wine is weakly correlated with equity markets is because one variable is weather in France, which by definition is not affected by investor sentiment. (There is some causality between equity returns and Bordeaux wine because the price for Bordeaux is also a function of general wealth, which to some extent is dependent on the level of the stock markets.) Further alternative investments could include other commodities which are dependent on weather (as opposed to economic conditions for commodities) or weather risk itself.

[2] At this stage of the document we should be showing the classic 'hedge-funds-are-good-for-you' graph, ie the potential portfolio efficiency improvement when hedge funds are added to a traditional portfolio in mean-variance space. We, however, assume that the reader, like ourselves, has seen this graph so often over the past 12 months that we will refrain.

Large universe of opportunities

There are around 2,000-6,000 hedge funds available.[1] Certainly, many of them are closed or do not meet certain basic criteria. However, picking hedge funds from a small, easily accessible universe is probably similar to building a diversified equity portfolio with pulp and paper stocks only.

Finding and hiring investment staff could be difficult and expensive

There are two aspects with respect to staff analysing and selecting hedge fund managers: finding and hiring. Since the hedge fund industry is relatively young, there is no oversupply of investment professionals who have the necessary skill set and experience to analyse the investment philosophy and quality of business franchise and management. Given the opaqueness of the industry, someone from within the industry will probably have a competitive advantage over someone from outside. We believe experience is an important variable in ex-ante manager evaluation. Finding investment staff is not equal to hiring. Location probably matters. One could make the point that a plan sponsor located in the suburbs of Helsinki will not appeal equally to all investment professionals with hedge fund manager selection experience. In other words, the costs of setting up one's own hedge fund selection process could exceed those charged by fund of funds managers.

Low administration costs

A fund allows easier administration of widely diversified investments across a large variety of hedge funds.

Reduced minimum investment requirement

Private and small institutional investors are not able to diversify properly by investing in single hedge funds. The fund of funds approach allows access to a broader spectrum of hedge funds than may otherwise be available due to high minimum investment requirements.

Providers of Capacity

Fund of funds managers are the gatekeepers of capacity

The notion that fund of funds managers are gatekeepers of capacity is not entirely uncontroversial. An established fund of funds manager is quick to spot talent and can secure a certain capacity in a new fund, even when the fund closes for new money. On the other hand, many hedge fund managers are only *soft-closed*, ie they officially announce they are closed but are still open for high-quality investors.

Most swords are double-edged

The term *high-quality investors* is obviously subjective. However, hedge fund managers prefer sophisticated long-term investors who understand the merits and risks of the strategy. This reduces the risk that the investor will pull out of the fund at the worst possible moment. In other words, a hedge fund manager might prefer a professionally managed pension fund over a fund of funds. Although the fund of funds manager might understand the merits of the strategy, this might not necessarily be true for the investors in the fund of funds. In this respect, the capacity argument for fund of funds managers is a double-edged sword.

[1] This is a pretty wide spread. The reason is that there is no consensus as to what a 'fund' is. We assume that some vendors, to exaggerate the size of their database, list for example Class A shares (leverage 2:1) and Class B shares (leverage 3:1) as two separate funds. We would consider these two separate share classes. By this reckoning, the number tranches joined by pari passu approaches (hot issues/no hot issues, onshore/offshore, leveraged/non-leveraged, US$/other currency, etc.) suggest only about 2,000 different 'funds', with probably 8,000 different share classes.

There is probably a difference whether the end-investor of a fund of funds is retail or institutional

We believe the capacity argument has been diminishing over time because the allocation from institutional investors into funds of funds has been increasing relative to hot (short-term) money. In other words, a hedge fund manager will distinguish between a fund of funds marketed to retail investors or a fund of funds where the client base is institutional or sophisticated or both.

Conclusion

We believe the hedge fund industry is inefficient as information on managers is not available for all market participants at the same time and at the same price. This means a fund of funds manager with a competitive advantage should be able to add value through manager selection.

The hedge fund industry is heterogeneous. This means different hedge fund strategies have different *expected* returns, volatilities and correlation characteristics. Unlike with equities, portfolio volatility can be reduced to below 5% through portfolio construction. A fund of funds manager is probably more likely to estimate return, volatility and correlation, and is therefore in a position to construct more efficient portfolios.

Probably every investment decision can be broken down to balancing the advantages and disadvantages. In the following section we will discuss some of the disadvantages of investing in fund of funds. The main disadvantage is probably cost.

Disadvantages

Double Fee Structure

Paying the farmer as well as the milkman

With funds of funds, fees are charged twice. The individual hedge fund collects fees from the fund of funds manager and the fund of funds manager collects additional fees from the distributor or investor. The double fee structure is often seen as a negative aspect of investing in hedge funds.[1]

The hedge fund industry is not efficient

The double fee argument does not relate fees to the value added by the fund of funds manager.[2] If a random selection of hedge funds yields the same gross risk-adjusted returns as the fund of funds approach, then we would have to question the double fee structure. However, we doubt that the hedge fund industry is efficient. Most likely it is quite the opposite. Information is still scarce and costly. Institutions have just begun to think about hedge funds on a grander scale. Someone once said with respect to investing and dealing with uncertainty:

> *"We are all in a dark room. However, the one who has been in the room for some time will have an advantage over someone who just entered."*

A massive increase in liquidity has reduced to lower costs of exposure to beta

In theory, an active fee should be paid on active management and a passive (lower) fee for passive management. The main reason for passive management having lower fees is that the costs of getting exposure to efficient markets such as the US or UK stock market have continuously been falling. In other words, an active fee should be charged on exposure that is not available through indexation or other passive investment strategies. Put differently, excess returns attributed to skill are scarce and costly while market exposure is not.

Distinction between alpha and beta is becoming more important

We believe that performance attribution is becoming more and more important to the fee-paying investor base. The distinction between performance attributable to beta and performance from alpha is, therefore, becoming increasingly important. Chart 26 below shows the results of a study conducted by Fung and Hsieh (1997a) based on a sample of 3,327 US mutual funds and 409 hedge funds/CTAs. The authors compared the performance attribution of mutual funds with the performance attribution of hedge funds. Although this example applies to individual hedge funds, the logic should apply to active and passive fees in general.

Hedge fund returns are not driven by the market

Chart 26 shows the percentage of performance attributable to traditional asset classes for long-only funds and hedge funds. In the chart, a reading of 100% indicates that 100% of the return is attributable to asset classes whereas a reading of 0% indicates that performance is not attributable to any asset class.[3] While more than half the mutual funds have R^2s above 75%, nearly half (48%) of the hedge funds have R^2s below 25%. This means that whatever is driving hedge fund returns it is not the stock market or any other efficiently replicable variable. We believe it is

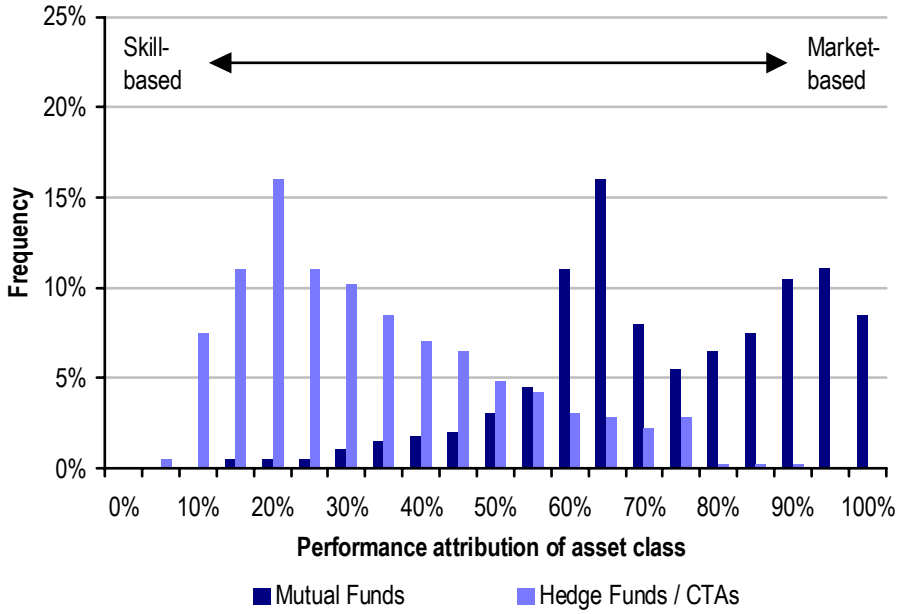
[1] Some investors still regard the fee structure of a single hedge fund as excessive. However, fees are probably positively correlated with skill. An unskilled manager will not be in a position to demand high fees. Liang (1999), for example, finds that average hedge fund returns are positively correlated with incentive fees, fund assets, and the lockup period. In addition, excess returns cannot be explained by survivorship bias.

[2] We have discussed the difference of paying a fee for alpha or beta on page 14 of this report as well as on pages 84-87 of UBS Warburg (2000) *In Search of Alpha*.

[3] The asset classes were US equity, non-US equity, emerging markets, US bonds, non-US bonds, high-yield corporate bonds, the US dollar, gold, and cash.

primarily differences in the skill and flexibility of hedge fund managers' mandates that allow them to deliver an uncorrelated set of returns.[1] We discuss the Fung and Hsieh (1997a) article and other related, more recent papers in more detail in the Appendix on page 92.

Chart 26: Performance Attribution



Source: Fung and Hsieh (1997a), UBS Warburg
Note: Terms 'skill-based' and 'market-based' are not in the original by Fung and Hsieh (1997a).

There is normally no passive alternative in inefficient markets

We believe that the high fees of hedge funds and the double layer of fees of the fund of funds manager have to be put in context with the value added on an after-fee basis. Exposure to price-efficient markets is most efficiently accessed through passive vehicles such as index funds or total return swaps or any other variant. Exposure to price and informationally inefficient markets do not normally have a passive alternative.

Lack of Transparency

Black-box syndrome

Some investors find it unnerving not to know what they are investing in when investing in a hedge fund since transparency is lower compared with traditional managers. When we visited him, one pension fund manager asked us the (rhetorical) question:

> *"So you suggest we invest in a venture which is not regulated, its positions and investment philosophy are not transparent, is illiquid and is run by a bunch of 30-year olds?"*

In some cases, transparency is diminished still further when investing in funds of funds because not all fund of funds managers disclose the names of the funds they invest in. However, quite often fund of funds managers have greater transparency of

[1] This is, obviously, not the full story. The flexibility comes at a cost. In addition, hedge fund returns are not normally distributed, adding an extra layer of complexity and calling for greater efforts in due diligence, portfolio construction and risk monitoring. We have added an essay entitled 'Who's long?' at the end of this document (page 100). This touches on the subject of performance attribution of market-neutral, long/short and long-only managers.

the positions of a hedge fund manager they invest in than any other investor. Hedge fund managers might be more willing to disclose information to market participants who do not trade in the same markets and securities as they do.

Most hedge funds have little or no name recognition

Again, we attempt to challenge this disadvantage: How many hedge funds does the reader know by name? Hedge funds are not like stocks with respect to brand recognition. Every investor, or every person for that matter, has knowledge of companies because they affect our daily lives. Hedge funds, in most cases, do not. The industry itself is opaque to most investors. Even an investor who can name 20 different hedge funds still only 'knows' a fraction of the industry. Fund of funds managers specialise and operate in a field where knowledge is only attainable at high cost.

Asset management firms that specialise in AIS in general or hedge funds in particular are not usually household names. This is a disadvantage for two reasons: Unfamiliarity and information cost.

Unfamiliarity

Banks in Gualeguaychu also have no brand recognition

In the most general sense, everything else being equal, something unfamiliar has more subjective risk than something familiar, ie uncertainty is perceived as higher.[1] For example, most people would prefer banking with an established Swiss bank rather than with a small and new private bank in Gualeguaychu (Argentina).[2]

Alternative asset managers are less established than traditional asset managers

Many fund of funds managers are not well known to the decision-maker in an institutional setup. However, today there is a core of asset management firms that have a track record of five years or more. Given that the hedge fund industry is newer than the traditional long-only industry, investors are familiar with the large asset management institutions but unfamiliar with the newer alternative asset management firms.

Mergers between traditional asset management and alternative management houses are likely

Going forward we will probably witness combinations of traditional asset management firms with niche alternative asset management firms in general and funds of hedge funds in particular. That way the traditional asset manager can market a product where demand is increasing and margins are high while the fund of funds manager gets distribution power.

Cost

Due diligence is costly

The cost of information in the hedge fund industry is high. The main reason is the persistent opaqueness of the industry. An institutional investor will have to go through a lengthy due diligence process before the fiduciaries and plan sponsors are prepared to invest the OPM (Other People's Money) they were entrusted to manage. The decision-making process for non-institutional investors is faster and less rigid, ie cheaper, than it is for fiduciaries.

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[1] Unfamiliarity is not a very scientific and sophisticated way of expressing risk. Note, however, that LTCM was, without a shadow of a doubt, the most scientific and sophisticated risk managers with honours and high-flying reputations in both academia as well as Wall Street. The point is that it is probably healthy to practice some degree of conservatism to anything new, even if we cannot model it econometrically.

[2] Although the boom in banking with online startups in 1999/2000 would indicate otherwise.

Limited Liquidity

Liquidity on a Single Hedge Fund Level

Allocations to AIS in general or hedge funds in particular are long-term investments

Some investors might find comfort in the fact that most hedge fund managers have a large portion of their net wealth tied to the fund, ie the same long redemption periods as the investor. A more pragmatic argument for low liquidity is the fact that hedge funds exploit inefficiencies and therefore are by definition in markets that are less liquid than the bluest of blue chips. In other words, exploiting inefficiencies by its nature involves some degree of illiquidity.

Liquidity on a Fund of Hedge Funds Level

Liquidity is best optimised, not maximised

Limited liquidity in a fund of funds is certainly a detraction, especially when compared with single hedge funds offering superior liquidity or traditional investments offering daily withdrawal/redemption terms. Limited liquidity comes with a cost, and this cost ought to be compensated with proper returns for the investor. Earlier (page 29) we examined the issue of liquidity of fund of funds managers in relation to performance. Skilful fund of funds managers should not only be able to construct portfolios that outperform, but also be able to target a liquidity horizon that is optimal both for hedge fund investments as well as the needs of the investors in the fund of funds.

Caveat emptor

Some funds of funds nonetheless offer opportunities for withdrawal on a weekly or daily basis, though mainly with penalties attached. We however would regard a fund of funds manager who aggressively provides liquidity free of charge with suspicion. Non-marketable securities are by definition illiquid. Our suspicion for such an operation is based on two assumptions:

1. A fund of funds manager could be investing in hedge funds which are only trading in liquid markets. These funds are traditionally directional and their performance more volatile. We would view this as negative because market inefficiencies are by definition to be found in smaller, less liquid and less efficient markets. Long-term investing in hedge funds, therefore, is to some extent about picking up a liquidity premium.
2. '*Beggars can't be choosers*'. We do not believe that the most talented managers in the alternative investment arena make compromises. At least not at this stage in the cycle. We assume these managers can resist the temptation of being part of a retail product that offers high-frequency, eg daily, liquidity.

No 'Learning-by-doing' Effect

'What They Don't Teach You at Harvard Business School'

A further disadvantage of investing in a fund of funds instead of investing in hedge funds directly is a lack of knowledge transfer. One could argue that, at the most general level, investing involves a 'learning-by-doing' effect. Mark McCormack's classic *What They Don't Teach You at Harvard Business School* could have easily been addressed to investment management as opposed to marketing sport celebrities. Success in investment management is to some extent a function of experience.[1]

Sticking a toe into the water

This argument has two sides to it. Many institutions use funds of funds to get acquainted with the asset class,[2] for example by investing some of the allocation with the fund of funds manager and, at the same time, investing with the hedge fund manager directly. This implies that the fund of funds manager is part fund manager and part advisor. The investor, therefore, benefits from the experience of the fund of funds manager in the field of alternative investments.

Conclusion

The main disadvantage of investing in funds of funds is the double fee structure. Fund of funds managers charge a fee on top of the fee structure of the hedge fund manager. We believe investors should relate the double fee structure with the value added of the fund of funds manager. However, to a minority of institutional investors the total amount of fees charged is unacceptable, irrespective of the net value added.

[1] The counterargument to this notion is that from 1995 until March 2000 inexperienced investors loading up on internet stocks were outperforming the establishment which, to a large extent, thought that the market was 'overpriced.' Most 'seasoned' investment veterans probably agreed with Alan Greenspan and Robert Shiller that the market was 'irrationally exuberant.' That was in December 1996, ie many years before the peak.

[2] Whether hedge funds are a separate asset class or not is open to debate. Normally, investment vehicles with different risk, return and correlation attributes are classified into different asset classes. This would suggest that hedge funds are a separate asset class as their risk, return and correlation attributes are different from equities and bonds. However, value and growth investing have different attributes but are not separate asset classes. One could argue that long-only, market-neutral or long/short strategies are simply other investment styles (but not different asset classes) as are value, growth and small-cap investing.

Investment Process of Fund of Funds Manager

"To us who think in terms of practical use, the splitting of the atom means nothing." British science writer Lord Richie Calder, 1932.

Summary

- The investment process of a fund of hedge funds manager is dynamic and can be classified into two selection processes (manager selection and portfolio construction) and two monitoring processes (manager review and risk management).
- Initial and ongoing due diligence of the hedge fund managers is probably the single most important aspect of the investment process for anyone investing in hedge funds.
- Portfolio construction and managing the risk of the hedge fund portfolio are mission-critical in the hugely heterogeneous hedge fund industry.

Portfolio Mandate and Investment Process

Portfolio Mandate

The hedge fund industry is heterogeneous and portfolio tilts vary widely

The first step in starting any business is probably setting the objectives. Different fund of funds managers will have different objectives. Different portfolio designs will serve different purposes. Given the breadth of the hedge fund industry it is likely that fund of funds managers might specialise in a certain investment style. We believe that some fund of funds managers might be closer to the non-directional arena, whereas other managers might have an implicit or explicit bias towards directional hedge fund managers and strategies. The difference between directional and non-directional is probably the most general classification of the strategies in the hedge fund industry.

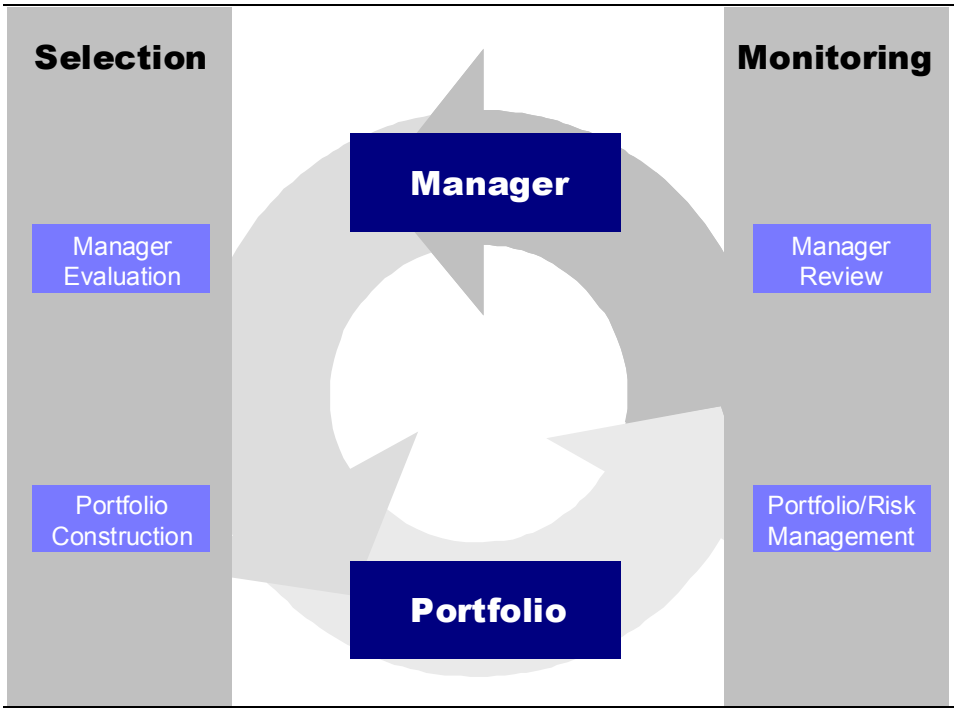
Investment Process

Once the fund of funds manager has set up his business and knows what objectives are to be met, the actual investment process begins. At the most general level there are two variables and two processes. The two variables are the hedge fund manager and the portfolio of the fund of funds. The two processes are a selection and a monitoring process.[1] Most important aspect, in our opinion, is that these two variables and processes are dynamically interrelated. There is little chance of success in a 'let's-go-home-the-work-is-done' approach.[2]

[1] To some extent this is similar to creating a stock portfolio. In a stock portfolio there is a selection process (picking constituents) and a monitoring process (managing the portfolio, ie, aggregate of individual constituents).

[2] We are inclined to argue that a fund of funds manager who does not have dark rings under his eyes is probably too relaxed on at least one of the processes.

Chart 27: Dynamic Investment Process of Fund of Funds Manager



Source: UBS Warburg

Manager Selection and Monitoring

Manager Evaluation

The hedge funds industry is a 'people business'

Manager identification and evaluation is probably the key to success. Investing in hedge funds is essentially a people business. By allocating funds to a manager or a group of managers, the investor expects to participate in the skill of the manager or managers and not necessarily in a particular investment strategy or process. Allocating funds to a convertible arbitrage manager, for example, does not necessarily imply participation in the classic trade of buying the bond and managing the delta through selling the stock. The expectation is to participate in inefficiencies and opportunities in the convertible bond (CB) market where a skilled and experienced manager has a competitive advantage over the less skilled, ie the rest of the market.

Manager data is difficult to obtain

Manager evaluation is not only the most important step but also the most cumbersome. Commercial databases on hedge funds are a starting point but are incomplete. The difficulty and effort of collecting information probably puts in place significant barriers to enter the fund of funds business in a serious entrepreneurial fashion. Put differently, this means that fund of funds managers with an operating history of a couple of years might have a competitive advantage over those fund of funds managers who entered the game last year.

Qualitative as well as quantitative information is important

Due diligence is probably the single most important aspect of the investment process for an investor investing in a hedge fund directly or a fund of hedge funds. Due diligence includes quantitative as well as qualitative assessment. Quantitative analysis of (imperfect) data, however, is not everything. We believe that qualitative

analysis is at least as important as quantitative analysis. We also believe that this view is the consensus in the industry. Due diligence includes a thorough analysis of the fund as a business and a validation of manager information, and covers operational infrastructure, financial and legal documentation, affiliates, investment terms, investor base, reference checks etc.

"The due diligence process is an art, not a science"[1]

Martino (1999) also stresses the point of prudence and integrity in an unregulated market where the hedge fund structure provides a manager with a great deal of freedom.[2]

Due diligence is value added

We believe the due diligence done by the fund of funds manager is part of their value proposition. Whether a fund of funds manager is able to pick the best manager is, by definition, uncertain. As most bottom-up equity fund managers will claim to have superior stock-picking skill, most fund of funds managers will equally claim to have superior hedge fund picking skill.[3] However, an investor can assess the due diligence capabilities of the fund of funds manager in advance by assessing the level of experience of the fund of funds managers in the field of absolute return strategies. This is the reason why most fund of funds managers will list the fund managers' number of years in the industry in the marketing prospectus.

There is no definitive guide to manager evaluation. Below we show an incomplete list of some factors we consider important:

- Intangibles: integrity, lifestyle and attitude
- Strategy: identifiable opportunity sets, embedded market risks, definition of investment process, market knowledge in defined strategy
- Experience: portfolio management ability, risk assessment and management ability, strategy implementation, experience of different market conditions, understanding of the impact of market flows, overall trading savvy
- Assets: size (critical mass versus manageable amount), ability to manage growth, quality of investors
- Operation: back office infrastructure and reliability; fee structure; decision and execution process; quality, stability, compensation and turnover of staff

Manager Review

Manager review is a dynamic and iterative process

The due diligence process never ends. As mentioned before, we believe this to be the consensus among investors and hedge fund professionals. Our belief is based on speaking with hundreds of institutional investors, and several hedge fund and fund of funds managers over the past year. The qualitative nature of the due diligence process is also flagged at most of the hedge fund conferences we attended over the year.

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[1] Martino (1999), p. 281.

[2] See also section 'On Prudence, Trust and Integrity' on page 69 of this document.

[3] This is slightly unfair, because the hedge fund picker is operating in an opaque and inefficient market whereas a stock picker in, say, US large caps is operating in a transparent and price-efficient market. The opportunity to add value is, by definition, larger in an inefficient market than in an efficient market. The value propositions of the two, therefore, are diametrically opposed.

Acknowledging the importance of due diligence and questioning the business model of a fund of funds manager is a paradox

What we find amazing is that the value added of a fund of funds manager is often put in doubt (or the extra layer of fees determined as excessive and/or unnecessary). This is, in our opinion, a paradox: On the one hand, investors agree that seeing hundreds (from a universe of thousands) of hedge fund managers on a regular basis is important, yet on the other hand they postulate that fund of funds managers do not add value. Who else is in the position of doing the due diligence other than experienced investment professionals who are in the loop of the information flow? The industry itself is opaque, ie information does not flow efficiently, so scarce resources must be expended to find and analyse the information. Shouldn't fund of managers be compensated for performing a service that investors both need and want? We doubt that the information advantage of a top-quartile fund of funds manager over a less informed investor will deteriorate any time soon.

Portfolio Selection and Monitoring

Portfolio Construction

There are probably more roads not leading to Rome than there are roads leading to Rome

Most portfolio construction will probably blend bottom-up (manager selection) and top-down (asset allocation) approaches. Different fund of funds managers will have different biases. These biases can be in terms of geographical focus, investment style or strategy. Some managers might put more weight on their personal network in the industry, while others have a more scientific approach to portfolio construction. We are quite confident that there many wrong ways of approaching portfolio construction. There are many potential conflicts of interest which have to be addressed. However, we also believe that there is no single right way of constructing a portfolio of hedge funds.

Hedge fund exposure can involve optionality

As outlined earlier, the mandate and purpose of the portfolio determine the first step. For example, a fund of funds manager who believes that market timing[1] in efficient capital markets does not work is tempted to ignore Commodity Trading Advisors (CTAs) funds from the start, despite their potential attractive diversification and (exploding) gamma features.[2]

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[1] Until a couple of decades ago, scientists viewed the world as an orderly place governed by immutable laws of nature. Once uncovered, it was believed, these laws would enable scientists to determine the future by extrapolating from historical patterns and cycles. This approach worked well for Sir Isaac Newton. Once he discovered the mathematics of gravity, he was able to predict the motions of our planets. This line of thinking, called *determinism*, is based on the belief that future events unfold following rules and patterns that determine their course. Current science is proving this deterministic view of the world to be naïve. The theories of chaos and complexity are revealing the future as fundamentally unpredictable. This applies to our economy, the stock market, commodity prices, the weather, animal populations, and many other phenomena. Sherden (1998) analysed sixteen different types of forecasting. He found that from the sixteen, only two – one-day-ahead weather forecasts and the ageing of the population – can be counted on; the rest are about as reliable as the fifty-fifty odds of flipping a coin. An interesting view is that only one of the sixteen – short-term weather forecasts – has any scientific foundation. The rest are typically based on conjecture, unproved theory, and the mere extrapolation of past trends. *"...something no more sophisticated than what a child could do with a ruler (or perhaps a protractor)."*

[2] CTAs had a stunning quarter in Q3 98, ie, when everyone else had a difficult period. One could argue – assuming history repeats itself – that exposure to CTAs, to some extent, is similar to being long gamma in a stress scenario: the market (long) exposure is decreased as markets fall, or, in plain English, losses are reduced. Edwards and Caglayan (2001b) examined the returns of CTAs and hedge funds in bull and bear markets. They found that CTAs have higher returns in bear markets than hedge funds, and generally have an inverse correlation with stock returns in bear markets. Hedge funds typically exhibit a higher positive correlation with stock returns in bear markets than in bull markets. The authors also found that three hedge fund styles – market-neutral, event-driven, and global macro – provide fairly good downside protection, with more attractive returns over all markets than commodity funds.

In the following pages we examine some aspects of hedge fund portfolio construction. In the absence of perfect foresight, we use historical data. Table 12 shows the historical returns, volatility and correlation of a selection of hedge fund strategies.

Table 12: Return, Volatility and Correlation for a Selection of Hedge Fund Strategies

	Return (%)	Volatility (%)	Equity Market Neutral	CB Arbitrage	Fixed Income arbitrage	Risk Arbitrage	Distr. Securities	Macro	Equity hedge	Equity non-hedge	Emerging markets
Equity Market-Neutral	11.6	3.5	1								
Convertible Arbitrage	12.1	3.5	0.12	1							
Fixed Income Arbitrage	8.9	4.9	0.04	0.12	1						
Risk Arbitrage	12.8	4.5	0.12	0.46	-0.06	1					
Distressed Securities	15.4	6.6	0.16	0.60	0.37	0.52	1				
Macro	18.1	9.0	0.24	0.40	0.11	0.28	0.46	1			
Equity Hedge *	21.7	9.3	0.38	0.47	0.05	0.41	0.58	0.60	1		
Equity Non-Hedge **	18.4	14.8	0.22	0.48	0.09	0.47	0.64	0.59	0.89	1	
Emerging Markets	14.6	16.4	0.13	0.46	0.28	0.42	0.66	0.61	0.64	0.70	1
Off-diagonal correlation			0.18	0.39	0.13	0.33	0.50	0.41	0.50	0.51	0.49

Source: HFR, UBS Warburg calculations

Calculations based on monthly US$ total returns: January 1990 - May 2001.

The off-diagonal correlation measures the average correlation of one subject with all subjects in the correlation matrix except itself (correlation of 1).

*Equity Hedge investing consists of a core holding of long equities hedged at all times with short sales of stocks and/or stock index options. Some managers maintain a substantial portion of assets within a hedged structure and commonly employ leverage. Where short sales are used, hedged assets may comprise of an equal dollar value of long and short stock positions. Other variations use short sales unrelated to long holdings and/or puts on the S&P 500 index and put spreads. Conservative funds mitigate market risk by maintaining market exposure from 0% to 100%. Aggressive funds may magnify market risk by exceeding 100% exposure and, in some instances, maintain a short exposure. In addition to equities, some funds may have limited assets invested in other types of securities.

**Equity Non-Hedge funds are predominately long equities although they have the ability to hedge with short sales of stocks and/or stock index options. These funds are commonly known as 'stock-pickers.' Some funds employ leverage to enhance returns. When market conditions warrant, managers may implement a hedge in the portfolio. Funds may also opportunistically short individual stocks. The important distinction between equity non-hedge funds and equity hedge funds is that equity non-hedge funds do not always have a hedge in place. In addition to equities, some funds may have limited assets invested in other types of securities.

- Fixed income arbitrage has the lowest off-diagonal average correlation of 0.13 from the selection in Table 12. This is intuitive as fixed income arbitrageurs (most often) trade in non-equity spreads. We show more detailed correlation analysis in the Appendix on page 98.

- Equity market-neutral has lower volatility, lower correlation and lower returns than long/short equity (equity hedge). Off-diagonal average correlation with other hedge fund strategies in Table 12 was 0.18.

- Equity non-hedge and emerging markets have higher volatility, equal correlation and lower returns than equity hedge. This means these strategies add little value in terms of efficiency improvement in mean-variance space.

In Table 13 we contrast three hedge fund portfolios with four equity indices and one global government bond index. The three hedge fund portfolios were optimised for lowest volatility, 5% volatility and highest return and were rebalanced monthly. Again we used historical data as a proxy for expectations. We show monthly returns of these three portfolios in the Appendix on page 92.

Table 13: Skill-based Portfolios versus Market-based Portfolios

	Skill-based			Market-based				
	Minimum Risk Portfolio	5%-volatility portfolio	Maximum return portfolio	MSCI World	S&P 500	MSCI EAFE	MSCI Europe	JPM Global Gov't Bonds
Return	11.38	16.26	21.74	8.33	14.36	3.96	10.31	6.67
Volatility	2.32	5.00	9.31	14.51	14.32	17.07	15.14	5.82
Sharpe ratio (5%)	2.75	2.25	1.80	0.23	0.65	-0.06	0.35	0.29
Worst month (%)	-2.65	-6.06	-7.96	-14.30	-15.64	-14.97	-13.42	-3.35
Worst month (date)	Aug-1998	Aug-1998	Aug-1998	Aug-1998	Aug-1998	Sep-1990	Aug-1998	Feb-1999
Worst 12-months (%)	1.64	0.71	-5.02	-28.59	-24.42	-29.67	-25.49	-6.37
Worst 12-months (date, 12m to)	Apr-1999	Jan-1995	Mar-2001	Mar-2001	Mar-2001	Mar-2001	Mar-2001	Jan-2000
Skew	-1.37	-0.21	-0.02	-0.58	-0.69	-0.26	-0.60	0.16
Excess kurtosis	5.89	2.65	1.36	0.78	1.43	0.49	0.70	0.10
Correlation MSCI World (all)	0.32	0.61	0.59	1.00	0.83	0.94	0.86	0.34
Correlation MSCI World (down)*	0.44	0.49	0.40	1.00	0.73	0.88	0.81	0.04
Correlation MSCI World (up)*	0.06	0.30	0.33	1.00	0.58	0.85	0.69	0.23
Correlation JPM Global Gov't Bonds	-0.06	0.07	0.07	0.34	0.20	0.38	0.37	1.00
Negative months (%)	6.6	21.2	25.5	38.7	34.3	42.3	37.2	40.9
Average monthly return (%)	0.90	1.32	1.64	0.67	1.12	0.32	0.82	0.54
Average positive monthly return (%)	1.02	1.95	2.79	3.29	3.32	3.15	3.04	0.98
Average negative monthly return (%)	-0.68	-1.03	-1.70	-3.49	-2.37	-4.15	-2.71	-0.16

Source: HFR, Datastream, UBS Warburg

Calculations are based on monthly US$ total returns between January 1990 and May 2001.

*Measures correlation in months when MSCI World is down or up respectively.

By comparison: statistics for an equally weighted skill-based portfolio (nine strategies): return 14.9%, volatility 6.1%, Sharpe ratio 1.6x, correlation MSCI World 0.66, worst 12-month performance –6.5%.

- The minimum risk portfolio[1] outperformed the maximum return portfolio in the (difficult) years of 1994 (by 112 basis points), 2000 (435bp) and 2001 to May (263bp). This is not surprising, as one would expect less volatile portfolios to outperform in falling markets and underperform in rising markets.

- The three skill-based portfolios have, for what it's worth, much higher Sharpe ratios than the market-based strategies. If risk were equal with volatility of returns and, therefore, the Sharpe ratio a measure for risk-adjusted returns, the hedge fund portfolios would be superior by a wide margin.

- The worst month in the 11½-year period was August 1998 except for bonds and the MSCI EAFE index.[2] This implies that in a stress-test scenario, correlation moves towards 1 for all portfolios. The worst monthly loss for the skill-based portfolios is a fraction of the equity indices.

[1] We use the terms *minimum risk portfolio*, *minimum volatility portfolio* and *minimum variance portfolio* interchangeably to describe the portfolio with the lowest possible expected volatility in mean-variance space. The terms could be misleading as, in the real world, risk is not equal to volatility and variance.

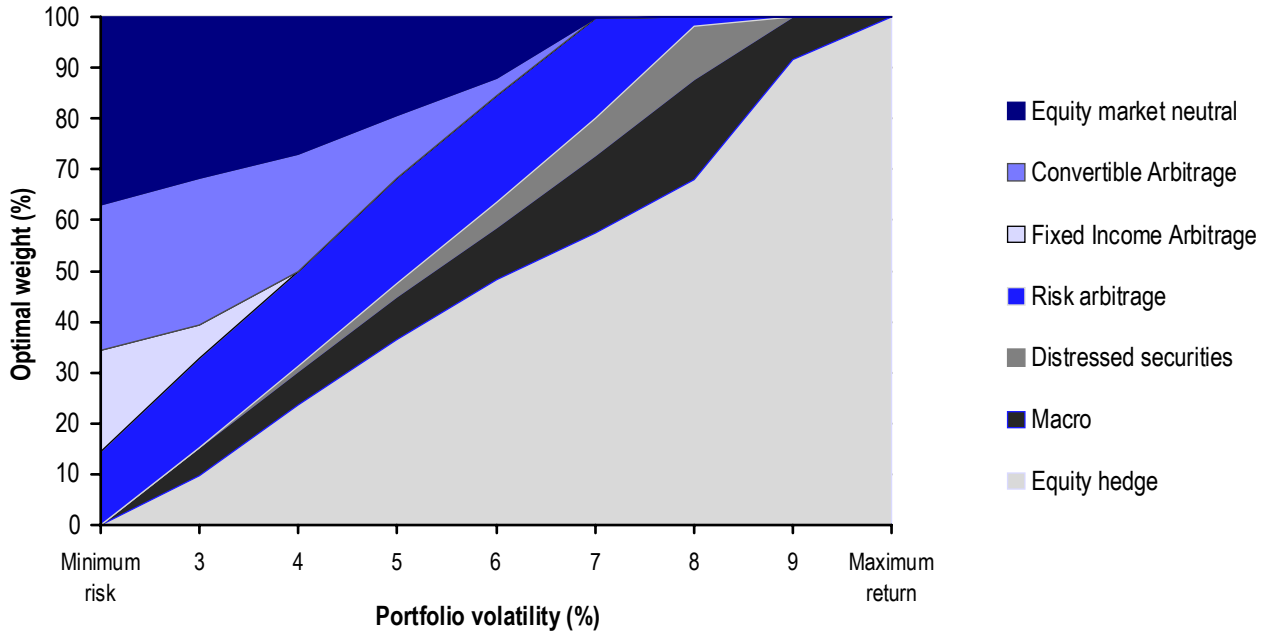
[2] The MSCI EAFE index measures the performance of Europe, Australasia and Far East, ie essentially the developed world ex-Americas.

- The worst 12-month period for the equity indices and the maximum return skill-based portfolio ended in March 2001. Note that the maximum return skill-based portfolio has an equity-long bias. The minimum risk skill-based portfolio had its worst 12-month period in April 1999, ie the period including Q4 98.

- Excess kurtosis is highest for the minimum risk portfolio, which constitutes only strategies based on a spread (arbitrage strategies). In the rare event of all the spreads blowing up at the same time, these strategies are prone to outliers on the left-hand side of the return distribution.

Chart 28 shows the three skill-based portfolios discussed above. We have added the portfolio in between in 1% volatility increments.

Chart 28: Mean-variance Optimal Hedge Fund Portfolios



Source: HFR, Datastream, UBS Warburg calculations
All efficient allocations have zero weight in Equity non-hedge (long/short with long bias) and Emerging markets.
The weights floated between 0% and 100% (short positions constrained).
Calculations are based on monthly US$ total returns: January 1990 - May 2001.
Returns, volatility and correlation matrix from Table 12 on page 52.

- Depending on the fund of funds manager's objectives, the hedge fund portfolio will be biased towards directional or non-directional, ie towards the left-hand or right-hand side of Chart 28. Note that the maximum return portfolio contains a 100% allocation to long/short equity strategies (equity hedge).[1]

[1] Fund and Hsieh (2001) point out that the 'spread risk' inherent in a long/short portfolio, for example, often overwhelms the market directional component of the portfolio's exposure. The authors make reference to the former Tiger Fund favouring value stocks on the long side and being negative on growth stocks which led to the dissolution of the fund in February 2000. The authors also note the destiny of George Soros' Quantum Group of funds which experienced substantial losses in a period where the Wilshire 5000 index showed positive returns. In other words, volatility of returns can substantially underestimate the risk of a dynamic trading strategy.

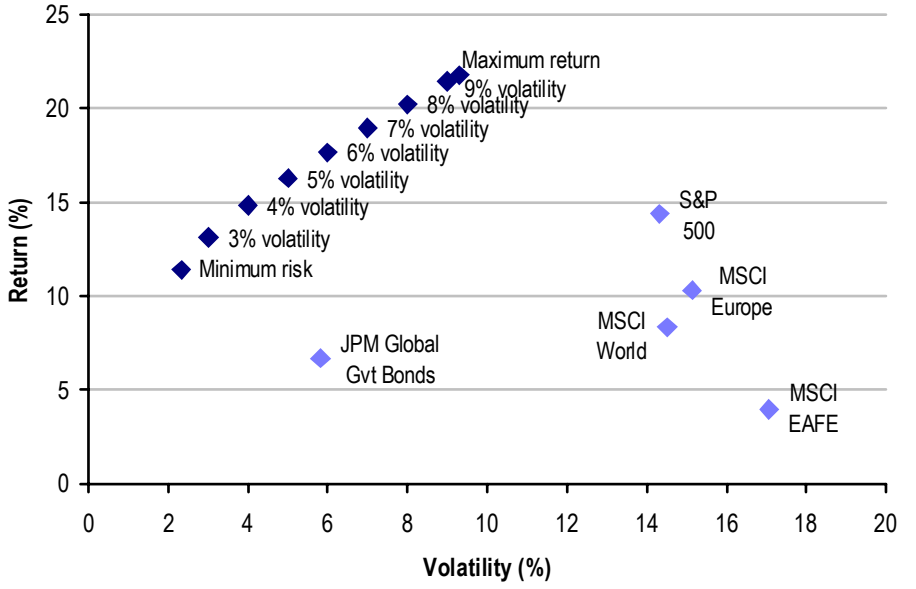
Minimum risk portfolio is biased towards spread-based strategies

If low portfolio volatility, ie stable positive returns are the main objective, the hedge fund portfolio will include high Sharpe ratio strategies such as market-neutral, convertible arbitrage, and risk arbitrage. These are all spread-based strategies. Traditionally, these portfolios were for wealthy individuals who wanted to grow their wealth steadily with little downside volatility. We believe institutional investors use low-volatility hedge fund exposure to diversify exposure to equities and bonds, ie traditional assets. Schneeweis and Spurgin (2000) call these strategies 'risk reducers' (see Table 11 on page 40).

The maximum return portfolio consists of 100% long/short equity

The maximum return portfolio consists of 100% in long/short equity (equity hedge). These portfolio have a long bias, ie correlation with equities is higher than portfolios constructed with arbitrage strategies.[1] The assumption is that these portfolios will not yield positive returns in a bear market, ie not diversify portfolios of traditional risks as well as hedge funds portfolios with non-directional exposure. We believe that in the past these portfolios had more appeal to investors seeking high equity-like returns as opposed to diversification opportunities and stable income.[2] The superiority of long/short equity strategies in the high-return spectrum in mean-variance space is one of the reasons why we believe that absolute-return investment styles are as much a new paradigm as they are a bubble. Schneeweis and Spurgin (2000) call these strategies 'return enhancers'.

Chart 29: Mean-variance Optimised Hedge Fund Portfolios versus Traditional Indices



Source: HFR, Datastream, UBS Warburg calculations
Calculations are based on monthly US$ total returns: January 1990 - May 2001.

Chart 29 compares the mean-variance optimised hedge fund portfolios from Chart 28 from page 54 with traditional asset classes.

[1] We apologise for using the term 'arbitrage' quite loosely. However, we believe the term has somewhat lost its original meaning of a riskless profit. Today the term is used, it seems, for any investment style involving a spread.

[2] If we optimise using historical returns, volatility and correlation from the past five years ending May 2001 instead of 11.5 years, the maximum return portfolio remains 100% equity hedge. The minimum risk portfolio only changes slightly. The weight in convertible arbitrage increases at the expense primarily of fixed income arbitrage. Fixed income arbitrage was able to use much lower leverage to amplify returns in the post-LTCM era.

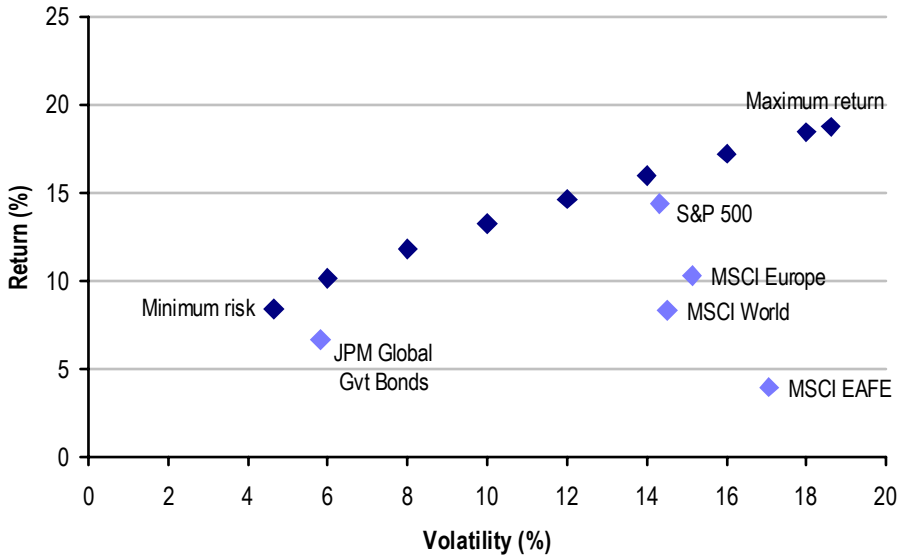
- This or a similar looking graph is probably the most often shown graph at any hedge fund conference. Some speakers even go as far as to describe the horizontal axis as 'risk' instead of standard deviation of returns or volatility.

Survivorship bias in hedge fund data is a problem but not a major issue

The following graph (Chart 30) indicates that even when we shave off 300-400 basis points off the returns due to survivorship or any other bias, little changes when compared with traditional asset classes. Survivorship bias[1] is a problem with any fund data.[2] However, it is unlikely to be a rational reason for not investing in hedge funds.

For the sake of argument, we have subtracted 300bp from the historical returns (to account for any positive biases in the data) and doubled volatility (to account for non-normality of returns, the 'unfamiliarity aspect' and limited liquidity and transparency) for the nine mean-variance efficient hedge fund portfolios in Chart 29.

Chart 30: Return versus Volatility (Hedge Fund Return –300bp and Volatility Doubled)



Source: HFR, Datastream, UBS Warburg calculations
Calculations are based on monthly US$ total returns: January 1990 - May 2001. 300bp was subtracted from historical returns to account for any imperfection in the data and volatility was doubled, potentially to account for imperfection in calculating standard deviations of non-marketable financial instruments.

- We were admittedly surprised to see the superiority of these non-traditional portfolios. Mean-variance efficiency remained intact, even when subtracting 300bp for any upward bias from returns and doubling the volatility. Note that

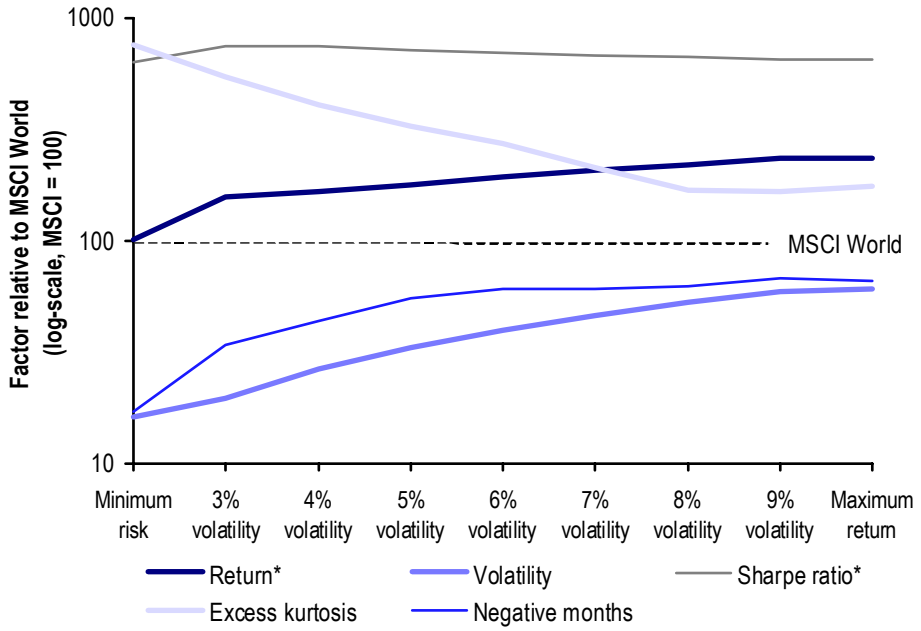
[1] Survivorship bias occurs when data samples exclude markets or investment funds or individual securities that disappeared. The data sample of survivors describes an environment that overstates the real-world return and understates the real-world risk.

[2] Park, Brown and Goetzmann (1999), Brown, Goetzmann and Ibbotson (1999) and Fung and Hsieh (2000) estimated survivorship bias in hedge fund data to be 2.6% and 3% respectively. Survivorship bias is not a phenomenon exclusively in hedge funds performance data. Grinblatt and Titman (1989); Brown, Goetzmann, Ibbotson, and Ross (1992); Malkiel (1995), and Elton, Gruber, and Blake (1996) found that survivorship biased mutual fund returns upward by 0.5-1.4% a year.

Fung and Hsieh (1999) suggest that using a mean-variance criterion to rank hedge funds and mutual funds will produce rankings which are nearly correct.

In Chart 31 below we have normalised some variables from Table 13 on page 53 (skill-based portfolios versus market-based portfolios). We normalised relative to a global equity portfolio. In this case we used the MSCI World Index (including dividends). The graph also shows differences between the different hedge fund portfolios. The MSCI World was normalised to 100. A reading at 200 or 50, therefore, indicates that the variable for the hedge fund portfolio is double or half that of MSCI World. Note that the vertical axis is on a log scale.[1]

Chart 31: Hedge Fund Portfolios Compared with a Global Equity Portfolio (MSCI World)



Source: HFR, Datastream, UBS Warburg calculations
* Historical return minus 300bp

- The minimum risk portfolio, ie the hedge fund portfolio with the lowest possible volatility, has the same historical total return (after subtracting 300bp) as the MSCI World Index. The return increases as the volatility of the hedge fund portfolio is increased.

- The volatility of the minimum risk portfolio is less than one-sixth (2.3% versus 14.5%) that of the global equity index. The Sharpe ratio, in theory a measure for risk-adjusted returns, for all skill-based portfolios is substantially higher than the Sharpe ratio of the market. Portfolios with a volatility of around 3% have the highest Sharpe ratios.

- Excess kurtosis is 7.5 times higher (5.9 versus 0.8) for the so-called minimum risk portfolio. Excess kurtosis is negatively correlated with volatility, ie as volatility increases excess kurtosis is reduced.

[1] We have subtracted 300bp from the historical returns, primarily to avoid further debates about survivorship bias in hedge fund data and potential conspiracies of the providers of hedge fund data to sell hedge funds.

- The number of negative months is lower for all skill-based portfolios. As volatility increases, the number of negative months increases as a result.

Conclusion

In conclusion we believe that portfolios of different fund of funds managers will have similar allocations depending on their volatility preference. Standard mean-variance optimisation is far from being a perfect portfolio construction tool.[1] Risk assessment cannot be done accurately using a second-order, ie mean-variance, approach. However, until a superior model is found it most likely will continue to be the industry standard.

Portfolio/Risk Management

Expectations matter

The second monitoring process, next to reviewing the manager, is monitoring the portfolio or managing the risk of the portfolio on an ongoing basis. The analysis above is ex-post. The key to success of any portfolio construction exercise is to estimate return, volatility and correlation, ie the three input variables of the mean-variance optimisation process, and to combine the variables to construct a mean-variance efficient portfolio. It is therefore obvious that different fund of funds managers will have different portfolios, as their estimates for the future differ. Some might be more reliant on the past and others might try to 'call the market,' ie try to pick the strategy which will perform best over the next 12-24 month period.

Little variance in strategy allocations is favourable

The picking of strategies and the resultant portfolio rebalancing is probably not entirely independent of the fund of funds managers' marketing effort. A fund of funds involved in marketing to retail investors, for example, has an incentive to bias the portfolio constituents towards the current darlings of the industry. This would have meant having large allocations in convertible arbitrage and risk arbitrage in the beginning of 2001.[2] These two strategies performed extremely well in 2000. In other words, there are fund of funds managers who are opportunistic with respect to portfolio construction and rebalancing and those who accept less variance in their strategy allocations. We would favour the latter over the former on the grounds that it is probably difficult to time strategies. In addition, short-term trading of skill-based strategies is, in our opinion, counterintuitive and probably expensive to execute.

Assessing risk management capability is more subjective than assessing risk measurement skill

Risk management is not the same as risk measurement. The measurement of portfolio risk is to a large extent a quantitative process. However, risk management is judgmental. Any investor investing in a fund of funds will probably find it easier to assess whether the fund of funds manager can measure risk. This can be achieved by examining the models, the data and the skill and experience of the fund of funds management operation. These input parameters are more objective. The judgement to take action based on the changing risk parameters is more subjective. Whether a fund of funds manager takes action according to its objectives is uncertain. One layer of comfort from the investors' perspective is when the fund of funds manager

[1] That said, Fung and Hsieh (1999) analysed whether the mean-variance analysis of hedge funds approximately preserves the ranking of preferences in standard utility functions. Their results suggest that using a mean-variance criterion to rank hedge funds and mutual funds will produce rankings which are nearly correct. The authors also examine the usefulness of the Sharpe ratio to measure risk-adjusted returns. They concluded that the Sharpe ratio works poorly when the investor's risk aversion is low, but works reasonable well when risk aversion is high.

[2] This would also have meant no allocation to hedge funds operating in emerging markets and global macro.

is also a principal. This is not a guarantee of prudently executed and continuous risk management. However, at least it should align the interests of the investor with those of the manager.

This concludes our general thoughts on hedge funds in general and funds of funds in particular. In the following section we attempt to define the 'edge' of a fund of funds manager. Ideally, this should allow investors to pick fund of funds managers with a competitive advantage.

The Edge

"As an investor, as long as you understand something better than others, you have an edge."
George Soros

Summary

We believe an investor interested in funds of funds should search for the following attributes when seeking in a manager selecting hedge funds. The manager should:

- understand all hedge fund strategies,
- understand all instruments used by hedge funds,
- emphasise qualitative aspects relative to quantitative variables,
- be in the 'information loop' and have extensive proprietary data,
- be of highest integrity, as there is little regulation or reputational risk of large corporates to assist investors.
- Ideally, the interests of the managers are aligned with those of their investors.

Investment Philosophy of Fund of Funds Manager

Industry's heterogeneity results in opportunities as well as risks

The hedge fund industry is heterogeneous when compared with the traditional long-only asset management industry. This heterogeneity allows one to pursue different strategies. The two extreme choices are to (1) minimise portfolio volatility or (2) maximise expected return. The former aims to capture stable returns in the region of 12%. The latter expects returns in the low twenties. We believe that most funds of funds will opt for a blend of the two extremes with a bias either towards directional or non-directional strategies.

Does market timing work or not?

Among important considerations is whether the fund of funds manager believes in market timing or not. We find that many investment professionals in a risk management discipline or professionals with a bias to academia have developed an aversion to market risk, which they perceive as being exposed to chance.[1] Those investors will find attraction in strategies where the manager's alpha is isolated from beta, ie from timing the market.[2] The other extreme will be biased towards timing the market. These managers will include more opportunistic, ie directional strategies. Note that the goal of the first hedge fund (Alfred Jones) was to reduce exposure to chance (market risk) and increase exposure to skill (stock selection). Note also that the hedge fund boom of the early 1970s ended because funds were long and leveraged, ie the industry disappeared after departing from its origins.

[1] Behaviourists argue that we have a hard time discerning probabilities of events and cannot distinguish a long-shot prediction from something that is likely to occur by pure chance. Or as Warren Waver, author of the book *Lady Luck*, observed, *"The best way to lose your shirt is to think that you have discovered a pattern in a game of chance."* From Sherden, p121.

[2] Peter Lynch was quoted as saying, *"I don't believe in predicting markets,"* and that market timers *"can't predict markets with any useful consistency, any more than the gizzard squeezers could tell the Roman emperors when the Huns would attack."* From Sherden (1998), p106.

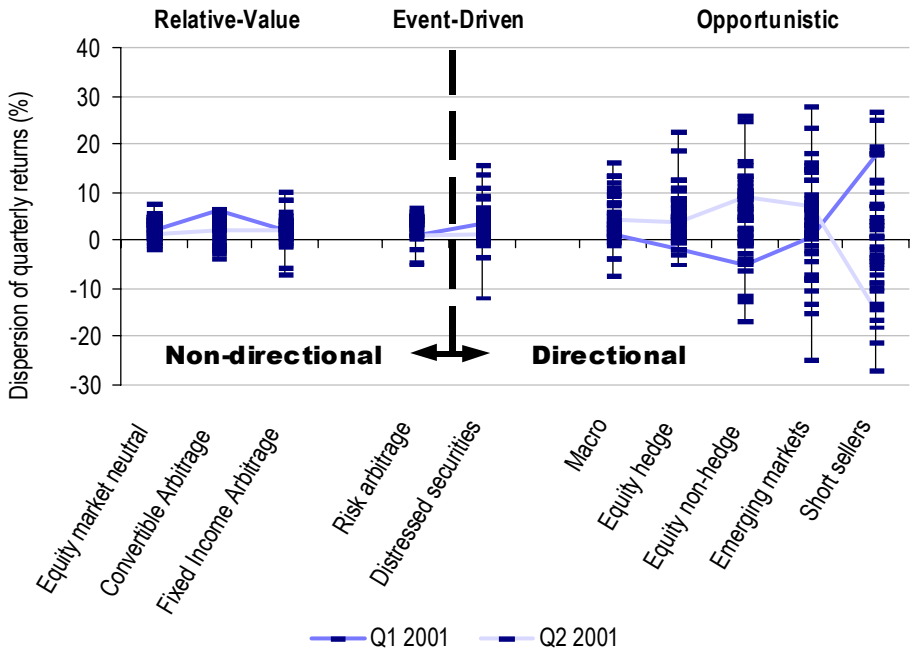
At the end of the day, a fund of funds manager will offer what his clients demand

A fund of funds manager might also elaborate the demand structure of its clientele. Retail investors are probably more likely to be in 'get-rich' mode and high-net-worth private investors in 'stay-rich' mode, while institutional investors might seek diversifiers to their equity stake. Fund of funds managers targeting a specific client type have an incentive to structure a fund of funds that matches what their clients demand.

Not utilising the full spectrum of hedge fund strategies is probably similar to playing the piano by only using the ebony keys

One of the first decisions a fund of funds manager either implicitly or explicitly will do, therefore, is focus on the left- or right-hand side of Chart 32. Strategies on the right-hand side include market timing, strategies on the left do not, or do so to a much lesser extent.[1] We believe the more sophisticated fund of funds managers will blend either directional with non-directional or non-directional with directional strategies. The diversification benefits due to low correlation is, simply put, too great not to be utilised in constructing a portfolio of hedge funds.

Chart 32: Dispersion of Quarterly Returns



Source: HFR, UBS Warburg
Horizontal marks measure quarterly total return in US$; vertical line measures dispersion of quarterly returns from January 1990 to June 2001. Q1 and Q2 01 are marked with lines.

All fund of funds managers have absolute return and risk targets

Most fund of funds managers will aim for absolute returns and low volatility when compared with the traditional asset classes such as equities and bonds. Capital preservation or the protection of wealth is also the goal of most fund of hedge funds managers. Not only is the return target defined in absolute levels but the long-term risk target is also defined in absolute terms.

[1] A convertible arbitrageur, for example, will occasionally time both market direction as well as volatility. It could be argued that to some extent all hedge fund strategies are opportunistic.

Investment Philosophy versus Track Record

Investment philosophy is more important than track record

We believe one of the most important criteria in evaluating a hedge fund is its investment philosophy. If a fund of funds manager is selecting managers from the whole hedge fund universe, he will need deep understanding and expertise in the most complex financial instruments and their usage and risks. However, there is still the perception that track record is the single most important variable in hedge fund selection.[1] In the Golin/Harris Ludgate (2001) survey, one institutional investor was quoted when asked what criteria is used when choosing a hedge fund manager:

> *"We look for a track record of at least four to five years."*

The blow-up syndrome

We suspect that if a hedge fund manager is still in search of funding capital after four to five years, he is unlikely to be top tier. If he is top tier he might be closed for new investment. In addition, there is the increased risk of what Jaeger (2000) calls the 'blow-up syndrome.' The pattern of the blow-up syndrome is as follows: a manager puts together a superb performance record, which increases the size of assets under management and dramatically boosts the manager's confidence in his own investment process. At some point, confidence becomes complacency, complacency becomes hubris, hubris creates errors, and errors breed disaster.

Another institutional investor was quoted in the Golin/Harris Ludgate (2001) survey:

> *"The most important issue is the past performance of the manager. After that we check the strategies and leverage policies that the hedge funds use."*

Past performance is probably not the Holy Grail of hedge fund selection

We believe a quantitative assessment of past performance is good especially after rigorous performance attribution analysis and the adjustment for chance. However, by insisting on past performance many opportunities will be foregone. The risk is that one buys at the peak of success. This is true for the selection of relative as well as absolute return managers. In AIS, there is evidence that hedge funds have their highest absolute returns in the first three years.

Do losers continue to be losers?

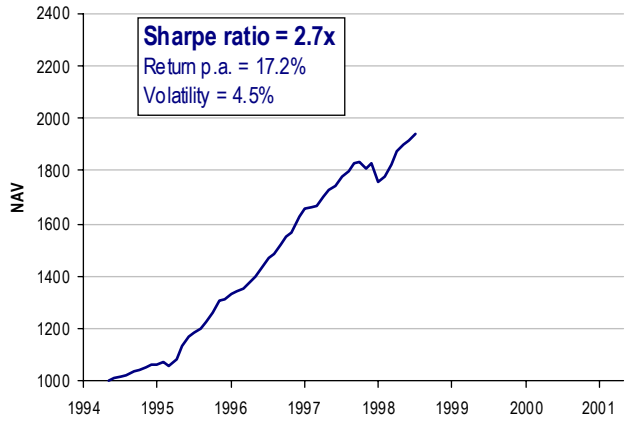
We aim to put numbers behind this statement in future research. Current research is inconclusive. Brown, Goetzmann and Park (1999), for example, found that the longer a fund is in business, the less likely it is to fail. Agarwal and Naik (2000a) examined the extent of before- and after-fee performance persistence exhibited by hedge funds during 1982 to 1998. Given the significant lockup period with hedge funds, the authors also examined if persistence observed is sensitive to whether the returns are measure over quarters or over years. Results suggest that there exists considerable amount of persistence at a quarterly horizon which decreases as one moves to yearly returns, indicating that persistence among hedge fund managers is primarily short-term in nature. Whenever persistence is observed, it is mainly driven by losers continuing to be losers instead of winners continuing to be winners. The authors also find that persistence seems to be unrelated to the type of strategy

[1] Track record is probably the single most criteria of institutional investors selecting a fund of funds.

followed by the fund. Using data on the monthly returns of hedge funds during the period 1990 to 1998, Edwards and Caglayan (2001a) estimate six-factor Jensen alphas for individual hedge funds employing eight different investment styles. Result shows that 25% of hedge funds earn positive excess returns, and the frequency and magnitude of funds' excess returns differ markedly by investment style. Performance persistence was found for both winners and losers. The excess return is partially attributable to the skill of hedge fund managers.

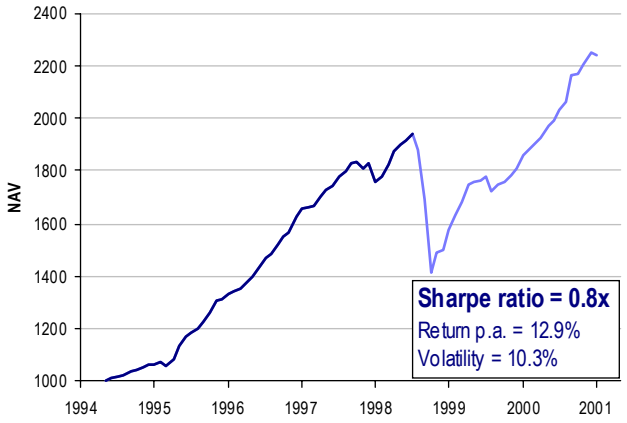
The following two graphs underline this point. Chart 33 shows the performance of a typical fixed income arbitrage fund from inception until summer 1998. The track record was excellent and the Sharpe ratio astronomical.

Chart 33: Fixed Income Arbitrage Fund 1994 – July 1998



Source: UBS O'Connor. Graph shows performance of typical fixed income arbitrage fund as judged by UBS O'Connor.

Chart 34: Fixed Income Arbitrage Fund 1994 – January 2001



Source: UBS O'Connor. Graph shows performance of typical fixed income arbitrage fund as judged by UBS O'Connor.

Chart 34 shows the performance between inception and January 2001, ie including autumn 1998. We believe several points can be made:

1. Any analysis of hedge fund data that does not include autumn 1998 is probably upwardly biased and/or of limited use.
2. The Shape ratio is not an indication of risk-adjusted returns when returns are not normally distributed.
3. Historical returns are not always correlated with future returns. Overemphasis of past performance, therefore, might be misleading, especially when return distributions depart normality.
4. Events causing investors to run for cover (flight to quality) are not predictable and are a challenge to quantitative modelling.
5. There is no way around understanding the fundamental merits and risks of the strategy.

Up until autumn 1998, fixed income arbitrage was generally delivering equity-like returns with bond-like volatility. However, balance-sheet leverage was in the region of c20-30 times equity. In other words, arbitrageurs had to lever up to achieve high returns in markets where inefficiencies were tiny. Today, both – returns and leverage – have halved.

Understanding risks allows more complete evaluation and analysis

Fixed income arbitrage is admittedly an extreme example. However, understanding the risks and merits of the strategy and instruments in use allows the investor (or fund of funds manager) to assess the risks ex-ante. The examination of a (often engineered) track record only allows one to assess risk partially and on an ex-post basis.

The Benchmark Conundrum

Absolute return strategies by definition do not have a classical benchmark (otherwise they would not be called *absolute* return strategies)

A benchmark to measure performance is normally required by plan sponsors and fiduciaries in the traditional asset management industry. Hedge funds do not have a benchmark in the classical sense. Most hedge fund managers perceive themselves as absolute return managers rather than relative return managers. The return goal is defined in absolute terms or, if anything, relative to the risk-free rate of return. The author of this report – while giving an after-dinner speech in Sydney – was nearly thrown into Darling Harbour when postulating that the typical benchmark approach does not work for hedge funds. The audience requested an answer on how to assess whether a manager is doing his job if there is no benchmark other than cash.[1]

A benchmark index essentially fulfils two purposes:

- display performance of a market to compare performance of an active manager relative to the market
- instrumentation of passive investment strategies

The requirements of a typical benchmark in the traditional asset management industry focusing on liquid and marketable securities should have the following main characteristics. The benchmark index should be:

- unambiguous
- representative
- measurable
- replicable, ie a passive alternative to an active position

We understand that the hedge fund industry is in the process of being institutionalised. However, we have some doubt that hedge fund benchmarks will meet the four aforementioned criteria any time soon.

Hedge fund classification systems are ambiguous

Unambiguity would imply that the hedge fund universe is classifiable. However, classifying hedge funds is difficult. As mentioned in earlier research, classifying hedge funds is an attempt fit something into a box which does not, by any means, fit into a box.[2] All classification systems of hedge funds are ambiguous. Not only are the borders between the strategies and funds blurred, they are constantly changing.[3] This is different to the traditional asset management universe. The traditional asset

[1] Dessert was nearly refused after the remark that investors should focus on variables which can be assessed ex-ante, such as experience, motivation, investment philosophy, competitive advantage, etc., instead of focusing on historical performance.

[2] For example: UBS Warburg research (2000), p20.

[3] Over the years, there has been an increasing tendency of hedge fund managers to employ multiple strategies, as Fung and Hsieh (2001a) point out.

long-only industry is homogeneous when compared with the diversity of strategies executed by hedge funds. A manager investing in global pulp and paper companies can be compared with an index measuring the performance of all listed pulp and paper companies.

A hedge fund index cannot be representative

Every existing database of hedge funds is incomplete. The universe of hedge funds is infinite as the definition of a fund is unclear and there is no obligation to register a fund. Hedge funds are most often private, ie not publicly listed. This is mainly because there is no requirement for a hedge fund to list or report performance data. The universe of exchange-listed securities, by comparison, is finite. In other words, any attempt to measure the performance of a strategy would be not only ambiguous but also not representative.

A hedge fund index is not a passive alternative to an actively managed hedge fund portfolio

Any benchmark should be replicable. For example a stock index used as a benchmark to measure the performance of a manager is a passive alternative to allocating funds to the manager. This is possible if the constituents are marketable, but is impossible if they are not. Hedge funds by definition are not marketable.[1] There have been attempts to make them more marketable, but the success of these attempts is as yet uncertain. In addition, there is the issue of matching the liquidity of the 'index' with those of the hedge funds.

Conclusion

The use of a hedge fund benchmark has many inherent problems. First, there is no requirement that a hedge fund manager reports performance numbers to any organisation. Therefore, representation is not a given. Second, most of the numbers submitted are unaudited and may be estimates. This may change with time. There is no guarantee that the performance numbers submitted are correct. Third, it is not uncommon for a manager undergoing difficult performance not to report the fund's numbers on a timely basis or at all.[2]

We are not sure whether all hedge fund products in the market are enrichment for the investment community.

Risk Management Experience

A fund of hedge funds manager not understanding risk is probably similar to a doctor not familiar with human anatomy

We believe that the ability to identify and understand risk characteristics is one of the most important issues when investing in hedge funds. A fund of funds manager will have to demonstrate the skill as well as experience in the field of the most complex financial instruments and trading strategies. We believe it to be a handicap to not understand all instruments used by all hedge funds and all strategies employed by hedge funds. Vast risk management expertise will, we believe, give a fund of funds manager an edge relative to the peer group.

[1] Most hedge funds are not listed. Some funds are (hard-) closed for new investors.

[2] Peltz (2001), p59.

A hedge fund not utilising the most advanced financing opportunities is probably similar to a surgeon operating with a cleaver

We were surprised to hear from a fund of hedge funds manager at a recent hedge fund conference in London that all leverage is bad. Although our impression is entirely subjective, the misunderstanding of leverage seems shocking. We might not be entirely unbiased on the subject of risk management, financial engineering and the use of derivatives. However, the distinction between using debt to amplify returns or to hedge market risk as well as funding risk should be assumed as basic knowledge when operating in finance in general and in alternative investment strategies in particular. Ignoring hedge funds that use leverage – essentially all non-directional funds which have put on a spread – is scalping the hedge fund universe of its most attractive feature, namely consistent positive returns weakly correlated with equities and bonds.

Motivation and Other Intangibles

Motivation is important but difficult to measure

One of the intangibles of allocating funds to any money manager is motivation. This is probably true for selecting a fund of funds manager in the traditional asset management arena as well in alternative fund management. A highly motivated manager is more likely to go the extra mile in terms of negotiating fees, capacity, liquidity, and transparency than a less motivated manager. However, how do we measure motivation?[1]

Incentives

Incentives Can Include Option-like Features

A manager is either in 'stay-rich' mode or 'get-rich' mode

One question a hedge fund manager is often asked by evaluators is how much of his own money is in his fund. The general perception is that a manager with his 20-year savings in the fund is, everything else held equal, superior to a manager who puts last year's bonus at risk. The argument is that interests between manager and investor are aligned when both have their funds tied together. The alignment of interest is obviously also relevant between fund of funds manager and investor. Some fund of funds managers might be closer to a principal, ie investing alongside its investors. Others might be closer to consultancy, ie in the role of an agent with its own challenges regarding conflicts of interest.

Top performing hedge fund managers hardly ever retire at the top: the risk is that they will fade away, or blow up

We believe that the net amount invested by the manager is not necessarily a good indication of motivation. It does not account for potential option-like characteristics that are observed in incentive schemes. For example a 28-year old investment professional with three years experience might set up a hedge fund, initially investing his full net wealth of US$5m along with his investors. In this case, applying the logic outlined above, this manager would be highly incentivised to do well. However, we would argue that this is not necessarily the case. He has little to lose. If the venture does not work out he will go back to his Wall Street job having lost his savings of three years plus six months of work. We believe such an incentive is similar to a cheap call option: unlimited upside with limited ex-ante measurable downside.

[1] One approach to deal with factors difficult to model, such as intangibles, is to ignore them. We believe this might be an option in the laboratory environment of the econometrician but could have disastrous consequences to the investor.

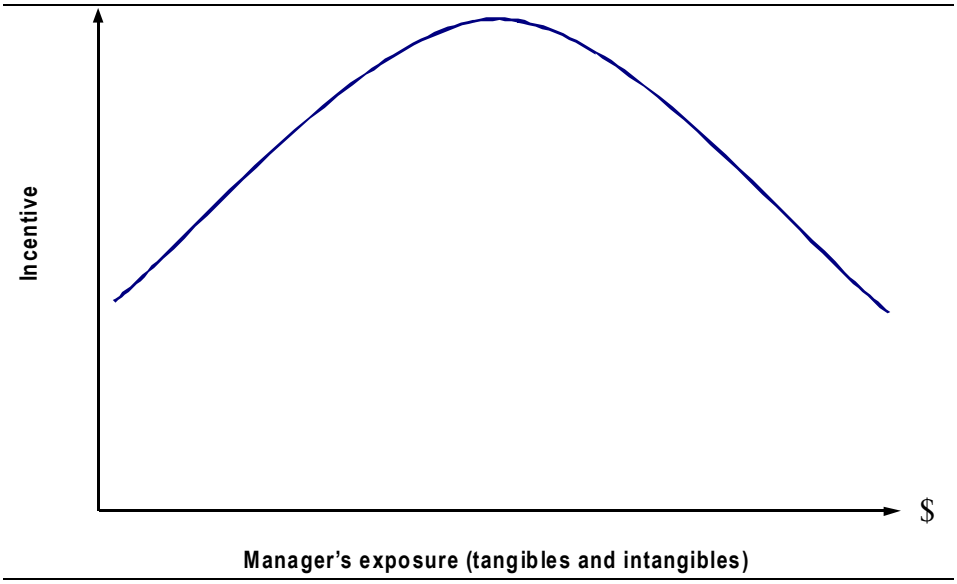
Risk of disaster

The other extreme is the 20-year hedge fund veteran who might have 90% of his US$1bn net wealth in his own funds. This structure might also have odd incentive characteristics when combined with hubris. For example the prestige of winning a certain trade might weigh more strongly than the risk of a huge loss. A huge loss would not have an effect on the lifestyle of the manager. It may or may not affect self-confidence, but not the manager's personal economics.

Risk of disappointment

A manager fading away is just another example of reversion to the mean. A manager who has compiled an excellent historical record gradually turns into just another manager, with higher risk than before, and lower return. Maybe he has lost his competitive edge, his hunger for success. Maybe his historical record was just a fluke, not really a symptom of genuine investment skill. Or maybe the inefficiency he is an expert at exploiting has disappeared as others have copied his style. In any case, what looked like an exceptional investment opportunity turns into a disappointment.[1]

Chart 35: Incentive versus Manager's Exposure



Source: UBS Warburg

The good old days

For many years the hedge fund industry had something like a natural hedge as managers had all their savings at risk. This hedge, we believe, is becoming less prevalent. In Peltz (2001) retired hedge fund manager Michael Steinhardt (Steinhardt Partners) is quoted arguing that times have changed. In the old days things were different.

> *"Steinhardt says the distinguishing characteristics were the manager investing his assets solely in his own fund, having a long track record, and being successful in a variety of economic climates. The manager was intense, intellectually superior, and motivated by performance – not growth of assets under management."*[2]

[1] From Jaeger (2000), p75.

[2] From Peltz (2001), p30.

Opportunities and risks to some extent are balanced when the manager has high large exposure to the venture

We believe a point can be made that motivation is probably highest in the middle of the two extremes as conceptually visualised in Chart 35. This could be true for a single hedge fund as well as a fund of funds manager. A manager with full commitment of tangibles as well as intangibles is probably highly incentivised for the venture to work. This, obviously, is no guarantee of success. However, if tangibles as well as intangibles are at risk, the incentive should not include any option-like features and secure a realistic assessment of opportunities and risks.

High watermark in combination with a large loss can cause incentive to increase risk

Intuitively one would assume that a high watermark, for example, could also create odd option-like incentive features. For example a large loss means that that the fund would have to perform well over the next couple of years without receiving an incentive fee. This could potentially damage a business as key staff leave to create their own fund. It also creates an option-like incentive to bet the bank as survival is at stake. Current research is not conclusive.

Poor managers increase volatility of fund

Fung and Hsieh (1997b) suggest that reputation costs have a mitigating effect on the gambling incentives implied by the manager contract. Results by Brown, Goetzmann and Park (1999) confirm the hypothesis of Fung and Hsieh (1997b). Brown, Goetzmann and Park (1999) investigated whether hedge fund and CTA return variance depends on whether the manager is doing well or poorly. Results show that managers whose performance is relatively poor increase the volatility of their funds, whereas managers whose performance is favourable decrease volatility. This is consistent with adverse incentives created by the existence of performance-based fee arrangements. A corollary of this theory is that managers whose performance contract is out of the money should increase volatility the most. The data does not support this further implication – managers whose return is negative do not substantially increase volatility. In some years of the sample, the authors found that they even decrease the volatility of their fund's return. Thus, while the data fit with certain conjectures derived from theory about investment manager compensation, they appear to contradict others.

Funds with high watermark outperform funds without

Liang (1999) argues that empirical evidence indicates that hedge funds differ substantially from traditional investment vehicles such as mutual funds. Hedge funds' special fee structures apparently align managers' incentives with fund performance. Funds with high watermarks significantly outperform those without. Hedge funds provide higher Sharpe ratios than mutual funds, and their performance in the period January 1992 through December 1996 reflects better manager skills, although hedge fund returns are more volatile. Average hedge fund returns are related positively to incentive fees, fund assets, and the lockup period. The author adds that outperformance cannot be explained by survivorship bias.

Conflicts of Interest

Agent has different incentives than principal

The wedge between principal goals and agent actions causes problems at the highest level of governance. The agent is normally in a 'fees-only' relationship with the principal and therefore the set of incentives might not be fully aligned. For example the agent has a conflict of interest in recommending investments where the kickback is low. It lies in human nature to bias towards the fund where incentives are high. This, however, might not be in the interest of the principal.

In an ideal world, the fund of funds manager invests alongside his investors

Aligning the incentives of the manager with those of the investor reduces the principal/agent conflict and may lead to greater care in the management of funds. We would argue that the principal/agent conflict is to some extent relaxed when the manager himself is a principal. In other words, we are inclined to argue that a fund of funds manager has the stronger business model than an advisor.

Chinese Wall between fund of funds operator and prime brokerage

There are other areas of potential conflict of interest, for example an operator of a fund of funds in parallel with its prime brokerage or capital introduction franchise. The temptation of the fund of funds operator to favour 'clients' would be a conflict of interest relative to the investors. Such a fund of funds operator should not survive the scrutiny of a sound due diligence process.

Caveat emptor

There are differences between fund of funds managers. Comparing the different fee structures on a like-for-like basis is not straightforward. The main difference is transparency. Some show all fees to the fund of funds investors, others do not. Some fund of funds managers show a relatively low flat-fee but receive kickbacks from the individual hedge fund managers. Others have performance-related fees on top of a flat fee. In any case, caveat emptor. The buyer will have to gain transparency and judge whether there is the potential for conflicts of interest.

On Prudence, Trust and Integrity

'Homo economicus' is an android[1]

Other intangibles important to investing in hedge funds include trust and integrity. An interesting observation, we believe, is that intangibles such as prudence, trust and integrity are not an issue in some of the classic textbooks of economics and finance. Elton and Gruber (1995) do not mention these variables, nor is it an issue for Dornbusch and Fischer (1991). Bodie et al. (1993) at least discuss the Prudent Man Law (back on page 894). We wonder whether 'orthodox economics' took a wrong turn at some stage in its evolution, ie treating economic agents as androids such as 'Data' from *Star Trek* instead of more socially adept beings such as 'Diana Troy'. Two exceptions are von Mises (1996) and Keynes (1936). The former's *praxeology*[2] has largely been discredited[3] and the latter's *general theory* has been

[1] Most social scientists believe that human behaviour is often complex, contradictory, imperfect and unpredictable. Economists, however, use a model of human behaviour called Homo economicus (also: 'Economic Man'), who is endowed with perfect (or abnormally high) rationality, self-interest and knowledge. Besides the obvious fact that humans are not perfect, the model suffers from other basic problems. Humans are ultimately driven by emotions, not logic, and emotions are often irrational. Nor are humans 100 percent self-interested. They perform altruistic acts like charity, volunteering, lending a helping hand, parenting and even giving one's life for one's country. They also perform self-destructive acts like substance abuse, addiction, negative risk-taking, masochism and suicide. Nor are people highly knowledgeable about all their affairs; they can be expert in only a few topics at a time. Some economists argue that the reasons why economists use such a flawed model as Homo economicus is because it makes their analysis simpler and allows them to generate results that confirm their prejudices. Such methodology, one could argue, can lead to inaccurate conclusions. However, whether altruism is relevant for studying financial markets or whether altruistic action cannot be fitted into a modified utility function is, obviously, open to debate.

[2] von Mises (1996)*: "The system of economic thought must be built up in such a way that it is proof against any criticism on the part of irrationalism, historicism, panphysicalism, behaviourism, and all varieties of polylogism. It is an intolerable state of affairs that while new arguments are daily advanced to demonstrate the absurdity and futility of the endeavours of economics, the economists pretend to ignore all this."*

[3] The Austrian School of Economics is a tiny group of libertarians at war with mainstream economics. They reject even the scientific method that mainstream economists use, preferring to use instead a pre-scientific approach that shuns real-world data and is based purely on logical assumptions. But this is the very method that thousands of religions use when they argue their opposing beliefs, and the fact that the world has thousands of religions proves the fallibility of this approach. Academia has generally ignored the Austrian School, and the only reason it continues to exist is because it is financed by wealthy business donors on the far right. The movement does not exist on its own scholarly merits.

swamped by the *androidesque* Chicago school of thought. New research (behavioural finance) – interestingly also centred in Chicago – is a faint indicating that economics and its variants might be a social science after all.

Relatively speaking, assessing intangibles is at least as important as tangibles

The hedge fund industry is not as regulated as the traditional asset management industry. This means the human risk element is different than when a regulatory body controls business. In other words, fraud is easier to conduct than in a regulatory tight environment.[1] Table 14 shows a selection of hedge fund disasters and/or occasions where investors lost money. Most losses were caused by either a wrong directional view or a faulty business model. However, some losses to investors are attributable to fraud.

Table 14: Hedge Fund Disaster and Large Losses

Case	Strategy	Date	Loss (US$ m)	What went wrong?	Risk
Askin Capital Management	Fixed income arbitrage (mortgage-backed securities)	1994	420	Hedge did not work. Liquidity squeeze. Could not meet margin calls. Did not inform investors.	Market
Argonaut Capital Management	Macro	1994	110	Market losses. Departure of general partner.	Market/ business
Vairocana Limited	Fixed income arbitrage	1994	700	Change of strategy from duration-neutral to punt on falling interest rates. Could not calculate proper NAV figures. Investors lost confidence.	Market/ business
Fenchurch Capital Management	Fixed income arbitrage	1995	NA	Change of strategy from US bond basis trading and US yield curve arbitrage to European bonds and equities despite being unacquainted with markets.	Market
Global Systems Fund (Victor Niederhoffer)	Macro	1997	NA	Market losses. Short puts in market correction. Failed margin calls.	Market
LTCM*	Fixed income arbitrage	1998	3600	Market losses. Excess leverage. Margin calls.	Market/ business
Manhattan Investment Fund (Michael Berger)	Long/short equity (short bias)	1999	400	Fictitious statements sent by manager.	Fraud
Princeton Economics International (Martin Armstrong)	Macro	1999	950	Market losses. Fraudulent sale of notes and misrepresentation of assets.	Fraud
Tiger Management**	Macro	2000	2600	Concentrated portfolio, style drift, redemptions, 'mouse clicks and momentum'	Market/ business
Soros Fund***	Macro	2000	NA	Departure of key personnel, lack of opportunity.	Market/ business
Ballybunion Capital Partners	Long/short equity	2000	7	Reporting of false performance figures. Wrong information on web.	Fraud
Maricopa Investment Corp. (David M. Mobley)	Long/short equity (quantitative)	2000	59	Market losses. Reporting of false performance figures. Fraudulent misrepresentation of assets. Ponzi scheme, paying distributions with new investor assets.	Fraud
Cambridge Partners, LLC (John C. Natale)	Long/short equity	2000	45	False audits, tax documents and monthly statements. Overstatement of performance. Pleaded guilty to securities fraud, theft and misappropriation of property.	Fraud

[1] Hedge funds are not free from all regulation. Hedge funds are not exempt from regulations designed to monitor and safeguard the integrity of markets. The US Treasury, for example, requires traders to report large positions in selected foreign currencies and treasury securities. The SEC requires traders to report positions that exceed 5% of the shares of a publicly traded firm. The Federal Reserve has margin requirements for stock purchases that apply to all market participants. The CFTC requires traders with large futures positions to file daily reports. In addition, the CFTC and the futures exchanges set futures margins and position limits on futures contracts. These regulations apply to all market participants, including hedge funds.

Case	Strategy	Date	Loss (US$ m)	What went wrong?	Risk
HL Gestion/Volter Fund (Imad Lahoud)	Managed Futures	2000	40	French regulators closed down the money manager because the firm's capital had fallen below the minimum level of €50m required to operate in France.	Market
Ashbury Capital Partners (Mark Yagalla)	Long/short equity	2001	40	Reporting of false performance figures and accused of running a pyramid scheme. Used investors' funds to finance lavish lifestyle.	Fraud
ETJ Partners (E. Thomas Jung)	Relative Value	2001	21	Market losses. Reporting of false performance figures. Fraudulent misrepresentation of assets.	Fraud

Sources: Cottier (1996), Peltz (2001), AP wire, Bloomberg News, UBS Warburg.
* Initial investors compounded at 18% as LTCM returned funds in 1997 (Lowenstein 2000).
** US$7.65bn withdrawals between August 1998 and April 2000. Tiger assets went from US$22.8bn in October 1998 to US$6bn in March 2000. However, Tiger Management compounded at 24.8% between 1980 and 2000.
*** Quantum fund compounded at 32.1% between 1969 and 2000. US$3bn were redeemed when Druckenmiller announced his departure.

- Most market losses can probably best be characterised as market and/or business risk. This means either being on the wrong side of a trade or getting the business setup wrong, ie operational malfunction. However, outright fraud has been perpetrated in the past.

Is speculation prudent?

Hedge funds are often viewed (primarily by the tabloid end of the writing guild) as a high-risk asset class and investing in hedge funds is associated with speculation. One could ask the question whether investing in hedge funds is speculative and therefore not prudent.

Are Prudent Expert Rule and Code of Ethics consistent with hedge fund investing?

Views and definitions of ethics vary across countries and cultures.[1] Any view, therefore, is subjective and has a strong home bias. The following view is based on the Prudent Expert Rule from ERISA (Employee Retirement Income Security Act) and the Code of Ethics from AIMR (Association of Investment Management and Research)[2]. Under ERISA, fiduciaries must discharge their duties with respect to the plan[3]:

- Solely in the interest of plan participants and beneficiaries.
- For the exclusive purpose of providing benefits to participants and their beneficiaries and defraying reasonable plan expanses.
- With the care, skill, prudence, and diligence under the circumstances then prevailing that a prudent person acting in like capacity and familiar with such

[1] On a separate note, Socially Responsible Investing is, as is hedge fund investing, gaining popularity. According to the Social Investment Forum, from 1997 to 1999 assets in all segments of social investing in the US grew 82% to US$2.16tr, representing about 13% of the US$16.3tr under professional management and essentially dwarfing the hedge fund industry. See *Sustainability Investment – The Merits of Socially Responsible Investing,* UBS Warburg research report, August 2001.
[2] The AIMR is a global, non-profit organisation of more than 41,000 investment professionals from more than 90 countries worldwide. Through its headquarters in the United States and 94 affiliated societies and chapters throughout the world, AIMR provides knowledge to investment professionals while promoting a high level of standards, ethics, and professionalism within the investment industry. According to the AIMR (1999) Code of Ethics members shall: 1. Act with integrity, competence, dignity, and in an ethical manner when dealing with the public, clients, prospects, employers, employees, and fellow members. 2. Practise and encourage others to practise in a professional and ethical manner that will reflect credit on members and their profession. 3. Strive to maintain and improve their competence and the competence of others in the profession. 4. Use reasonable care and exercise independent professional judgement.
[3] From AIMR (1999).

matters would use in the conduct of an enterprise of a like character and with like aims (the Prudent Expert Rule).

- By diversifying the investments of the plan so as to minimise the risk of large losses, unless doing so is clearly not prudent under the circumstances.
- In accordance with the governing plan documents, as long as they are consistent with ERISA.

The Prudent Expert is probably not an ignoramus

Assuming ERISA's Prudent Expert Rule is some indication of how a fiduciary should act and AIMR's Code of Ethics is a reference for ethical conduct of an individual financial professional, we believe that investing in hedge funds cannot be reckless. The fourth of ERISA's points listed above states that a fiduciary should diversify and reduce risk of large losses. In a portfolio context, risk is reduced by increasing the allocation to less risky assets or introducing assets with low or negative correlation to the core of the portfolio. The strategies by relative-value managers exploiting inefficiencies have proven to be sound – conceptually as well as empirically – and achieve high risk-adjusted returns and low correlation to traditional assets. In addition, once risk to individual hedge funds is diversified, large losses hardly occur, especially when compared with traditional investments that are essentially long the asset class outright. Note that for example Jacobs and Levy (1996) find the responsible use of long/short investment strategies is consistent with the prudence and diversification requirements of ERISA.

Conclusion

We believe a point can be made that in an industry where the investor is not protected by regulation, caveat emptor is a paramount variable in the decision-making process. Intangibles such as motivation, trust, integrity are important. This is probably true for investors investing in hedge funds directly or in a fund of funds.

Manager Selection and Access

Talent Search and Identification

Capability of identifying talent could potentially be single most important performance driver

One could argue that the search for talent or 'skill' is the single most important issue in the whole investment process of investing in AIS in general and hedge funds in particular. This is true especially in the context of us advocating a differentiation between skill-based and market-based strategies.

Reputation of manager is important

One aspect of manager selection is reputation. Reputation is probably the closest thing to brand recognition in the world of intangibles. We even came across the notion that the talent of a manager is negatively correlated with the number of sales staff in a hedge fund. Although we would not go as far as that,[1] we believe there is a huge difference in a few of the successful launches and the many *also-ran* launches.

Being in the position of spotting talent early is a competitive advantage

We believe a fund of funds manager has to be inside the 'information loop' of high-calibre investment personnel on the sell as well as the buy side of the business. This will enable him to spot talent early in the evaluation process. Some fund of funds managers identify and track skilled investment professionals before they announce that they are launching a hedge fund. In other words, a fund of funds manager who has superior information on key staff in the main investment centres will have a competitive advantage.

[1] It would be politically incorrect to do so.

Due Diligence and Track Record

Quantitative versus qualitative assessment

Most investors are familiar with the phrase 'past performance is no guide to future performance'. However, many investors seem to focus on track record when evaluating investment in the hedge fund industry as highlighted by the aforementioned Golin/Harris Ludgate survey. We believe that quantitative analysis has its limitations when evaluating and selecting hedge fund managers. At best it should be used to support in-depth qualitative research and rigorous due diligence. We believe that quantitative analysis is more relevant for risk monitoring than for manager selection.

Quantitative assessment is cheap when compared with qualitative analysis

The advantage of quantitative research is its relatively low cost and easy access. Anyone can buy a database for a couple of thousand US dollars and screen for top quartile performers. However, many top performers in the hedge fund industry do not appear in commercially available databases.

A proprietary database including qualitative and quantitative information is essential

We believe a proprietary database, which includes qualitative information, is important. The qualitative information can be scored and used in a ranking process to compare different managers within a strategy. A ranking process also allows elaborating on the strengths and weaknesses of each manager. The weakness of one manager can then be balanced through the strength of another manager in the portfolio construction process. This option is not available to the fund of funds manager who does not have qualitative information.

Due diligence and corporate governance are qualitative processes

Given the importance of qualitative research and due diligence, an investor evaluating a fund of funds manager will want to assess whether the manager is equipped to manage the laborious task of due diligence on an increasing number of funds. One could argue that the job of the fund of funds manager used to be to pick one outstanding manager per quarter from ten new managers. Today this task is probably more picking one or two managers out of c200 new funds per quarter; manager selection has probably become more difficult over time.

Risk and Performance Monitoring

Transparency

There are no patents on investment strategies

Transparency is among the hottest topics discussed at fund of funds conferences and in the minds of institutional involvement in hedge funds. A hedge fund manager has an incentive not to reveal the fund's positions for two main reasons. First, the market can trade against the manager if the position is in an illiquid security or spread and the position is revealed to the market. Inefficiencies are found in illiquid markets, not liquid markets. The period of autumn 1998 was a showcase example of the market trading against LTCM once the company was in distress and positions were revealed to the market. Second, most managers believe they have an edge relative to the market. In other words, they are making money by doing something the market does not know or by doing it better than the market does. This 'edge' is their whole value proposition and justification for being in business. It is only rational that they protect what they believe is most valuable.[1]

[1] This point might be open to debate. We took the view that someone investing in a hedge fund invests in the skill of the manager and not in a mechanical investment process.

The costs of attaining transparency of complex strategies might be higher than the risk monitoring benefits

There are additional reasons why a hedge fund manager might not want to reveal positions to a prospective or existing investor. A rude cynic might argue that most investors will not understand the real-time or daily positions of an arbitrage fund in any case. The information given to the investor would give transparency but would, in the cynic's view, cause more harm than good. We obviously do not share this view. However, as mentioned before, a fund of funds manager having full access to a manager's positions but not understanding the underlying strategies and instruments has a competitive disadvantage relative to the fund of funds manager who does.

In *Sound Practices for Hedge Fund Managers* (2000) the authors[1] recommend that investors should receive periodic performance and other information about their hedge fund investments. According to the report, hedge fund managers should also consider whether investors should receive interim updates on other matters in response to significant events. Hedge fund managers should negotiate with counterparties to determine the extent of financial and risk information that should be provided to them based on the nature of their relationship in order to increase the stability of financing and trading relationships. They should also work with regulators and counterparties to develop a consensus approach to public disclosure. Agreements and other safeguards should be established to protect against the unauthorised use of proprietary information furnished to outside parties.

Manager Risk Factors

The standard deviation of returns is the tip of the iceberg

We believe that one of the most important factors in terms of risk is that risk is not synonymous with volatility.[2] This is especially true when investing in non-marketable securities or ventures. When managing the risk of a manager, Jaeger (2000) distinguishes between portfolio market and non-market related factors as well as operational factors. We believe these factors also apply for someone investing with a fund of funds manager.

(1) Porfolio factors: non-market related.
-Leverage
-Concentration
-Illiquidity
-Trading behaviour

(2) Portfolio factors: market-related.
-Directional factors: long bias, short bias, neutral, etc.
-Technical factors: volatility
-Spread-related factors: sector tilts, style tilts, credit spreads

[1] Caxton Corporation, Kingdon Capital Management, Moore Capital Management, Soros Fund Management, and Tudor Investment Corporation.

[2] Rahl (2000) uses the term 'iceberg risk' in connection with the lessons learnt from LTCM. The visible tip of the iceberg (for example the volatility of returns) is not necessarily a clear indication of the full risk. A long/short equity manager, for example, normally has lower beta risk. This means volatility of returns is lower. However, the manager is also exposed to 'spread risk'. Spread risk is not necessarily captured be measuring the standard deviation of returns. Returns from beta are fairly normally distributed. Returns from taking spread risk are not normally distributed. The returns from spread risk are leptokurtic, ie narrowly distributed around the mean with (usually) negative outliers (when spreads blow up). Favouring one form of distribution over the other is subjective depending on personal preference or tolerance of risk. However, what is not subjective is the fact that the combination of different return distributions driven by different factors reduces portfolio volatility.

(3) Organisational factors:
-Length of record
-Assets under management (rate of growth, nature of client base)
-Ownership/compensation structure
-Risk monitoring/control systems

High degree of sophistication is required

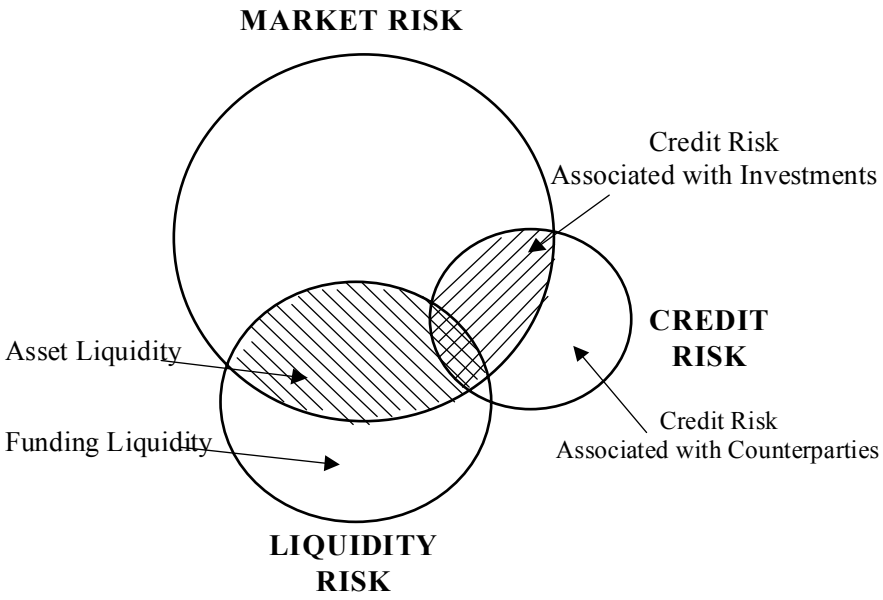
We believe that a fund of funds manager needs the sophistication and the operational setup to assess and weigh all of these factors. We do not believe that policies such as 'no-leverage-only' or 'five-year-track-record-required' make a lot of sense.

Market risk is only one source of risk

In *Sound Practices for Hedge Fund Managers* (2000) the authors distinguish between three categories of risk that are quantifiable – 'market risk', 'credit risk', and 'liquidity risk' – and on the less quantifiable 'operational risk'. Market risk relates to losses that could be incurred due to changes in market factors, ie prices, volatilities, and correlations. Credit risk relates to losses that could be incurred due to declines in the creditworthiness of entities in which the fund invests or with which the fund deals as a counterparty. Liquidity risk relates to losses that could be incurred when declines in liquidity in the market reduce the value of the investments or reduce the ability of the fund to fund its investments.

The authors of the report recommend that while current market practice is to treat the risks separately, it is crucial for hedge fund managers to recognise and evaluate the overlap that exists between and among market, credit and liquidity risks. This overlap is illustrated in the following diagram (recognising that the relative sizes of the circles will be different for different strategies):[1]

Chart 36: Risk Monitoring Function



Source: *Sound Practices for Hedge Fund Managers* (2000)

[1] *Sound Practices for Hedge Fund Managers* (2000), p16.

Consequently, any risk-monitoring activity should monitor three interrelated variants of market, liquidity and credit risks in combination:

- Market risk – including asset liquidity and the credit risk associated with investments
- Funding liquidity risk
- Counterparty credit risk

In this framework, the risk sometimes referred to as 'sovereign risk' would be included as 'credit risk', if the potential loss is related to the financial solvency of the sovereign, or as 'market risk', if the potential loss is related to policy decisions made by the sovereign that change the market value of positions (eg currency controls). The term 'event risk' is broader and could incorporate aspects of 'credit risk' and 'operational risk', as well as some elements of 'market risk'.

Funding liquidity is important

Funding liquidity is critical to a hedge fund manager's ability to continue trading in times of stress. Funding liquidity analysis should take into account the investment strategies employed, the terms governing the rights of investors to redeem their interests and the liquidity of assets, eg all things being equal, the longer the expected period necessary to liquidate assets, the greater the potential funding requirements. Adequate funding liquidity gives a hedge fund manager the ability to continue a trading strategy without being forced to liquidate assets when losses arise.

Dealing with the complexity of monitoring manager risk is labour intensive

The reason why we are highlighting this is to show the complexity of the task. If we are in a hedge fund bubble, as some are suggesting,[1] it is because shortcuts are being taken. We believe only a team of dedicated and experienced full-time financial professionals are equipped to implement and monitor these risk variables. The use of leverage adds a further layer of complexity.

Leverage

Fund of funds manager must monitor accounting-based and risk-based leverage

One of the consistently hot topics in the hedge funds arena is the use and misuse of leverage. However, leverage is not a concept that can be uniquely defined, nor is it an independently useful measure of risk. Nevertheless, leverage is important to investors, counterparties and fund managers because of the impact it can have on the three major quantifiable sources of risk: market risk, credit risk and liquidity risk. A fund of funds manager, must therefore, have the ability to monitor accounting-based and risk-based leverage. We believe that the aforementioned fund of funds manager who declared arbitrage strategies as too risky because of the use of leverage has not spent a lot of time thinking about the different aspects of leverage.

Accounting- versus risk-based leverage

The variety of 'leverage' measures used in banking and finance is evidence that leverage is not a uniquely defined concept.[2] These measures may be accounting-based (also referred to as 'asset-based') or risk-based. The accounting-based measures attempt to capture the traditional notion of leverage as 'investing

[1] See Footnote 1 on page 7.

[2] *Sound Practices for Hedge Fund Managers* (2000)

borrowed funds'. Using borrowed money (or its equivalent) enables an investor to increase the assets controlled for a given level of equity capital. Accounting-based measures of leverage relate some measure of asset value to equity. Both returns and risk, relative to equity, are magnified through the use of traditional, accounting-based leverage. The risk-based measures of leverage capture another aspect associated with leverage, namely, the risk of insolvency due to changes in the value of the portfolio. The risk-based measures relate a measure of a fund's market risk to its equity (or liquidity). Although useful in this capacity, risk-based leverage measures do not convey any information about the role that borrowed money plays in the risk of insolvency.

No single measure captures all of the elements that market participants, regulators, or market observers attribute to the concept of leverage. Indeed, the authors of *Sound Practices for Hedge Fund Managers* 2000 show examples in which a risk-reducing transaction increases some leverage measures while decreasing others. This leads to the observation that leverage is not an independently useful concept, but must be evaluated in the context of the quantifiable exposures of market, credit and liquidity.

Leverage viewed in isolation is not an indication of risk

While continuing to track and use accounting-based measures of leverage, the authors of *Sound Practices for Hedge Fund Managers* (2000) recommend that hedge fund managers focus their attention on measures of leverage that relate the riskiness of the portfolio to the capacity of the fund to absorb that risk. These measures must include elements of market risk (including the credit risk associated with the assets in the portfolio) and funding liquidity risk. Hedge fund managers should focus on such measures because traditional accounting-based leverage by itself does not necessarily convey risk of insolvency. To say that one fund is levered 2-to-1 while another is unlevered does not necessarily mean that the levered fund is more risky or more likely to encounter liquidity problems. If the levered fund is invested in government securities while the unlevered fund is invested in equities, accounting-based leverage would lead to erroneous conclusions about the riskiness of the two funds. In this sense, accounting-based measures of leverage are arguably deficient since they convey the least information about the nature and risk of the assets in a portfolio.

Risk-based measures present a measure of market risk (usually VAR) relative to a measure of the resources available to absorb risk (cash or equity).[1] However, in doing so, risk based measures effectively condense several dimensions of risk into a single number. The result of this compression is that some of the detail is lost; the specific effect of leverage is intertwined with dimensions of market, credit and liquidity risk. To illustrate, consider two funds with identical risk-based leverage. One fund employs 2-to-1 accounting leverage while investing in 'low-risk' strategies (eg long/short strategies) using borrowed funds, while the other fund uses no accounting leverage but employs 'high-risk' strategies (eg macro directional) and large cash reserves. One is 'high risk' and 'high cash' and the other is 'low risk' and 'low cash/high borrowing', yet each achieves the same risk-based leverage. This comparison highlights the second reason why leverage measures are not independently useful: more comprehensive measures that blend the effect of

[1] *Sound Practices for Hedge Fund Managers* (2000)

multiple risk dimensions are required. To assess the contribution of leverage requires additional information.[1]

Risk-based leverage relates the riskiness of a portfolio to the ability to absorb that risk

The authors of the report argue that managers and investors alike must recognise that leverage is important, not in and of itself, but because of the impact it can have on market, credit and liquidity risk. In other words, leverage influences the rapidity of changes in the value of the portfolio due to changes in market, credit, or liquidity risk factors. Consequently, the most relevant measures of leverage are 'risk-based' measures that relate the riskiness of a portfolio to the ability of the fund to absorb that risk. Recognising the impact that leverage can have on a portfolio's exposure to market, credit, and liquidity risk, the fund of funds manager or investor should assess the degree to which a hedge fund is able to modify its risk-based leverage in periods of stress or increased market risk. Traditional, accounting-based measures of leverage should also be examined. This can provide insights into the source of risk-based leverage and how that leverage could be adjusted.

The Risk of Style Drift

Defining style drift is difficult

A further ongoing risk factor to be monitored by the fund of funds manager is style drift. Style drift is the risk to the investor that the hedge fund manager drifts away from his area of expertise where he has an edge into a field where he has a competitive disadvantage. Historical examples have been fixed income arbitrageurs investing in non-domestic equity markets or equity managers investing in Russian debt.

There are probably two types of style drift: a short-term opportunistic style drift as well as a continuous departure of a manager's area of expertise. A permanent shift will force reassessment of the investment. We are inclined to argue that a short-term opportunistic drift into a related area is probably not as negative for the investor as a permanent shift. The short-term shift is both a risk to the investor as well as entrepreneurial expansion through exploiting economies of scale, ie an opportunity. A convertible arbitrage manager, for example, has a competitive advantage in areas of analysing changes in credit and volatilities. There are, potentially, related trading opportunities to make money by exploiting inefficiencies left behind by less informed investors.

Diversification results in a more stable stream of returns

Over the years, there has been an increasing tendency for hedge fund managers to employ multiple strategies.[2] The value of creating a more stable stream of returns over different market cycles has attracted hedge funds to adopt a multi-strategy approach. By investing in a manager attempting to achieve absolute returns, one automatically invests in the skill of the manager, ie not in an asset class or mechanical execution of an investment technique, strategy or process. This implies a higher degree of flexibility for the manager. In other words, the hedge fund manager is not restricted to replicate a benchmark but has a mandate to exploit opportunities. The basic question is how far a hedge fund manager should be allowed to drift away from his initial area of expertise.

[1] See *Sound Practices for Hedge Fund Managers* (2000), p 50-55.

[2] From Fung and Hsieh (2001a), p7.

Restrictions are a double-edged sword

Restrictions work in both ways. On one hand restrictions reduce risk; on the other they limit the set of opportunities to add value. Every market changes over time. Change, and its derivative, uncertainty, are the most certain variables in any social science. Market inefficiencies, for example, have a tendency to disappear as they become known to the market and attract capital. If manager restrictions were too tight, the manager would not be able to exploit inefficiencies in a neighbouring or related market as they appear, thereby missing out on *first-mover* advantage.

Handcuffs and Opportunism – a Trade-off

An active fund manager with very tight restrictions is essentially running an enhanced index fund (charging an active fee)

Our belief that a high degree of freedom is good is based on the assumption that a large portion of the value added in the hedge fund industry is attributable to flexibility and not purely to skill.[1] If ex-ante value added is defined as manager skill times the square root of breadth, then handcuffing an active manager does not make a lot of sense.[2]

Loose restrictions potentially could essentially increase portfolio volatility and correlation

A high degree of freedom causes many challenges in terms of monitoring risk on an ongoing basis.[3] In addition, investors construct portfolios of hedge fund strategies according to their own risk tolerances and return preferences. A high degree of flexibility means that the investor's portfolio of different hedge fund managers could occasionally experience a higher degree of overlap. This would result in higher volatility and higher correlation of the hedge fund portfolio.

There are no guarantees

One important aspect that aligns the interests of the investor with those of the manager is the fact that many hedge fund managers have large portions of their net wealth tied to their fund. Often hedge fund managers view their fund as the safest place for their wealth to compound. An aversion to market risk exposure was the main reason why hedge funds started back in 1949 in the first place. To some extent, this alignment of interest is a hedge against the manager leaving his area of competence by risking his and his investors equity. However, human nature does not always work that way. There are no guarantees for a prudent assessment of new opportunities. Judgement is omnipresent in pure active management, ie hedge fund investing. The degree of tolerable style drift will remain in the eye of the beholder.

Legal and Compliance

A fund of funds manager's legal/compliance personnel must have the authority and resources to operate independently and effectively. This function should seek to actively manage the legal risks presented by the hedge fund manager's trading, focusing on the documentation governing trading relationships and individual transactions. A fund of funds manager will have to ensure that the hedge fund managers pursue a consistent and methodical approach to documenting transactions so that the legal consequences of periods of market stress or performance declines

[1] Other restrictions include the use of derivatives. According to Kosky and Pontiff (1999), 79% of the researched sample of 679 equity mutual funds do not use derivatives.

[2] More formally: Information ratio = information coefficient (skill or correlation between forecast and realised active returns) times the square root of the breadth or scope (number of independent forecasts of exceptional return a manager can make a year). Grinold and Kahn (2000a), p 148. The formula is often regarded as the law or sine qua non of active money management. If one of the two variables (skill or breadth) is zero, the product of the equation is also zero. In other words, a skilled manager stripped of all opportunities to add value has an expected information ratio of zero and cannot add value.

[3] Note that there is a controversy surrounding long/short investing. See page 108 in the Appendix.

may be more clearly anticipated and managed. The legal aspect should allow risk monitoring with useful input in the evaluation of a hedge fund's projected liquidity in stressed environments, including inputs derived from the fund's transaction documentation (eg terms regarding termination, collateral and margining).

Data and Information

Data on hedge funds is not perfect

Generally speaking, data on hedge fund performance in general is bad and information is difficult and costly to obtain. Hedge fund data suffers from various biases, of which survivorship bias is the most often quoted deficiency.[1] The hedge fund industry is still opaque. This means information flow is not efficient and transparent.

The lack of information and transparency is a risk to the investor

The lack of transparency, the poor quality of available data and the high cost of information are a risk to some investors. It is essentially is a risk to investors who are not in the information loop. However, information and high-quality data are among the competitive advantages of the fund of hedge funds manager.

This concludes our search for 'edge' in the fund of funds business. In the following chapter we analysed data on a 929 funds of funds from a proprietary database.

[1] Probably the most extreme example of survivorship bias in capital markets today is the notion that equities outperform bonds in the long term, ie the widely touted equity risk premium puzzle. The term 'equity risk premium puzzle' refers to the puzzling high historical average returns of US stocks relative to bonds. Mehra and Prescott (1985) show that standard general equilibrium models cannot explain the size of the risk premium on US equities, which averaged 6% over the period 1889-1978. The view that stocks outperform bonds could be because most analysis is based on a surviving stock market, ie the US stock market. However, the standard error of such an analysis is high. Unfortunately, one cannot test the equity premium by rerunning US market history to see what would have happened along other sample paths. However, one can look at other stock markets. Jorion and Goetzmann (1999) did exactly that. They examined the 20th century returns of 39 stock markets around the world, including several with experiences vastly different from the US stock market, such as Russia (disappeared in 1917) and Germany and Japan (experienced discontinuities). The authors reported that the US market was the best performing market of all 39 markets. The belief that equities outperform bonds in the long run, therefore, is founded on some debatable assumptions.

Performance of Funds of Funds

"Q: What is the definition of a stock that fell by 90%?
A: A stock that fell 80% and then halved."
Hedge fund investor humour[1]

Performance Analysis

Data

Caveat lector (reader)

For the purpose of this research report we had access to the proprietary database of Quellos Group LLC, a Seattle-based financial services and wealth management group. The advantage of being able to analyse the Quellos proprietary data is the size of the universe, which we believe is a several times larger than any commercially available database in terms of number of data points and information. The disadvantage of such an analysis is that it is of little value for any academic pursuits because the data cannot be made available and, therefore, the findings cannot by verified or falsified by peers.

The total universe comprises 929 funds of funds. The data includes terminated funds, different share classes of the same fund of funds, closed funds as well as funds still in operation. It included performance data on 726 funds of hedge funds. Performance data of at least 12 consecutive months was available for 680 funds, of which 444 reported until December 2000. The data does not state why performance stopped (termination of fund or termination of reporting returns). The performance data starts in January 1986 and ends in December 2000.

Analysis

Table 15 shows the annual returns of four fund of funds universes compared with some traditional indices, a hedge fund composite index and private equity. For the first Quellos universe we selected all 726 funds with performance data. For the second Quellos universe we took a selection comprising 258 funds of funds that had at least five years of monthly returns.

Note that there are some imperfections with this analysis. First, the average for 1986 is based on only 14 funds of funds. The number of funds of funds increased more or less linearly to 258 in 1996 and decreased to 202 at the end of December 2000. Second, we have calculated an average of funds of funds, not an average of fund of funds managers. A manager could have more than one fund of funds. Third, at no point in time would these returns have been achievable by a passive investor. Fourth, an index is not constructed by averaging simple returns. In summary, therefore, these returns are – at best – indicative of how the fund of hedge fund industry performed over time and how this performance compares with traditional investment strategies as well as private equity.

[1] Note that for the traditional hedge fund investor, being long a portfolio of stocks is regarded as much higher risk than being long a portfolio of hedge funds, primarily because correlation among portfolio constituents is close to 1 with the former and much less than 1 with the latter.

Table 15: Fund of Hedge Funds Performance Compared With Traditional Indices, Hedge Fund Composite Index and Private Equity

	Traditional					Alternative Investment Strategies							
	Equities				Bonds	HFR	Fund of Hedge Funds				Private Equity		
(%)	MSCI World	S&P 500	MSCI EAFE	MSCI Europe	JPM Global Gvt. Bonds	HFR Comp. Index	Quellos (1)	Quellos (2)	HFR	Zurich/ MAR (3)	All PE	Venture Capital	LB/ Mezz
1975	34.5	31.5	37.1	43.9	N/A	N/A	N/A	N/A	N/A	N/A	3.8	4.2	-13.2
1976	14.7	19.2	3.7	-6.4	N/A	N/A	N/A	N/A	N/A	N/A	15.0	15.7	-17.0
1977	2.0	-11.5	19.4	23.9	N/A	N/A	N/A	N/A	N/A	N/A	18.7	18.8	10.7
1978	18.2	1.1	34.3	24.3	N/A	N/A	N/A	N/A	N/A	N/A	41.6	43.3	-25.0
1979	12.7	12.3	6.2	14.7	N/A	N/A	N/A	N/A	N/A	N/A	22.7	22.9	45.8
1980	27.7	32.6	24.4	14.5	N/A	N/A	N/A	N/A	N/A	N/A	33.8	33.9	28.0
1981	-3.3	-4.9	-1.0	-10.4	N/A	N/A	N/A	N/A	N/A	N/A	16.9	18.8	-1.9
1982	11.3	21.7	-0.9	5.7	N/A	N/A	N/A	N/A	N/A	N/A	15.5	16.9	4.7
1983	23.3	22.5	24.6	22.4	N/A	N/A	N/A	N/A	N/A	N/A	34.7	38.6	9.3
1984	5.8	6.2	7.9	1.3	N/A	N/A	N/A	N/A	N/A	N/A	1.7	1.6	3.6
1985	41.8	31.8	56.7	79.8	N/A	N/A	N/A	N/A	N/A	N/A	11.6	4.6	35.8
1986	42.8	18.7	69.9	44.5	20.1	N/A	18.7	18.7	N/A	N/A	19.1	9.6	42.1
1987	16.8	5.2	24.9	4.1	13.8	N/A	35.9	35.9	N/A	N/A	16.7	12.3	24.1
1988	24.0	16.6	28.6	16.4	5.0	N/A	18.3	18.3	N/A	N/A	21.8	4.0	47.7
1989	17.2	31.7	10.8	29.1	6.8	N/A	19.7	19.7	N/A	N/A	16.8	5.2	29.3
1990	-16.5	-3.1	-23.2	-3.4	11.8	17.5	14.4	14.8	5.8	7.5	2.2	3.1	1.3
1991	19.0	30.5	12.5	13.7	15.4	14.5	12.2	11.5	32.2	11.3	12.7	16.9	11.8
1992	-4.7	7.7	-11.8	-4.2	4.6	12.3	12.9	12.7	21.2	11.9	7.8	9.8	9.4
1993	23.1	10.1	32.9	29.8	12.3	26.3	24.6	24.9	30.9	24.2	23.4	19.0	27.8
1994	5.6	1.3	8.1	2.7	1.3	-3.5	-2.8	-2.4	4.1	-4.4	14.8	12.8	13.6
1995	21.3	37.6	11.6	22.1	19.3	11.1	12.4	12.8	21.5	12.3	20.8	39.7	12.6
1996	14.0	22.9	6.4	21.6	4.4	14.4	17.3	17.7	21.1	16.7	27.8	32.2	24.5
1997	16.2	33.4	2.1	24.2	1.4	16.2	17.1	18.0	16.8	17.2	22.5	28.9	19.9
1998	24.8	28.6	20.3	28.9	15.3	-5.1	0.5	-0.2	2.6	1.7	14.4	18.6	12.6
1999	25.3	21.0	27.3	16.2	-5.1	26.5	27.1	24.3	31.3	16.2	57.6	142.8	26.1
2000	-12.9	-9.1	-14.0	-8.1	2.3	4.1	5.8	5.5	5.0	7.4	12.0	24.0	4.1
2001	-7.5	-4.4	-10.8	-13.7	-3.6	2.3	N/A	N/A	3.0	3.0	-4.5	-8.0	-3.1
1975-00*	15.6	16.0	16.1	17.3	N/A	N/A	N/A	N/A	N/A	N/A	19.5	23.0	14.9
1986-00*	14.4	16.9	13.8	15.8	8.6	N/A	15.6	15.5	N/A	N/A	19.4	25.2	20.5
1986-95*	14.9	15.6	16.4	15.5	11.0	N/A	16.6	16.7	N/A	N/A	15.6	13.2	22.0
1990-00*	10.5	16.4	6.6	13.0	7.5	12.2	12.7	12.7	17.5	11.1	19.6	31.6	14.9
1995-00*	14.8	22.4	8.9	17.5	6.3	11.2	12.6	13.0	16.4	11.9	25.8	47.7	16.6
1975-00**	14.7	14.5	20.7	19.7	N/A	N/A	N/A	N/A	N/A	N/A	12.3	27.2	18.3
1986-00**	15.7	14.4	22.6	15.0	7.4	N/A	9.8	9.7	N/A	N/A	12.4	34.2	13.1
1986-95**	16.5	13.9	25.5	16.0	6.4	N/A	9.9	9.9	N/A	N/A	6.6	10.7	14.9
1990-00**	15.3	15.9	17.4	14.0	7.6	10.3	9.6	8.9	11.5	7.9	14.6	38.3	8.7
1995-00**	14.3	16.6	14.5	13.2	9.2	10.8	11.9	9.0	10.9	6.2	16.5	47.1	8.4
1975-00***	0.72	0.76	0.54	0.63	N/A	N/A	N/A	N/A	N/A	N/A	1.18	0.66	0.54
1986-00***	0.60	0.83	0.39	0.72	0.48	N/A	1.08	1.08	N/A	N/A	1.16	0.59	1.18
1986-95***	0.60	0.77	0.45	0.65	0.94	N/A	1.17	1.18	N/A	N/A	1.61	0.77	1.14
1990-00***	0.36	0.72	0.09	0.58	0.33	0.70	0.80	0.87	1.09	0.77	1.00	0.69	1.13
1995-00***	0.68	1.05	0.27	0.95	0.14	0.57	0.64	0.89	1.05	1.11	1.26	0.91	1.39

Source: Quellos, HFR, Zurich Capital Markets, Venture Economics, Datastream, UBS Warburg calculations

All annual returns are total returns in US$. 2001 returns until June (except VE until March). PE returns are based on the pooled average method of calculating time weighted returns using periodic IRRs. See Glossary for explanation on methodology.

*Arithmetic average of annual total returns.

**Standard deviation of annual returns.

***Sharpe ratio. Here calculated as arithmetic return – 5% over standard deviation of arithmetic returns.

(1) based on universe of 726 current and terminated funds of hedge funds

(2) based on universe of 258 funds of funds with at least five years of consecutive monthly returns.

(3) as of April 2001: 256 funds of funds with US$22.2bn assets under management

Abbreviations: HFR: Hedge Fund Research; VE: Venture Economics; LB: Leveraged buy-out; Mezz: Mezzanine.

- Simple average annual returns of a large universe of funds of funds suggest that, at least in the past, fund of hedge funds managers have delivered what they promised, ie equity-like returns with bond-like volatility.

- When comparing the Quellos (1) universe of fund of funds in Table 15 with the MSCI World and S&P 500, we find that the average fund of funds delivers superior risk-adjusted returns. Only for the period from 1995 to 2000 is the Sharpe ratio of 0.64 lower than the Sharpe ratio of MSCI World and S&P 500 of 0.68 and 1.05 respectively.

- The largest underperformance of funds of hedge funds relative to equities occurred in extremely bullish market environments such as 1986 and 1998. However, in strong equity years that follow a negative year, ie a 'technical rebound year', there is little underperformance. In 1988 and 1993, for example, when equities performed well after a difficult year, funds of funds did not underperform, or if so, by only a small amount.

- The largest outperformance of funds of funds relative to equities was in 1990. Equities had to deal with war and a commodity-inflation induced global recession while most capital markets were volatile. Note that volatility is a risk to some investors and an opportunity to others.

Chart 37 below shows a ranking process for the years 1986 to 2000. We have ranked 15 yearly returns for three traditional indices and for two proxies for alternative investment strategies (hedge funds and private equity). Then we sorted the first column (MSCI World) by rank, the best performing year first and the worst last. The five best years for all proxies is marked dark blue, the consecutive five years are medium blue and the worst five years light blue. This ranking process is another way of assessing correlation between the investment vehicles.

Chart 37: Ranking of Traditional Indices and AIS

(rank)	MSCI World	S&P 500	JPM Global Gvt. Bonds	Quellos HF FoF	Venture Econ. Private Equity
1986	1	8	1	5	7
1999	2	7	15	2	1
1998	3	5	4	14	11
1988	4	9	9	6	5
1993	5	10	6	3	3
1995	6	1	2	11	6
1991	7	4	3	12	12
1989	8	3	8	4	8
1987	9	12	5	1	9
1997	10	2	13	8	4
1996	11	6	11	7	2
1994	12	13	14	15	10
1992	13	11	10	10	14
2000	14	15	12	13	13
1990	15	14	7	9	15

Source: Quellos, Venture Economics, Datastream, UBS Warburg calculations
All annual returns are total returns (including reinvestment of dividends) in US$.
(1) based on universe of 726 current and terminated funds of hedge funds

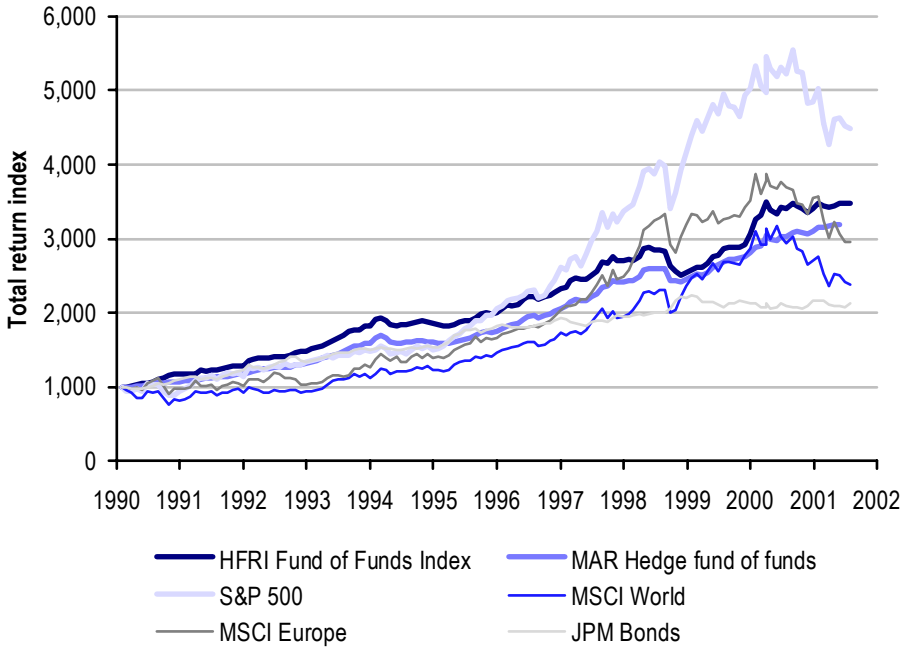
- This ranking process shows that whatever the correlation of AIS with equities and bonds, it is certainly not negative. The worst years for equities were not stellar years for bonds, nor hedge funds, nor private equity. In other words, it is not AIS or funds of funds in general that have low correlation to traditional assets. It is only a small segment of the AIS universe which has consistent low correlation with traditional investment vehicles.

- The three worst years for the MSCI World were also the three worst years for private equity.

Fund of Hedge Funds Indices

Chart 38 compares two fund of funds indices with three equity indices and one bond index.

Chart 38: Fund of Hedge Funds Performance



Source: HFR, MAR, Datastream
Based on total US$ returns: January 1990 - July 2001, except MAR to May 2001.

- Funds of hedge funds outperformed the MSCI World and MSCI Europe but underperformed the S&P 500.

- Using different indices for fund of hedge funds results in slightly differing performance patterns. This indicates differences in fund of funds selection (most managers report figures to only one vendor) and methodology. In addition it supports our notion that the dispersion of returns among fund of funds managers is wide.

Table 16: Fund of Hedge Funds Risk and Return Characteristics

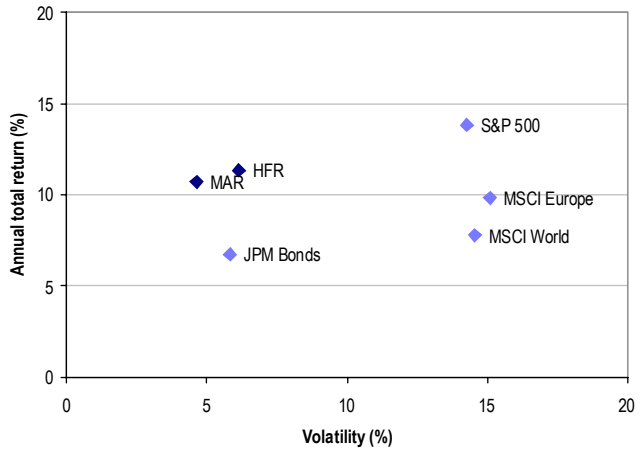
	# of monthly returns*	Annual return (%)	Volatility (%)	Sharpe ratio**	Worst 1-month return (%)	Negative months (%)	Worst 12-month return (%)
S&P 500 (Total return)	139	13.8	14.3	0.62	-14.5	24	-21.7
MSCI World (Total return)	139	7.8	14.6	0.48	-13.3	27	-24.9
MSCI Europe (Total return)	139	9.8	15.1	0.58	-12.6	26	-22.5
JPM Global Gov't Bonds (Total return)	139	6.7	5.8	0.58	-3.3	31	-6.2
HFRI Fund of Funds Index	139	11.3	6.1	1.03	-7.47	25	-7.4
MAR Hedge fund of funds	137	10.7	4.6	1.23	-6.40	18	-6.2

Source: HFR, MAR, Datastream, UBS Warburg calculations
*January 1990 - July 2001, except Mar to May 2001.
**based on risk-free rate of 5%

- Both fund of funds indices resulted in double-digit returns with volatility similar to that of bond indices.
- On a Sharpe-ratio basis, for what it is worth, funds of funds appear superior to both equities and bonds. If we subtract 300bp off the return of the fund of hedge funds indices to account for data imperfections, the Sharpe ratios fall in line with equity and bond indices.
- The number of negative months is similar to equities. However, the worst months are not as bad as in equities resulting in outperformance over a longer time period.
- The worst 12-month return is comparable to developed-market government bonds and a fraction of the losses in equities.

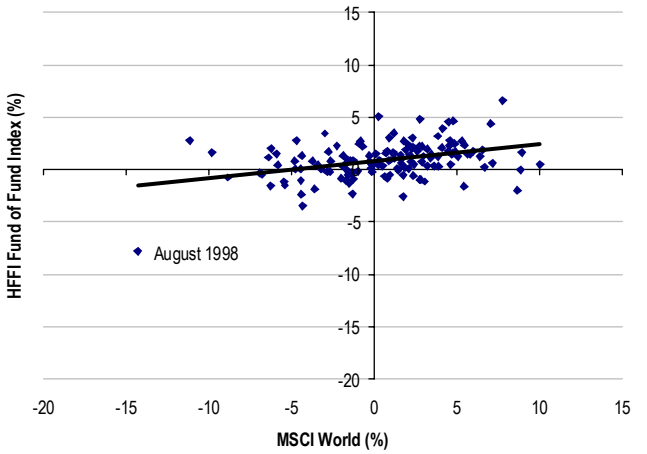
The first of the following two graphs shows the returns of two fund of hedge fund indices with some equity and bond indices. The second graph compares monthly total MSCI World returns in US dollars with the HFRI Fund of Funds Index. Both graphs are based on returns from January 1990 to July 2001.

Chart 39: Return versus Volatility



Source: HFR, MAR, Datastream, UBS Warburg calculations

Chart 40: MSCI World versus Funds of Hedge Funds



Source: HFR, Datastream

- Chart 39 is an indication that funds of hedge funds delivered what they promised in the past: equity returns with bond volatility.

- Note that the correlation with equities is low, but not zero or negative.

Table 17: Statistical Analysis of Fund of Hedge Funds Index Returns

	Alpha to MSCI World	Beta to MSCI World	Skew	Excess kurtosis	Correlation MSCI World	Correlation JPM Global Bonds
HFRI Fund of Funds Index	0.79	0.16	-0.52	4.10	0.410	-0.075
MAR Hedge fund of funds	0.75	0.15	-1.23	6.92	0.490	-0.024

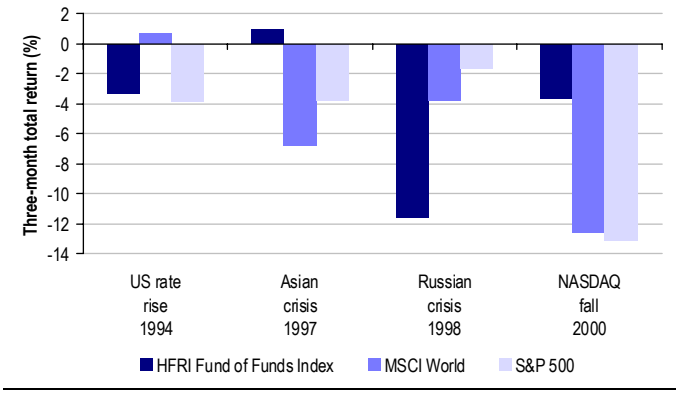
Source: HFR, MAR, Datastream, UBS Warburg calculations

- Both fund of funds indices have positive alpha and low beta against the MSCI World. The low beta indicates that returns are generated without being exposed to the equity market as a whole. In other words, the source of returns in funds of hedge funds is not derived from capturing the equity risk premium, as in long equity funds. See also Appendix page 92 on the subject of performance attribution of hedge funds.

- The distribution of returns of both fund of funds indices are slightly negatively skewed (to the left with a long tail to the left) and leptokurtic (narrow distribution with outliers).

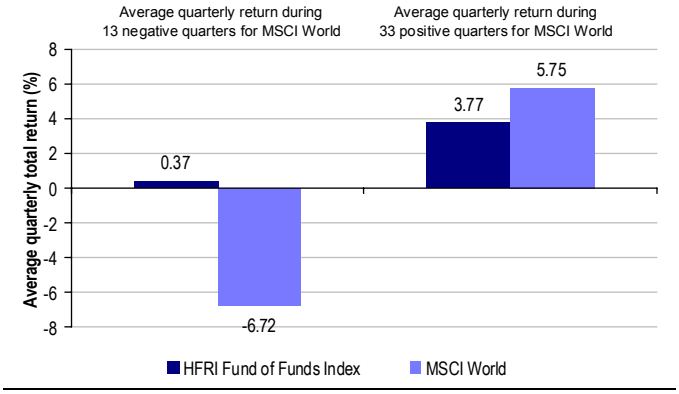
- Correlation to equities was around 0.45 over a longer period of time and around 0.55 over the past five years. These correlation statistics indicate that most funds of funds are a combination of directional as well as non-directional hedge fund strategies. Funds of funds dedicated to non-directional hedge fund strategies will have lower correlation statistics.

Chart 41: Scenario Analysis



Source: HFR, Datastream, UBS Warburg calculations.
US rate rise: Q1 94; Asian crisis: 1 August – 31 October 1997; Russian crisis: 1 August – 31 October 1998; Nasdaq fall: 1 September – 30 November 2000 (=worst three-month return)

Chart 42: Average Negative versus Average Positive Returns



Source: HFR, Datastream

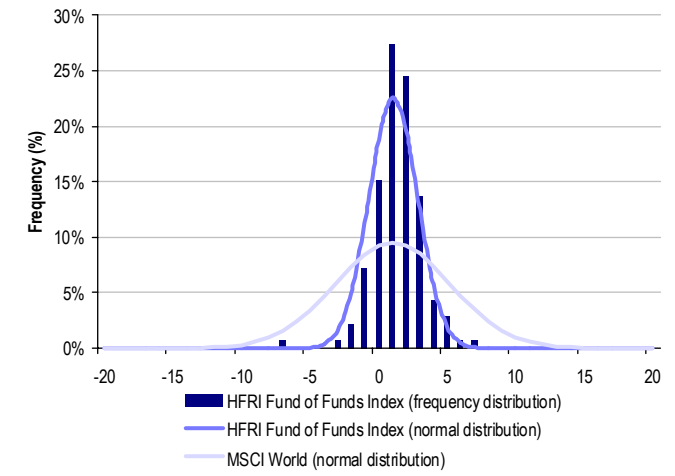
- Autumn 1998 was a difficult period for most hedge funds. Funds of funds underperformed equities. In most other periods of equity market stress, funds of funds indices outperformed equities.

- Since January 1990 the total return index of MSCI World recorded 13 negative quarters of which the average fall was 6.72% (Chart 42). This compares with 0.37% for the HFRI Fund of Funds Index.

- In the positive quarters, funds of funds underperformed the MSCI World by 2.0%. In negative quarters, however, the MSCI World was beaten by 7.1%. The low-volatility features of hedge funds lead us to expect underperformance in bull markets and outperformance in bear markets. However, it is the asymmetric nature of this relationship of small underperformance in rising markets and large outperformance in falling markets which is one of the attractions of hedge funds. We believe that the definition of risk in absolute terms by hedge funds and the consequent use of risk management techniques and instruments are the reasons for the call-option-like asymmetric return pattern.

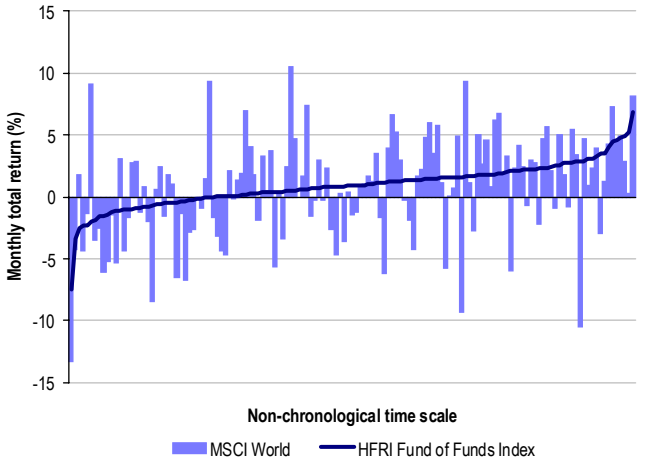
The left graph of the following pair shows how returns have been distributed in the past and compares the historical return distribution with a normal distribution of the HFRI Fund of Funds Index and a normal distribution of historical MSCI World returns. Both normal distributions are based on historical mean return and standard deviation of returns. For the graph on the right, we have sorted the fund of funds returns and compared them with the corresponding market returns. This allows us to see in which market environment the extreme positive and negative returns were achieved.

Chart 43: Return Distribution



Source: HFR. Datastream, UBS Warburg calculations

Chart 44: Correlation



Source: HFR, Datastream

- Chart 43 shows how narrowly around the mean the monthly returns of fund of hedge funds were distributed, especially when compared with equities. There were eight outliers in the fund of funds series, six positive outliers above the 95% range and two below the mean of 0.82%. Only two outliers were outside the 99% range, one on the upside (December 1999) and one on the downside (August 1998).

- Chart 44 shows that there is some concentration between negative returns of funds of funds and declining equity markets. This means that the average fund of funds loses money when equities fall. The chart also shows that fund of funds returns tend to have low volatility compared to equity returns.

Good Years versus Poor Hedge Fund Years

Table 18 below shows annual returns for the MSCI World and a selection of hedge fund strategies between January 1990 and June 2001. The two best and worst years for the 1990-2000 period are highlighted in dark and light blue respectively.

Table 18: Annual Total Returns of MSCI World and Selected Hedge Fund Strategies

(%)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001*	1990-2001*
MSCI World	**-16.5**	19.0	-4.7	23.1	5.6	21.3	14.0	16.2	**24.8**	**25.3**	**-12.9**	-7.5	8.4
Convertible Arbitrage	**2.2**	**17.6**	16.3	15.2	**-3.7**	**19.9**	14.6	12.7	7.8	14.4	14.4	8.4	12.0
Fixed Income Arbitrage	10.8	12.9	**22.1**	**16.6**	11.9	6.1	11.9	7.0	**-10.3**	7.4	**4.8**	4.2	8.9
Equity Market Neutral	15.5	**15.6**	8.7	11.1	**2.7**	**16.3**	14.2	13.6	**8.3**	10.8	14.6	3.5	11.7
Merger Arbitrage	**0.4**	17.9	7.9	**20.2**	8.9	17.9	16.6	16.4	**7.2**	14.3	**18.0**	1.5	12.6
Distressed Securities	6.4	**35.7**	25.2	**32.5**	3.8	19.7	20.8	15.4	**-4.2**	16.9	2.7	4.7	15.0
Macro	12.6	**46.7**	27.2	**53.3**	**-4.3**	29.3	9.3	18.8	6.2	17.6	**2.0**	5.7	18.4
Equity Hedge	14.4	**40.1**	21.3	27.9	**2.6**	31.0	21.8	23.4	16.0	**46.1**	**9.1**	1.4	21.5
Equity Non-Hedge	**-7.2**	**57.1**	22.8	27.4	5.1	34.8	25.5	17.6	9.8	**41.8**	**-9.0**	3.7	18.4
Emerging Markets	-3.4	45.4	24.4	**79.2**	3.4	0.7	27.1	16.6	**-33.0**	**55.9**	**-10.7**	7.5	14.7
Managed Futures**	N/A	N/A	N/A	N/A	12.0	**-7.1**	**12.0**	3.1	**20.6**	**-4.7**	4.3	-0.8	3.9

Source: HFR, CSFB/Tremont, Datastream
*ending June 2001
**from CSFB/Tremont
Based on total US$ returns.

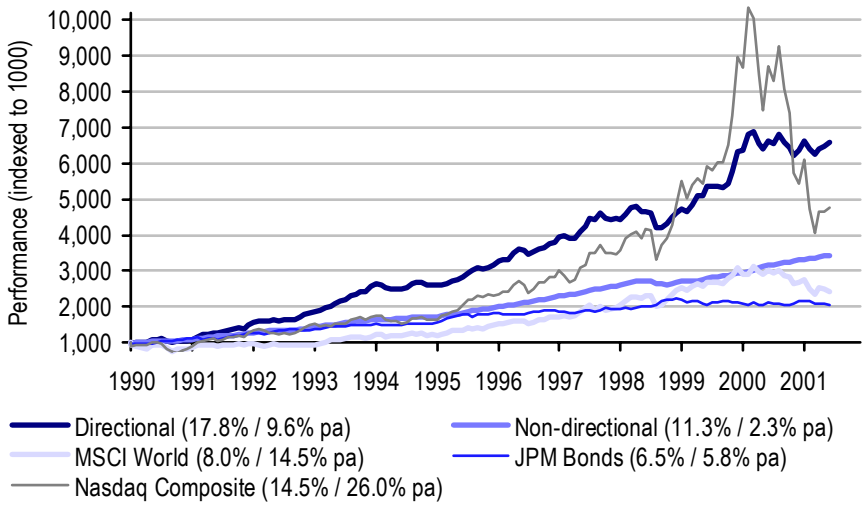
- On an absolute basis, 2000 was one of worst years for equities as well as most hedge fund strategies. Only for merger arbitrage was it one of the best. On one hand this sounds counterintuitive, as 2000 was the year when hedge funds became broadly 'en vogue'. On the other hand this could be an indication that some hedge fund strategies are niche strategies and suffer when swamped with capital.

- 1999 was good for most directional hedge fund strategies, while 1998 (LTCM) was bad for spread-related strategies. Note that there is a tendency for some years to be uniformly good and others uniformly poor.

Directional versus Non-directional Hedge Fund Exposure

As we have pointed out already, the most relevant distinction is between directional and non-directional. For the following graphs we have created a portfolio of five directional and five non-directional strategies. The portfolios were equally weighted with monthly rebalancing. The two hypothetical portfolios were compared with two equity indices and one global bond index.

Chart 45: Performance of Hypothetical Directional versus Non-directional Portfolio



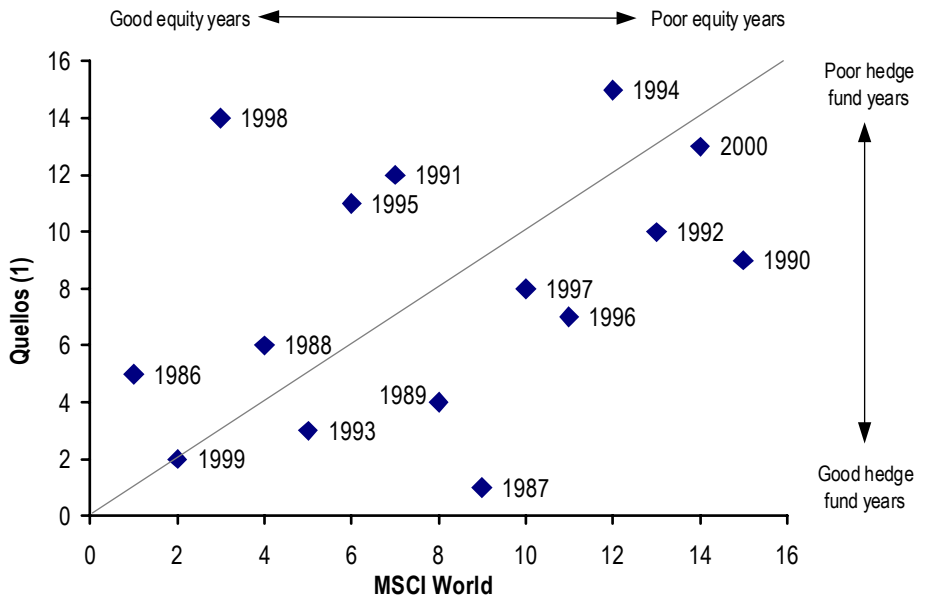
Source: HFR, Datastream, UBS Warburg calculations
Non-directional includes equity market-neutral, statistical arbitrage, CB arbitrage, fixed income arbitrage, and risk arbitrage.
Directional includes equity hedge, equity non-hedge, macro, emerging markets, and market timing.
Based on total US$ returns
Directional and non-directional portfolio are equally weighted and assume monthly rebalancing.
Figures in brackets show annual return and volatility respectively.

- In the past, the directional portfolio has compounded at 17.8% with 9.6% volatility while the non-directional portfolio has grown at a rate of 11.3% with 2.3% volatility.

The following graph compares the ranking of the 15 annual returns of MSCI World compared with the large fund of funds universe from Quellos. A reading in the lower left hand corner indicates a good year for both equities and hedge funds and a reading in the upper right hand corner indicates a bad year for both strategies. A reading in the lower right hand corner indicates a good year for hedge funds (low

ranking) and bad year for equities (high ranking). The upper left-hand corner shows the opposite, ie low ranking for hedge funds and high ranking for equities.

Chart 46: Ranking of Annual Returns: Funds of Funds versus MSCI World



Source: Quellos, Datastream, UBS Warburg calculations

- 1986 ranked as the best year for equities but was an average year for hedge funds. Relatively speaking, 1990 and 2000 were the worst years for global equities.

- 1987 was the best year for hedge funds but an average year for global equities. Based on the data chosen, 1994 and 1991 were the worst years for hedge funds. Based on HFR fund of funds data, 1998 and 1994 were the worst.

- 1987, 1999 and 1996 ranked as exceptional years for funds of funds, while 1986, 1998 and 1999 were best for global equities.

Our conclusion from looking at the ranking of annual returns (as opposed to relative performance) is that there are years where both perform poorly (upper right-hand corner) or both perform well (lower left-hand corner). In addition there are years where one ranks high and the other low (upper left-hand and lower right-hand corners). Therefore, if both have long-term positive but uncertain expected returns, it makes sense to combine the two in a portfolio construction context.

Low correlation is the rule, high correlation the exception

The practical implication of this analysis is that it is probably difficult to time the market and decide in which year it is best to be in one of the two (equities or hedge funds). The resultant portfolio implementation strategy for the long-term investor, we believe, therefore is to be exposed to both, as low correlation is the rule and high correlation the exception.

Closing Remarks

"The efficient market hypothesis is the most remarkable error in the history of economic theory."
Lawrence Summers, after the 1987 crash[1]

Passive investment strategies are gaining momentum everywhere around the globe. The benefits are convincing and the support from academia is overwhelming. The current trend of increased flows into hedge funds could be viewed as a counter-trend. Hedge funds, almost by definition, employ an active investment style. Their focus is absolute returns, which could be viewed as exactly the opposite of relative returns.

Some capital markets are more informationally efficient than others. There are probably more analysts covering Microsoft than Hanjin Shipping. If information is easily obtainable, flows freely and is cheap, there is probably less value to be added through actively searching for an informational advantage to be exploited financially. Hence the trend in asset management towards replacing active exposure in efficient markets with the superior passive alternative and allocating satellites to active specialists operating in less efficient markets.

Although hedge funds are occasionally portrayed as a separate asset class, the point could be made that they are not. One could view the strategies executed by hedge funds and other proprietary trading accounts as a different investment style to long-only. We could argue that value and growth styles are subgroups of relative-return managers, whereas long/short and market-neutral strategies are subgroups of absolute-return managers. From this point of view, hedge funds are just an extension of investment styles in asset management.

How do fund of hedge funds fit in?

An active long-only strategy stems from a time when markets were less efficient than today and there were few or no alternative ways of getting exposure to a market by diversifying systematic risk. It also stems from a time when there were fewer investment style opportunities and the degree of complexity and flexibility in financial instruments was lower. We believe that the market is migrating to the view that it does not make much sense to attempt to get an informational advantage in an informationally efficient market. If this is the case, flows to specialists adopting an active approach in markets where there is no passive alternative might continue to flourish. Given that a fund of hedge funds manager operates in a market as inefficient and opaque as the hedge fund industry, we believe they have a strong value proposition. However, economic logic suggests that over time the costs of active management (fees) are correlated with the set of exploitable opportunities and, therefore, inversely related to efficiency improvements of the market place. In the long-term, that is.

[1] From Lowenstein (2000), p72.

Appendix

Performance Attribution Analysis

In this section we give some more detail of the report by Fung and Hsieh (1997a). The authors used nine asset classes: MSCI US equity, MSCI non-US equity, JPM US government bonds, JPM government non-US bonds, one-month eurodollar deposit, the US dollar (Federal Reserve's Trade-Weighted Dollar Index), gold, IFC emerging markets and high-yield corporate bonds. This refers to the section on the double fee structure on page 43 and Chart 26 on page 44. We also look at some other performance-related articles from academia.

Mutual Fund Performance Attribution and Style Analysis

The authors run style regressions for 3,327 open-ended mutual funds in the Morningstar database (updated through December 1995), which have at least 36 months of returns. Chart 26 on page 44 summarises the distribution of R^2s of the regressions. It shows that 47% of the mutual funds have R^2s above 75%, and 92% have R^2s higher than 50%. The two most statistically significant factors where US equity and US government bonds. 87% of mutual funds were correlated to these two asset classes. In 99% of the funds, the coefficients of the most significant asset class are positive.

The authors note that the high correlation between mutual fund returns and standard asset class returns implies that choosing the style mix among mutual funds is similar to determining the asset mix in one's portfolio.

The high level of correlation between mutual fund returns and asset classes indicates that mutual fund styles are basically buy-and-hold strategies utilising various asset classes. The two exceptions were high yield corporate bond funds and municipal bond funds, which have low correlation with the eight asset classes.

Hedge Fund Performance Attribution

The regression was run on 406 hedge funds and CTA pools[1], which have at least 36 months of returns and at least US$5m in assets under management.

While more than half the mutual funds have R^2s above 75%, nearly half (48%) of the hedge funds have R^2s below 25%. No single asset class is dominant in the regressions, unlike with mutual funds where US equities and US bonds are dominant. Unlike mutual funds, a substantial fraction (25%) of hedge funds are negatively correlated with the standard asset classes.

The authors mention that the evidence indicates that hedge funds are dramatically different from mutual funds. Mutual fund returns have high and positive correlation with asset class returns, which suggests that they behave as if deploying a buy-and-hold strategy. Hedge fund returns have low and sometimes negative correlation with asset class returns.

[1] Managed futures or CTA funds invest in listed financial and commodity futures markets and currency markets around the world. The managers are usually referred to as Commodity Trading Advisors, or CTAs. Trading disciplines are generally systematic or discretionary. Systematic traders tend to use price and market-specific information (often technical) to make trading decisions, while discretionary managers use a judgmental approach. Some market observers view CTAs as hedge funds, while others see them as a separate discipline.

Fitting Hedge Fund Returns to Traditional Asset Class Returns

Performance attribution is important for all investors. Understanding the links between investment styles and traditional asset classes is paramount in the way investment strategies are implemented and how they relate to overall portfolio efficiency. A lot of the academic work tries to find asset-based style factors to model hedge fund returns. Sharpe (1992) is most often the starting point. Bill Sharpe's paper was intended to be an asset-class model that reduced the myriad mutual fund styles to a model involving only a limited number of major asset classes. The paper provides an explicit link between investment styles and traditional asset classes. Table 19 highlights some of the more recent research on hedge fund performance and performance attribution.

Table 19: Selection of Papers on Hedge Fund Performance and Performance Attribution

Authors	Title	Conclusions
McCarthy and Spurgin (1998a)	A Comparison of Return Patterns in Traditional and Alternative Investments	The authors find that over the time period analysed (1990-97), hedge funds offered risk-adjusted returns greater than traditional stock and bond investments. However, results also demonstrate that there are considerable differences in the relative performance of these hedge fund indices. These differences are sizeable enough that investors must realise that the use of seemingly similar benchmark hedge fund indices may result in different asset allocation decisions.
Schneeweis and Spurgin (1998)	Multi-Factor Analysis of Hedge Fund, Managed Futures, and Mutual Funds Return and Risk Characteristics	In this study, a wide set of factors is used to describe return movement of both traditional stock and bond funds and managed futures and hedge fund investment. Results indicate that a different set of market factors explains returns of mutual funds, hedge funds and managed futures investment, and that, correspondingly, each investment can contribute to a diversified portfolio.
McCarthy and Spurgin (1998b)	A Review of Hedge Fund Performance Benchmarks	The authors examine the benchmark composition and performance of three hedge fund indices: Management Accounts reports, Hedge Fund Research, and Evaluation Associates Capital Management. Data from 1990-97 indicate that these three indices all have similar risk-adjusted returns but have significantly higher Sharpe ratios than selected equity and fixed-income benchmarks. Furthermore, results indicate that correlation of hedge fund index returns with equity index returns is positive, depending on hedge fund strategy.
Brown, Goetzmann and Park (1999)	Conditions for Survival: changing risk and the performance of hedge fund managers and CTAs	The authors investigated whether hedge fund and CTA return variance depends on whether the manager is doing well or poorly. Results show that managers whose performance is relatively poor increase the volatility of their funds, whereas managers whose performance is favourable decrease volatility. This is consistent with adverse incentives created by the existence of performance-based fee arrangements. A corollary of this theory is that managers whose performance contract is out of the money should increase volatility most. The data simply does not support this further implication – managers whose return is negative do not substantially increase volatility. In some years of the sample, the authors found that they even decrease the volatility of their fund's return. Thus, while the data fit with certain conjectures derived from theory about investment manager compensation, they appear to contradict others. The authors find that relative returns and volatility play a role in determining which funds survive. In addition, the longer a fund is in business, the less likely it is to fail. Since the managers' performance fee contract dies with the fund, it is perfectly reasonable that they should care about relative performance and avoid excess volatility. This is particularly true for young funds. Such funds are more likely to fail, other things being equal.

Authors	Title	Conclusions
Liang (1999)	On the Performance of Hedge Funds	The author argues that empirical evidence indicates that hedge funds differ substantially from traditional investment vehicles, such as mutual funds. Hedge funds' special fee structures apparently align managers' incentives with fund performance. Funds with 'high watermarks' significantly outperform those without. Hedge funds provide higher Sharpe ratios than mutual funds, and their performance in the period of January 1992 through December 1996 reflects better manager skills, although hedge fund returns are more volatile. Average hedge fund returns are related positively to incentive fees, fund assets, and the lockup period. The outperformance cannot be explained by survivorship bias.
Agarwal and Naik (2000a)	Multi-Period Performance Persistence Analysis of Hedge Funds	The authors examined the extend of before and after-fee performance persistence exhibited by hedge funds during 1982 to 1998 using the traditional two-period framework and contrasted the findings with those observed using a multi-period framework. Given the significant lockup period with hedge funds, the authors also examined if persistence observed is sensitive to whether the returns are measure over quarters or over years. Results suggest that there exists a considerable amount of persistence at a quarterly horizon, which decreases as one moves to yearly returns, indicating that persistence among hedge fund managers is primarily short-term in nature. Whenever persistence is observed, it is mainly driven by losers continuing to be losers instead of winners continuing to be winners. The authors also find that persistence seems to be unrelated to the type of strategy followed by the fund.
Agarwal and Naik (2000b)	Performance Evaluation of Hedge Funds with Option-based and Buy-and-Hold Strategies	The authors examined the performance of hedge funds following different strategies using a generalised asset-class factor model consisting of excess returns on buy-and-hold strategies and passive option-based strategies. This model is able to explain a significant proportion of variation in hedge fund returns over time. The result of this study suggested that only 35% of the hedge funds have added significant value in excess of monthly survivorship bias of 0.30%. Performance varies over time. 37% of the funds added value in the early 1990s compared to 28% in the late 1990s. A comparison of averages and the distribution of alphas and information ratios of funds that use leverage with those that do not suggested that the two are statistically indistinguishable in a majority of cases.
Agarwal and Naik (2000c)	On Taking the 'Alternative' Route: The Risks, Rewards, and Performance Persistence of Hedge Funds	The risk-return characteristics, risk exposures, and performance persistence of various hedge fund strategies remains an area of interest to alternative asset investors. Using a database on hedge fund indices and individual hedge fund managers in a mean-variance framework, the results show that a combination of alternative investments and passive indexing provides a significantly better risk-return trade-off than passively investing in the different asset classes. Moreover, using parametric and non-parametric methods, a reasonable degree of persistence is found for hedge fund managers. This seems to be attributable more to the losers continuing to be losers instead of winners continuing to be winners, highlighting the importance of manager selection in case of hedge funds.
Mitchell and Pulvino (2000)	Characteristics of Risk and Return in Risk Arbitrage	The authors studied a sample of 4,750 stock swap mergers, cash mergers and cash tender offers during 1963-1998 to determine the risk and reward characteristics associated with risk arbitrage. Furthermore, the authors examined the performance of a sample of active risk arbitrage hedge funds during 1990-1998. Results from both samples indicate that risk arbitrage returns are positively correlated with market returns in severely depreciating markets but uncorrelated with market returns in flat and appreciating markets. This risk arbitrage return profile is similar to those obtained from selling uncovered index put options. As such, risk arbitrage may be better evaluated using a contingent claims analysis rather than a linear asset-pricing model such as the CAPM. Overall, results indicate that risk arbitrage generated excess annual returns of roughly 400bp.
Amin and Kat (2001)	Hedge Fund Performance 1990-2000	The authors analysed the performance of 77 hedge funds and 13 hedge fund indices over the period May 1990 to April 2000. Their results shows that hedge funds do not offer a superior risk-return profile as a stand-alone investment. Hedge funds score much better when seen as part of an investment portfolio. Due to their weak relationship with the index, 7 of the 12 hedge fund indices and 58 or the 72 individual funds classified as inefficient on a stand-alone basis are capable of producing an efficient payoff profile when mixed with the S&P 500. The best results are obtained when 10-20% of the portfolio value is invested in hedge funds. A sample of UK equity mutual funds studied shows levels of inefficiency that by far exceed those of the hedge funds. Given that hedge funds charge higher fees and are unlikely to be better

Authors	Title	Conclusions
		diversified or to incur lower transaction costs than mutual funds, this suggests that hedge fund managers tend to be more skilled than mutual fund managers.
Fung and Hsieh (2001a)	Asset-Based Hedge Fund Styles and Portfolio Diversification	The authors extend the Sharpe style model, which is intended to be an asset-class model that reduces the myriad mutual fund styles to a model involving only a limited number of major asset classes to account for return characteristics of hedge funds. Results showed that hedge fund strategies with a directional component could be modelled with 'long-only' asset-based style factors in the form of conventional indices. This methodology explained more than 50% of the observed variance in hedge fund returns. Due to the option-like return characteristics of hedge funds, techniques incorporating non-linear return and risk patterns are required to improve on the explanatory power of this model.
Fung and Hsieh (2001b)	The Risk in Hedge Fund Strategies: Theory and Evidence from Trend Followers	Due to the option-like return distribution of hedge funds strategies, the explanatory power of linear factor models using benchmark asset indices is limited at best. The authors show how to model hedge fund returns by focusing on the popular 'trend-following' strategy. By using lookback straddles to model trend-following strategies, the authors show that lookback straddles can explain trend-following returns better than standard asset indices. The first implication of this study is that trend-following funds do have systematic risk not observable with standard asset benchmarks. The second implication is that trend followers, or a portfolio of lookback straddles on FX, bonds and commodities, can reduce the volatility of a typical stock and bond portfolio during extreme market downturns. The authors suggest that the model is useful in the design of performance benchmarks for trend-following funds.
Fung and Hsieh (2001c)	Benchmarks of Hedge Fund Performance: Information Content and Measurement Biases	This paper revolves around the information content and potential measurement biases in hedge fund benchmarks. Hedge fund indices built from a database of individual hedge funds will suffer from measurement biases. The authors argue that the most direct way of measuring hedge fund performance is to observe the investment experience of hedge fund investors themselves. In terms of measurement biases, returns of funds of hedge funds can deliver a better estimate of investment experience of hedge fund investors. In terms of risk characteristics, indices of funds of funds are more indicative of the demand side dynamics driven by investor preference of hedge funds. The authors conclude that indices of funds of hedge funds can provide additional valuable information to the assessment of the performance of the hedge fund industry.
Brown and Goetzmann (2001)	Hedge Funds with Style	The authors studied the monthly return history of hedge funds during 1989 to 2000 and find that there are at least eight different distinct styles of management. Results show that the persistence of fund returns from year to year has a lot to do with the particular style of fund management and that 20% of the variability of fund returns can be explained solely by the style of management. The authors concluded that appropriate style analysis and style management are critical success factors for investors looking to invest in the hedge fund market.
Edwards and Caglayan (2001a)	Hedge Fund Performance and Manager Skill	Using data on the monthly returns of hedge funds during the period 1990 to 1998, the authors estimate six-factor Jensen alphas for individual hedge funds employing eight different investment styles. Result shows that 25% of hedge funds earn positive excess returns, and the frequency and magnitude of funds' excess returns differ markedly by investment style. Performance persistence was found for both winners and losers. The excess return is partially attributable to the skill of hedge fund managers.
Edwards and Caglayan (2001b)	Hedge Fund and Commodity Fund Investment Styles in Bull and Bear Markets	A primary motivation for investing in hedge funds and commodity funds is to diversify against falling stock prices. The authors evaluate the performance of 16 different such funds during rising and falling stock markets between 1990 and 1998 both as stand-alone assets and as portfolio assets. They use the Sharpe ratio and alternative safety-first criteria to evaluate performance. The conclusion is that commodity funds generally provide more downside protection than hedge funds. Commodity funds have higher returns in bear markets than hedge funds, and generally have an inverse correlation with stock returns in bear markets. Hedge funds typically exhibit a higher positive correlation with stock returns in bear markets than in bull markets. Three hedge fund styles – market-neutral, event-driven, and global macro – provide fairly good downside protection, with more attractive returns over all markets than commodity funds.

Source: see Bibliography

Monthly Returns of Hedge Fund Portfolio

The following tables show the monthly returns of the three skill-based mean-variance-efficient portfolios in Table 13 on page 53.

Table 20: Monthly Returns of Minimum Risk Portfolio

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1990	-0.45	0.87	1.01	1.28	1.06	1.13	0.75	0.51	0.02	0.43	0.71	0.93	8.56
1991	1.92	1.16	2.05	1.16	0.94	0.92	1.99	0.57	0.69	0.89	0.86	1.71	15.91
1992	1.92	1.27	1.20	0.70	0.64	0.37	1.16	0.52	0.86	1.48	0.80	1.69	13.35
1993	1.31	1.04	1.62	0.84	1.13	1.55	1.26	1.27	1.59	0.80	0.19	1.13	14.63
1994	1.18	0.58	-0.04	-0.24	0.00	0.68	0.72	0.53	0.33	0.05	-0.23	0.12	3.73
1995	0.50	1.06	1.75	1.37	0.77	1.03	2.13	1.01	0.90	1.39	1.02	1.19	15.06
1996	1.73	0.97	0.98	1.18	1.44	1.02	0.89	1.04	0.81	1.55	0.57	1.14	14.15
1997	1.17	0.65	0.59	0.64	1.28	1.49	1.60	0.63	1.53	0.88	0.50	0.80	12.40
1998	0.95	1.25	1.33	1.07	0.23	0.49	0.28	-2.61	-1.05	-1.21	1.36	2.15	4.23
1999	0.97	-0.20	0.55	0.76	0.80	1.55	1.35	0.41	0.77	0.62	1.25	2.39	11.79
2000	0.26	2.03	0.61	2.01	1.23	1.36	0.22	2.08	1.03	0.21	0.47	1.19	13.44
2001	0.72	1.41	0.93	0.50	0.65								4.28

Source: HFR, UBS Warburg calculations

- The minimum risk portfolio outperformed the maximum return portfolio in the years 1994 (by 112 basis points), 2000 (435bp) and 2001 to May (263bp).

Table 21: Monthly Returns of Maximum Return Portfolio

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1990	-3.34	2.85	5.67	-0.87	5.92	2.52	2.00	-1.88	1.65	0.77	-2.29	1.02	14.43
1991	4.90	5.20	7.22	0.47	3.20	0.59	1.41	2.17	4.30	1.16	-1.08	5.02	40.15
1992	2.49	2.90	-0.28	0.27	0.85	-0.92	2.76	-0.85	2.51	2.03	4.51	3.38	21.32
1993	2.09	-0.57	3.26	1.30	2.72	3.01	2.12	3.84	2.52	3.11	-1.93	3.59	27.94
1994	2.35	-0.40	-2.08	-0.37	0.41	-0.41	0.91	1.27	1.32	0.40	-1.48	0.74	2.61
1995	0.30	1.68	2.09	2.64	1.22	4.73	4.46	2.93	2.90	-1.44	3.43	2.56	31.04
1996	1.06	2.82	1.90	5.34	3.70	-0.73	-2.87	2.63	2.18	1.56	1.66	0.83	21.75
1997	2.78	-0.24	-0.73	-0.27	5.04	1.97	5.05	1.35	5.69	0.39	-0.93	1.42	23.41
1998	-0.16	4.09	4.54	1.39	-1.27	0.50	-0.67	-7.65	3.16	2.47	3.84	5.39	15.98
1999	4.98	-2.41	4.05	5.25	1.22	3.80	0.61	0.04	0.45	2.74	7.23	11.30	46.14
2000	0.25	10.00	1.73	-4.19	-2.44	4.85	-1.58	5.35	-1.08	-2.01	-4.30	3.16	9.09
2001	2.88	-2.65	-2.35	2.44	1.46								1.65

Source: HFR, UBS Warburg calculations

Table 22: Monthly Returns of Portfolio Structured to have 5% Volatility of Returns

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1990	-2.62	1.63	3.36	0.14	3.31	1.81	1.44	-0.96	-0.20	0.67	-0.17	1.15	9.81
1991	2.43	3.16	4.76	0.86	1.70	0.94	1.79	1.91	3.05	1.32	0.27	3.55	28.90
1992	2.15	1.84	0.43	0.34	1.30	-0.05	1.97	-0.31	1.88	1.72	2.14	2.35	16.90
1993	1.90	0.96	2.69	1.26	1.99	3.09	1.95	2.74	1.78	2.45	-0.84	3.13	25.63
1994	1.85	-1.03	-1.30	-0.47	0.53	0.07	0.83	1.27	0.68	0.11	-0.83	0.43	2.12
1995	0.28	1.53	1.81	1.81	1.36	2.95	3.28	2.50	2.45	-0.13	2.63	2.15	25.05
1996	1.96	1.22	1.44	3.41	2.34	-0.09	-1.41	1.85	1.64	1.54	1.74	0.76	17.61
1997	2.41	0.32	-0.23	-0.08	3.25	1.90	3.87	0.80	3.91	0.37	-0.09	1.46	19.29
1998	0.34	2.80	3.35	1.14	-0.61	0.62	-0.40	-5.81	1.62	1.16	2.90	3.85	11.12
1999	2.94	-1.50	2.44	3.63	1.01	2.85	0.88	0.15	0.65	1.60	4.84	7.72	30.46
2000	0.49	6.78	1.05	-2.19	-1.26	3.42	-0.70	3.85	-0.48	-1.13	-2.27	2.64	10.23
2001	2.06	-1.25	-1.03	1.43	1.18								2.36

Source: HFR, UBS Warburg

Correlation Matrixes

The following three tables show correlation coefficients in more detail than shown in Table 12 on page 52.

Table 23: Correlation Coefficients for a Selection of Traditional and Alternative Indices (1990-2001)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**MSCI World**	1														
2	**S&P 500**	0.83	1													
3	**Nasdaq Composite**	0.68	0.78	1												
4	**MSCI EAFE**	0.94	0.59	0.50	1											
5	**MSCI Europe**	0.86	0.69	0.56	0.85	1										
6	**JPM Global Bonds**	0.34	0.20	0.08	0.38	0.38	1									
7	**Equity market-neutral**	0.16	0.17	0.20	0.13	0.18	0.13	1								
8	**Convertible Arbitrage**	0.32	0.35	0.37	0.25	0.26	-0.03	0.13	1							
9	**Fixed Income Arbitrage**	0.00	-0.05	0.03	0.05	0.07	-0.29	0.05	0.13	1						
10	**Risk arbitrage**	0.37	0.44	0.36	0.29	0.33	0.05	0.13	0.46	-0.05	1					
11	**Distressed securities**	0.36	0.40	0.49	0.28	0.36	-0.16	0.17	0.59	0.37	0.50	1				
12	**Macro**	0.46	0.45	0.46	0.40	0.44	0.09	0.24	0.40	0.12	0.28	0.46	1			
13	**Equity hedge***	0.59	0.64	0.82	0.47	0.52	0.07	0.39	0.47	0.06	0.41	0.58	0.60	1		
14	**Equity non-hedge****	0.69	0.78	0.91	0.54	0.58	0.07	0.23	0.48	0.09	0.47	0.64	0.59	0.89	1	
15	**Emerging markets**	0.61	0.58	0.58	0.54	0.56	-0.05	0.13	0.46	0.28	0.42	0.66	0.62	0.64	0.70	1
	Off-diagonal correlation	0.52	0.49	0.49	0.44	0.47	0.09	0.17	0.33	0.06	0.32	0.41	0.40	0.51	0.55	0.48

Source: HFR, UBS Warburg calculations

Calculations based on monthly US$ total returns: January 1990 – July 2001.

The off-diagonal correlation measures the average correlation of one subject with all subjects in the correlation matrix except itself (correlation of 1).

*Equity Hedge investing consists of a core holding of long equities hedged at all times with short sales of stocks and/or stock index options. Some managers maintain a substantial portion of assets within a hedged structure and commonly employ leverage. Where short sales are used, hedged assets may be comprised of an equal dollar value of long and short stock positions. Other variations use short sales unrelated to long holdings and/or puts on the S&P 500 index and put spreads. Conservative funds mitigate market risk by maintaining market exposure from 0% to 100%. Aggressive funds may magnify market risk by exceeding 100% exposure and, in some instances, maintain a short exposure. In addition to equities, some funds may have limited assets invested in other types of securities.

**Equity Non-Hedge funds are predominately long equities although they have the ability to hedge with short sales of stocks and/or stock index options. These funds are commonly known as 'stock-pickers'. Some funds employ leverage to enhance returns. When market conditions warrant, managers may implement a hedge in the portfolio. Funds may also opportunistically short individual stocks. The important distinction between equity non-hedge funds and equity hedge funds is that equity non-hedge funds do not always have a hedge in place. In addition to equities, some funds may have limited assets invested in other types of securities.

Table 24: Correlation Coefficients for a Selection of Traditional and Alternative Indices (1995-2001)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**MSCI World**	1														
2	**S&P 500**	0.93	1													
3	**Nasdaq Composite**	0.77	0.77	1												
4	**MSCI EAFE**	0.93	0.74	0.65	1											
5	**MSCI Europe**	0.87	0.73	0.63	0.91	1										
6	**JPM Global Bonds**	0.19	0.14	0.06	0.24	0.23	1									
7	**Equity market-neutral**	0.26	0.22	0.21	0.28	0.33	0.12	1								
8	**Convertible Arbitrage**	0.39	0.38	0.40	0.35	0.32	-0.22	0.20	1							
9	**Fixed Income Arbitrage**	-0.04	-0.10	-0.02	0.04	0.09	-0.30	0.15	0.34	1						
10	**Risk arbitrage**	0.46	0.46	0.37	0.40	0.43	-0.01	0.29	0.55	0.00	1					
11	**Distressed securities**	0.50	0.48	0.54	0.46	0.48	-0.20	0.21	0.73	0.36	0.56	1				
12	**Macro**	0.50	0.48	0.52	0.47	0.50	-0.06	0.36	0.38	0.19	0.29	0.51	1			
13	**Equity hedge**	0.71	0.66	0.86	0.66	0.64	0.05	0.40	0.51	0.05	0.50	0.65	0.66	1		
14	**Equity non-hedge**	0.78	0.76	0.91	0.69	0.65	0.06	0.27	0.54	0.04	0.51	0.69	0.62	0.94	1	
15	**Emerging markets**	0.65	0.60	0.59	0.60	0.55	-0.23	0.22	0.53	0.22	0.49	0.74	0.60	0.70	0.72	1
	Off-diagonal correlation	0.57	0.52	0.52	0.53	0.53	0.01	0.25	0.39	0.07	0.38	0.48	0.43	0.57	0.58	0.50

Source: HFR, UBS Warburg calculations

Calculations based on monthly US$ total returns: January 1995 – July 2001.

Table 25: Correlation Coefficients for a Selection of Traditional and Alternative Indices (1999-2001)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**MSCI World**	1														
2	**S&P 500**	0.95	1													
3	**Nasdaq Composite**	0.81	0.75	1												
4	**MSCI EAFE**	0.94	0.79	0.75	1											
5	**MSCI Europe**	0.87	0.72	0.70	0.94	1										
6	**JPM Global Bonds**	0.27	0.15	0.03	0.40	0.40	1									
7	**Equity market-neutral**	0.15	0.03	0.09	0.26	0.29	0.15	1								
8	**Convertible Arbitrage**	0.18	0.24	0.31	0.09	0.00	-0.20	-0.11	1							
9	**Fixed Income Arbitrage**	0.18	0.14	0.22	0.21	0.17	-0.02	0.02	0.22	1						
10	**Risk arbitrage**	0.04	0.03	0.07	0.06	0.05	0.07	0.09	0.24	0.28	1					
11	**Distressed securities**	0.40	0.38	0.62	0.34	0.27	-0.02	-0.06	0.52	0.10	0.06	1				
12	**Macro**	0.47	0.32	0.61	0.58	0.58	0.13	0.33	0.10	0.15	0.03	0.51	1			
13	**Equity hedge**	0.75	0.64	0.88	0.76	0.71	0.12	0.33	0.36	0.22	0.18	0.68	0.79	1		
14	**Equity non-hedge**	0.81	0.74	0.94	0.77	0.70	0.14	0.14	0.37	0.25	0.15	0.71	0.72	0.94	1	
15	**Emerging markets**	0.73	0.65	0.74	0.70	0.59	-0.03	0.12	0.24	0.13	0.03	0.69	0.73	0.81	0.83	1
	Off-diagonal correlation	0.54	0.47	0.54	0.54	0.50	0.11	0.13	0.18	0.16	0.10	0.37	0.43	0.58	0.59	0.50

Source: HFR, UBS Warburg calculations

Calculations based on monthly US$ total returns: January 1999 – July 2001.

Selection of Essays[1]

Who's Long?

Market-neutral versus Long/short

Introduction

Market-neutral and long/short equity are different absolute-return strategies

Over the past few months we have had a few arguments with investors with regard to the difference between long/short and market-neutral strategies. Some investors disagreed with our view that long/short equity is not the same as market-neutral. We attempt to clarify. We – despite the debate – still believe that long/short equity and equity market-neutral is not the same strategy and we also believe that this view is the consensus. We will try not to be judgmental, favouring one strategy over the other. Both strategies are different in design and serve different purposes. We will leave it to the investor to decide which strategy will deliver superior performance if equities do not start compounding at 20% year again.

Beta-neutral

Traditionally market-neutral investing has been the domain of arbitrageurs looking for small pricing discrepancies between assets that are more often than not beta- and delta-neutral. The nature of such trades is that the securities on each side of the transaction have a proven interrelationship, where at some point in the future they will become fairly priced in relation to one another. It is trading pricing discrepancies ahead of this eventual convergence that offers the investment opportunity, independent of what the market may be doing.

Long/short is not a conversion play

Some equity long/short managers have borrowed the market-neutral brand to describe a strategy of taking a long position in one stock against a short position of a similar size in another, whether or not they are in the same sector. This type of investing, while it may be implemented with every conceivable effort taken to minimise volatility, nonetheless represents two separate strategies. There is no proscribed convergence at some future date that will ensure that the stocks' values match one another. Indeed in this kind of trade the short could rise indefinitely, resulting in theoretically unlimited losses. The stocks could also exhibit very different volatility characteristics even when they are in the same sector. Both stocks could fall or rise significantly together, or indeed inversely but not in the desired direction, thus magnifying losses.[2]

Beta merchants and hedge funds

According to Ian Wace (2000) of Marshall Wace Asset Management, the average correlation of the average European hedge fund to the market is 0.89 while the average net market exposure is 85%.[3] He noted that since the returns are derived mainly from market moves, these funds are 'beta merchants, not hedge funds'. We believe a point can be made that investing in hedge funds is about investment philosophies and strategies based on exploiting market inefficiencies by controlling risk and not based on the attempt to be smarter than the market.

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[1] Stand-alone, independent from main theme. Appeared in our monthly AIS performance update, which is not distributed in the US, Canada or Japan.

[2] From Laxey Partners (2001)

[3] This statement dates back to April 2000. Due to high holdings in cash, we today would intuitively expect the average market exposure of European long/short funds to be lower than 85% today than in April 2000.

Equity Market-neutral

Equity market-neutral is flat at all times

We understand a market-neutral strategy to be neutral at all times, ie beta is kept close to zero and the performance is attributed to stock-specific risk and not market timing risk. Managers normally hold a large number of long equity positions and an equal, or close to equal, dollar amount of offsetting short positions, for a total net exposure close to zero. A zero net exposure, referred to as 'dollar neutrality', is a common characteristic of all equity market-neutral managers.[1] Some, but not all, equity market-neutral managers extend the concept of neutrality to risk factors or characteristics such as beta, sector, investment style and market capitalisation. Their goal is to generate consistent moderate returns in both up and down markets. In equity market-neutral we distinguish between fundamental arbitrage and statistical arbitrage.

Difference between Fundamental and Statistical Arbitrage

Fundamental and statistical arbitrage are both market-neutral strategies

Fundamental as well as statistical arbitrage are market-neutral strategies.[2] The former buys and sells shares based on a fundamental view, whereas the latter uses quantitative models to create long and short portfolios. The factors in the quantitative models of the statistical arbitrageur are fundamental variables as well. The overlaying theme is most often mean reversion. The difference between a fundamental market-neutral manager and a long/short manager is, in our opinion, that the former is not involved in market timing, ie beta is held at zero at all times.

Statistical arbitrage strategies are most often based on mean-reversion

Statistical arbitrage involves creating groups of stocks that are fundamentally similar in some aspect, and then trying to exploit anomalous, statistical relationships between stocks within each group. Most common among these relationships is the tendency of the valuations of similar stocks to revert to the mean of the group. Stocks with valuations above the mean of the group are sold short, and stocks with valuations below the mean are held long. The expectation is that both sides will eventually converge on the mean of the group.

Insurers, banks, casinos are all in the business of statistical arbitrage

The basic assumption behind mean-reversion strategies is that anomalies among stock valuations may occur in the short term but, in the long term, these anomalies will correct themselves as the market processes information. The reason we like the term 'statistical arbitrage' for this particular strategy is because the mean reversion does not always work, but by doing it over and over again in a disciplined fashion it should work more often than not (assuming the mean reversion is truly there). Statistical arbitrage always has been the underlying theme for insurance companies, casinos and, in the recent history of finance, financial intermediaries and hedge funds. An insurance company selling life or car insurance will not make money on every policy. However, if it gets the statistics right, the proceeds from the profitable policies will exceed the losses from the loss-making accounts. The same is true for a casino. It does not win with every spin of the wheel. However, most people

[1] Nicholas (2000)

[2] Note that some call – what we refer to as 'statistical arbitrage' – 'risk arbitrage'. We use the term risk arbitrage as a slightly broader classification for merger arbitrage, which includes mergers as well as special (corporate) situations.

familiar with statistics would prefer being in the position of the casino owner than in the position of the gambler.[1]

Many mean-reversion managers use a relative value system to determine buy and sell decisions.[2] Stocks sold short are usually added to the portfolio when their prices are sufficiently higher than the rest of the group. They are covered when their price drops back closer to the mean of the group. On the long side, stocks that are valued below a certain level are held long until they rise above the mean of the group. Other managers may have more absolute targets for stocks. How managers choose to set up their rules determines how much trading they do, how much turnover the portfolio experiences, and what their transaction costs are. Transaction costs and trade impact on market price are often included in mean reversion models, allowing managers to forgo trade opportunities when the cost of completing the transaction is greater than the potential gain. We believe that the average statistical arbitrageur will turn his portfolio over as often as the average long/short manager.

Table 26: Estimated Annual Portfolio Turnover

(times)	Estimated range of portfolio turnover	Estimated median of portfolio turnover
Long-only	0.1-1	0.6
Long/short equity	5-30	8
Equity market-neutral	10-50	12

Source: UBS Warburg estimates

Controlling transaction costs is key

A key to success for any active manager is control of transaction costs. This requirement often leads hedge fund managers to recognise that too much money run by the strategy will generate adverse market impact. Some funds close for new money, while others increase the fee level or lengthen the redemption period.

Skill to adapt to a changing market environment is a key variable

As markets are constantly changing, the factors that unified a group in the past may not always continue to do so.[3] Statistical arbitrage managers must determine when and if to drop stocks from their groups and/or add new ones. For example, in the flight-to-quality situation of Q3 98, market capitalisation and credit quality became such powerful drivers in the market that they could confound formerly effective themes. If the goal is to create a model based on coherent groups with unifying themes, then keeping a model dynamic requires a certain level of vigilance. Deciding which factors are driving which groups – the essential component of model building – is a skill required of the individual manager.

Pair trade involves more judgement and less statistical analysis

We view pair trading as an example of fundamental arbitrage. In our view, a pair trade is more judgmental and involves qualitative aspects as well. A pair trade involves going long on a stock in a specific industry, and pairing that trade specifically with an equal-dollar-value short position in a stock in the same industry. Philosophically, the strategy tries to insulate the portfolio from systemic moves in industries by being long in one stock and short in another. Profit is derived from the difference in price change between the two stocks, rather than

[1] What comes to mind is the institutional investor quoted in the March 2000 Ludgate AIS survey saying: 'No, we don't (currently invest in hedge funds)! It is completely obvious that hedge funds don't work. We are not a casino.'
[2] Nicholas, Joseph G. (2000)
[3] Nicholas, Joseph G. (2000)

from the direction in which each stock moves. A trade between different share categories of the same stock would be an extreme pair trade, as market, industry and most of the company-specific risk is immunised. Recent examples of such pair trades included options where a conversion of one category was conditioned on the share price of the other. Other managers (long/short, event-driven) also conduct pair trades.[1]

Human discretion is higher with fundamental arbitrage

A further distinction between statistical and fundamental arbitrage is the human discretion the managers allow in their investment process. While statistical arbitrage is to a large extent model-based, the fundamental arbitrageur is essentially a stock-picker who wants to be market-neutral when he goes home in the evening. In a sense, the fundamental arbitrageur shares the goal of market neutrality with the statistical arbitrageur and the enjoyment and thrill of stock picking with the equity long/short manager.

Table 27: Yearly Returns of Market-neutral and Long/short Equity Compared With MSCI World, 1990-01

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	1990-2001*
MSCI World	-16.5	19.0	-4.7	23.1	5.6	21.3	14.0	16.2	24.8	25.3	-12.9	-7.5	8.8
Market-neutral	15.5	15.6	8.7	11.1	2.7	16.3	14.2	13.6	8.3	10.8	14.6	1.5	11.6
Statistical arbitrage	11.2	17.8	10.8	12.6	4.7	14.2	19.6	19.4	10.1	-1.3	8.9	2.4	11.3
Equity hedge	14.4	40.1	21.3	27.9	2.6	31.0	21.8	23.4	16.0	46.1	9.1	1.6	21.7
Equity non-hedge	-7.2	57.1	22.8	27.4	5.1	34.8	25.5	17.6	9.8	41.8	-9.0	1.8	18.4

Source: HFR, MSCI, Datastream, UBS Warburg
All returns are total returns in US$
* Annualised annual return January 1990 – May 2001

Mean reversion does not always work

HFR disaggregated its statistical arbitrage index from equity market-neutral in 1999 to more accurately reflect the quantitative nature of this substrategy. The most extreme difference between the statistical arbitrage and equity market-neutral subgroups was in 1999, when mean reversion did not work as valuations kept climbing. However, the long-term annual return and risk characteristics are similar.

Long/short Equity

Long/short equity has volatility in its beta

Long/short equity has a variable beta, ie can be neutral to the market, but also net long or net short. There is an element of market exposure. The mandate is more flexible, ie more opportunistic. However, the managers in long/short equity are not a homogeneous group. Some have long biases, others are close to market-neutral or short or vary over time. The managers in the long/short equity substyle, who are close to market-neutral, are effectively pursuing a relative-value strategy and therefore are closer to the 'equity market-neutral' camp. HFR, for example, has two indices for long/short equity. One category it calls *equity non-hedge*, which has a long bias, and the second it calls *equity hedge*, which is closer to zero beta.

[1] This once more indicates that any classification system of hedge funds is ambiguous.

Difference between Equity *Hedge* and *Non-hedge*

Equity hedge is the original hedge fund business model

Of all the hedge fund strategies, equity hedge strategies have the longest name lineage.[1] They are the typical long/short strategies, and are a direct descendent of Alfred Jones's original 'hedge' fund. However, as was the case in the initial hedge fund rush of the late 1960s, during the bull market of the 1990s many practitioners have foregone the short exposure that was characteristic of the original funds. Thus, the long/short universe should be subdivided in two groups: equity hedge and equity non-hedge.

Long/short managers are involved in market timing

Equity hedge strategies combine core long holdings of equities with short sales of stock or stock index options. Their portfolios may be anywhere from net long to net short, depending on market conditions. They increase long exposure in bull markets and decrease it or even go net short in a bear market. The market environment since March 2000 is a good showcase, as many long/short managers have huge cash positions, ie little exposure to the general swings of the equity market as a whole. We believe it is in markets as these where long/short excel when compared with their long-only peer group.

Short positions are more than just a hedge

Generally, the short exposure is intended to generate an ongoing positive return in addition to acting as a hedge against a general stock market decline. In a rising market, equity hedge strategies expect their long holdings to appreciate more than the market and their short holdings to appreciate less than the market. Similarly, in a declining market, they expect their short holdings to fall more rapidly than the market falls and their long holdings to fall less rapidly than the market.

Double alpha

One of the great advantages of spread-related strategies such as long/short equity or equity market-neutral strategies is the doubling of alpha. Although not entirely uncontroversial,[2] there is the argument that a long-only manager who is restricted from selling short-only has the opportunity to generate alpha by buying or not buying stocks. A 'not-only-long manager', however, can generate alpha by buying stock as well as selling stock short. Some market observers argue that this 'double alpha' argument is faulty because an active long-only manager can over- and underweight securities, which means he is short relative to benchmark when underweight. We do not share this view because we believe there is a difference between selling short and being underweight against a benchmark. Long/short strategies can capture more alpha per unit of risk. If a stock has a weight of 0.02% in the benchmark index, the possible opportunity to underweight is limited to 0.02% of the portfolio. We would even go as far as portraying short selling as a risk management discipline of its own.

Short positions behave differently to long positions. The portfolio consequences of adverse price movements require greater diversification of short positions. If a stock moves against a short seller by increasing in price, the position increases in size. To take advantage of the now more attractively priced short-sale opportunity, the short seller faces the uncomfortable prospect of further increasing the position. Starting with a modest allocation to a particular short idea allows an increase in position size without creating an uncomfortable concentration in a single stock. Contrast the dynamics of a losing short position with the behaviour of a losing long position. As

[1] Nicholas, Joseph G. (1999)

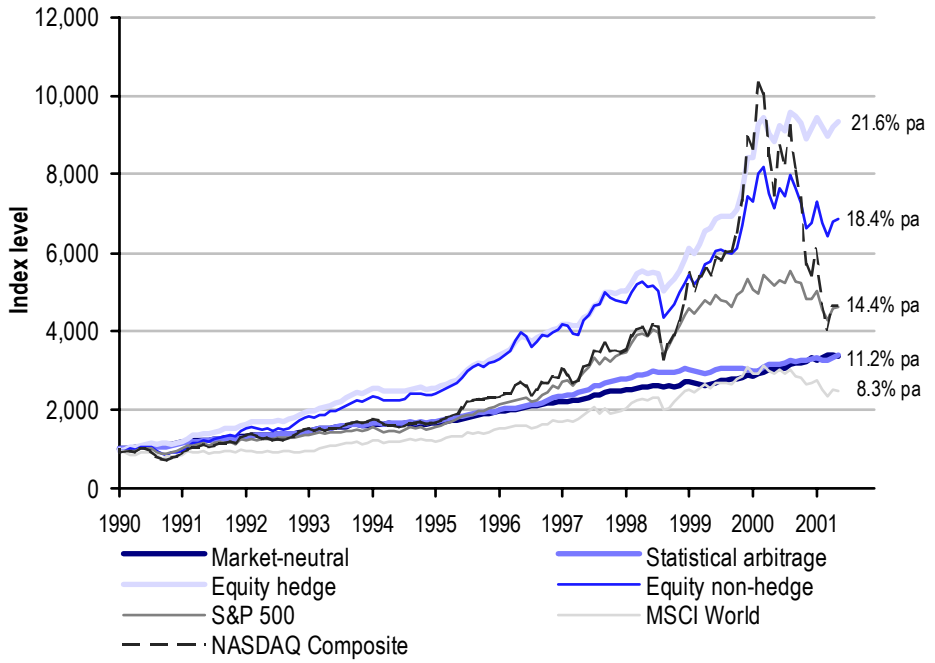
[2] We discuss this controversy on page 108.

the long position's price declines, it becomes a smaller portion of the portfolio, reducing its impact on returns and facilitating new purchases at the newly discounted, relatively more attractive price levels. There also is a technical difference between buying and selling short. To execute a short sale, the investor has to borrow securities to deliver to the buyer on the other side of the trade. If the lender recalls the shares, the short seller has to cover, ie buy back and deliver the stock. When the market for borrowing a particular security becomes tight, short sellers face a short squeeze. Security borrowers tend to have the most trouble with small, less liquid companies, which are exactly the type of security most likely to present interesting short-sale opportunities.

Performance Comparison

Chart 47 shows what it really means not to be 'long and wrong' when markets fall.

Chart 47: Performance Comparison Long/short Equity, Market-neutral and Long-only



Source: HFR, Datastream, UBS Warburg
Based on total US$ returns from January 1990 – May 2001
Equity hedge and equity non-hedge both measure the performance of long/short equity. The latter has a stronger long-bias

Long/short equity has had a stunning 11.5 years – outperforming both long-only and market-neutral

One of the main differences between long/short equity and market-neutral strategies is performance. Long/short equity has outperformed all major stock indices. We believe investing in long/short equity is similar to investing in equities in general. Correlation with equity is high. The difference between long-only and long/short is that the long/short industry, in the past, did not give back profits to the market when the market declined. Long/short equity might have a long bias. However, the long bias seems to be significantly reduced when markets fall. One long/short manager was once quoted as saying 'we were not hired to lose money.'[1]

[1] Needless to say that neither are long-only managers hired to lose money. However, the absolute return focus puts more weight on preserving wealth.

Market-neutral delivers what it is designed to do

Equity market-neutral did not outperform equity indices as the strategy is not designed to do so in one of financial history's most stupendous bull phases. The main aim is generating positive returns in the low-teens regardless of direction of the market. In other words, it appeals to investors who want to preserve wealth more than to investors who want to create wealth by taking more risk.

Equity market-neutral has grown from 1.7% in 1990 to over 10% in 1999 of all hedge funds.[1] This compares with a growth in long/short equity from 6% in 1990 to 26% in 1999. The following table shows difference between correlation with equity indices and among the four hedge fund strategies.

Table 28: Correlation Matrix

	S&P 500	MSCI World	Nasdaq Comp	Equity market-neutral	Statistical Arbitrage	Equity hedge	Equity non-edge
S&P 500	1						
MSCI World	.93	1					
Nasdaq Composite	.77	.77	1				
Equity market-neutral	.18	.21	.15	1			
Statistical arbitrage	.51	.42	.22	.46	1		
Equity hedge	.66	.71	.87	.31	.13	1	
Equity non-hedge	.76	.78	.91	.21	.23	.94	1
Off-diagonal average	0.64	0.64	0.62	0.26	0.33	0.60	0.64

Source: HFR, Datastream, UBS Warburg calculations
Based on monthly US$ total returns, January 1995 – May 2001.

- Equity market-neutral and the subgroup statistical arbitrage have the lowest off-diagonal correlation of 0.26 and 0.33, respectively. We cannot explain the large difference in correlation between market-neutral and statistical arbitrage with the S&P 500. The outlier in statistical arbitrage was in 1999. Equities performed well and statistical arbitrage did not because the positions of the mean-reversion based strategies did not mean revert in a momentum-driven market. This observation should actually lower the correlation coefficient.

- Off-diagonal correlation of equity hedge and non-hedge is 0.60 and 0.64, respectively. This compares with 0.64 for both S&P 500 and MSCI World and 0.62 for the Nasdaq Composite.

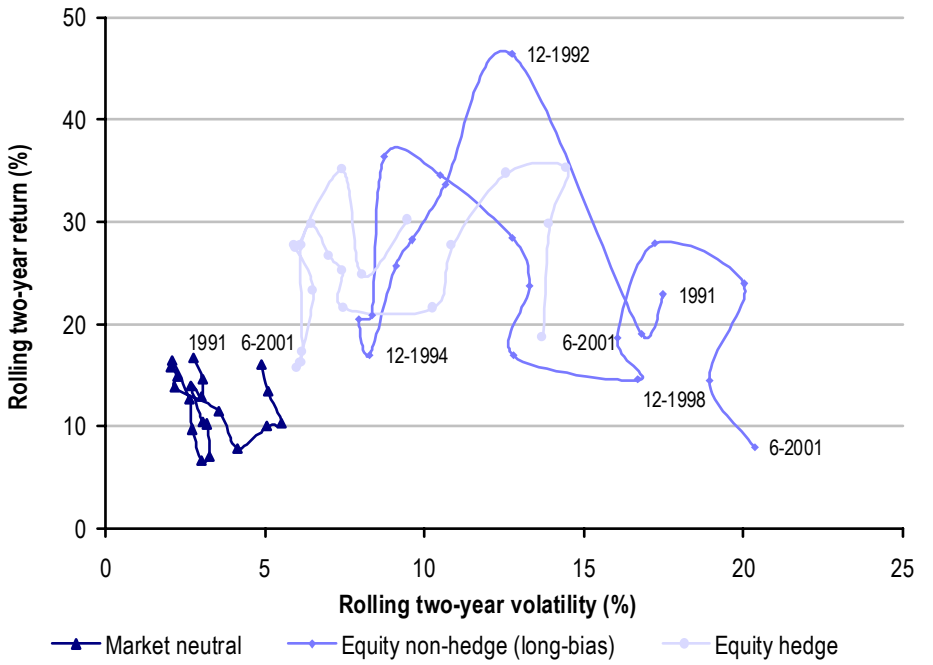
- On the most general level of portfolio construction, market-neutral strategies serve the purpose of reducing portfolio volatility due to its low volatility and correlation characteristics, while long/short equity strategies should be viewed as 'return enhancers' as opposed to 'volatility reducers'.

[1] Nicholas, Joseph G. (2000)

Different Return, Risk and Correlation Attributes

Chart 2 shows the rolling two-year total return and two-year rolling volatility for market-neutral, equity hedge and equity non-hedge. The chart should, in our opinion, make it clear that market-neutral is a different strategy from long/short equity.

Chart 2: Equity Market-neutral versus Long/short Equity



Source: HFR, UBS Warburg

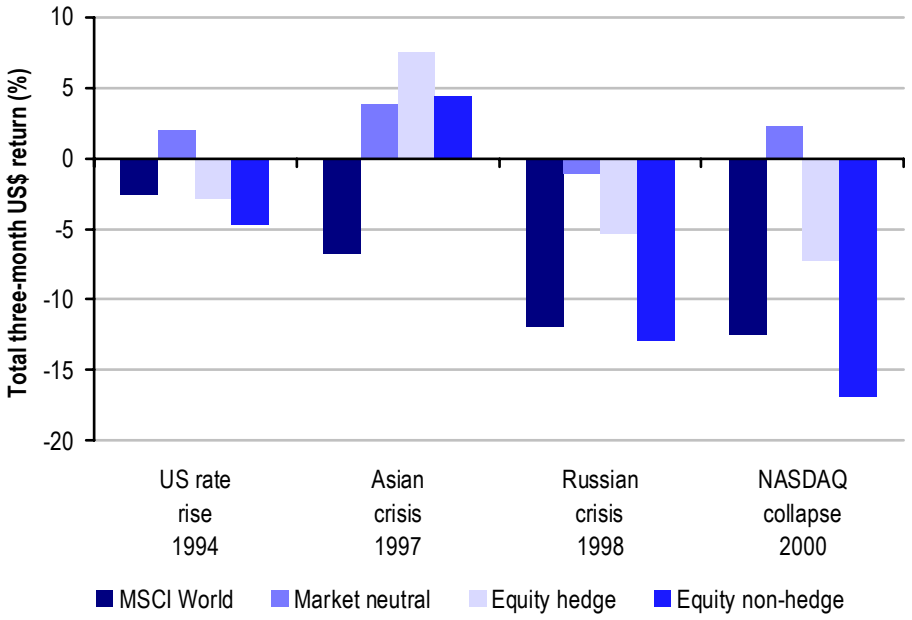
The three lines in the graph show the chronological path of three hedge fund strategies in half-year increments. A reading in the lower right hand corner means high volatility and low returns.

- An interesting observation is that the last few data points of both long/short equity indices are pointing south, whereas rolling two-year returns are rising with market-neutral. This can not be explained by capacity constraints because new funds are flowing into both strategies. The explanatory factor, we believe, is correlation with equities in general.

Stress Testing

Many hedge fund strategies experience difficulties in dislocating markets as spreads widen and liquidity dries up. Chart 3 shows the three-month performance of the MSCI World and the three hedge fund strategies during the US rate rise in 1994, the Asian crisis in 1997, the Russian default crisis in 1998 and the recent Nasdaq fall.

Chart 3: Market-neutral and Long/short Equity in Dislocating Market Conditions



Source: HFR, Datastream, UBS Warburg
US rate rise: 1 February – 29 April 1994; Asian crisis: 1 August – 31 October 1997; Russian crisis: 1 July – 30 September 1998; Nasdaq implosion: 1 September – 30 November 2000.

- There are differences between market-neutral and long/short equity when markets dislocate. Market-neutral is not necessarily affected when the market dislocates – as the strategy name *market-neutral* would suggest.

- Based on data from HFR, long/short equity with a long bias seemed leveraged and long during the last two stress periods. This is an indication that risk management philosophy and skill is a key determinant when picking a hedge fund manager involved in market timing.

- Note that market-neutral and equity hedge outperformed the stock market in all four three-month periods of stress.

Long/Short Controversy

There is a controversy whether long/short or market-neutral strategies are advantageous when compared with long-only strategies. The main bones of contention are whether there are more inefficiencies on the short side, whether there are diversification benefits, and whether there are efficiency gains. In the following table we summarise a selection of what we believe are the main papers on the subject. We have chosen 'The Fundamental Law of Active Management' (Grinold 1989) as an appropriate starting point.

Table 29: Chronology of Long/Short versus Long-only Debate

Grinold (1989)	The author showed that the information ratio depends on the strategy's information coefficient and its breadth where the information coefficient measures correlation between forecast and realisation (essentially skill) and where breadth measures the number of independent bets per year. The author basically showed that strategies earn high information ratios by applying forecasting edge many times over.
Michaud (1993)	Short selling: The author observes that conventional active management involves de facto 'short selling', in the sense that the active strategy is short any assets that compose less of the portfolio than the benchmark. Alpha: Long/short strategies can capture more alpha per unit of residual risk (for portfolios with significant residual risk) than long-only strategies. The author makes the observation that, if the correlation between long-alpha and short-alpha approaches 1, 'a long/short strategy may not substantially improve upon the investment characteristics of a long portfolio.' Fixed costs and efficiency: The author cites the increased costs of long/short management as a serious impediment to successful long/short management. Suitability and correlation: 'Given the current state of investment technology and implied levels of risk, the suitability of the strategy for long-term institutional investors is an open issue.' Portable alpha: not limited to long/short strategies.
Arnott and Leinweber (1994)	Short selling: The authors note that the long-only manager can only be underweight by the weight of the stock in the benchmark. Thus, long-only managers can take on a significant short position in only the largest holdings of the benchmark. Alpha: Authors criticise Michaud for failing to point out that the correlation between the long portfolio and the short portfolio will always be less than 1, and consequently, a long/short strategy will always improve upon the investment characteristics of a long portfolio, albeit often only slightly, as long as the long and the short alphas are positive. Fixed costs and efficiency: The authors regard Michaud's argument as irrelevant because they would apply identically to long-only management. Suitability and correlation: The authors point out that the returns from long/short strategies are, unlike long-only strategies, not highly correlated with core assets (such as stocks and bonds). The contribution of even an extremely risky long/short strategy to total portfolio risk may be small or negligible. Portable alpha: Authors observed that alpha of long-only strategies is normally not ported. They regard this as probably the most significant unexploited opportunity in the institutional investment world to date.
Michaud (1994)	Short selling: 'Surely, they do not believe that I intended to mislead by not explicitly citing such an obvious point.' The author dismantles criticism by pointing to a footnote and unveiling a contradiction in Arnott and Leinweber (1994). Alpha: The author argues that the long/short portfolio will not always improve the investment characteristics of a long portfolio even when correlation is less than 1. Long/short strategy entails additional costs and risks. When these are considered, improvement of the after-cost active return-risk ratio with respect to the long-only portfolio may be minimal or negative. Fixed costs and efficiency: Author argues that the after-costs reward-to-residual-risk ratio is not superior for long/short strategies if one uses more realistic assumptions. Suitability and correlation: 'Are they seriously claiming that long/short strategies are attractive because they have low correlation with stock and bond returns? Should institutional investors brace for a wave of managers touting lotteries, baseball cards, and postage stamps?' Portable alpha: The author argues that the impact of alpha portability on the active risk-return trade-off is irrelevant because porting alpha does not alter the portfolio's relationship of active return to active risk.
Jacobs and Levy (1995)	Short selling: The authors argue that Michaud's formal analysis ignores the added 'flexibility' the long/short strategy offers over the long-only strategy. A properly constructed long/short portfolio can control risk by offsetting long and short positions; it does not have to hold neutral positions to control exposure to an arbitrary market index. Alpha: The relaxation of index constraints in an integrated long/short portfolio provides added flexibility that translates into improved return and/or diminished risk vis-à-vis index-constrained long and short portfolios. The authors argue that Michaud (1993) concedes this by stating 'a long/short strategy may be less 'index-constrained' than a long-only portfolio…Consequently, a long/short portfolio may enhance the

	impact of forecast information.'
	Fixed costs and efficiency: The authors argue that whether the level of information the manager possesses is enough to justify the risks and costs of long/short investing, or active long investing, is an empirical question. While Michaud focuses on the many investors who do not possess sufficient information, the authors draw their attention to the few who do.
	Suitability and correlation: The authors also raise some questions about Michaud's analytical framework, eg integrated optimisation. With integrated optimisation, there are no separately measurable long and short alphas. And because long and short alphas are not separately measurable in an integrated long/short strategy, the correlation between long and short alphas is not a meaningful concept, hence cannot provide a meaningful gauge of the desirability of the strategy. What are meaningful are the extent and quality of the manager's information and the incremental costs associated with shorting.
Jacobs and Levy (1996)	The authors demystify long/short investing by commenting on 20 myths. Some demystification is drawn from Jacobs and Levy (1995). Other examples include:
	Myth 16: Long/short management costs are high relative to long-only. The authors argue that if one considers management fees per dollar of securities positions, rather than per dollar capital, there is not much difference between long/short and long-only fees. To the extent that a long-only manager's fee is based on the total investment rather than just the active element, the long-only fee per active dollar managed may be much higher than that of a long/short manager.
	Myth 18: Long/short portfolios are not prudent investments. The responsible use of long/short investment strategies is consistent with the prudence and diversification requirements of ERISA.
	Myth 19: Shorting is 'un-American' and bad for the economy. As Bill Sharpe noted in his 1990 Nobel laureate address, precluding short sales can result in 'a diminution in the efficiency with which risk can be allocated in an economy…More fundamentally, overall welfare may be lower than it would be if the constraints on negative holdings could be reduced or removed.'
Jacobs and Levy (1997)	The authors calculate some practical examples of long/short strategies and filter in their justifying arguments for long/short strategies outlined in Jacobs and Levy (1996).
Brush (1997)	Market-neutral long/short strategies get their returns from alphas and short rebates; long strategies get their returns from alpha and the market. Differing return and risk sources complicate their comparison, partly because of the strong market-referenced focus of conventional performance analysis. Compelling theoretical advantages of active return per unit of active risk suggests that long/short strategies are better able to deliver excess return than are conventional institutional long strategies. Long/short strategies, even with tiny positive alphas, are seen to improve investors' efficient frontiers when added to a traditional T-bill/long portfolio mix, mostly because their risk sources are uncorrelated. Surprisingly, the improvement occurs even if long/short strategies are Sharpe-ratio inferior to long strategies. These results provide theoretical support for including long/short strategies in most investors' mix of assets.
Freeman (1997)	An active managed portfolio is essentially a 'core' consisting of the benchmark index and an 'active' portfolio consisting of the differences between the benchmark index and the subject portfolio. To the extent that active managers charge their fees for all assets under management, the index core can be thought of as 'dead weight'.
Jacobs and Levy (1998)	The authors consider the optimality of portfolios not subject to short-selling constraints and derive conditions that a universe of securities must satisfy for an optimal active portfolio to be dollar-neutral or beta-neutral. We find that following the common practice of constraining long/short portfolios to have zero net holdings or zero betas is generally suboptimal. Only under specific unlikely conditions will such constrained portfolios optimise an investor's utility function. The authors also derive precise formulas for optimally equitising and active long/short portfolio using exposure to a benchmark security. The relative sizes of the active and benchmark exposures depend on the investor's desired residual risk relative to the residual risk of a typical portfolio and on the expected risk-adjusted excess return of a minimum-variance active portfolio. The authors demonstrate that optimal portfolios demand the use of integrated optimisations.
Grinold and Kahn (2000)	The authors view short-side inefficiencies difficult to prove and highlight the issue of the high implementation costs. They view the diversification argument as misleading, or even incorrect. Authors focus on efficiency gain through loosening the long-only constraint.
	The authors analysed the efficiency gains of long/short investing, where efficiency is defined as the information ratio of the implemented strategy (the optimal portfolio) relative to the intrinsic information ratio of the alphas. The efficiency advantage of long/short investing arises from the loosening of the (surprisingly important) long-only constraint. Long/short and long-only managers need to understand the impact of this significant constraint. Long/short implementations offer the most improvement over long-only implementations when the universe of assets is large, asset volatility is low, and the strategy has high active risk. The long-only constraint induces biases (particularly toward small stocks), limits the manager's ability to act on upside information by not allowing short positions that could finance long positions, and reduces the efficiency of traditional (high-risk) long-only strategies relative to enhanced index (low-risk) long-only strategies.

Source: See bibliography

Risks of Investing in Hedge Funds Revisited

'We Are Not a Casino'

To a risk manager, being long stock is probably more a game of chance than exploiting market inefficiencies

'No, we don't (currently invest in hedge funds)! It is completely obvious that hedge funds don't work. We are not a casino.' This is a statement from an investor quoted in the Ludgate hedge fund survey from March 2000. Note that the survey was conducted at the CIO level. We find it interesting that there are many investors who are willing and legally permitted to invest in a business model attempting to corner the global market for dog food via the internet, but are unwilling to invest – or are restricted from investing – with some of the most talented people in the financial industry.

In this brief encounter with the risk of investing in hedge funds we want to revisit some aspects of this type of investment with respect to the risk to the investor. In a nutshell we believe there are three main attributes to investing in hedge funds: high absolute, positive risk-adjusted returns; preservation of principal (risk management); and aligning the interests of the investor and the manager. Performance attribution is key to most investors. One of the most common measures for measuring risk-adjusted returns of funds is the Sharpe ratio.

The Merits of the Sharpe Ratio

Variance of returns is not synonymous with risk

The Sharpe ratio is defined as the total (normally annual) return minus the risk-free rate over the volatility (annualised standard deviation) of the fund. This approach implies that volatility is a synonym for risk – one of the standard (and anachronistic) assumptions of modern portfolio theory.

Why not 100% in hedge funds?

If risk was measured by the variance of returns (of which the square root is the standard deviation) then most investors should be invested 100% in hedge funds. The historical risk-adjusted returns (as measured by the Sharpe ratio) are superior to any other asset class, even when the poor quality of the available data (survivorship bias) is taken into account. This, interestingly, has been suggested by an author in the Winter 1999 edition of *The Journal of Investing*. The article ends:

> *"For aggressive investors, a blend of equities with hedge funds is appropriate, or even 100% exposure to hedge funds. For more conservative investors, hedge funds should be used in lieu of bonds as a diversification instrument."*[1]

Mean-variance overestimates the optimal allocation to non-marketable instruments

Although we advocate allocations to hedge funds as appropriate for most long-term investors, a 100% allocation seems inappropriate. The reason is that many of the risk factors to hedge fund investors are not measured by variance of returns. Any performance measure (eg the Sharpe ratio) or portfolio construction tool (eg mean-variance optimisation) which equates risk with variance of returns is therefore incomplete. We believe that a large proportion of the investor universe – institutional as well as private – puts a big question mark behind the notion that volatility of returns is equal to risk. The three main reasons for volatility of returns not being an appropriate measure for risk are non-normal return distributions, liquidity risk and systemic risk.

[1] See Lamm (1999)

Distribution Characteristics

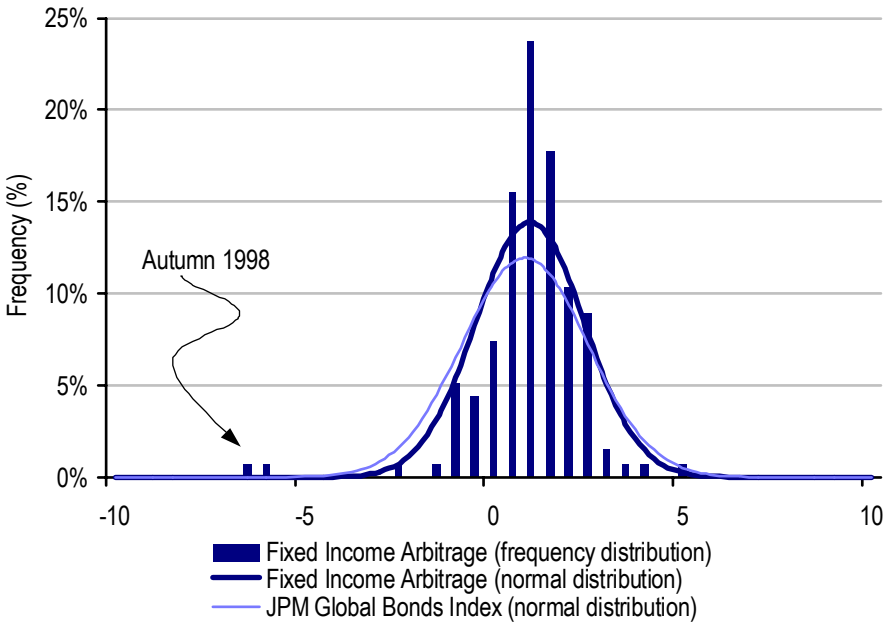
Hedge fund portfolio returns are not normally distributed

Hedge fund returns are not normally distributed around the mean expected return. The concept of variance – and therefore Sharpe ratios – are based on the assumption that returns are normally distributed. The recent history of equity markets suggests that the assumption of normality in return distributions is a rather extreme departure from reality. More importantly, returns from hedge fund portfolios are not normally distributed. The return distributions of some of the hedge fund strategies which employ leverage are negatively skewed (to the left with a long tail to the left) and leptokurtic (narrowly distributed – or 'spiky' – with outliers). The presence of statistical outliers or 'fat tails' is of particular interest in terms of assessing risk. If returns are not normally distributed, then Sharpe ratios do not work for measuring risk-adjusted returns, and mean-variance optimisations are inappropriate for portfolio construction purposes.

The insurance business is effectively statistical arbitrage

The return distribution of some relative-value strategies resembles the cash flow distribution of an insurance company selling disaster insurance. The insurance company's cash flow distribution is also negatively skewed and leptokurtic. It will generate a positive (insurance) premium in most market conditions (small cash inflows) and experience a large cash outflow in exceptional market conditions (in a disaster scenario). This cash flow distribution does not imply that selling insurance premium is a bad business to be involved in. The key is to determine whether the many small cash inflows will exceed the few large outflows in the long term.

Chart 48: Typical Return Distribution of Relative Value Strategy



Source: HFR, JPM, Datastream, UBS Warburg (monthly US$ total returns between January 1990 and March 2001)

Changes in margin requirements, increase in volatility and fall in liquidity can cause negative outliers

Chart 48 compares the frequency distribution of monthly returns in fixed income arbitrage – traditionally the hedge fund strategy which uses the highest degree of leverage – with the normal distribution of fixed income arbitrage and the JPM Global Bonds Index. The chart highlights the deviation of the historical return distribution from normality.

Liquidity Risk

There are two types of liquidity risk

There are two kinds of liquidity risk. First, the investor investing in a hedge fund cannot turn his investment into cash as fast as marketable securities. This is a risk to the investor. Second, positions in financial instruments held long or short by the hedge fund manager are exposed to liquidity constraints in the marketplace.

Non-marketability or reduced transparency is a risk to the investor

Hedge funds as well as private equity are alternative investment strategies (AIS). This means that these investments are normally private placements, ie they are not marketable securities. Risk measures that might work for marketable securities are not necessarily applicable to investments that are not marketable such as private equity, real estate and hedge funds. Non-marketability or reduced liquidity is a risk to the investor. The investor cannot exit the investment as easily as a portfolio of UK large caps. The investor expects to get paid for that type of risk; he will want to pick up a liquidity premium. Again, this type of risk is not measured by variance of returns.

Figure 1: Galaxy of Risks

• Accounting risk	• Daylight risk	• Liquidity risk	• Regulatory risk
• Bankruptcy risk	• Equity risk	• Market risk	• Reinvestment risk
• Basis risk	• Extrapolation risk	• Maverick risk	• Rollover risk
• Call risk	• Fiduciary risk	• Modelling risk	• Spread risk
• Capital risk	• Hedging risk	• Netting risk	• Suitability risk
• Collateral risk	• Horizon risk	• Optional risk	• Systemic risk
• Commodity risk	• Iceberg risk	• Personnel risk	• Systems risk
• Concentration risk	• Interest-rate risk	• Phantom risk	• Tax risk
• Contract risk	• Interpolation risk	• Political risk	• Technology risk
• Credit risk	• Knowledge risk	• Prepayment risk	• Time lag risk
• Currency risk	• Legal risk	• Publicity risk	• Volatility risk
• Curve construction risk	• Limit risk	• Raw data risk	• Yield curve risk

(Partial listing)

Source: Rahl (2000)

Risk is a complex beast

Figure 1 shows a partial listing of risks, of which only some are covered by measuring the variance (or semi-variance) of returns. Unidimensional quantitative measures fail to control or identify many loss situations in dislocating markets in the past and are likely to continue to fail in the future.

Exploiting inefficiencies involves exposure to less liquid markets and instruments

Some investors might find comfort in the fact that most hedge fund managers have a large portion of their net wealth tied to the fund, ie the same high redemption periods as the investor. A more pragmatic argument for low liquidity is the fact that hedge funds exploit inefficiencies and, therefore, are by definition in markets that are less liquid than the bluest of blue chips. In other words, exploiting inefficiencies by its nature involves some degree of illiquidity.

Full transparency of current positions is commercially unwise

Most hedge funds are less transparent than their long-only peer group. We believe that the lack of transparency is a similar risk factor to the lack of liquidity. An investor should expect to be compensated for both risk factors, ie pick up a premium for the lack of liquidity as well as transparency. Full transparency of current positions is commercially unwise. This is true for hedge funds and proprietary trading desks as well as other money managers of large size. The reason why it is more important for hedge funds is because they involve short positions

much more frequently than traditional funds. Short positions require more sensitive treatment than long positions. Many equity hedge funds are involved in illiquid markets, as the inefficiencies are higher in illiquid markets than in liquid markets. The results of being squeezed out of a short position in an illiquid market can be disastrous to overall portfolio performance. One way of controlling this risk is by not revealing one's positions to the market.

Systemic Risk

Speed of adjustment increases market efficiency as well as market volatility

We believe there is also a systemic risk factor to the asset class. However, numerous academic studies have shown that hedge funds were not the cause of the Asian crisis or other major world economic collapses. We believe it is true that in today's financial markets, capital reacts quickly to information. As a result, when countries or firms fail to live up to their promises – overbuild, overbuy, overmonetise – funds flee and the market reacts quickly. While such capital flight may have its own associated problems, the alternative to free flows is almost always worse. If investors are afraid of an inability to retrieve capital, it simply will not go there in the first place.

The hedge fund industry is at a much earlier stage in its industry life cycle. In addition, hedge funds are often domiciled offshore and are unregulated. The investor investing in hedge funds should be aware that the legal investor protection can be of a different nature from that with traditional long-only funds. Anyone investing in hedge funds should be aware of this type of risk and should expect to get compensated for carrying this risk. The point again is that regulatory risk is not measured by the volatility of returns.

Diversification is a laudable concept when dealing with uncertainty

The near collapse of LTCM is often referred to as example of systemic risk. Many hedge funds failed before LTCM, and many could fail in the future. Some failed quietly, returning some investor capital after liquidating positions. Others, like LTCM, failed in a more spectacular fashion. The failure of a single firm or investment product is always of concern to the investors as well as to those who invest in similar ventures. However, modern investment theory points out that no person or institution should have a sizeable portion of their wealth invested in any one investment product. In short, unless one has a perfect forecast of the future, diversification is a laudable concept when dealing with uncertainty. The stock market has survived the bankruptcy of many companies. This does not mean that stocks are bad investments. It does not even mean that the investors in a company that loses money ex-post made the wrong choice initially. The most notable aspect of the LTCM is not in its near collapse, but in the fact that many highly sophisticated investors held a large portion of their wealth in a single fund, which is completely contrary to modern investment principles.

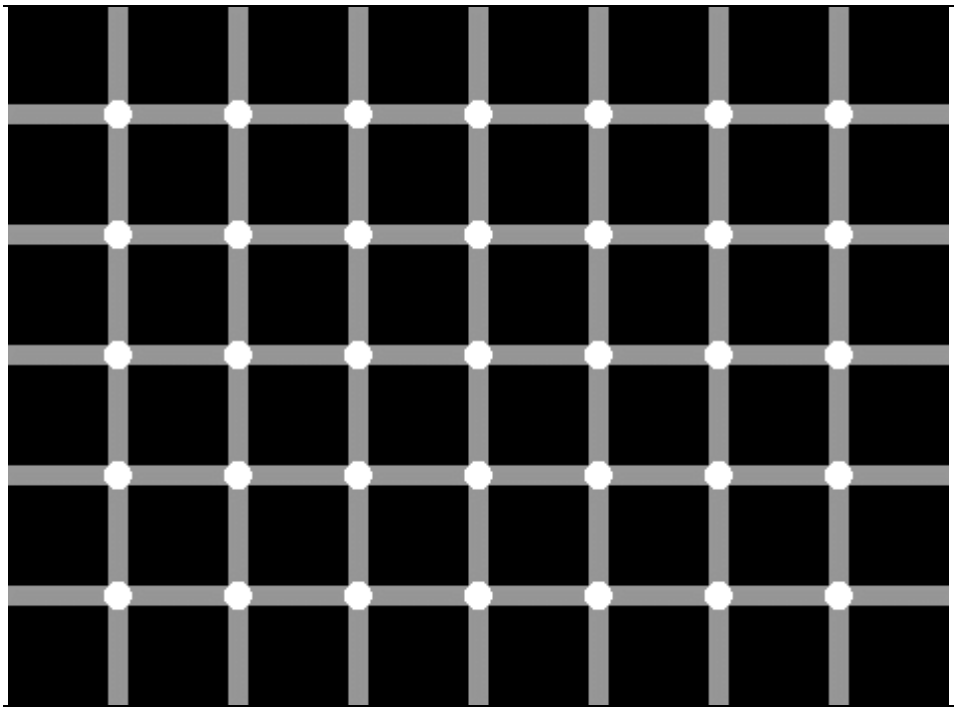
Conclusion

We believe that diversified hedge fund investors have been compensated for the various forms of risks in the past. We are now equally convinced that investors who have the ability and capacity to identify and invest with the most talented hedge fund managers are able to increase the efficiency of their portfolios – traditionally biased to equities and/or bonds.

Risk Illusion

Try to count the black dots in the image below.

Chart 49: Optical Illusion

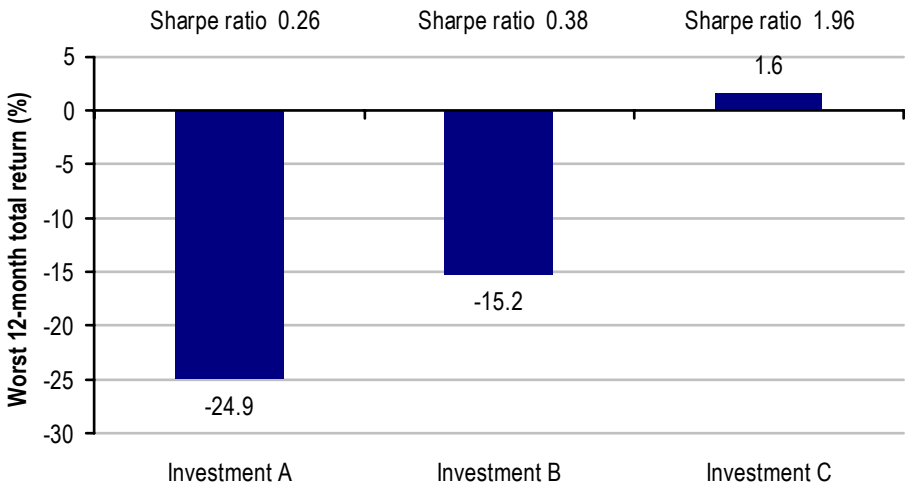


Source: www.eyetricks.com

There are none. All dots are white. The human brain is tricked.

Which of the following three investments has the highest risk?

Chart 50: Worst 12-month Return Compared with Sharpe Ratio

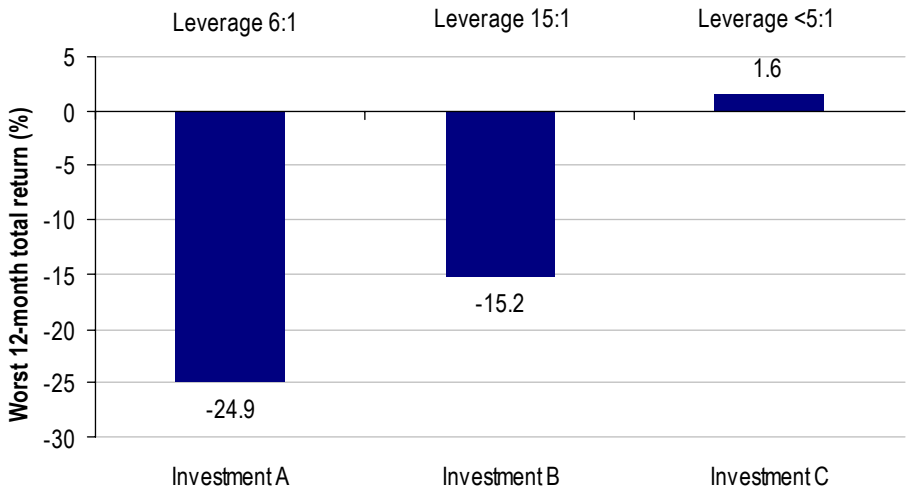


Source: MSCI, DJ STOXX, HFR, Datastream
Worst 12-month total return measured between January 1990 and April 2001.

Investment A is the most risky

Most people would intuitively view investment A as the most risky. Is this a trick?

Chart 51: Worst 12-month Return Compared with Balance-sheet Leverage



Source: MSCI, DJ STOXX, HFR, Datastream, UBS Warburg estimates
Worst 12-month total return measured between January 1990 and April 2001.

Investment B is the most risky

Chart 51 compares the worst one-year draw-down with an estimate for the balance-sheet leverage (total assets relative to equity) of the same three investments. This could be called a risk illusion because in many brains investment B becomes the most risky investment.

Investment C is the most risky

Only when we reveal the nature of investment C to the press does investment C become the most risky investment.

Investment C is a proxy for a portfolio of equity market-neutral strategies as measured by the HFRI Equity Market-Neutral Index. Investment A is the MSCI World Index and investment B is the DJ STOXX Banks Index. All indices are total returns and in US dollars. Note that the observation period includes war and the oil price shock (1990/91), sharp Fed tightening (1994), the Peso crisis (1994/95), the Asian crisis (1997), the Russian debt crisis (1998) and the burst of the internet bubble (2000).

Intangibles are not non-existent just because one cannot see or touch them

We acknowledge the fact that something unfamiliar or unknown is more risky than something familiar, simply because risk is – at the most general level – a synonym for uncertainty. However, we believe a point can be made that investment C is as much the most risky investment as there are black dots in Chart 49.

Correlation is not directly visible

One reason why this risk illusion might exist is the lack of visibility of correlation between securities and/or asset classes. Correlation is not visible to the human eye. By reading the newspaper or sitting in front of a Bloomberg screen, we observe return and volatility on a daily or weekly basis. Both variables are easily observable. Correlation, however, is not.

Stocks are highly correlated

Investment C comprises constituents with extremely low correlation with each other whereas investments A and B contain assets with high correlation with each other. If we analyse the constituents of investment C in isolation, we might conclude that they are of high risk. However, in portfolio construction, the expected correlation between the constituents is a key variable.

Guatemalan Dentists

Quezaltenango versus Switzerland

Where would you rather visit a dentist for a serious tooth operation: in the suburbs of Quezaltenango or Switzerland? [1]

Quezaltenango wins

While we believe that Switzerland would be the more rational choice, there are still voices opting for Quezaltenango. Only still a minority, it seems, would prefer Switzerland relative to Quezaltenango. This despite Swiss dentists operating with modern technology and high-end dental equipment, and with likely higher dental standards than in the suburbs of Quezaltenango.[2]

The link between money managers…

Akin to Swiss dentists, hedge funds use more advanced techniques and instruments for hedging, enhancing returns and financing. Traditional fund managers do to a much lesser degree. The reasons are manifold. The two main reasons are that they might be restricted to use certain instruments or that they do not understand how to utilise the instruments to their advantage.

…and the Guatemalan dentist

A money manager who does not consider using derivatives and short selling is similar to the aforementioned Guatemalan dentist. Both do not use the technology and equipment (techniques) that are available to them.[3] Both, to some extent, have missed out on capitalising on the developments of the past three decades.

The author, regrettably, is not particularly familiar with the developments of dental techniques and equipment over the past three decades. However, the developments over the past three decades in finance and portfolio construction are about risk and the measurement and control thereof. As a result of these developments, there is a risk management, derivatives and financial engineering industry. Ignoring and/or avoiding derivative strategies, cash equivalents and alternatives, and financial engineering techniques cannot, in our opinion, be the most efficient way of managing money.

Most people cannot choose the location of their dentist. They have no option. In addition, someone with a tooth problem visiting Quezaltenango will most likely see a local dentist.

Conclusion

Some investors cannot choose between investing in relative return managers or absolute return managers. They have no option. To all others, we recommend revisiting the value of the option to invest in hedge funds – if they have not already done so.

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[1] Quetzaltenango formerly Quezaltenango, south-western Guatemala, 7,656ft (2,334m) above sea level, near the foot of the Santa María Volcano. The city's high elevation causes the temperature to drop below freezing in the dry season. It is near the site of the battle in which the Spanish and their Indian allies from Mexico decisively defeated the Quiché Indians in 1524. Before the conquest, Quetzaltenango had been the capital of a Quiché kingdom known as Xelajú; Santa María Volcano, now dormant, destroyed the city in 1902. Now Guatemala's second largest city, Quetzaltenango is a centre for trade between the coast and the highlands, and a processing centre with textile factories, mills and breweries. The city has preserved much of its dignified neoclassical architecture. There are several university faculties, and many of Guatemala's best-known scholars, writers and musicians have lived there. It is linked to Guatemala City, 70 miles (110km) to the east, by paved highway and by air. Pop (1989 est.) mun, 88,769 (Source: www.britannica.com).

[2] Although we, admittedly, have not come across any complaints.

[3] For different reasons.

Avoiding Negative Compounding

Our report last year[1] on investing in hedge funds was about – among other aspects about hedge fund investing – adding value and avoiding negative compounding. Table 30 summarises what we meant by 'avoiding negative compounding'.

Table 30: Different Ways of Creating Value

	MSCI World	S&P 500	Nasdaq Comp.	Market neutral	Equity hedge	Equity non-hedge
Dec-1998	100	100	100	100	100	100
Dec-1999	125	121	186	111	146	142
Dec-2000	109	110	113	127	159	129
Jun-2001	98	103	99	131	162	134
Return 1999	25.3	21.0	85.6	10.8	46.1	41.8
Return 2000-01	-21.9	-15.2	-46.9	18.6	10.7	-5.7
To peak*	28.1	17.9	88.3	0.0	0.0	6.0

Source: HFR, Datastream, UBS Warburg calculations
* Return required to break-even initial investment at the end of 1998.

To the casual observer a return of 85.6% looks high even if it is followed by a retreat of 'only' 46.9%. However, if US$100 had been passively invested in the Nasdaq Composite Index at the beginning of 1999 and transaction costs were zero, the portfolio would have grown to US$99 by the end of June 2001.

Investing in hedge funds is for conservative, risk-averse investors

The figures in Table 30 are only moderately conclusive because the analysis has starting and end-point bias. However, a point worth making (again) is that investing in hedge funds or adding alternative asset classes to traditional asset classes is a conservative undertaking. Diversifying into assets with low correlation to one's existing assets or combining assets with low correlation reduces risk.

There is optionality in hedge fund returns

A further aspect of investing in hedge funds is about avoiding negative compounding. We (and others before us) have found that the returns of investment strategies pursued by hedge funds are normally not correlated. In addition, different hedge fund strategies show various return distribution characteristics. One of these characteristics is a call-option like P&L. In other words, some hedge fund strategies provide some degree of protection on the downside while also providing upside exposure.

Why can hedge funds outperform in falling markets, as in 2000? Note that hedge funds do not always outperform traditional funds in falling markets. There are exceptions.

Aversion towards losing money

The most straightforward answer would be: 'because they do not like losing money'. Although we believe that probably most hedge fund managers will agree with this notion, it implies that other managers do like to lose money. However, we believe the fact that hedge fund managers have most of their personal wealth in the funds under management is a strong incentive to hedge, ie avoid destroying principal.

[1] UBS Warburg research (2000)

Risk Management

Tracking risk versus value at risk

Risk control and capital preservation are among the main areas where the best hedge funds consistently excel. Many hedge funds grew out of a risk management environment and many hedge fund managers focus entirely on their edge by eliminating all market risk. The risk management of most hedge funds is sophisticated, ie similar to those of banks and insurers where daily P&L accounts are monitored, and the economic leverage is related to invested capital.

Making money when markets fall

Traditional money managers are not able to protect portfolios effectively (if at all) against declining markets other than by going into cash or by shorting a limited amount of stock index futures. Hedge funds, on the other hand, are often able to protect against declining markets by utilising various hedging strategies. The strategies used vary tremendously depending on the investment style and type of hedge fund. However, as a result of these hedging strategies, certain types of hedge funds are able to generate positive returns, even in declining markets.

Incentives

Absolute versus relative performance-related incentives

Mutual funds generally remunerate management based on a percentage of assets under management. Hedge funds always remunerate managers with performance-related incentive fees as well as a fixed fee. Not surprisingly, the incentive-based performance fees tend to attract the most talented investment managers to the hedge fund industry. A further distinction is that hedge fund managers usually have a substantial portion of their net wealth invested alongside their investors' wealth.

Aligning goal of principal and agent

The wedge between principal goals and agent actions causes problems at the highest level of governance. Fund managers as individuals desire immediate gratification, leading to an overemphasis on policies expected to pay off in a relatively short timeframe. At the same time, fund fiduciaries hope to retain power by avoiding controversy, pursuing only conventional investment ideas. By operating in the institutional mainstream of short horizon, uncontroversial opportunities, committee members and staff ensure unspectacular results, while missing potentially rewarding longer-term contrarian plays (Swensen 2000). Aligning incentives between the manager and the investor reduces the principal/agent conflict, and may lead to greater care in the management of funds. An investment manager's level of commitment is meaningfully higher when a substantial portion of their liquid personal assets is invested in the strategy and when their remuneration is linked to investment performance.

High fee structure attracts most skilled money managers

The attractive incentives afforded by the hedge fund industry are regarded as one of the main drivers of the high returns of hedge funds since it attracts managers who have superior skill. Hedge fund managers may just be better than other active fund managers. It is not, after all, unreasonable to think that the attractive fee structure used by hedge funds may succeed in enticing money managers with the greatest skill. Remarks by senior staff in the mutual fund industry might be taken as evidence that this is in fact happening. Senior management of traditional fund managers, after all, is in a position to know whether they are losing their best fund managers.

Dead weight

Hedge funds can manage risk more efficiently

Hedge fund managers minimise 'dead weight'. Dead weight in a portfolio results from securities owned in which the manager has no insight. For example, in a long equity account, the manager may maintain a market weighting in one sector in order to control tracking error within an acceptable range, even when the manager has no insight into the sector. The proportion of the portfolio, which is held to control residual volatility (volatility relative to the benchmark), is the proportion that will not add value.

Hedge funds carry less dead weight and therefore manage invested capital more efficiently

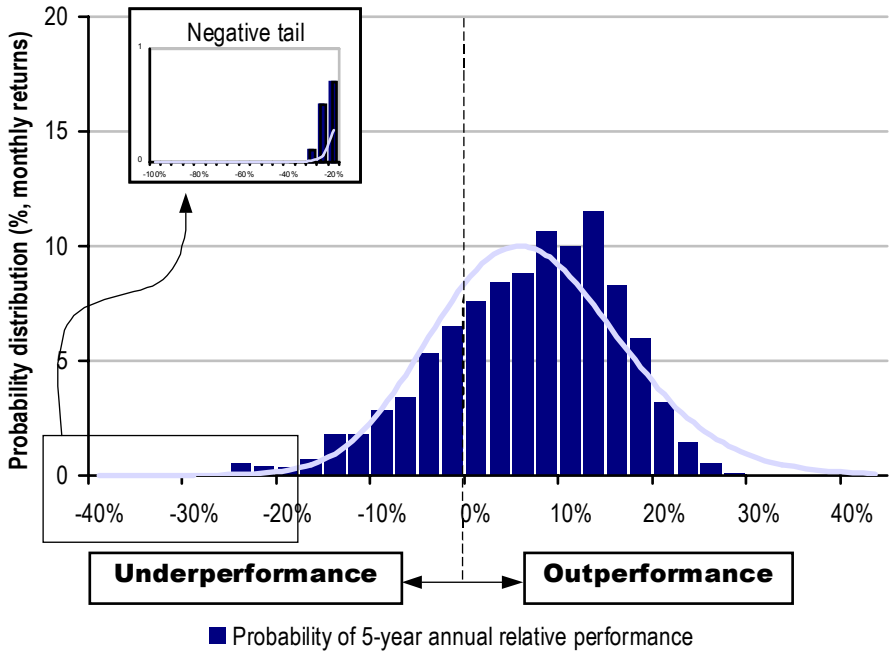
In a hedge fund, in general, only positions about which the manager has conviction will be held or sold short. Portfolio volatility and higher-moment and residual risks are controlled with risk management instruments or other hedging techniques, most of which require less capital than holding dead weight positions in the cash market. Consequently, a higher proportion of the hedge fund manager's capital is invested in positions about which the manager has convictions. Hedge fund managers, therefore, should be able to provide higher alphas, since relative outperformance against a benchmark is not the primary objective.

Simulation Exercise

Methodology

The analysis in Chart 52 shows a simulation that tries to estimate the probability of hedge funds with a strong long bias outperforming cash equity (and therefore traditional long-only funds). The dark bars show the probability distribution of relative returns (outperformance of hedge funds), and the line shows a normal distribution based on mean relative performance and the standard deviation of the simulated relative performance. Simulations like these are a function of the assumptions. The assumptions, therefore, are as follows: we calculated two random time series of 60 monthly returns (five years). The chart shows the distribution of the outperformance. The time series randomly pick a return from the historical return series over the past 100 months from the HFRI Sector Technology index and the Nasdaq Composite index respectively. To account for the probability of a disaster, we have modified one return of the hedge fund return series. We changed the return of –16.4% from the LTCM crisis in August 1998 to –50%. In other words, we assumed that every 100 months (every 8.3 years) there is a disaster that wipes out 50% of one's exposure to opportunistic hedge funds. Hedge funds on average did not lose close to this amount in Q4 98. However, many hedge funds went out of business in the early 1970s during the bear market which followed the boom of the 1960s. History – occasionally – repeats itself. In the simulation, we have chosen the frequency of such a meltdown occurring as one in a hundred. Since we are using monthly returns, this means once in 8.3 years. We regard these assumptions to be overly pessimistic.

Chart 52: Distribution of Relative Performance from Simulation



Source: HFR, Datastream, UBS Warburg calculations
The probability distribution of relative performance between technology dedicated hedge funds and the Nasdaq index is based on a Monte Carlo simulation with 1,000 iterations. The simulation randomly selects actual returns from the past 100 monthly returns from the HFRI Sector Technology index and the Nasdaq (with replacement). One hedge fund return has been modified from –16.4% to –50% to account for systemic risk.

Conclusions

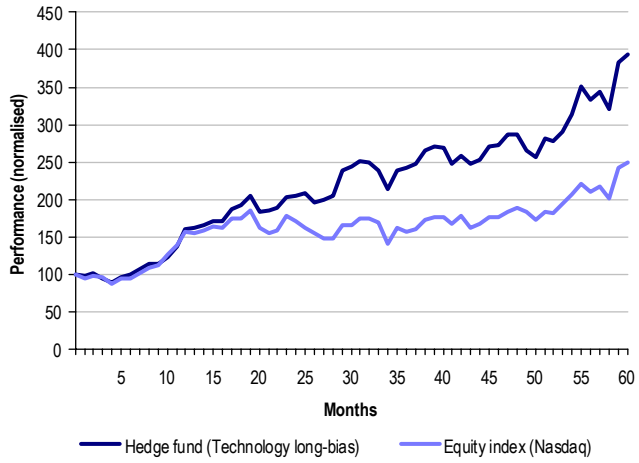
The main conclusion from the probability analysis is that the outperformance does not cease to exist. The mean relative return is still positive even if we assume that 50% of long or long/short managers go out of business every 8.3 years. A simulation devoid of a disaster scenario results in a probability of hedge funds outperforming equity of 99%. In the simulation including a disaster scenario the probability of hedge funds outperforming traditional equity falls to 76%.

The average outperformance excluding a disaster scenario was 11.2% per year for the five-year period. When we include the possibility of a 50% loss every 100 months, the average outperformance (mean of the relative return distribution) falls to 4.1%. This, we believe, is a feasible scenario for the next five years: there could be conversion between traditional ways money is managed and alternative ways (hedge funds). Additionally, the hedge fund industry is becoming crowded with managers with a long-only mentality. If this continues to be the case over the next five years, there is a possibility that there will be conversion between the two sets of returns, ie the outperformance is reduced over time.

The second observation is that the simulated distribution of relative returns is 'non-normal', ie negatively skewed and positively kurtotic (leptokurtic). Skew measures the asymmetry of the return around the mean. Negative skew means that the distribution is skewed to the left, ie the left tail is longer than the right tail. Kurtosis measures the 'peakedness' of the distribution and the extent of the tails. A strongly leptokurtic distribution has a taller peak, wider tails, but lower shoulders than a normal distribution. In other words, positive excess kurtosis means that returns

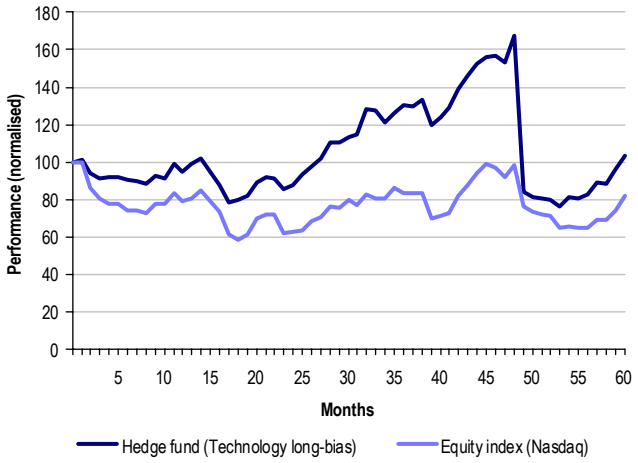
close to the mean and erratic swings are more frequent than a normal distribution would suggest. Equity returns are also considered leptokurtic.

Chart 53: Typical Five-year Performance without Disaster



Source: HFR, Datastream, UBS Warburg calculations

Chart 54: Typical Five-year Performance with Disaster



Source: HFR, Datastream, UBS Warburg calculations

Chart 53 and Chart 54 show two examples of the randomly generated time series on which the distribution in Chart 52 on page 122 is based. Chart 53 is an example without a disaster and Chart 54 shows an example of a –50% disaster occurring every 100 months.

The assumptions of the simulation are too simplistic. The simulation does not include trends. If there is conversion between hedge fund returns and returns from traditional managers, the mean in Chart 52 would be slowly moving to the left.

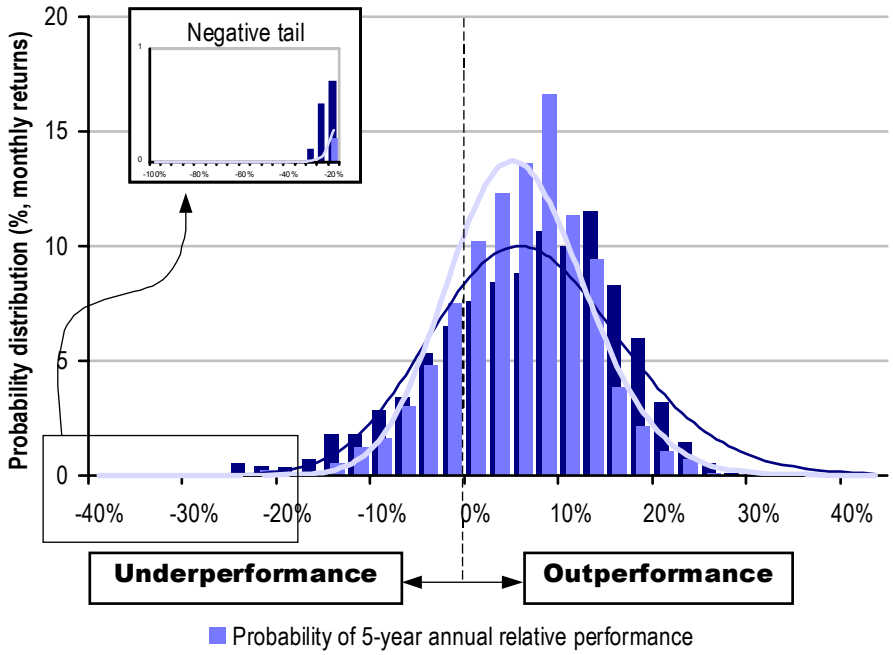
Methodology and assumptions

Chart 55 shows a further simulation where we additionally assumed the following:

- There is convergence between alternative and traditional money managers. After every run (there are 1,000 runs per simulation), the relative performance between the hedge fund index and the equity index converges by a factor of 1/2000. This alteration results in the assumption that after 1,000 runs, 50% of the superior returns (or outperformance or competitive advantage) are erased. This is, we believe, a reasonable scenario for the next five years.

- Additionally, the systemic risk of the hedge fund industry is reduced. The –50% disaster assumption is linearly reduced to –36.1%. This alteration again assumes that there is a 50% conversion between alternative and traditional money managers. Had we assumed 100% conversion, the distribution of relative performance would gradually disappear as alternative and traditional managers converge into one, ie become one and the same. For now, we are comfortable with assuming 50% conversion over five years.

Chart 55: Distribution of Relative Performance from Simulation Including Conversion



Source: HFR, Datastream, UBS Warburg calculations.
The dark bars show the previous simulated distribution, as shown in Chart 52 on page 122. The dark thin line shows the corresponding normal distribution. The light bars show the new distribution of simulated relative returns. The light line shows the corresponding normal distribution.

Conclusions

The most interesting aspect of the second simulation, in our opinion, is that the probability of outperformance actually rises from around 76% to 81%. However, the average outperformance (mean of the distribution) fell from 4.1% to 3.8%.

The reasons for the increase in the probability of outperformance are: (1) the volatility of relative performance decreases; and (2) the non-normal features are reduced as we have relaxed the systemic risk factor. The new distribution (light bars) more closely resembles a normal distribution than does the previous distribution (dark bars).

Summary and Conclusions

We believe hedge funds have a strong investment case. Even hedge funds that have a correlation close to 1 with equities have a strong investment case. The main reason, in our opinion, is that they seem to lose less money when markets fall. One of their main goals is to preserve principal, ie avoid negative compounding.

References

Glossary

Table 31: Selection of Terms and Expressions

Aggressive growth	Hedge funds that trade aggressively in order to produce the highest possible returns. These funds often use leverage and trade options, but generally can be considered opportunistic and can not be pigeonholed into a single definition.
AIS	Alternative Investment Strategy
Alpha	Difference between a portfolio's risk-adjusted return and the return for an appropriate benchmark portfolio. Most active investors are trying to maximise alpha.
Alpha transport strategy	See portable alpha approach.
Annuity stream	Annuity stream is usually a 'general' description given to highlight the long-term nature of income either via a management fee or another 'guaranteed' type of flow of revenue. See also retrocession, trail fee, kickback
Asset swaps / asset swapping	In convertible arbitrage, for example, this involves stripping out the equity derivative from the convertible; this is the optimal hedge for convertible arbitrage funds as it allows financing the position cheaply and removes interest-rate risk and credit risk.
Capital structure arbitrage	While a company is restructuring, the prices of its different financial instruments can become mispriced relative to one another. This is an opportunity for what is referred to as capital structure arbitrage. Specialists in distressed securities purchase the undervalued security and take short trading positions in the overpriced security to extract an arbitrage profit. a.k.a. intra-capitalisation arbitrage
Convertibles arbitrage	Convertibles arbitrageurs are simultaneously long the convertible securities and short the underlying securities of the same issuer, thereby working the spread between the two types of securities. Returns result from the difference between cash flows collected through coupon payments and short interest rebates and cash paid out to cover dividend payments on the short equity positions. Returns also result from the convergence of valuations between the two securities. A typical investment is to be long the convertible bond and short the common stock of the same company. Positions are designed to generate profits from the fixed income security as well as the short sale of stock, while protecting principal from market moves.
Core-satellite approach	The core-satellite approach is an alternative to the 'all-inclusive' balanced asset allocation approach. In a core-satellite strategy, a money manager will invest typically 70-80% of its assets in an index tracking fund. Specialist fund managers are hired around this 'passive core' as 'satellites' to invest in sectors where index-tracking techniques are difficult to apply, for example AIS, smaller companies or emerging markets. See also portable alpha approach.
CSFB/Tremont Hedge Fund Index	The CSFB/Tremont Hedge Fund Index provides the financial industry with the most precise tool to measure returns experienced by the hedge fund investor. The methodology utilised in the CSFB/Tremont Hedge Fund Index starts by defining the universe it is measuring. Credit Suisse First Boston Tremont Index LLC uses the TASS+ database which tracks over 2,600 funds. The universe consists only of funds with a minimum of US$10m under management and a current audited financial statement. Funds are separated into primary subcategories based on investment style. The Index in all cases represents at least 85% of the assets under management in the universe. CSFB/Tremont analyses the percentage of assets invested in each subcategory and selects funds for the Index based on those percentages, matching the 'shape' of the Index to the shape of the universe. The Index is rebalanced on a monthly basis. Funds are reselected on a quarterly basis as necessary.
CTAs	CTA is short for Commodity Trading Advisor. CTAs generally trade commodity futures, options and foreign exchange and most are highly leveraged. See also Managed Futures
Current Leverage	The amount of leverage currently used by the fund as a percentage of the fund. For example, if the fund has $1m and borrows another $2m to bring total dollars invested to $3m, then the leverage used is 200%.
Current Net Exposure	The exposure of the fund to the market at the present time. It is calculated by subtracting the short percentage from the long percentage. For example, if a fund is 100% long and 25% short, then the net exposure is 75%.
Dedicated Short Bias	Dedicated short sellers were once a robust category of hedge funds before the long bull market rendered the strategy difficult to implement. A new category, short-biased, has emerged. The strategy is to maintain net short as opposed to pure short exposure. Short-biased managers take short positions in mostly equities and derivatives. The short bias of a manager's portfolio must be constantly greater than zero to be classified in this category.
Distressed Securities	Distressed securities is an event-driven strategy. Fund managers invest in the debt, equity or trade claims of companies is financial distress and generally bankruptcy. The securities of companies in need of legal action or restructuring to revive financial stability typically trade at substantial discounts to par value and thereby attract investments when managers perceive a turnaround will materialise.
Downside deviation (DD)	See Sortino ratio

Downside risk	Because standard deviation measures risk as dispersion on either side of the mean, it cannot distinguish between 'good' volatility and 'bad' volatility. Both practitioners and academics have recognised the need to make this distinction, resulting in a search for a better risk measure. Several measures claim the title of 'downside risk'.
Emerging Markets	This strategy involves equity or fixed income investing in emerging markets around the world. Because many emerging markets do not allow short selling, nor offer viable futures or other derivative products with which to hedge, emerging market investing often employs a long-only strategy.
Equity Market-Neutral	This investment strategy is designed to exploit equity market inefficiencies and usually involves being simultaneously long and short matched equity portfolios of the same size within a country. Market-neutral portfolios are designed to be beta-neutral and/or currency-neutral. Well-designed portfolios typically control for industry, sector, market capitalisation, and other exposures. Leverage is often applied to enhance returns.
Event-driven strategy	Manager takes significant position in limited number of companies with 'special situations': companies' situations are unusual in a variety of ways and offer profit opportunities: eg depressed stock; event in offing offering significant potential market interest (eg company is being merged with or acquired by another company); reorganisations; bad news emerging which will temporarily depress stock (so manager shorts stock), etc. See also risk arbitrage, distressed securities, Regulation D, and high yield.
Exit catalyst	An event on the horizon that the distressed securities specialist expects to change the market's perception of (and therefore the value of) the distressed company.
Feedback Trading	Although hedge funds have the flexibility to take short positions, they can also be the first to take long positions in currencies that have depreciated in the wake of a speculative attack, providing liquidity to illiquid markets and helping the currency establish a bottom. Clients' expectations that hedge funds will make above-normal returns – as they often do – will discourage managers from buying the same assets being purchased by other investors since these asset prices already reflect others' moves. Hedge funds' greater flexibility makes them less inclined than other investors to buy and sell in the same direction as the market. Hedge funds are not bound by their prospectuses, as mutual funds often are, to invest new inflows of capital in the same manner as existing capital. When a market is falling, hedge funds can wait it out, while mutual funds may be required by their internal controls to liquidate positions, or they may have to pay off withdrawals by their investors. Hedge funds – except for those with very high amounts of leverage – are often able to await a market reversal, either because they may have credit lines to draw on to put up more margin or collateral, or because their investors are locked in for substantial periods.
Fixed Income Arbitrage	The fixed income arbitrageur aims to profit from price anomalies between related interest rate securities. Most managers trade globally with a goal of generating steady returns with low volatility. This category includes interest rate swap arbitrage, US and non-US government bond arbitrage, forward yield curve arbitrage, and mortgage-backed securities arbitrage. The mortgage-backed market is primarily US-based, over-the-counter and particularly complex.
Forward yield curve arbitrage	See fixed income arbitrage
Fulcrum rule	US mutual fund performance-based fee must satisfy the 'fulcrum' rule. That is, gains and losses must have a symmetric effect, in the sense that the same amount of over- and underperformance relative to a benchmark must result in the same amount of positive and negative incentive fees for a mutual fund manager. Hedge fund managers are not subject to the fulcrum rule, or for that matter, any rules other than what investors would bear.
Fundamental spread trading	Fundamental spread trading strategies focus on buying and selling comparable financial instruments based on a fundamental view of the relationship between them. The fundamental view is most often based on macroeconomic factors and/or technical supply and demand factors that are believed to cause temporary distortions of spread relationships.
Funds of funds	A fund of funds is simply a fund of hedge funds; there are many benefits to a multi-manager approach to investing. Most funds of funds are of the diversified type, meaning assets of the limited partners are allocated among many strategies.
Global Macro	Opportunistic; the 'classic' Soros-Steinhardt-Robertson type hedge fund manager profiting wherever they see value. Use leverage and derivatives to enhance positions, which will have varying timeframes from short (under one month) to long (more than 12 months). Global macro managers can carry long and short positions in any of the world's major capital or derivative markets. These positions reflect their views on overall market direction as influenced by major economic trends and/or events. The portfolios of these funds can include stocks, bonds, currencies, and commodities in the form of cash or derivatives instruments. Most funds invest globally in both developed and emerging markets.
Haircut	(1) In determining whether assets meet capital requirements, a percentage reduction in the stated value of assets. (2) In computing the worth of assets deposited as collateral or margin, a reduction from market value.
Hedge directional strategies	Hedge directional strategies involves buying and/or selling a security or financial instrument based primarily on fundamental or technical research analysis. Hedge directional strategies take both long and short positions in securities believed to be significantly over- or underpriced by the market in relation to their potential value. The strategy might concentrate on a specific company, industry, or country. The goal of these strategies is to generate profit through price movements of debt and equity securities, as well as through financial instruments based on interest rates, currencies, commodities and market indices.
Hedge Fund	Hedge funds are investment partnerships that seek above-average returns through superior portfolio management and whose primary compensation is a percentage of the profits. Because hedge funds are private limited partnerships, the SEC limits hedge funds to sophisticated accredited investors.

Herding

Hedge fund managers are often regarded as astute and quick off the mark. Mere rumour that they are taking a position may encourage other investors to follow. Although pension funds, insurance companies, and mutual funds are subject to prudent restrictions on their foreign exchange market positions, they still have some freedom to follow. And their financial assets are far larger than those of hedge funds.

Despite the possibilities, the evidence on whether other investors engage in such copycat behaviour is mixed or even negative. Analysis of reported large transactions gives no evidence that other traders are guided by the positions taken by hedge funds in prior periods. When big moves are underway, the data show hedge funds often act as contrarians, leaning against the wind, and therefore often serve as stabilising speculators.

HFR

Hedge Fund Research, Inc

www.hfr.com

High Water Mark

The assurance that a fund only takes fees on profits unique to an individual investment. For example, a $1,000,000 investment is made in year 1 and the fund declines by 50%, leaving $500,000 in the fund. In year 2, the fund returns 100%, bringing the investment value back to $1,000,000. If a fund has a high water mark, it will not take incentive fees on the return in year 2, since the investment has never grown. The fund will only take incentive fees if the investment grows above the initial level of $1,000,000.

High water mark contracts have the appealing feature of paying the manager a bonus only when the investor makes a profit, and in addition, requiring that the manager make up any earlier losses before becoming eligible for the bonus payment. On the other hand, their option-like characteristics induce risk-taking behaviour when the manager is below the high water mark, and the large bonus above the benchmark reduces long-run asset growth.

High Yield

'High yield' is an event-driven strategy. Often called junk bonds, this subset refers to investing in low-grade fixed-income securities of companies that show significant upside potential. Managers generally buy and hold high-yield debt.

Hot issue

A newly issued stock that is in great demand and rises quickly in price. Special rules apply to the distribution of hot issues.

Hurdle Rate

The return above which a hedge fund manager begins taking incentive fees. For example, if a fund has a hurdle rate of 10%, and the fund returns 25% for the year, the fund will only take incentive fees on the 15% return above the hurdle rate.

Incentive Fee

The fee on new profits earned by the fund for the period. For example, if the initial investment was $1,000,000 and the fund returned 25% during the period (creating profits of $250,000) and the fund has an incentive fee of 20%, then the fund receives 20% of the $250,000 in profits, or $50,000.

Interest rate swap arbitrage

See fixed income arbitrage

International credit spreads

See TED spreads

Intra-capitalisation arbitrage

See capital structure arbitrage

Jones Model

The first hedge fund on record, the Jones Hedge Fund, was established by Alfred Winslow Jones in 1949. The fund invested in US stocks, both long and short, in an attempt to reduce market risk and focus on stock selection. Jones generated very strong returns while managing to avoid significant attention from the general financial community until 1966, when an article in *Fortune* led to increased interest in hedge funds. Two years later in 1968, the SEC estimated that approximately 140 hedge funds were in existence. However, many funds perished during the market downturn of 1969, having apparently been unable to resist the temptation to be net long and levered during the prior bull run. By the early 1970s, hedge funds had lost their prior popularity, and did not gain it back again until the mid-1980s.

See also Long/short Equity

Kickback

Some funds of funds get a fee from the hedge fund's clearing broker eg a hedge fund of funds manager insisting that a hedge fund clears with a broker of their choosing and that broker then gives a percentage back to the fund of funds. Another kickback idea is for the hedge fund to give a percentage of their total fee income and a percentage of their hedge fund business for being an initial investor. Both of these are rarely announced.

See also retrocession, trail fee, annuity stream

Leverage

When investors borrow funds to increase the amount that they have invested in a particular position, they use leverage. Investors use leverage when they believe that the return from the position will exceed the cost of the borrowed funds. Sometimes, managers use leverage to enable them to take on new positions without having to liquidate other positions prematurely. Managers who target very small price discrepancies or spreads will often use leverage to magnify the returns from these discrepancies.

Leveraging both magnifies the risk of the strategy as well as creating risk by giving the lender power over the disposition of the investment portfolio. This may occur in the form of increased margin requirements or adverse market shifts, forcing a partial or complete liquidation of the portfolio.

Long/Short Equity

This directional strategy involves equity-oriented investing on both the long and short sides of the market. The objective is not to be market-neutral. Managers have the ability to shift from value to growth, from small to medium to large capitalisation stocks, and from a net long position to a net short position. Managers may use futures and options to hedge. The focus may be regional, such as long/short US or European equity, or sector specific, such as long and short technology or healthcare stocks. Long/short equity funds tend to build and hold portfolios that are substantially more concentrated than those of traditional stock funds.

See also: Long/short hedged, Jones Model

Long/Short Hedged	See hedge directional strategies
Long-only Leveraged	Traditional equity fund structured like a hedge fund; ie uses leverage and permits manager to collect an incentive fee.
Loss carryforward	Synonymous with high water mark.
Managed account	Managed account and direct investment into a hedge fund are two avenues of investment. In a managed account, the investor essentially gets his own tranche, usually with greater transparency. However, the minimum investment to set up a managed account may be much higher than the fund minimum investment (eg US$5m minimum for a managed account versus US$500,000 minimum for investment in the fund directly). Investing directly in the hedge fund, the investor is one of 99 or 499 investors, with less transparency. The managed account may be particularly desirable for US taxable investors when possible, since an investor buying into a fund at the wrong moment may inherit a tax burden he was not responsible for. There is a trend away from hedge fund managers offering managed accounts since they represent significant additional paperwork and reporting.
Managed Futures	This strategy invests in listed financial and commodity futures markets and currency markets around the world. The managers are usually referred to as Commodity Trading Advisors, or CTAs. Trading disciplines are generally systematic or discretionary. Systematic traders tend to use price and market specific information (often technical) to make trading decisions, while discretionary managers use a judgmental approach.
Market-Neutral	Any strategy that attempts to eliminate market risk and be profitable in any market condition.
Market Timer	Manager attempts to 'time the market' by allocating assets among investments primarily switching between mutual funds and money markets.
Mortgage-backed securities (MBS) arbitrage	Seeks to benefit from relative mispricings in the mortgage-backed security sector while neutralising interest rate risk. See also fixed income arbitrage
Master-Feeder Fund	A typical structure for a hedge fund. It involves a master trading vehicle that is domiciled offshore. The master fund has two investors: Another offshore fund, and a US (usually Delaware) Limited Partnership. These two funds are the feeder funds. Investors invest in the feeder funds, which in turn invest all the money in the master fund, which is traded by the manager.
Minimal Acceptable Return (MAR)	If there is a minimum return that must be earned to accomplish some goal (the minimal acceptable return [MAR]), then any returns below the MAR will produce unfavourable outcomes and any returns greater will produce good outcomes. Risk is associated only with bad outcomes; therefore, only returns below the MAR are associated with risk. The MAR separates the good volatility (above the MAR) from the bad volatility (below the MAR). See Sortino ratio
Offshore hedge fund	Offshore hedge funds are usually mutual fund companies that are domiciled in tax havens such as Bermuda and that can utilise hedging techniques to reduce risk. They have no legal limits on numbers of non-US investors. Some meet requirements of the US Securities & Exchange Commission that enable them to accept US investors. For the purposes of US investors, these funds are subject to the same legal guidelines as US-based investment partnerships.
Opportunistic	A general term describing any fund that is 'opportunistic' in nature. These types of funds are usually aggressive and they seek to make money in the most efficient way at the given time.
Options Arbitrage	Manager will seek to capture the 'spread' between similar options through inefficiencies in the market.
Pair trading	A pair trade involves the purchase of one share category and the sale of another on the same stock, for example, A versus B in Sweden, bearer versus registered shares in Switzerland or ordinary versus saving shares in Italy.
Poison put	A poison put is a change of control feature of certain convertible bonds that enable the holder to put the bond back to the company at par value.
Pooled average method of calculating time weighted returns using periodic IRRs	The pooled method is a measure that attempts to capture investment timing and scale. The pooled return is calculated by treating all funds as a single 'fund' by summing their monthly cash flows together. This cash flow series is then used to calculate a rate of return. This method implicitly would create an investment-weighted return and most closely matches the method that many investors used in measuring the return on their portfolio. Rather than averaging all the returns for their funds, they would lump all the cash flows together and calculate a return on the underlying 'pooled' portfolio. In a likewise manner, rather than calculating individual returns for each fund and aggregating those returns by an average, the pooled return aggregates the cash flows for a group of funds into a portfolio and then calculates the rate of return on that portfolio of cash flows, thus treating the cash flows as if they were one fund. The advantage is that it does take the scale and timing of cash flows of large and small scale into consideration. The disadvantage is of course that larger cash flows will be given more weight, so in a composite portfolio of small early-stage funds and large later-stage or buyout funds, the larger funds will have more influence on the performance than the smaller funds. However, many investors would say that this mimics the performance characteristics of their own portfolio. We find that this measure is the most appropriate measure for aggregate performance at either the vintage year or composite portfolio level (from Venture Economics).
Portable alpha approach	With the portable alpha approach, the alpha of a manager or group of managers or strategy is transported to a target index. For example a pension fund allocates its fund to a bond manager who generates an alpha of 200bp yearly without an increase in credit risk. In addition it swaps total returns of an equity index with the risk-free rate. The end result is the total index return plus 200bp. This approach can be used quite broadly. Alpha can be generated in many different areas and transported onto virtually any index. The limiting factor is the availability of derivatives to carry out the alpha transfer. One of the disadvantages is cost of the transfer. However, if the target index is an index with a liquid futures contract, the costs are usually much less than 100bp per year. a.k.a. Alpha transport strategy

Prudent Expert Rule The Prudent Expert Rule established by ERISA differs from the common-law standard. The major distinguishing difference is that the rule is applied to the total portfolio rather than to individual investments within the portfolio.

Prudent Man Rule In the US, for more than a century, the investment actions of fiduciaries have been subject to the test of the Prudent Man Rule as interpreted by US courts. As enacted into legislation by most states, the Prudent Man Rule holds that a fiduciary shall exercise the judgement and care, under the circumstances then prevailing, which men of prudence, character and intelligence exercise in the management of their own affairs, not in regard to speculation but in regard to the permanent disposition of their funds, considering the probable income as well as the probable safety of their capital.

Regulation D or Reg D Regulation D is an event-driven strategy. This subset refers to investments in micro and small-cap public companies raising money in private capital markets. Investments usually take the form of a convertible security with an exercise price that floats or is subject to a lookback provision that insulates the investor from a decline in the price of the underlying stock.

Relative value strategies Relative value strategies seek to profit from the mispricing of related financial instruments. These strategies utilise quantitative and qualitative analyses to identify securities or spreads between securities that deviate from their fair value and/or historical norms. Typical strategies include convertible bond and warrant trading, long/short equity basket trading, pair trading and fixed income spread trading.

Retrocession A fee-sharing arrangement whereby a portion of the fees the hedge fund or fund of funds makes is given back either to marketers or other agents in consideration for their efforts in raising money for the product, or given back directly to the client as a form of compensation (mainly true of retail-distributed products).

See also trail fee, annuity stream, kickback

Reward-to-variability ratio (RVAR) See Sharpe ratio

Risk arbitrage Risk arbitrage is an event-driven strategy. In risk arbitrage (or merger arbitrage, or event-driven), the manager takes a long position in the stock of a company being acquired in a merger, leveraged buyout, or takeover and simultaneously takes a short position in the stock of the acquiring company.

Sharpe Ratio The reward-to-variability ratio (RVAR) was proposed by William Sharpe and is commonly referred to as the Sharpe ratio. The numerator of the Sharpe ratio is the difference between the return on the portfolio and the risk-free rate. A comparable downside risk ratio that has come to be called the Sortino ratio has for the numerator the difference between the return on the portfolio and the MAR. The denominator for the Sharpe ratio is standard deviation, and for the Sortino ratio it is downside deviation.

See also Sortino ratio

Short bias Any manager who consistently has 'net short' exposure to the market. This category also includes short-only funds.

See also dedicated short bias

Short rebate When a stock is sold short, the seller borrows that stock and immediately sells it on the market with the intention of buying it back later at a lower price. The cash proceeds from the sale are held in a money market account earning interest. This interest is known as a short rebate or short interest rebate.

Short-term trading Manager focuses on short duration, opportunistic trades, and sometimes this strategy will include 'day trading'.

Small / Micro Cap Usually long biased, the manager will exclusively focus on small- and micro-cap stocks.

Sortino Ratio The Sortino ratio is similar to the Sharpe ratio, except that instead of using standard deviation as the denominator, it uses Downside Deviation. The Sortino ratio was developed to differentiate between 'good' and 'bad' volatility in the Sharpe ratio. If a fund is volatile to the upside (which is generally a good thing) its Sharpe ratio would still be low. To quote the Sortino website: 'A comparable downside risk ratio that has come to be called the Sortino ratio has for the numerator the difference between the return on the portfolio and the MAR. The denominator for the Sharpe ratio is standard deviation, and for the Sortino ratio it is downside deviation.' The MAR is the Minimum Acceptable Return (usually 5%).

Special Situations 'Special situations' may broadly consist of some type of event-driven strategy. Managers will opportunistically trade in any type of security that they deem to be a 'special situation'.

See also event-driven strategy

Statistical Arbitrage Believing that equities behave in a way that is mathematically describable, managers perform a low-risk, market-neutral analytical equity strategy. This approach captures momentary pricing aberrations in the stocks being monitored. The strategy's profit objective is to exploit mispricings in as risk-free a manner as possible.

Survivorship bias Survivorship bias occurs when data samples exclude markets or investment funds or individual securities that disappeared. The data sample of survivors describes an environment that overstates the real-world return and understates the real-world risk.

A classic example of survivorship bias is the paradigm that equities do well in the long run since market studies primarily focus only on returns for securities in the US. At the turn of the twentieth century, active stock markets existed in Russia, France, Germany, Japan, and Argentina, all of which have been interrupted for a variety of reasons, including political turmoil, war, nationalisation, and hyperinflation.

TED spreads The TED originally referred to Treasuries over eurodollars, but now usually refers to all global government bonds hedged against par swaps in the same currency. These spreads seek to take advantage of the differences in yields between government securities and LIBOR contracts of similar maturity.

a.k.a. international credit spreads

Trail fee	A trail fee is usually payable on mutual funds and seen as a payment to an intermediary for ongoing client servicing and monitoring on the fund. See also retrocession, annuity stream, kickback
Value	Manager invests in stocks which are perceived to be selling at a discount to their intrinsic or potential worth; ie 'undervalued', or stocks which are out of favour with the market and are 'underfollowed' by analysts. Manager believes that the share price of these stocks will increase as 'value' of company is recognised by the market.
Venture Capital / Private Equity	Any manager who focuses on, or has a component of, venture capital or private equity. As hedge funds are not restricted to trade only 'listed' securities, some manager will make private investments.
Vulture investing	Derogatory term applied when a venture capitalist or a distressed securities investor gets an unfairly large equity stake

Source: UBS Warburg

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