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Investing in Hedge Funds: Risks, Returns and Performance Measurement*

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Abstract

Hedge funds are collective investment vehicles that are often established with a special legal status that allows their investment managers a free hand to use derivatives, short sell, and exploit leverage to raise returns and cushion risk. We review various issues relating to the investment in hedge funds, which have become popular with high net-worth individuals and institutional investors, as well as discuss their empirical risk and return profiles. The concerns regarding the empirical measurements are highlighted, and meaningful analytical methods are proposed to provide greater risk transparency in performance reporting. We also discuss the development of the hedge fund industry in Asia.

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1. Introduction

In 1990, the entire hedge fund industry was estimated at about US\$20 billion. At of 2004, there are close to 7000 hedge funds worldwide, managing more than US\$830 billion. Additionally, about US\$200-300 billion is estimated to be in privately managed accounts. While high net worth individuals remain the main source of capital, hedge funds are becoming more popular among institutional and retail investors. Funds of hedge funds and other hedge fund-linked products are increasingly being marketed to the retail market.

While hedge funds are well established in the United States and Europe, they have only begun to grow aggressively in Asia. According to AsiaHedge magazine, there are more than 300 hedge funds operating in Asia (including those in Japan and Australia), of which 30 were established in year 2000 and 20 in 2001. In 2003, 90 new hedge funds were started in Asia, compared with 66 in 2002, according to an estimate by the Bank of Bermuda. Currently estimated at more than US\$15 billion, hedge fund investments in Asia are expected to grow rapidly. Several factors support this view. Asian hedge funds currently account for a tiny slice of the global hedge fund pie and a mere trickle of the total financial wealth of high net worth individuals in Asia.

Hedge funds have posted attractive returns. From 1987 to 2001, the Hennessee Hedge Fund Index posted annualised returns of 18%, higher than the S&P's 13.5%. Hedge funds are seen as a natural "hedge" for controlling downside risk because they employ exotic investment strategies believed to generate returns that are uncorrelated to traditional asset classes. Hedge funds vary in their strategies. So-called macro funds, such as Quantum Fund, generally take a directional view by betting on a particular bond market, say, or a currency movement. Other funds specialize in corporate events, such as mergers or bankruptcies, or simply look for pricing anomalies the stock markets. Hedge funds vary widely in both their investment strategies and the amount of financial leverage.

There are a number of factors behind the meteoric rise in demand for hedge funds. The unprecedented bull-run in the US equity markets during the 1990s expanded investment

portfolios. This led an increased awareness on the need for diversification. The bursting of the technology and Internet bubbles, the string of corporate scandals that hit corporate America and the uncertainties in the US economy have led to a general decline in stock markets worldwide. This in turn provided fresh impetus for hedge funds as investors searched for absolute returns.

Unlike registered investment companies, hedge funds are not required to publicly disclose performance and holdings information that might be construed as solicitation materials. Since the early 1990s, there has been a growing interest in the use of hedge funds amongst both institutional and high net worth individuals. Due to their private nature, it is difficult to obtain adequate information about the operations of individual hedge funds and reliable summary statistics about the industry as a whole.

Hedge funds are known to be growing in size and diversity. As at the end of 1997, the MAR/Hedge database recorded more than 700 hedge fund managing assets of US\$90 billion (See Table 1). This is only a partial picture of the industry, as many funds are not listed with MAR/Hedge. In practical terms, it is not easy to estimate the current size of the hedge fund industry unless all funds are regulated or obligated to register their operations with a common authority. Brooks and Kat (2001) estimated that, as at April 2001, there are around 6000 hedge funds with an estimated US \$400 billion in capital under management and US \$1 trillion in total assets.

Three interesting features differentiate hedge funds from other forms of managed funds. Most hedge funds are small and organized around a few experienced investment professionals. In fact, more than half of U.S Hedge Funds manage amounts of less than US\$25 million. Further, most hedge funds are leveraged. It is estimated that 70 per cent of hedge funds use leverage and about 18% borrowed more than one dollar for every dollar of capital. (See Eichengreen and Mathieson (1998), pp. 7). Another peculiar feature is the short life span of hedge funds. Hedge funds have an average life span of about 3.5 years (See

Stefano Lavinio (2000) pp 128). Very few have a track record of more than 10 years. These features lead many to view hedge funds, as “risky” and “opportunistic”.

2. What are Hedge Funds?

Hedge Funds are innovative investment structures that were first created more than 50 years ago by Alfred Winslow Jones. He established a fund with the following features:

- (a) He set up “hedges” by investing in securities that he determined as undervalued and funding these positions partly by taking short positions in overvalued securities, creating a “market neutral” position;
- (b) He also designed an incentive fee compensation arrangement in which he was paid a percentage of the profits realized from his clients’ assets; and
- (c) He invested his own investment capital in the fund, ensuring that his incentives and those of his investors were aligned and forming an investment “partnership”.

Most modern hedge funds possess the above listed features, and are set up as limited partnerships with a lucrative incentive-fee structure. In most hedge funds, managers also often have a significant portion of their own capital invested in the partnerships. The term “hedge fund” has been generalized to describe investment strategies that range from the original “market-neutral” style of Jones to many other strategies and opportunistic situations, including global/macro investing.

Due to the large variety of hedge fund investing strategies, there is no standard method to classify hedge funds neatly. There are at least 8 major databases set up by data vendors and fund advisors. We follow the classification used by Eichengreen and Mathieson (1998), which relied on the MAR/Hedge database. Under this classification, there are 8 categories of hedge funds with 7 differentiated styles and a fund-of-funds category:

- (a) *Event driven funds*. These are funds that take positions on corporate events, such as taking an arbitrated position when companies are undergoing re-structuring or

mergers. For example, hedge funds would purchase bank debt or high yield corporate bonds of companies undergoing re-organization (often referred to as 'distressed securities'). Another event-driven strategy is merger arbitrage. These funds seize the opportunity to invest just after a takeover has been announced. They purchase the shares of the target companies and short the shares of the acquiring companies.

- (b) *Global funds* are a catchall category of funds that invest in non-US stocks and bonds with no specific strategy reference. It has the largest number of hedge funds. It includes funds that specialize on the emerging markets
- (c) *Global/Macro funds* refer to funds that rely on macroeconomic analysis to take bets on major risk factors, such as currencies, interest rates, stock indices and commodities.
- (d) *Market neutral funds* refer to funds that bet on relative price movements utilizing strategies such as long-short equity, stock index arbitrage, convertible bond arbitrage and fixed income arbitrage. Long-short equity funds use the strategy of Jones by taking long positions in selective stocks and going short on other stocks to limit their exposure to the stock market. Stock index arbitrage funds trade on the spread between index futures contracts and the underlying basket of equities. Convertible bond arbitrage funds typically capitalize on the embedded option in these bonds by purchasing them and shorting the equities. Fixed income arbitrage bet on the convergence of prices of bonds from the same issuer but with different maturities over time. This is the second largest grouping of hedge funds after the Global category.
- (e) *Sector funds* concentrate on selective sectors of the economy. For example, they may focus on technology stocks if these are over-priced and rotate across to other sectors.

- (f) *Short-sellers* focus on engineering short positions in stocks with or without matching long positions. They play on markets that have risen too fast and on mean reversion strategies.
- (g) *Long-only funds* take long equity positions typically with leverage. Emerging market funds that do not have short-selling opportunities also fall under this category.
- (h) *Fund of funds* refer to funds that invests in a pool of hedge funds. They specialize in identifying fund managers with good performance and rely on their good industry relationships to gain entry into hedge funds with good track records.

Table 1 presents statistics about the various categories of hedge funds and past performance. The sectoral hedge funds provided the best mean return over the period studied, while the “market-neutral” funds had the lowest standard deviation of returns. On a risk-adjusted basis (dividing the mean return by the standard deviation), the category of fund that ranks highest is the market neutral funds followed by event-driven funds.

Unlike registered investment companies, hedge funds are not required to publicly disclose performance and holdings information that might be construed as solicitation materials. This makes it more difficult for investors to evaluate hedge fund managers.

 INSERT TABLE 1 HERE

2.1 Fund of Hedge Funds

Fund of hedge fund managers are hedge funds established to hold shares in other investment companies and charge a fee for doing so. Like hedge funds, fund of hedge funds are limited partnerships, and are restricted to at most 99 investors with at least 49 accredited

investors. Fund of hedge fund do not make direct investments but allocate their capital to hedge funds.

A hedge fund charges a management fee and incentive fee while a fund of hedge fund not only charges these fees at the fund-of-fund level but also passes on hedge fund level fees in the form of after fee returns to the fund-of- fund investors. In fact, underlying hedge fund fees will be transferred to the fund-of-fund investors regardless of whether the funds-of-funds makes a profit or not. As a result, total fees from a fund-of-fund can exceed the total realized return on the fund.

Fund of hedge funds have grown in popularity over the last decade because of their specialized investment strategies and objectives. At present, fund of hedge funds managed around 20-25% of this amount. As of March 2000, the TASS hedge fund database contains 2,104 hedge funds, including 1,330 survived funds and 774 dissolved funds. The total assets under management totaled about \$198 billion. According to TASS, there are 328 funds that are classified as fund of hedge funds, compared with 1,442 regular hedge funds. More recently, according to the Zurich Capital Markets database, fund of hedge funds represent 23 per cent (in terms of assets) of the hedge fund universe as of 31 December, 2001. Between January 1990 and October 2003, the datasets provided by TASS consist of 4,241 funds that reported monthly return information, of which 2,796 are regular hedge funds (1,621 live funds and 1,175 dead funds), 838 are fund of hedge funds and 484 are managed futures funds. Acito and Fisher (2002) estimated that fund of hedge funds managed in excess of \$100-\$120 billion in capital worldwide.

3. Investing in Hedge Funds

It is commonly believed that hedge funds may have superior returns. There are many anecdotal stories about the stunning success of hedge fund managers and their skills. George Soros' Quantum Fund was reported to have obtained returns in excess of 30% per annum over a long period. From Table 1, there is also evidence that hedge funds, as a

group, have returns that are impressive. For example, over the period 1990-1997, all the hedge funds had positive absolute returns. Global/Macro funds obtained mean returns of 28.1% p.a. with a standard deviation that is comparable to equity funds.

Traditional asset allocation optimizes the use of equities, bonds, real estate and private equity to invest in a portfolio that maximizes returns and minimizes the portfolio risk. Thus, hedge funds become a natural candidate for enhancing returns in an investment portfolio. Moreover, in a bear market, many investment managers find it uninteresting to merely beat the market index, which may have negative returns. They generally prefer to go short or avoid long positions to have positive returns. Investing in appropriately chosen hedge funds may provide the possibility of obtaining positive “absolute returns”.

It is also generally believed that hedge funds have returns that are generally uncorrelated with the traditional asset classes. In fact, hedge funds may even have a lower risk profile. For example, Morgan Stanley Dean Witter (November 2000, p1) reported that hedge funds “exhibit a low correlation with traditional asset classes, suggesting that hedge funds should play an important role in strategic asset allocation”.

Table 2 shows a common presentation of the underlying relationships between hedge funds and the other assets.

INSERT TABLE 2 HERE

3.1 Why Invest in Fund of Hedge Funds?

In a study using the TASS database, Brown, Goetzmann and Liang (2003) found that fund of hedge funds reduce by a third the standard deviation of monthly hedge fund returns, as well as significantly reduce the value at risk of hedge fund investment. Hence, fund of

hedge funds can also provide significant diversification potential. A well-diversified fund of hedge fund manager can therefore take advantage of market-specific risks while maintaining low correlations to stock, bond, and currency markets. As a result, the fund of hedge fund manager can theoretically provide superior returns and generate alpha (reflecting managerial skills). More generally, since fund of hedge funds deliver more consistent returns with lower volatility than individual hedge funds, they are considered to be ideal for diversifying traditional portfolios. During 1993–2001, fund of hedge funds outperformed the S&P 500 index on a risk-adjusted basis (Gregoriou, 2003a).

More generally, a fund of hedge fund manager is able to add value through manager selection, portfolio construction and the monitoring of the portfolio. They provide professional management services and access to information that would be difficult or expensive to obtain on a fund by fund basis by the investor. A fund of hedge fund manager often employs multiple investment strategies and styles through a diversified portfolio of individual fund managers.

Investing in fund of hedge funds is not cheap. Cost of investing in a well-known and established fund of hedge fund can be higher than the cost of building, monitoring, and maintaining a proprietary portfolio of hedge funds. Thus, while it is true that the fund of hedge fund structure allows for diversification and hence reduction of risk at the fund level, this comes at a cost, since the more diversified the fund is, the greater the likelihood that the investor will incur an incentive fee on one or more of the constituent managers, regardless of overall fund of hedge fund performance. In fact there is a significant probability that the incentive fee for a fund of hedge fund will be so large that it absorbs all of the annual fund return.

4. Commercial Databases and Statistical Inferences

There are therefore very persuasive reasons for hedge funds to be considered as “alternative investments”. However, relying on statistics compiled from public databases is

fraught with data biases. Uninformed investors may be misled into common misperceptions about the return and risk of hedge funds. In this section, we discuss some of the issues of analyzing hedge funds using commercial databases of hedge funds. There are three main sets of issues: (a) data collation; (b) selection bias; and (c) survivorship bias.

Data Collation Issues

Hedge funds generally do not disclose their activities to the public, as they are organized as private limited partnerships, and frequently as offshore investment vehicles. This has resulted in frequent complaints about the lack of transparency. Fortunately, many funds do release selective information to publicize themselves and their performance to attract new investors. These data are collected by a small number of data vendors and fund advisors. A few large advisors and vendors are currently publishing performance data and indices/sub-indices periodically corresponding to the various investment strategies. A listing of Hedge Funds Databases and some descriptive details is provided in the Appendix.

However, voluntary participation in performance reporting leads to incompleteness of information regarding the hedge fund population as a whole. Thus, sampling biases are present whenever an investor analyses a hedge fund database on a stand-alone basis. Some of these biases are briefly discussed below.

Selection Bias

Database vendors impose their own criteria before a hedge fund may enter their database. The criteria would include the type of fund involved, track record and assets under management. Databases may also exclude types of hedge funds whose trading activities or instruments do not meet their criteria. Again, the result is a likely upward bias in the database, which has become a biased sample belonging to the larger population. Park (1995) analyzes a subset of selection bias termed “instant history bias”. This bias arises because when a new

fund is first included, database managers often “back-fill” its performance history. Up to a year or more of data may be added to the database. Again, another sampling bias is added.

Survivorship Bias

Funds that perform poorly often choose not to submit their performance. Thus, poorly performing funds are likely to be missing from a database. Therefore, a “survivorship bias” arises when a database includes only the performance of funds that are alive and present at the end of the sample period. A subset of survivorship bias, called liquidation bias, occurs when disappearing funds may not report final periods leading up to and including their liquidation. If funds cease operation due to poor performance, the historical returns of surviving funds in the database is biased upward with risk biased downward relative to the population of hedge funds.

Database vendors often delist funds that do not provide reliable information. Hedge funds may also exit a database for other reasons than poor performance. Some popular funds also stop reporting their performance when they have reached a desired size, and do not need to further solicit “new” money. Omissions of these funds would also bias a database.

Brooks and Kat (2001) stated that around 30% of newly established funds do not survive the first three years, primarily due to poor performance. Thus, not including defunct funds is likely to lead to over-estimation of the returns and profile of hedge fund industry. Fung and Hsieh (2001a) found that estimates of survivorship biases differed across two commonly used databases, HFR and TASS. The survivorship bias (and attrition rate) was much higher in TASS than that in HFR. They estimated that survivorship bias would over-report hedge fund mean returns by about 1.5% to 3% per annum.

Collation and statistical biases not only present problems in the measurement of returns and risk across different categories of hedge funds. These biases also affect the computation of hedge fund indices. Brooks and Kat (2001) showed that different databases have different sample statistics for similar categories of funds. Table 3 shows that

while the mean return for macro hedge funds computed by the various databases ranges from 10.2% to 17.2%. Yet, this is a statistic for a common class of hedge funds over the same time-period. More interestingly, the standard deviation ranges from 19.3% to 50.2%. This is compelling evidence for the investor to be wary about obtaining statistics from hedge fund databases and making statistical inferences.

INSERT TABLE 3 HERE

5. Performance Measurements of Hedge Funds

Most mutual funds are generally engaged in “buy-and-hold activities” – acquiring and managing stocks and bonds over a longer period of time. Although some mutual funds would engage in activities like leverage or short-sell, most do not. The organization structure of hedge funds, their investment objectives, trading strategies and managerial compensation differentiate them significantly from the usual mutual fund.

5.1 Mean, Variance, Skewness and Kurtosis

Due to the type of strategies employed by hedge fund managers, there is strong evidence that hedge fund returns and hedge fund indices returns are not normally distributed. Typically, hedge fund investments are based on absolute return strategies. They are expected to deliver performance regardless of market conditions. To do so, hedge fund managers use two main approaches to achieve absolute return targets: (a) directional (or market timing) and (b) non-directional approaches.

The directional approach dynamically bets on the expected directions of the markets. Funds will invest long or sell-short securities to capture gains from their advance and decline. In contrast, the non-directional approach attempts to extract value from a set of embedded

arbitrage opportunities within and across securities. The non-directional approach typically exploits structural anomalies in the financial market.

Mean-variance analysis is appropriate when returns are normally distributed or investors' preferences are quadratic. The reliability of mean-variance analysis therefore depends on the degree of non-normality of the returns data and the nature of the (non-quadratic) utility function. While the utility function may not be a serious problem, the non-normal distribution of returns presents an issue.

According to Fung and Hsieh (1999a), "... when returns are not normally distributed (as it is the case for hedge funds), the first two moments (i.e. mean and standard deviation) are not sufficient to give an accurate probability." Fung and Hsieh found that hedge fund returns are leptokurtic or fat-tailed. One likely explanation is that net returns include spreads that are distributed with fat tails.

Many hedge fund indices exhibit relatively low skewness and high kurtosis, especially in the case of funds investing in convertible arbitrage, risk arbitrage and distressed securities. Brooks and Kat (2001) found that hedge fund index returns are not normally distributed. They argued that while hedge funds may offer relatively high means and low variances, such funds give investors third and fourth moment attributes that are exactly the opposite to those that are desirable. Investors obtained a better mean and a lower variance in return for more *negative skewness* and ***higher kurtosis***.

In sum, the dynamic trading strategies of hedge funds render traditional mean-variance measures meaningless. While some hedge funds may have low standard deviations, this does not mean they are relatively "riskless". In fact, they harbor skewness and kurtosis, which makes them "risky".

5.2 Correlations of Returns

Fung and Hsieh (1997) examined the returns of hedge funds and commodity trading advisers. They found that hedge fund managers and commodity trading advisers

generate returns that have low correlations to the returns of mutual funds and standard asset classes. This is the benefit often cited by portfolio managers in their choice of hedge funds as an “alternative investment”. Having an additional asset with a low or negative correlation permits the diversification of risk in a means-variance environment. However, there are complications that arise in the case of hedge funds where correlation -based diversification may not be valid.

Fung and Hsieh (2001) stated that “... Risk management in the presence of dynamic trading strategies is also more complex.” Hedge fund managers have a great deal of freedom to generate returns that are uncorrelated with those of other asset classes. But, this freedom comes at a price. Dynamic trading strategies predispose hedge funds to extreme or tail events. Thus, correlations may come at a cost. They cautioned that “periodically the portfolio can become overly concentrated in a small number of markets” and market exposures converge. This would lead to an “implosion” due to diversification.

Lavino (2000, p177) argued that many hedge funds are not *consistently* and *continuously* negatively or poorly correlated with other asset classes over time. Hedge funds also may not have meaningful standard deviations. In fact, many hedge funds have distributions with fat-tails, and so normality assumptions on the distribution of hedge fund returns are generally not correct. This means it is not appropriate that the use of correlation as a gauge to execute portfolio diversification.

Lo (2001) reinforced this view. He explained that many investors participate in hedge funds to diversify their returns, as hedge fund returns seem uncorrelated with market indexes such as the S&P 500. However, uncorrelated events can become synchronized in a crisis, with correlation changing from 0 to 1 overnight. These situations are examples of “phase-locking” behavior encountered in physical and natural science.

6. Other Performance Measures for Hedge Funds

The above discussion shows that the means and standard deviations used to report the returns and risks of hedge funds are not adequate, and probably not meaningful at all. Providing skewness and kurtosis statistics would be helpful. Relying on simple correlation measures to diversify portfolio risks is not appropriate when deciding to add hedge funds to a portfolio of other assets.

Sortino and Price (1994) have proposed evaluating downside risks rather than total risks. They defined a new measure and termed it the Sortino Ratio. This ratio differentiates between deviations on the upside and on the downside and is more consistent with the investors' concern over risk of losses in their investments. It is similar to the Sharpe Ratio, except that it uses 'downside deviation' instead of using standard deviation as the denominator. The Sortino ratio also allows for the setting of a user-defined return benchmark where the numerator is the difference between the return on the portfolio and the Minimum Acceptable Return (MAR). The MAR is usually the risk free rate, zero or user-defined (for example, 5%).

We have earlier highlighted that the high skewness of a hedge fund's returns may be connected to the hedge fund manager's selection of high-reward and low variance opportunities. Lavinio (1999) has defined another measure to capture this, as follows:

$$d\text{-Ratio} = \text{Abs} (d/U)$$

where

d	=	number of returns less than zero times their value
U	=	number of returns greater than zero times their value
Abs	=	absolute value.

The d -Ratio compares the value and frequency of a manager's winners to losers to capture the skewness in returns. This statistic, which does not require any assumption of the

underlying distribution, may be used as a proxy for a fund's risk, with $d = 0$ representing a distribution with no downside, and $d = \text{infinity}$ representing one in which the manager does not make any positive returns.

In analyzing the performance of hedge fund managers, we also need to gain insights into the permanence of a manager's skill. One way to examine if good performance is merely transitory is to see if it is mean-reverting (i.e. whether the performance will reverse and converge toward some predictable long-term value). We can capture this with the Hurst Ratio¹, which is defined as follows:

$$\text{Hurst Ratio} = \log M / (\log N - \log a)$$

where

$$M(t) = \text{Max}(t) - \text{Min}(t) / S(t)$$

$$N = \text{length of shorter sub-periods into which a manager's return record has been sub-divided}$$

$$t = \text{number of sub-periods into which a manager's return record has been sub-divided}$$

$$S(t) = \text{standard deviation of data over sub-period } t$$

$$a = \text{constant term that is negligible if track record is five years or less.}$$

A Hurst Ratio between 0 and 0.5 means that a manager's return will tend to fluctuate randomly, but converge to a stable value over time. With a Hurst Ratio around 0.5, a hedge fund manager's track performance will be regarded as random, i.e. returns in one period are not affected by returns in another period. Such hedge funds are deemed to be “risky” as any stellar short-term gains may be accompanied by substantial losses in another time period.

¹ Lo (1991) applied the Hurst Ratio to stock returns and found that short-range dependence adequately captured the time series behavior of stock returns.

Hurst Ratios, which are between 0.5 and 1, describe returns that are persistent. These fund managers have “hot” hands. However, such findings should be interpreted with care, as there is a need to examine whether the same manager can maintain his fund’s Hurst Ratio in future time-periods that are beyond the chosen sampling periods. More rigorous testing is required with out-of-sample data to provide meaningful conclusions.

Though the Sortino, d and Hurst Ratios would provide additional insights to the performance and risk of hedge fund investing, further work is needed before these analytical methods can be used to report on the risk and return performance of hedge funds.

7. Practical Issues in Performance Measurement

Hedge funds performance measures are beset by many practical business issues, which make it extremely difficult to have a simple measure to fully convey risk and return. Earlier, in Section 4, we discuss various data issues and how they may create problems in the comparisons of hedge fund performance. However, even if one possesses a set of reliable data, it is unlikely that there will be a statistically computed measure of risk-adjusted return, which would satisfy a sophisticated investor.

Specifically, hedge funds face many practical issues that increase their “riskiness.” We have identified at least 6 types of practical issues that confound risk and return measurements: style purity, consistency, fund size, use of leverage, liquidity and asset concentration.

Firstly, many hedge funds are assumed to have a pure and consistent style. This is rarely the case. Many funds may be opportunistic and operate with more than one style. Thus, many hedge funds do not always function exactly as their self-reported classifications indicate. From the outside looking in, it is almost impossible to classify hedge funds neatly.

A hedge fund’s style purity over time is definitely less consistent when compared to Unit Trusts (and mutual funds), which by nature are “buy-and-hold” accounts. Fung and Hsieh (2001b) and others have suggested using factor analysis to discern the

underlying dimensions or “factors” that drive the returns for funds. This may, then, go below the surface to determine unique hedge fund strategies that differentiate one fund from another. Hopefully, this would enable an investor to detect style purity, style consistency and most importantly, style deviations.

Till (2001a and 2001b) suggested that a number of hedge fund strategies might appear to “earn their returns due to assuming risk positions in a risk-averse financial world, rather than from inefficiencies in the market place.” In this sense, returns are made from a “risk transfer” and not due to managerial abilities per se. If indeed this is the case, then the skill of selecting the appropriate hedge fund styles and the type of managers who can execute the styles consistently, and how to allocate funds across these managers become important to achieve superior returns. Viewed from this standpoint, style purity and consistency are important attributes to measure exposure to hedge fund risks rather than statistical measures like variance and skewness.

A hedge fund’s asset under management (“AUM”) growth may be (a) internally generated through performance, (b) externally induced because of inflows, or (c) magnified through use of higher leverage. Hedge fund size is a dimension that has significant implications for risk and return. A hedge fund’s risks increase proportionately with its AUM. This is because the use of specialized strategies naturally limits a hedge fund to some “optimal size” beyond which it becomes increasingly difficult to keep the same strategy or have the opportunities for execution (often with leverage). Hedge fund managers are inclined to close their funds for further investments as soon as a target size is reached, as they understand the trade-offs between size and performance.

Hedge fund managers are drawn to the use of leverage to magnify potential returns from small arbitrage opportunities. They are also inclined to concentrate their investible funds in a small subset of potentially “rich” opportunities. Weisman and Abernathy (2000) demonstrated the importance of guarding against excessive leverage, which is compounded by a lack of liquidity when a disastrous event strikes. They pointed out that if one were to

construct a non-diversified, illiquid and/or leveraged portfolio and let it grow over time, it would eventually lead to bankruptcy of the fund, if a misfortune strikes.

The potential risk is very high employing these strategies since a well-constructed downside-oriented measure using past data may not reveal the potential risks from the occurrence of a *future* disastrous event. This is because a catastrophic event has not yet struck. However, the potential risks, which are usually unforeseen, are large and threaten the eventual survival of the fund.

8. Accounting for Various Sources of Risk

How should we compare different hedge funds? Let us begin with an example. Suppose there are two hedge funds with similar statistical attributes: the same average holding period returns adjusted by its standard deviation. We want to know which fund has a better "risk-adjusted" return. Let us further assume that the first fund (compared to the second) is less leveraged, invests in more liquid assets, is less concentrated or more diversified, and more disciplined in its application of investment styles. We are, most likely, very inclined to prefer the first fund to the second. That is because the second fund, although it has the same average return adjusted by its standard deviation, has taken extraneous risk to achieve the same results. This is especially more obvious if analyzed in the context of possible disastrous events. Thus, depending on the strategy employed, it is generally correct to say that a non-leveraged, more liquid, more diversified and more disciplined fund has a better chance of survival in the long term.

Perhaps, the crucial question has now become more obvious: how to modify "risk-adjusted returns" to account for the many other forms of risks not captured statistically. We define "risk-adjusted return" is defined as:

$$\frac{(\text{Observed Returns} - \text{Benchmark Returns})}{\text{Indicated Risk Measure}}$$

This measure assumes that all the named variables are observable, measurable and reliable. The benchmark return may be a stock index, a peer measure or the interest rate of the 90-day Treasury bill. The risk measure may be the “tracking error”, “standard deviation”, or some other measure. While this risk-adjusted measure allows us to measure the risk of hedge funds, we discuss below another metric that can be used to account for the numerous risks faced by a hedge fund investor. We define:

$$\text{Risk Adjusted Return} = \frac{(\text{Observed Returns} - \text{Benchmark Returns}) \times \text{Penalty Function}}{\text{Indicated Risk Measure}}$$

We postulate that the Penalty Function is a discount factor that takes into account various dimensions such as hedge fund style (purity and consistency), size, leverage, liquidity and asset concentration. These dimensions penalize the statistically measured risk-adjusted returns of hedge funds. Table 4 itemizes the risk dimensions and suggests avenues to discount them in the penalty function.

 INSERT TABLE 4 HERE

Using a penalty function would provide a handle to scale the observed return for the many practical risks that had been assumed by the hedge fund manager. A properly constructed "risk-adjusted return with penalty" that has accounted for practical business risks is more meaningful to an investor than a return measure that is merely adjusted by standard deviations cannot alert an investor to such risks as leverage or liquidity, which had been undertaken (to achieve the returns).

However, the data requirements are higher, since the leverage, liquidity and concentration measures necessitate the supply of additional data by hedge fund managers. In turn, this calls for more disclosure and transparency from the hedge fund managers.

9. Asian Hedge Funds

The Asian hedge fund industry has been rapidly expanding. Being a relatively young market, fewer than 100 hedge funds have been in existence for more than a couple of years. In fact, according to one estimate (as reported in Douglas, 2003), only about 40 funds have been around for more than five years.) Based on data from two Asian fund databases, AsiaHedge and EurekaHedge, the number of funds which invest predominantly in Asia have risen dramatically from around 75 in January of 1999 to around 290 in June 2003. This represents a 276% increase over a span of around four years. Studies like Liang (2000), Agarwal and Naik (2000), and Brown and Goetzmann (2003) have improved our understanding of the survivorship bias, persistence, and style issues with hedge funds in general, there are still other areas where our understanding of hedge fund performance can be deepened further. By size of funds under management, the breakdown is as follows:

INSERT TABLE 5 HERE

Almost 80% of Asian hedge funds employ either Goldman Sachs or Morgan Stanley as their prime broker. In all, 58% charge management fees of 1- 1.5% and performance fees of 20%. About 14% have a hurdle rate, but all face a high water mark. Almost 70% are opened on a monthly basis for subscriptions and redemptions, and 28% require minimum investment of US\$1,000,000 or higher.

Of the hedge funds included in the Asia Hedge Fund Directory of Eureka Hedge, 57% are domiciled in Cayman Islands, while 15% are situated in the British Virgin Islands. The estimated geographical distribution of the Asia-Pacific hedge funds is shown in Table 6. Most of the decision-makers of the funds are located in a number of Asian cities, with Australia, Singapore, and increasingly China being the preferred locations. Depending on their investment strategies, hedge fund managers may concentrate on one financial market, or a couple of the most liquid markets.

INSERT TABLE 6 HERE

Previous studies in the area of hedge funds have tended to pool hedge funds with fund of hedge funds (see Ackermann, McEnally, and Ravenscraft (1999) and Liang (1999)). Koh, Koh and Teo (2003) analyzed the performance of Asian hedge funds from three angles. First, they explore the relationship between fund characteristics and fund returns. Second, they investigate the drivers of the various Asian hedge funds investment styles. Third, the persistence of hedge fund return over various horizons was analyzed.

Koh, Koh and Teo (2003) found that that hedge funds managed by larger holding companies attain greater returns on average than funds managed by smaller holding companies. An increase in the size of the fund holding company to the next size category results in an economically significant 17 basis point increase in monthly returns (2% per annum) for the funds it manages. The use of both holding fund size and fund size in the regressions enables a separation of the effects of economies of scale from that of a diminishing investment opportunity set (Goetzmann, Ingersoll, and Ross, 2003). This is because controlling for hedge fund size, an increase in holding company size does not require a fund to scale up its investment strategy. Hence our finding that a fund benefits by belonging

to a larger holding company is consistent with the view that economies of scale exist in the hedge fund industry.

Koh, Koh and Teo (2003) also found no evidence to suggest that funds with higher fees (management and performance fees) reap greater post-fee returns. This is consistent with the result from the mutual fund literature that mutual funds on average do not make up for their expenses and investors are better off investing in mutual funds with lower fees.

Third, it was also found that hedge funds with longer redemption (lockup) periods tend to perform better than hedge funds with shorter redemption periods. An increase in redemption period of 10 days is associated with an 11 basis point increase in fund monthly post-fee return (1.3% per annum). The reason for the differential performance is because longer redemption periods allow funds to close out of their positions in a more timely fashion and incur less transactions costs while doing so.

Koh, Koh and Teo (2003) also found that Asian hedge fund returns persist at various horizons. This persistence is strongest at one-month to two-month horizons but dies off beyond the six-month to nine-month horizons. This short-term return persistence is due neither to persistence/imputation of expenses nor to style.

Table 7 provides an overview of the performance of Asian hedge funds.

INSERT TABLE 7 HERE

11. Concluding Remarks

The paper presented an overview of hedge funds, describing their development and characteristics. We also discussed the various issues related to the measurement of hedge fund performance, as well as examined alternative performance measures. We end this chapter with some remarks on the development of the hedge fund industry in Asia.

Hedge funds look set to play a larger role in Asia. Investor demand for Asian hedge funds is likely to increase as investors in the region build up a better understanding of this new asset class. From an investment perspective, the volatility in the Asian markets in recent years has allowed long-short and other strategic plays to outperform regional indices. The relative inefficiency of the regional markets also presents arbitrage opportunities.

The Asian financial crisis puts the spotlight on hedge funds in terms of their impact on the stability of developing economies. There have been calls among Asian governments to regulate hedge funds. It is unlikely that direct regulation of hedge funds will work. There is the practical problem of regulatory arbitrage – such players can easily relocate if regulation is forced on them. In deciding whether to restrict the activities of hedge funds, there are three sets of considerations to bear in mind. Firstly, hedge funds typically invest on behalf of wealthy individuals and institutional investors who do not need consumer protection. Hedge funds are thus private business and need not be subject to the same strict regulations and disclosure demands as financial institutions that collect monies from the general public. Secondly, financial institutions that lend to hedge funds should be sufficiently prudent in provisioning enough capital in relation to the lending. Hedge funds are not rated by commercial rating agencies, since their portfolios and strategies are not disclosed publicly. Thirdly, due to their sheer size and leverage, hedge funds can have a significant impact on the stability of financial markets. Of course, many other institutions make similar plays as the hedge funds. Indeed, the contrarian and arbitrage investment strategies of hedge funds can help to stabilize and even enhance the efficiency of financial markets.

Table 1

MAR Hedge Fund Categories: December 1997
Mean and Standard Deviation of Returns (1990-1997)

Category	Number	Assets (US\$ billion)	1990-1997		
			Mean Return (%)	Standard Deviation (%)	Risk adjusted Returns
Event-driven	120	8.6	18.9	5.9	3.2
Global	334	30.9	17.7	9.4	1.9
Global/macro	61	29.8	28.1	16.3	1.7
Market neutral	201	18.0	8.6	2.1	4.1
Sectors	40	1.8	29.6	15.9	1.9
Short-sellers	12	0.5	7.0	15.2	0.5
Long-only	15	0.4	27.3	15.4	1.8

Source: Eichengreen et al. (1998, pp 37)

Notes:

- (a) The mean returns are annually compounded returns over the period 1990 to 1997, except for the Long-only Funds, which were computed from 1994 to 1997.
- (b) The annualized standard deviations were computed from the standard deviation of monthly returns for each investment style.
- (c) Risk-adjusted returns are obtained by dividing the mean return by the standard deviation.

Table 2

**Performance Measures For Hedge Fund Indices
(Jan 1990 - April 2000)**

	Annualized Return	Annualized Std Dev	Correlation with S&P 500	Correlation with Lehman Bro
EACM 100 ¹	15.2	4.4	0.37	0.19
Eq Mkt Neutral	9.1	3.2	-0.11	0.15
Eq Hedged	20.6	10.3	0.20	0.00
Event	13.7	5.4	0.48	0.09
Global/Intl	20.8	11.5	0.61	0.15

Source: Lehman Brothers (2000)

Notes:

1. The EACM 100 is an index of hedge funds representing a wide range of strategies.

Table 3

**Hedge Fund Indices from Different Databases
Mean and Standard Deviation of Returns (Jan 1995-Apr 2001)**

Category/Database	Mean (%)	Standard Deviation (%)
Risk Arbitrage ¹	14.1 ³	
Zurich ²	13.2	12.8
Hennesse	13.0	11.8
Tuna	14.9	12.4
Altvest	15.6	13.4
HFR	13.6	12.7
Macro	13.3	
Zurich	10.2	19.3
Hennesse	10.4	30.6
HFR	13.2	28.1
CSFB/Tremont	17.2	50.2
Tuna	15.6	33.8
Altvest	17.0	32.6
Van	9.4	41.8
Equity Market Neutral	12.8	
Zurich	11.9	6.5
Hennesse	8.5	10.4
HFR	10.9	13.3
CSFB/Tremont	13.7	10.8
Tuna	15.2	19.2
HFR	16.8	17.2
Market Indices		
S&P 500	18.6	54.4
DJIA	18.1	54.7
Russell 2000	13.7	69.1
NASDAQ	21.6	106.9
Lehman Government Bond	7.4	10.3

Source: Brooks & Kat (2001)

Notes:

1. The major databases are explained in the Appendix
2. Zurich Capital Markets computes the indices using the MAR/Hedge database that it acquired in March 2001.
3. Simple Average of returns estimated using the different databases.

Table 4

Discount to Risk-Adjusted Returns to Account for Various Types of Practical Risk

Sources Of Risks	To Penalise for	Suggested Measurement method	Predicted Discount to Returns
Style Purity	Deviation from Self-reported Investment Style	Deviation from Style Benchmark	The higher the style “impurity” the higher the discount
Style Consistency	Style Inconsistency	Deviation from Factors Models	The higher the style “inconsistency” the higher the discount
Asset Growth	Unexpected increases in Fund Size (and Assets Under Management)	Change in Fund Size	The higher the increase in fund size in the period under review, the higher the discount
Leverage	Excessive Leverage	(a) Average gross exposure (b) Active Use of Leverage (Computed from a comparison of returns with and without the use of leverage following the standards recommended by the Association for Investment Management and Research)	The higher the use of leverage the higher the discount.
Liquidity	Low Asset Liquidity	(a) Average Day to Complete Sales (b) Ratio of Position to Trading Volume	The higher the threat of “illiquidity” the higher the discount
Asset concentration	(a) Single Security Exposure (b) Erratic Returns	(a) Average Percentage of 10 Largest Holding over reporting period (b) Fractal Dimension or Inverse of Hurst Ratio	The higher the asset concentration the higher the discount

Table 5

Distribution of Asian-based Hedge Funds by Assets Under Management

Asset Size (US\$m)	Number of Funds
Less than 10	70
10 - 50	112
50 to 100	43
100 – 200	51
200 – 500	40
500 – 1000	8
More than 1000	4
Total Number	328

Source: EurekaHedge, April 2003

Table 6

Estimated Geographical Distribution of Asia-Pacific Hedge Fund Managers

Country	Distribution (%)
Australia	14
Hong Kong	19
Japan	9
Korea	1
Malaysia	2
Singapore	14
Thailand	1
United Kingdom	20
United States	20

Table 7

Performance of Asian Hedge Funds

Strategy	Average Annualized Return (%)	Average Annualized Return (%)	Average Maximum Drawdown (%)
Convertible Arbitrage	-0.23	4.57	-5.03
CTA	15.61	13.06	-6.46
Distressed debt	26.53	9.80	-2.00
Fixed Income	13.82	2.65	-0.55
Long/short equities	3.40	9.65	-8.30
Macro	15.36	16.18	-10.37
Multi-strategy	2.71	8.37	-8.12
Relative value	12.84	11.66	-4.93

Source: Asia and Japan hedge Fund Directory, 2003, Eureka Hedge Pte Ltd

APPENDIX

List of Commercial Hedge Fund Databases

Name	Description	Features of Indices
HFR (www.hfr.com)	Hedge Fund Research (HFR) is a hedge fund research and consulting firm that has collected data on around 4,000 different hedge funds.	Around 1,500 funds are used to calculate 33 indices that reflect the monthly net of fee returns on equally weighted baskets of funds.
Zurich Capital Markets (www.marhedge.com)	Originally developed by Managed Accounts Reports (MAR) but it was sold to Zurich Capital Markets in Mar 2001.	Database contains 1,500 hedge funds, which are used to calculate 19 indices that reflect median monthly net of fee returns.
CSFB/Tremont (www.hedgeindex.com)	The TASS database tracks around 2,600 funds. There are strict rules for fund selection. The universe consists only of funds with a minimum of USD 10m under management and a current audited financial statement. Funds are re selected quarterly as necessary.	Using a subset of around 650 funds, CSFB/Tremont calculates 10 indices that the monthly net of fee returns on an asset-weighted basket of funds. Large fund have a larger influence in these indices.
Hennesse (www.hennessegroupp.com)	The Hennesse Group is a hedge fund advisory firm that maintains a database of around 3000 funds.	Based of subset of about 500 funds, Hennessee calculates 23 indices that reflect the monthly net of fee returns on equally weighted basket of funds.
Van (www.vanhedge.com)	Van Hedge Fund Advisors is a hedge fund advisory firm with a database of about 3,400 funds.	Using a subset of around 500 funds, Van calculates 15 indices that reflect the monthly net of fees returns on equally-weighted baskets of funds
Altvest (www.altvest.com)	Altvest is hedge fund website that provides information on alternative investments. The Altvest database contains information on around 2000 hedge funds.	Altvest calculates 14 equally weighted indices from the monthly net of fee returns of the funds in its database.
TUNA (www.hedgefund.net)	Hedgefund.net is a website providing free hedge fund information and performance data. Its database covers 1,800 hedge funds.	Hedgefund.net calculates 35 equally weighted indices from the monthly net of fee returns of the funds in its database. In Tuna's case, if a fund shuts down, it is completely removed from the indices ²
AsiaHedge (www.hedgefundintelligence.com)	AsiaHedge is a subscription database that provides information on hedge fund industry in the Asia Pacific Region. Publishes a league table of 156 funds.	AsiaHedge establish the Bank of Bermuda AsiaHedge indices. There are 4 indices to measure the performance of hedge funds in 4 geographies based on the median net of fee returns of funds in its league table.

Source: Brooks and Kat (2001), Hedge Fund Intelligence

⁵ Estimated returns may suffer from survivor bias (ranging from 1.5-3%). Around 30% of newly established funds do not survive beyond 3 years. Most data vendors (with the exception of TUNA) do incorporate funds that have ceased to exist in their index to avoid this.

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