

Chapter 1

Risks and risk management for hedge funds

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Challenges for the hedge fund industry

Recent years have seen unparalleled capital inflows into alternative investment strategies, that is, hedge funds, which have provided this industry with a tenfold increase in assets in the past 12 years. Investors in hedge funds now stretch beyond the select group of high-net-worth individuals who have traditionally made up the large majority of investors. The widespread interest in hedge funds can be attributed to their attractive risk-reward characteristics and their low correlation to traditional asset classes.¹

However, despite increasing mainstream popularity, the hedge fund industry must address two important challenges in order to continue its impressive growth. First, it must generate absolute returns in challenging market conditions and, second, it must introduce reliable independent risk management.

Falling returns lead to rising investor scrutiny

The surge in capital flows to hedge funds and the increase in institutional investment come as hedge fund managers have provided, on average, rather mediocre returns that are significantly below their historical mean. The three-year period from early 2000 to early 2003 was characterised by the weakest performance in the history of hedge funds. Falling hedge fund returns lead investors to ask about their return sources and risk exposures before allocating capital to them. Despite the claim of market-neutrality, hedge fund strategies as a group have clearly not escaped the downward pull of falling stock markets. Lacking the beta tail wind of the bull markets in the 1990s, many hedge funds have yet to prove themselves as real alpha generators. While this chapter focuses on risk management rather than returns, the two are directly related.

Two short remarks are necessary. First, one should note that the statement about weak hedge fund performance applies to the absolute level of performance, the only measure of performance by which hedge funds (according to their own claims) should be measured. On a relative basis, however, hedge funds outperformed stocks by more than ever before, having escaped the large losses of equity markets. Second, although the hedge fund industry has fallen short of keeping its return promise in recent years, the industry has kept the low risk promise. Despite extremely high volatilities in global financial markets, volatility of hedge funds has remained rather limited: a diversified hedge fund portfolio usually displayed volatilities of around 5 to 8 per cent (however, individual hedge funds have shown significantly larger fluctuations, including the total loss of capital).

The need for risk management

Investors are also more and more concerned about the diverse risks of hedge fund investments that are unknown to them. This risk is aggravated in the minds of investors by the lack of independent risk management, low transparency and limited liquidity (that is, long redemption periods) that still characterise most hedge funds today. Many potential investors continue to view hedge funds as too mysterious, secretive and hard to get in and out of – a blind jump into a dark tunnel of indefinite length, with few exits. While for years certain types of investors accepted and followed a black box investing approach (that is, investing in non-transparent and illiquid funds), and accepted long redemption periods in exchange for attractive returns, this approach is now harder to sell. Increased interest from institutional investors has led to new demands for disclosure, more clearly defined risk profiles, independent third-party risk management, greater transparency about performance attribution and higher liquidity due to the fiduciary responsibilities associated with investing clients' money.² Further, several widely publicised hedge fund failures during the market crisis of 1994 (for example, Askin) and 1998 (for example, Long-Term Capital Management (LTCM)), and periodic reports of other hedge fund blow-ups and fraud (for example, Manhattan Fund in the spring of 2000, Beacon Hill in the autumn of 2002), have added to investor concerns about the extraordinary event risks of their hedge fund investments. Finally, rapid developments in financial risk management have made risk analysis for even complex hedge fund portfolios feasible in near-real time. When such analysis and risk management are possible, investors expect that they should be done.

These developments illustrate a trend in investors' attitudes, changing from accepting (trust me) to demanding (show me). A new class of fiduciary investors has put the issue of risk management at the top of its priority list. Perhaps this is also in the context of rising investment prudence in falling markets post 11 September more generally. This chapter deals with the challenge of independent hedge fund risk management, and shows how the industry can address growing investor concerns about the diverse and partly unknown risks of hedge funds, as well as the lack of investment transparency, low liquidity and long redemption periods. The discussion starts with a short outline of hedge fund return sources in the following section.

Sources of hedge fund return

Financial textbooks state that return and risk of investments are directly related. The level of systematic (that is, non-diversifiable) risk of a financial asset determines its return. Any discussion of hedge fund risks and risk management can therefore not be complete without mentioning a few words on their return sources. The understanding of hedge fund return sources in connection with systematic risks is an essential tool for appropriate diversification in the hedge fund portfolio and risk management.

There is a widespread belief that hedge funds earn their returns solely through the identification of market inefficiencies not recognised by other market participants. This creates some confusion and scepticism among investors, as the markets that hedge funds operate in are not considered to display inefficiencies large enough to provide such attractive return profiles (it is widely believed that Wall Street does not very often offer a 'free lunch' in these markets, even to smart hedge fund managers). A significant part of the confusion arises from the inability of conventional risk measures and asset pricing theories to properly measure the diverse risk factors and return sources of hedge funds. It is important to realise that hedge funds man-

agers are largely exposed to a variety of different systematic risks³ and thus earn corresponding risk premiums as a significant part of their return profile (asset pricing theory links these returns to betas). Many hedge fund investors often lack an understanding of the fundamental difference between managers providing returns through an informational advantage or applying a certain investment skill to exploit market inefficiencies (alpha), and a manager generating returns by assuming systematic risks and earning corresponding risk premiums (beta).

The statement that risk premiums are a dominant source of hedge fund returns by no means implies that manager skill is not essential or is even meaningless. Manager skill and the direct exploitation of market inefficiencies are important return sources for hedge funds. The implementation of a particular trading approach can be quite complex and difficult, and often requires a rather unique skill set and edge on the side of the manager. It is the experience and creativeness of the single hedge fund managers related to the complexity of the traded instruments, the nuances of the hedging process, the daily trade execution and, last but not least, the details of the risk management process (avoiding/hedging certain risks and consciously taking other risks) that enable him to create real value to investors, be it through the smart capturing of risk premiums or through the direct exploitation of market inefficiencies.

Many investors believe that investing in hedge funds revolves around the search of alpha (and the quest for capacity with the perceived star managers). The author believes that the search of alpha must begin by understanding beta, that is, the assessment of systematic risk factors (going beyond the equity markets' beta). Perceived price anomalies and apparent arbitrage opportunities are often related to risks and corresponding risk premiums. The sources of hedge fund return are discussed in detail in Chapter 3 of this book.

Special challenges of hedge fund risk management

Comprehension of return sources and risk factors is a vital element of hedge fund investing and risk management. If independent hedge fund risk management is so important and in such current demand, why is it still the exception rather than the rule? Hedge fund risk management presents two unique challenges: complexity and rapid change. Hedge fund strategies are much more complex and varied than traditional asset classes. They partake of all of the complexity of the traded markets, plus a meta-layer of complexity of their own. Yet these strategies are changing even as investment professionals and risk managers struggle to understand them. To make matters worse, the overall risk management practices of the investment community are also rapidly changing across all asset classes. However, there is hope. The state of the art in financial risk management has developed dramatically over the past few years, with new paradigms and ever more complex models continuing to emerge. While confusing to some investors, these new tools create new opportunities to monitor and fine-tune risks in hedge funds much more accurately than just a few years ago.

Further challenges for hedge fund risk management are their low visibility and limited liquidity. Hedge funds have traditionally been reluctant to disclose details about their trading strategies and market exposure, and have imposed extended redemption periods (lock-ups) on the investor. However, the demand for independent risk management has important implications for transparency and liquidity. It should be undisputed that transparency to the level of knowledge about trading positions is a prerequisite for solid risk analysis. Further, the possibility of acting on sufficient liquidity is a necessary requirement for active risk management. Clearly, the traditional lack of transparency and long redemption periods with single hedge

fund managers present serious problems to the risk manager. Monthly returns, standard deviations, maximal draw-downs and, in most cases, a monthly or quarterly letter to investors just do not provide sufficient information for this purpose.

The discussion within the hedge fund industry about how to address these issues is in its early stages. At the centre of this discussion lies the challenge of eliminating undesired risks while reaping the benefits of hedge funds. With the advent of a higher degree of sophistication in hedge fund portfolio management by institutional investors and funds of funds, solutions to these problems have started to emerge (and will be discussed later in this chapter).

Risks in hedge funds

Hedge fund risks compared to the risks of traditional investments

Discussion of risk management has to start with a definition of risk. There is an important difference between hedge funds and traditional investments in how risk is defined. Hedge fund managers define risk as total risk whereas most traditional equity and bond (long-only) managers measure risk relative to a benchmark (and measure it correspondingly by the so-called tracking error). Thus, the latter define risk as only the active risk element in the portfolio.⁴ Note that the exclusion of the passive risk (that is, the beta risk of the broad market) in a risk measure leaves the largest risk source in a traditional portfolio unconsidered. The end-investor's definition of risk is total risk as this is what determines the level of his wealth. The traditional manager has no incentive (nor any means) to manage the passive risk. It is effectively managed (that is, determined) by the market itself.

In contrast, the hedge fund manager has strong incentives to keep the total risk of the investment under control. Due to the hedge fund's focus on absolute returns, the first priority of the manager is capital preservation. Hedge funds make consistency and stability of absolute returns, rather than magnitude, their key priorities. The hedge fund manager follows strict risk controls and concentrates on very particular risks, which he understands, with which he has good experience and for which he has a unique skill set. Unwanted and uncontrolled risk (for example, broad equity market risk) he often actively hedges away. Many consider the name 'hedge fund' a misnomer, as many hedge funds are leveraged rather than hedged. However, the hedging of unwanted risk in most hedge funds actually gives the name a justification. Managing hedge funds has at least as much to do with risk management as with picking stocks or timing a particular market. Good hedge fund managers are today among the best risk managers on Wall Street.

An important consideration for hedge funds relates to the statistical measurement of risk. Numerous hedge fund strategies, such as short option strategies, have non-symmetric (negatively skewed) return distributions and leptokurtic (that is, fat-tailed) return distributions. As an example, Exhibit 1.1 shows the first four moments of different event driven and relative value strategies.⁵ In these cases, the conventional measure of risk, namely standard deviation, is insufficient for risk measurement. Investors usually have a preference for positively skewed outcomes, and an aversion to negatively skewed and fat-tailed outcomes. This is not captured by a risk measure such as the standard deviation that weighs each part of the distribution identically and does not display a sufficiently high probability to extreme events. One should therefore be cautious when using the standard mean variance optimisation approach when hedge funds are part of the investment portfolio. The appropriate choice of a risk measure is essential for the management of hedge fund portfolios (see Chapters 28 and 29).

Exhibit 1.1

The first four moments (mean return, standard deviation, skew, kurtosis), maximal drawdown and the Sharpe ratio (5 per cent risk-free rate) of the return distribution of event-driven, convertible arbitrage and fixed income arbitrage strategy sector indices of the CSFB/Tremont and HFR indices

	Return (%)	Volatility (%)	Max. drawdown (%)	Sharpe ratio	Skew (m)	Kurtosis (m)
Event-driven						
HFR	14.19	6.90	-10.78	1.33	-1.48	5.26
Tremont	10.48	6.43	-16.04	0.85	-3.54	24.33
Relative value						
Convertible arbitrage (HFR)	11.69	3.38	-4.84	1.98	-1.37	3.31
Convertible arbitrage (Tremont)	10.23	4.88	-12.04	1.07	-1.22	4.39
Fixed income arbitrage (HFR)	8.58	4.64	-14.42	0.77	-1.82	9.68
Fixed income arbitrage (Tremont)	7.32	4.70	-12.47	0.49	-1.13	14.35

Sources: CSFB–Tremont, HFR; author's calculations.

One can argue that the higher risk-adjusted returns for hedge funds (when measured by mean and variance) are partly a compensation (risk premium) for higher tail risk (that is, leptokurtosis) and the relatively higher probability of very low returns rather than very high returns (that is, negative skew).

Market risk and manager risk

Hedge fund investors have to deal with two main categories of risk.

1. *Style (or strategy) risk*. This risk is also known as systematic risk. It is related to each strategy sector (or style) and describes the *a priori* known risk of potential market behaviours affecting the entire strategy sector adversely, for example equity market (directional) risk for long-biased long/short equity, credit spread risk or equity market volatility risk for convertible arbitrage. Style risk can be a complex combination of market risk (risk arising from changes in the market price of financial assets), credit risk (risk that a counterparty does not meet or is expected not to meet its contractual obligations), or liquidity risk (inability to execute transactions or unexpected decrease in funding opportunities).⁶ As discussed above, the (systematic) style risks of the individual strategy sector are essential return generators of most hedge fund strategies. Therefore, taking a certain amount of these risks is a prerequisite for hedge fund performance.
2. *Manager-specific (structural or operational) risks*. These are the risks related to the possibility that the specific manager experiences a large unexpected loss related to certain risks unique to the manager, such as style drifts, operational problems, concentration in individual securities, fraud and business risks (for example, key people leaving). Manager-specific risk is unsystematic, that is, it rewards investors with an expected return.

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Strategy or portfolio risk is best dealt with through appropriate diversification among various strategy sectors. This requires precise knowledge of these sectors, including their return sources, dependence structure, and behaviour in favourable and unfavourable market environments. A diversified hedge fund portfolio contains strategies that have their strengths and weaknesses in different market environments.

There are different views on how to achieve sufficient protection against manager risk. Some hedge fund investors follow the approach of selecting several dozen different managers, thus limiting the impact of a single-manager blow-up on their portfolio. This approach is often sub-optimal as it leads to efficiency losses resulting in more required manager due diligence, less time spent per manager and over-diversification. The outcome is often mediocre performance and undesired high correlation to equity markets. Recent research indicates that one can build a well-diversified portfolio with 15–20 managers.⁷ Active post-investment risk management can decrease manager risk dramatically, and thus the number of managers needed for appropriate diversification.

The scaling of risk: leverage

Leverage is a way to scale risk and return proportionally, and, on a stand-alone basis, it is not a very useful measure of risk. High leverage factors do not necessarily imply unacceptably high risk. However, in investors' perceptions excessive leverage is widely considered one of the main risk factors of hedge funds (especially after the fall of LTCM, an exceptionally highly leveraged hedge fund). It often remains unmentioned that most hedge funds employ rather limited degrees of leverage. A recent survey revealed that 77 per cent of hedge funds employ a leverage of less than two (that is, less than 100 per cent borrowed foreign capital).⁸ Leverage is not always undesirable and, in certain instances, can be helpful to achieve the desired risk-return profile of a strategy. However, leverage bears additional specific risks. Asset liquidity, leverage and financing risk are inter-related, and cannot be assessed in isolation. When instrument liquidity evaporates (for example, in market stress situations), counterparties, usually consisting of prime brokers as providers of leverage financing, can quickly withdraw funding. Prime brokers have policies as to how much a certain type of strategy can borrow and the margins provided for each strategy. These policies can be subject to sudden change. It is important to understand the implications of leverage (rather than stick to rigid policies such as investing in strategies with no or little leverage only), because of its impact on other sources of risk such as market, credit and liquidity risk.

Elements of hedge fund risk management

The tasks of a hedge fund portfolio manager

A portfolio management process, if properly structured and set up, can add significant value to hedge fund investors provided that the portfolio manager (in most cases a fund of funds manager) adheres to some fundamental criteria in his investment approach regarding strategy allocation, manager due diligence and risk management capabilities. The following describes the three key duties of the hedge fund portfolio manager:

1. *Sector allocation (top-down analysis)*. Deciding on the relative allocation of capital to various hedge fund styles.

2. *Manager evaluation (bottom-up analysis)*. Evaluating the individual managers' strategies in a chosen style sector and a thorough manager due diligence process.
3. *Continuous monitoring/risk assessment*. Monitoring open investments for inappropriate risk and style drift.

Top-down strategy sector analysis and bottom-up manager evaluation, though principally pre-investment activities (thus we refer to them also as pre-investment risk management), must be periodically reassessed after the investment is initiated (post-investment risk management). However, post-investment risk management faces some limitations if it is not combined with regular position monitoring and active risk management. At the same time we emphasise that no amount of post-investment transparency and risk management tools can compensate for a lack of knowledge about, and confidence in, the manager's strategy and his trading edge.

Pre-investment risk management

Sector allocation

Top-down strategy sector allocation consists of two core processes.

1. *Strategic asset allocation (long-term, that is, six to 18 months)*. Selecting the accepted systematic risk factors and reaching effective diversification among them. The goal here is to appropriately allocate capital among the various hedge fund styles, and reach a stable diversification across different return drivers, economic functions and risk factors in the hedge fund universe. A popular financial term for this process is risk budgeting.⁹
2. *Tactical asset allocation (short-term, that is, one to six months)*. Accounting flexibly for the changing dynamics of global capital markets and return opportunities, as well as the time-varying character of risk premium returns, and ensuring the regular re-balancing of the desired risk budget structure within the portfolio on a shorter time horizon. A statically fixed asset allocation can result in widely fluctuating portfolio risk. Risk budgets need to be reassessed and rebalanced frequently according to strategy sector performances, market conditions, and level of relative attractiveness (and thus performance expectations) for the underlying set of strategies.

Sector allocation has qualitative and quantitative components. It is less a quantitative science than an art based on the investor's experience. A pure quantitative approach ignores the well-known pitfalls of portfolio optimisation for hedge funds (see Chapter 4), while a pure qualitative approach ignores the value of information about strategy features that can be obtained through a statistical analysis of risk, return and correlation features of the various hedge fund strategies. Empirical performance and correlation studies can serve as valuable guidelines for the hedge fund investor/allocator. However, no amount of statistical and econometric analysis can replace proper judgement. A significant part of qualitative understanding is the assessment of the sources of return (especially for the tactical asset allocation, since it is impossible to effectively predict the time variation of manager skill).

There are four elements of the strategic sector allocation process.

1. Judgement of the return drivers and opportunities of the various hedge fund strategies. Return profiles across the universe of strategies are very opaque and thus influenced differently by developments in global capital markets.

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2. Assessment of the desired risk types and magnitude for the portfolio. Hedge fund strategies are rewarded for their exposure to a variety of systematic risks (see above).
3. Determination of the correlation and dependence structure in various market environments across the universe of hedge fund strategies.
4. Identification of secular trends in the global capital markets. The global financial, economic and political trends determine the performance of the various risk premium.

The following are components of tactical asset allocation.

1. *Consideration of mean reversion in risk factors.* Many risk factors show signs of mean reversion in their behaviour (for example, credit spreads and volatility). In periods of extreme deviation of a risk factor's behaviour from the longer-term value of its mean, an over-allocation to strategies that benefit from a reversion of this risk factor (by relative over-performance) is particularly attractive.
2. *Rebalancing exposure due to profit and loss (P&L).* The relative performance across the various strategies in the portfolio necessitates a frequent rebalancing (for example, commodity trading adviser (CTA) run-ups in relatively short periods of time).
3. *Risk budget rebalancing.* Due to the dynamically changing nature of return opportunities and risk exposure in the different strategy sectors, certain hedge funds can at particular times take more (or less) risk – relative to their own expected average as well as relative to other strategies. This often leads to a mis-balance of the risk and correlation profile in the overall portfolio, despite compliance with the desired nominal allocation sizes according to the strategic sector allocation. It is the balance of the risk exposure and risk type (that is, the risk budget), not the nominal allocation to the different strategies, that one needs to consider in a proper risk budgeting approach.
4. *Macroeconomic outlook on risk factors.* The attractiveness of return drivers changes over time, even on a shorter time horizon, for example, due to changing economic circumstances (business cycle), political events (for example, elections and regulatory changes), geopolitical events (for example, war) or other factors.

Manager evaluation

Manager due diligence encompasses important elements of risk management and the decision to allocate money to a particular manager is of ultimate importance for the investor. Each investment involves certain manager risks that are specific to trading styles and employed investment techniques, such as leverage, investment instruments and short selling. Manager-specific risks also include operational risks, legal risk, business risk (such as key person risk), model risk and fraud risk. Two pre-investment measures are essential in minimising these risks: proper due diligence and manager diversification. Thorough due diligence should, without exception, be a requirement for an investment with a particular hedge fund manager and should result in a detailed understanding of each manager's individual trading strategy. Managers within the same strategy sector can differ with regard to strategy implementation, instrument diversification, hedging, use of derivatives, short selling and the degree of leverage.¹⁰

Unfortunately, many investors still rely too much on past performance when selecting managers, without thorough qualitative analysis. Qualitative aspects of due diligence involve knowing the manager's edge for returns, the investment style and attitude of the manager,

details of the investment decision-making processes, the organisation and structure of the manager's operations, the trading facilities, and the character, quality and background of key people¹¹ (see also Chapter 7 for a discussion of due diligence) The first question to a hedge fund manager should be: why do you make money? The second question should be: how do you make money? The answers to these will allow the investor to answer the most important question: will the hedge fund manager continue to make money?

Prerequisites of post-investment management

The issue of transparency

Transparency has become a catchy expression and refers to a variety of different possible information types disclosed to the investor. First, controlling the risk of his trading strategy as well as the specific risks of his firm¹² requires insight into the details of the manager's investment techniques and the operations of his company. It is undisputed that one of the core responsibilities of the professional hedge fund investor and portfolio manager (fund of funds) is to access this level of pre-investment transparency and use this information for an optimal investment allocation. Post-investment transparency may then come in a number of different (non-exclusive) forms, from regular qualitative information in retrospect about the trading activity and direct conversations with the manager (the weakest form) to obtaining a daily disclosure of all positions from the manager's prime broker (the strongest form).

Detailed insight into the activities of the hedge fund manager lies at the very heart of the risk manager's capability to perform his post-investment monitoring task. It should be clear that without this knowledge risk analysis remains largely a guessing game. There is a widespread discussion within the hedge fund industry about what constitutes the necessary and appropriate information base that the risk manager needs for monitoring and managing risk effectively (in other words, what the right level of hedge fund disclosure is) while at the same time protecting the interests of the hedge fund manager. An important element of this discussion is whether (standardised) information about the aggregated risk exposure without complete position transparency is sufficient for monitoring and risk management purposes, or whether regular full disclosure of all positions is needed. While the Investor Risk Committee (IRC) advocates the first solution,¹³ and is currently in the process of developing appropriate style-specific aggregation and information levels, the author of this chapter believes that, if possible, the disclosure of trading positions is the most efficient way to ensure the risk manager has all necessary information to independently assess and control the risk in a particular hedge fund. Investors and hedge fund portfolio managers (funds of funds) may not always need position transparency on a daily basis for each strategy to effectively manage and measure risk. However, it should be clear that without sufficient transparency, hedge fund investing and multi-manager portfolio diversification remain a search in the dark, with the tendency being to allocate most money to the stars of the past.

However, the issue of transparency covers more than position disclosure, and even complete transparency does not guarantee proper risk management. The art of transparency, that is, the integration of transparency into the risk management infrastructure, consists of a multi-level process, ranging from collecting structural information about the hedge fund in the due diligence prior to investment to efficiently dealing with the possibly thousands of single positions in hedge funds, the appropriate valuation of all instruments in the portfolio, the calculation of the appropriate risk variables and the definition of necessary risk management

activities. Position-level risk analysis requires skills and methodologies that need to be developed by independent third parties and risk-monitoring agents.¹⁴

An interesting analogy regarding transparency and independent risk monitoring for hedge fund strategies might be the following. Consider the level of scrutiny for the investment activities inside financial institutions such as banks, broker dealers, corporate finance departments of large firms and insurance companies. The supervision of proprietary trading desks in investment banks (where mostly the balance sheet capital of the bank is traded) takes place in a very rigorous and independent risk-monitoring framework. Consider further that many hedge fund strategies are quite similar to proprietary trading at these desks (many hedge fund strategies actually came out of these institutions and are now seen as the outsourced activities of the proprietary traders). It seems difficult to imagine that external managers would be allowed to pursue these investment activities in a completely unmonitored and largely unregulated way. To make matters worse, these strategies are exposed to a much larger variety of risk factors and can be made riskier at the discretion of the manager.

Another interesting perspective on the question of how much disclosure is necessary can be obtained if one considers the position of the prime broker, the other party next to the investor, which is exposed to the risk of financial losses as a consequence of a hedge fund manager's trading activities, as a lender of securities and provider of leverage. If risk and exposure monitoring without disclosure of positions were sufficient for appropriate risk management, the prime brokers would monitor their exposures to hedge funds based on aggregated risk information, without worrying about the tedious job of identifying single positions. However, in reality prime brokers have full transparency of positions on a continuous basis. They consider position disclosure as the foundation for their own risk management.

The necessity for position disclosure and the usefulness of full transparency vary among the different hedge fund strategies. Model-based systematic strategies are easier to monitor and understand on a regular basis than discretionary (that is, not model-based) strategies such as long/short equity, macro or short selling, where it is more difficult to follow the rationale of positions on a stand-alone basis, that is, without further information provided by the manager. However, this is no argument against position disclosure even for the latter strategies, as monitoring and controlling exposure to the main risk factors, as well as leverage and potential style drifts, are essential in all cases. The optimal frequency of disclosure is related to the liquidity of traded instruments. For distressed securities and regulation D strategies weekly or monthly disclosures can be sufficient, while for most other strategies, more frequent (that is, up to daily) position transparency is most useful and appropriate.

While standardised measures such as gross and net exposure, leverage factors, Value-at-Risk (VaR) numbers and simulated losses after predefined stress test scenarios provide valuable insights into the hedge fund's activity, and often constitute some basis for monitoring style drift, knowledge of trading positions enables the risk manager to assess the full magnitude and all details of risk completely (and independently), especially in light of the dynamic and complex nature of most hedge fund strategies.

The issue of liquidity

The benefits of transparency in a hedge fund portfolio cannot be fully realised if the investor is not provided with sufficiently short redemption periods. It is obvious that if the investor faces redemption periods that do not correspond to the frequency of transparency provided, he is prevented from responding to time-sensitive information and taking the necessary steps

in line with his analysis. The hedge fund investor has to be proactive and should be in a position to take steps to remedy critical situations in a timely fashion. Often, when a crisis has arrived it is too late to make adjustments.

Hedge fund liquidity has two different meanings: first, the ability to sell an investment without a price impact (instrument liquidity); and, second, the availability of financing for leverage (funding liquidity). The hedge fund investor should understand the liquidity of the instruments in which a strategy invests, and the sources and reliability of leverage financing. The best liquidity indicator for a strategy is the market liquidity of the traded instruments. Managed futures, large-cap long/short equity, macro, market-timing and risk arbitrage strategies involve highly liquid exchange-traded instruments, as do most arbitrage and relative value strategies (with some exceptions for convertible and fixed income arbitrage strategies).¹⁵ On the other side of the spectrum are distressed debt and regulation D strategies, which are generally extremely illiquid. However, it is important to note that the liquidity of investments can be very different in times of turbulence in capital markets. Liquidity tends to evaporate when it is most needed. An extreme example of previously unknown liquidity risk was the ‘flight to quality’ event in September 1998, which led to the failure of LTCM.¹⁶

It is important to note that most hedge funds operate in markets that exhibit a high degree of efficiency and liquidity. In most cases hedge funds trade only the most liquid stocks and bonds, the most liquid currencies, and futures markets. This liquidity stands in great contrast to the rather extended redemption periods of many hedge funds (ranging from one month to several years). Note further that most redemption policies can be overridden in extreme market environments, as many managers include clauses in their offering memorandums giving them the right to suspend redemptions during certain vaguely defined scenarios of market turmoil, regardless of normal liquidity policies. Until recently hedge fund managers have not been asked for shorter redemption periods nor have they been willing or operationally organised to provide it (one reason why hedge fund managers are not willing to provide this liquidity is the involved administrative back-office process for frequent redemptions and subscriptions, as most hedge funds have very limited resources to do so). However, if the hedge fund manager executes strategies with comparably high liquidity in the underlying instruments, why should the investor be confronted with long redemption periods?¹⁷

Elements of post-investment risk management: the monitoring and risk analysis process

Post-investment risk management essentially consists of two elements: the periodic re-evaluation of the manager (performance, skill base, uniqueness, operations and people); and frequent risk analysis. When it comes to quantitative risk analysis a variety of different tools are available to investors. Furthermore, risk service providers have developed business models to provide investors with a range of calculation and analysis tools. These tools are increasingly geared towards hedge funds.

Exposure analysis

Risk is a combination of exposure and uncertainty. Besides aggregate exposure on the level of the global portfolio, exposure analysis is a breakdown of the exposure to different aggregation levels. It further includes monitoring of certain exposure ratios such as margin characteristics and leverage factors (net and gross leverage), credit quality, and hedge ratios.

Value-at-Risk

VaR has introduced a new dimension of risk analysis to the financial community. With VaR, risk can be quantified across different instrument and asset classes where correlation as well as volatilities are fully accounted for, using a uniform and comparable measuring system for risk. However, VaR provides only a very incomplete picture of the extreme left tail region of the distribution. VaR thus does not help us to forecast and prevent unacceptable losses. It is undisputed among theoreticians and practitioners of risk management that VaR needs to be supplemented by other analytical tools (for example, expected shortfall), not least to cope with extreme market conditions (for example, stress tests). Chapters 28 and 29 provide a discussion of the pitfalls of VaR, and discuss various alternative measures.

Stress tests and scenario analysis

Stress tests apply extreme scenarios to the portfolio in order to ascertain coverage of the impact of pre-determined extreme price changes in the market. Such tests give insight into the portfolio's behaviour under extreme but plausible market conditions. We distinguish two different types of scenario underlying stress tests – historical scenarios (for example, the equity market crash of October 1987); and general market scenarios (for example, a drop of 15 per cent in a certain currency) – which include appropriate size shocks, asymmetries in return distribution and correlation considerations (for example, shockingly different combinations of asset classes separately and combined).

Extreme value theory

The accurate prediction of extreme events is of central importance to risk analysis. Financial risks exhibit fat tails (leptokurticity): that is, extreme events are more likely to occur compared to what a normal distribution suggests. Most available tools for parametric VaR estimation, such as general autoregressive conditional heteroskedasticity (GARCH) models, are designed to predict common volatilities and therefore have poor tail properties. Extreme value theory (EVT) provides the theoretical background for the description of the asymptotic distribution of the tails of leptokurtic distributions.¹⁸ After determining the tail properties of the data the VaR can be estimated as a quantile of the determined extreme value distribution. Studies have shown that VaR calculated on the basis of an underlying EVT distribution is considerably higher than normal VaR.¹⁹ In other words, VaR calculated on the basis of standard volatilities and correlations severely underestimates the real risk. Chapters 28 and 29 discuss advanced alternative risk measures based on EVT.

Active risk management

Risk management is both an art and a science. While the latter refers to the more quantitative elements of risk measurement, the art of risk management corresponds to the wisdom and good judgement that the risk manager develops over time. Risk measurement is an important element of risk management, but in itself it remains a passive activity. In contrast, risk management requires action and goes beyond risk measuring (but is nevertheless based on accurate risk analysis). While risk measurement aims at providing an objective assessment of how much risk is present in the portfolio, risk management consists of a variety of other, sometimes rather subjectively determined, factors. Active risk management entails the dynamic and optimal allocation of risk among different assets and managers. It consists of

defining and enforcing risk limits, performing dynamic portfolio allocation according to (possibly changing) risk parameters, and accepting certain risk factors, but eliminating others that are deemed unacceptable.

The very fact that hedge fund managers take risks is surely not undesirable. However, risk that is unintended, misunderstood, mismanaged or mispriced should not be accepted. Bearing these risks consciously, the risk manager needs to be able to take proactive steps and remedy critical situations quickly. When a crisis has arrived it is often too late to make adjustments. Within a framework of active hedge fund risk management there are various ways to manage risk and exercise control over trading managers.

- *Regular conversations.* The AIS allocator should talk frequently with managers about the current and potential future risks of their trading strategy. He should know how the individual manager judges his strategy's current risk profile and, based on his understanding of the strategy, develop his own view about its vulnerability in given market conditions.
- *Risk or exposure limits.* The risk manager should distinguish between risk levels and sources that are accepted, and those that are not. He can define certain risk budgets on the level of the global portfolio, single asset class, strategy sector or manager. These are ceilings on the amount of acceptable risk as indicated by measures such as VaR, notional exposure, leverage or simulated stress test losses. The values should be dynamic rather than statically fixed in accordance with the hedge fund manager and his strategy (imposing unsuitable limits on a manager will affect returns negatively). Once predefined and agreed limits are exceeded, the risk manager must undertake action ranging from discussion with the manager to re-allocation or de-leveraging and, in the worst circumstances, to closure of positions or complete exclusion of the strategy from the portfolio.
- *Definition of stop-loss limits.* The portfolio manager can set limits on each manager's maximal drawdown. The definition of such a limit should depend on the strategy and should be made in consultation with the manager before the allocation.
- *Request for explanations of unusual positions.* Unexpected and unexplained high exposures to certain securities or asset classes or unusual leverage factors should be immediately addressed. They are warning signs of upcoming problems. If the manager does not provide a convincing explanation for such exposures, the allocator should force him to close the positions and consider excluding him from the portfolio.
- *Firing of managers with issues.* Managers who have breached certain agreements, are convicted of illegal or unethical behaviour by regulatory authorities or take excessive single bets that do not correspond to defined trading strategies should be quickly excluded from the portfolio.

Current issues for hedge fund risk management

Arguments raised against full transparency

Despite growing investor awareness of the importance of transparency (that is, position disclosure) and active risk management by selected monitoring agents (for example, funds of funds), there remains a surprising degree of resistance to such transparency in the hedge fund industry. The following three concerns are frequently expressed with respect to transparency down to the position level.

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1. Confidential position information reaches the market place, potentially causing the strategy either to lose its competitive edge, if more players adopt the strategy, and/or to be actively traded against by certain market players.
2. Investors lack the skill to evaluate the massive amount of information provided by daily positions.
3. The request for transparency will lead to the exclusion of the best managers within the universe of hedge funds from the portfolio.

A reply to the transparency doubters

The three arguments against position transparency to selected independent third parties are addressed in the following paragraphs.

As to the first argument, the author wants to emphasise that the argument for transparency is by no means a pledge to provide every single investor and the wider investing public access to confidential information about a hedge fund manager's trading activities. Hedge fund managers can set up confidentiality and non-disclosure agreements with large investors and fund of fund managers. As mentioned above, transparency is possible (and necessary) only for a small class of hedge fund portfolio managers such as funds of funds. One must consider who actually poses a threat to hedge fund managers. The threat comes mostly from the dealer community and the proprietary trading desks within the large investment banks (that is, the prime brokers) rather than from fund of funds managers or individual investors.

The second argument neglects to take into account the increasing expertise and capacity of some fund of fund managers. With the advent of modern communication and data-processing tools the handling of large sets of information can be performed quite efficiently. A large variety of tools and software packages for sophisticated risk management are now available. Chapters 25 and 26 provides more detailed information about risk management systems in practice.

Sometimes the third argument is raised in combination with the statement that the best managers are unwilling to provide transparency or insight into their trading approach. Critics argue that hedge fund investors that require transparency (for example, through a managed account) necessarily have to invest with lower-performing managers. There are indeed some managers with excellent performance track records who refuse to provide any transparency to investors, but it is one of the persistent myths about hedge funds that attractive returns are linked with lack of transparency. Examples of secretive, non-transparent and, for certain periods of time, very successful strategies are LTCM, Quantum Fund, Tiger and Niederhoffer, all of which failed spectacularly in the end. Investors failed to understand that high past returns were connected to high risks, which eventually led to failure. The discussion of return sources of hedge funds (see Chapter 3 of this book) is essential for a better picture of their risks, and thus illustrates the point that the image of secrecy and mystique that still surrounds hedge funds is largely unjustified.

The belief that the best managers are necessarily non-transparent and that hedge fund portfolio managers focusing on transparency are therefore left with second-tier managers also does not find any empirical support. An increasing number of managed account platforms have succeeded in working with the best names in the industry. Many high-quality managers with excellent past track records are willing to offer the desired transparency to the fund of fund manager, if certain requirements (efficiency in trading as in the manag-

er's own fund vehicle, confidentiality, minimum size) are fulfilled. Conversely, managers who refuse to provide transparency as to their investment activities have a systematic disadvantage: lack of transparency means a significantly higher risk to the investor, which, according to investor expectations, subsequently requires a higher return. However, where should that return come from? It is not plausible that performance should depend on the fact that a fund of funds manager receives, or does not receive, disclosure of the manager's activities.

Managed accounts

The most effective way to address the need for both liquidity and transparency as prerequisites of effective risk management is via a managed account. The hedge fund investor/allocator sets up a separate account in which the hedge fund manager has special authority to execute his trading strategy, in most cases one to one as in his fund. Managed accounts provide the hedge fund investor/allocator with full disclosure of the managers' trading activities together with the highest possible degree of liquidity. Further, the investor/allocator is in a position to select all involved counterparties, including the prime broker, custodian, and auditor. All this creates the optimal basis for proactive risk management.

With the institutionalisation of hedge funds and the fiduciary role that an increasing number of investors assume, the popularity of managed accounts is likely to continue to increase in the near future. However, a managed account is not always possible or practical. The efficient setting-up of a managed account requires a great deal of expertise and experience by the investor/allocator.

The following criteria are crucial for successfully investing through managed accounts.

- A managed account requires the replication of the entire trading infrastructure of a hedge fund. The manager needs to be provided with a more or less identical environment to execute his strategy efficiently, and identically to his own fund. This is more complex than it at first seems. One has to work with the prime broker of the manager's choice, which can quickly lead to relationships with a dozen different prime brokers with different systems and conventions, etc. Further, the portfolio manager may need to provide the legal environment for the manager, in particular the different ISDA swap agreements, legal representations (i.e. qualified investor status) and the prime brokerage agreement, etc. A managed account can require a dozen or more different legal contracts. It is essential to convince high-quality managers to execute their strategy in a managed account to make trading as easy and comfortable in the managed account as in their own funds. This requires experience and a great deal of extra work by the portfolio (fund of funds) manager.
- The portfolio has to be willing and able to provide the manager with confidentiality agreements. Managers need to be certain that proprietary information about their trading does not go beyond the portfolio or fund of funds manager. The independence of the portfolio manager from a larger institution is a great benefit, as it is more difficult for hedge fund portfolio managers in banks and other financial groups with their own proprietary trading desks to ensure confidentiality.²⁰
- The hedge fund allocator should be in a position to allocate a significant amount of capital to the hedge fund strategy. Managed accounts often require a significant minimum investment of up to US\$20 million.

Even if these requirements are met, not all hedge fund managers agree to exercise their strategy via a managed account. However, the number of these managers actually is decreasing rapidly, and often is limited to particular strategy sectors such as distressed securities, regulation D and the large global macro traders. It is increasingly considered a sign of quality even within the community of hedge fund managers themselves if a manager offers transparency with respect to his investment approach and trading activities.

Transparency in the institutional context: the new role of funds of funds

The author acknowledges that there is a natural conflict between the investors' need for information to perform independent risk management and the manager's legitimate interest in keeping some of his most sensitive positions secret from the wider public (spread of this information can be quite harmful to the manager, especially with respect to short positions). It should be reiterated that the pledge of transparency is by no means a request to provide every single investor and the wider investing public with access to confidential information about a hedge fund manager's trading activities. Transparency to the level of position details is possible and necessary only for a small class of investors, mostly professional hedge fund portfolio managers, for example, funds of funds.

Realising that insufficient independent risk management for hedge funds is one of the key challenges of the industry, one can go further and anticipate an important additional strategic role that funds of funds will play in the future: acting as the independent risk manager on behalf of investors. Their role would be to resolve the conflict between the managers' legitimate interest in confidentiality and investors' need for information and independent risk management. Having a fund of funds manager playing this intermediary role is probably the most promising proposal for addressing persistent investor concerns about hedge fund risks.

It is important to note that, besides position transparency, the fund of funds manager needs a deep strategy understanding as well as the appropriate procedural infrastructure to act on the information obtained (that is, adequate liquidity management). The challenges of hedge funds (their complexity and rapid change) require fund of funds operations with highly specialist staff and strong commitment. The asset inflow to hedge funds has led to a proliferation of funds of funds, many of which perhaps lack the skill and resources to meet all these challenges at once, the dynamic complexity of hedge funds and their risks as well as the efficient use of position information for the purpose of risk control. It remains to be seen whether existing funds of funds possess the will and the capability to develop the necessary expertise to meet these challenges.

Conclusion

The increasing demand for hedge funds from institutional investors and a generally higher level of investor sophistication renders the black-box approach more and more unsuitable. The demand and need for independent risk management is obvious, and the industry has to face the challenges associated with this new type of investor demand. An important prerequisite for implementing an independent risk management infrastructure is transparency on the level of trading positions and sufficient liquidity to react when necessary. Both can be most efficiently achieved in a managed account set-up. Fortunately, the primary instrument liquid-

ity in hedge funds is relatively high, which means that returns are not much affected by shorter redemption periods.

Active risk management can help to decrease the severity of investment losses by avoiding accidents and investment disasters. However, it has to be noted that risk management does not by itself lead to positive performance, nor does it prevent losses under all circumstances. For each investment there are hostile market environments that will lead to the strategy showing weak performance or losses. Risk management entails the process of allocating and diversifying an acceptable level of measurable risk across hedge fund strategies, assessing frequently whether the risk limits are exceeded, and taking corrective measures if deemed necessary. The author wishes to conclude by stressing that no degree of transparency and no amount of quantitative analysis can replace proper investment judgement.

¹ See Jaeger, L. (January 2003), 'The Benefits of Alternative Investment Strategies in the Global Investment Portfolio', Partners Group Research. Available on the Partners Group web page: <http://www.partnersgroup.net>.

² See also the Survey conducted by the Barra Strategic Consulting Group in 2001, published in *Fund of hedge funds – Rethinking resource requirements*, September 2001.

³ As the reader surely remembers from finance textbooks, systematic risks are those risks that cannot be diversified away by investors. The corresponding returns are economic risk premiums, which are the result of imperfect risk-sharing among different investors in financial markets.

⁴ Risk measured against a benchmark can yield to the counterintuitive effect that an increase of the cash allocation in a portfolio at the expense of a lower stock allocation can lead to a higher risk in the portfolio. A traditional relative money manager's first goal is to perform better than the benchmark, even when the benchmark loses 50 per cent.

⁵ This calculation provides an estimate of the higher moments of the return distribution. For mathematical correctness it needs to be mentioned that this does not mean that the higher moments actually exist, that is, the corresponding integral converges.

⁶ See Jaeger, L. (2002), *Risk Management in Alternative Investment Strategies*, London, Financial Times Prentice Hall, for more details on these systematic risk factors.

⁷ Interesting studies of how many managers are needed to reach sufficient 'manager diversification' in an AIS portfolio are presented in Schneeweiss, T., and G. Martin (2000), *The Benefits of Hedge Funds*, New York, Lehman Brothers. See also a new study by Lhabitant, S., and M. Learned (Winter 2000), 'Hedge Fund Diversification: How Much is Enough?', *Journal of Alternative Investment*.

⁸ Source: Van Hedge Fund Advisors.

⁹ For a coverage of the different aspects of risk budgeting, see the collection of articles edited by Rahl, L. (2000), *Risk Budgeting: A New Approach to Investing*, London, Risk Books.

¹⁰ Note that leverage itself is not a risk measure, but a way to increase and scale the risk and return distribution of a strategy. It can serve (in combination with other items) as one indicator for a strategy's risk level.

¹¹ See Jaeger, L. (2000), *Risk management of Alternative Investment Strategies*, London, Financial Times Prentice Hall, for a more detailed discussion of the '8 Ps' of manager due diligence, 2002.

¹² An important and much-overlooked point is perhaps that it is not enough to be a skilled money manager. Running a hedge fund also means running a firm, which requires a number of entrepreneurial skills.

¹³ The Investor Risk Committee is a group of hedge funds, service providers and investors with the aim of developing risk disclosure guidelines for the hedge fund industry. See their publication *Hedge Fund Disclosure for Institutional Investors*, available on the IAFE Web-page: <http://www.iafe.org> or on <http://www.cmra.com>, and the amendment in July 2001.

¹⁴ A further challenge lies in enabling the end-investor (for example, institutional investors) to appropriately interpreting the risk numbers. However, the emphasis of the argument here is on the statement that there needs to be independent party with the necessary skills and sophistication to perform the risk monitoring.

¹⁵ Convertible bonds are usually traded OTC, as are swaps and other fixed income and credit derivatives. However, with the proliferation of these instruments liquidity has often reached high levels.

¹⁶ For a well-written and quite entertaining account of LTCM we recommend Lowenstein, Roger *When Genius Failed: The Rise and Fall of Long-Term Capital Management*, Random House, 2000; see also report of the

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President's Working Group on Financial Markets, 'Hedge Funds, Leverage, and the Lessons of Long-Term Capital Management,' April 1999, available on <http://risk.ifci.ch/146530.htm>.

¹⁷The rise in popularity of managed accounts (see discussion below) by funds of funds is about to change this. Managed accounts offer hedge fund liquidity to the level of liquidity of the instruments traded, so it will be in the hands of the fund of funds, which employs managed accounts to structure products with the necessary liquidity.

¹⁸The well-known Fisher-Tippett theorem gives an explicit form of the asymptotic distribution of the tails for a wide class of different distributions. A good reference for the mathematical properties and theorems of extreme value can be found in Embrecht P., et al (1999), *Modelling Extremal Events*, Berlin/Heidelberg, Springer. See also McNeil, A. (1999), 'Extreme Value for Risk Managers', *Internal Modelling and CAD II*, London, Risk Books, pp. 93–113.

¹⁹Neftci, S. N. (Spring 2000), 'Value at Risk Calculations, Extreme Events, and Tail Estimation', *Journal of Derivatives*, pp. 23, and Danielsson, J., and C. de Vries (1998), 'Value at Risk and Extreme Returns', *Tinbergen Institute Discussion Paper*, TI, 98-017/2, (21).

²⁰Chinese walls are often less dense than they are claimed to be.