PART

One

Portfolio Allocation in Hedge Funds

Chapter 1 shows how investors can neutralize the unwanted skewness and kurtosis effects from investing in hedge funds by purchasing out-of-the-money equity puts, investing in managed futures, and/or overweighting equity market neutral and global macro and avoiding distressed securities and emerging market funds. It shows that all three alternatives are up to the job but also come with their own specific price tags.

Chapter 2 investigates the hedge fund industry as it enters a more mature stage. The industry has extended its investor base to institutional investors, who are now faced with a large number of product offerings. These include not only single hedge funds, but also funds of funds and, more recently, investable indexes. Although the existing literature seems to concur on the interest of hedge funds as valuable investment alternatives, a large number of institutional investors still are considering hedge fund investing, but are unsure of which product to choose. This chapter examines the risk factors in hedge fund strategies and assesses the diversification benefits investors can expect from allocating part of their wealth to hedge funds. Different uses of hedge funds are separated into alpha management and beta management. For both of these management issues, indexes that give a true and fair view of particular hedge fund strategies are a necessary tool for the investor. This chapter also examines construction methods for investable hedge fund indexes and how these methods can conserve the properties for a desirable index. Finally, the chapter presents a simplified

approach that allows institutional investors to use such indexes to optimally exploit the diversification properties of different hedge fund strategies.

Chapter 3 examines 2,247 individual hedge funds and 647 funds of hedge funds for the period January 1994 to December 2002, investigating whether portfolios of individual hedge funds constructed using a pure momentum strategy can outperform existing funds of hedge funds. Results indicate that neither a momentum nor a contrarian strategy seems appropriate in portfolio construction to beat existing funds of hedge funds. However, the nondirectional individual hedge funds deciles consistently and significantly beat existing funds of hedge funds.

Chapter 4 provides information about investment styles, which is often one of the key ingredients in creating a portfolio of hedge funds. Hedge funds are opportunity driven and therefore change their investment styles at a high rate. The chapter reviews an adaptive technique that tackles the style drift of hedge funds in an optimal way using returns information only. The method gives better insight in the composition of a hedge fund portfolio and may improve its value-at-risk estimates. The method is illustrated with examples from a long-short equity hedge fund and a fund of hedge funds.

Chapter 5 investigates possible gains from diversifying into hedge funds, using a decision function that allows for the inclusion of the higher moments of the return distribution. The results suggest that higher moments are dominated by the first two moments when portfolios are rebalanced on a monthly basis. Further, the findings suggest that inherent biases in hedge fund return indices may overstate the gains from allocating into hedge funds. Finally, through a simple experiment, it is shown that the inability to rebalance the portfolio may seriously impact the benefits that hedge funds appear to offer.

Chapter 6 addresses three important issues that investors need to better understand. First, it discusses the error associated with the classification of hedge fund strategies under one single header—hedge funds—demonstrating that the universe is really quite heterogeneous and should be the broken down into distinct subgroups. Second, the chapter revisits the critical issue of the distribution of hedge fund returns, focusing on the importance of skew and excess kurtosis. And, finally, it suggests that traditional mean-variance analysis takes great pains to construct efficient balanced portfolios incorporating hedge funds.

Chapter 7 develops a synthetic "desirability" index complementing the pursuit for both high risk-adjusted returns and low correlations. It demonstrates that although some hedge fund strategies are less alpha "efficient" than others, their diversification added value with respect to their overall ranking makes them more attractive in portfolios.

CHAPTER 1

Integrating Hedge Funds into the Traditional Portfolio

Harry M. Kat

This chapter shows how investors can neutralize the unwanted skewness and kurtosis effects from investing in hedge funds by purchasing out-of-the-money equity puts, by investing in managed futures, and/or by overweighting equity market neutral and global macro funds and avoiding distressed securities and emerging market funds. All three alternatives are up to the job but also come with their own specific price tags.

INTRODUCTION

Due to their relatively weak correlation with other asset classes, hedge funds can play an important role in risk reduction and yield enhancement strategies. Recent research, however, has also shown that this diversification service does not come for free. Amin and Kat (2003b), for example, show that although the inclusion of hedge funds in a portfolio may significantly improve that portfolio's mean-variance characteristics, it can also be expected to lead to significantly lower skewness and higher kurtosis. This means that the case for hedge funds is not as straightforward as is often suggested and includes a definite trade-off between profit and loss potential.

The sting of hedge funds is literally in the tail because, in terms of skewness, hedge funds and equity do not mix very well. When things go wrong

This chapter originally appeared in the *Journal of Wealth Management* 7, No. 4 (2005): 51–57. This article is reprinted with permission from Institutional Investor, Inc.

in the stock market, things also tend to go wrong for hedge funds, as a significant drop in stock prices is typically accompanied by a drop in market liquidity and a widening of a multitude of spreads. Equity-market-neutral and long/short funds have a tendency to be long in smaller stocks and short in larger stocks and need liquidity to maintain market neutrality. As a result, when the stock market comes down, this type of fund can be expected to have a hard time. Likewise, when the stock market comes down, mergers and acquisitions will be postponed, which will have a negative impact on the performance of risk arbitrage funds. Problems are not limited to funds that invest in equity. A drop in stock prices will often also lead to a widening of credit spreads, which in turn will seriously damage the performance of fixed income and convertible arbitrage funds. Diversification among different funds will not mitigate this.

This chapter discusses a number of ways to solve the skewness problem and the associated costs. We look at the use of out-of-the-money stock index puts, managed futures, and sophisticated strategy selection. Before we do so, however, we briefly discuss the exact nature of hedge fund returns and the associated skewness problem.

EFFECTS OF INTRODUCING HEDGE FUNDS IN A PORTFOLIO

Generally speaking, risk is one word, but not one number. The returns on portfolios of stocks and bonds risk are more or less normally distributed. Because normal distributions are fully described by their mean and standard deviation, the risk of such portfolios can be measured with one number: the standard deviation. Confronted with nonnormal distributions, however, it is no longer appropriate to use the standard deviation as the sole measure of risk. In that case investors should also look at the degree of symmetry of the distribution, as measured by its skewness, and the probability of extreme positive or negative outcomes, as measured by the distribution's kurtosis. A symmetrical distribution will have a skewness equal to zero, while a distribution that implies a relatively high probability of a large loss (gain) is said to exhibit negative (positive) skewness. A normal distribution has a kurtosis of 3, while a kurtosis higher than 3 indicates a relatively high probability of a large loss or gain. Since most investors are in it for the long run, they strongly rely on compounding effects. This means that negative skewness and high kurtosis are extremely undesirable features, as one big loss may destroy years of careful compounding.

Table 1.1 shows the average skewness and kurtosis found in the returns of individual hedge funds from various strategy groups. The average hedge fund's returns tend to be nonnormally distributed and may exhibit signifi-

TABLE 1.1 Average Skewness and Kurtosis Individual Hedge Fund Returns

	Skewness	Kurtosis
Merger Arbitrage	–0.50	7.60
Distressed Securities	–0.77	8.92
Equity Market Neutral	–0.40	5.58
Convertible Arbitrage	–1.12	8.51
Global Macro	1.04	10.12
Long/Short Equity	0.00	6.08
Emerging Markets	–0.36	7.83

cant negative skewness as well as substantial kurtosis. Put another way, hedge fund returns may exhibit low standard deviations, but they also tend to provide skewness and kurtosis attributes that are exactly opposite to what investors desire. It is this whole package that constitutes hedge fund risk, not just the standard deviation. Actually, this is not the whole story as, strictly speaking, we should also include the relationship between the hedge fund return and the returns on other assets and asset classes in the definition of risk. We look at this shortly.

The skewness and kurtosis properties of hedge funds do not come as a complete surprise. If we delve deeper into the return-generating process, it becomes obvious that most spread trading and pseudoarbitrage strategies will generate these features by their very nature as the profit potential of trades is typically a lot smaller that their loss potential. Consider a merger arbitrage fund, for example. When a takeover bid is announced, the share price of the target will jump toward the bid. It is at this price that the fund will buy the stock. When the takeover proceeds as planned, the fund will make a limited profit equal to the difference between the relatively high price at which it bought the stock and the bid price. When the takeover fails, however, the stock price falls back to its initial level, generating a loss that may be many times bigger than the highest possible profit. Spread traders are confronted with a similar payoff profile. They make a limited profit when the spread moves back to its perceived equilibrium value, but when the market moves against them, they could be confronted with a much larger loss. This is why strategies like this are sometimes thought of as akin to picking up nickels in front of a steamroller. Of course, there is no reason why a trader could not get lucky and avoid getting hit by the steamroller for a long time. This does not mean that the risk was never there, however. It always was, but it never materialized so it does not appear from the trader's track record.

Since individual hedge funds carry some idiosyncratic risk, combining hedge funds into a basket, as is standard practice nowadays, substantially reduces the standard deviation of the return on that portfolio. However, it can also be expected to lower the skewness and raise the correlation with the stock market.

Table 1.2 shows the standard deviation, skewness, and correlation with the Standard & Poor's (S&P) 500 of the average individual hedge fund in the various strategy groups as well as an equally weighted portfolio of all funds in each group. From the table we see that forming portfolios indeed leads to a very substantial reduction in standard deviation. With the exception of emerging market funds, the portfolio standard deviations are approximately half the standard deviations of the average individual fund. Apparently, there are many different ways in which the same general strategy can be executed. Contrary to standard deviation, skewness is not diversified away and drops as portfolios are formed. With the exception of equity-market-neutral funds, the portfolio skewness figures are quite a bit lower than for the average individual fund, with especially merger arbitrage and distressed securities funds standing out. Despite the lack of overall correlation, it appears that when markets are bad for one fund, they tend to be bad for other funds as well. Finally, comparing the correlation with the S&P 500 of individual funds and portfolios, we clearly see that the returns on portfolios of hedge funds tend to be much more correlated with the stock market than the returns on individual funds. Although individual hedge funds may be more or less market neutral, the portfolios of hedge funds that most investors actually invest in definitely are not.

So far we have seen that hedge fund returns tend to exhibit a number of undesirable features, which cannot be diversified away. Skewness, kurtosis, and correlation with stocks worsen significantly when portfolios are formed. But we are not there yet, as we have not looked at what happens when hedge funds are combined with stocks and bonds. Although the inclusion of hedge funds in a portfolio may significantly improve that portfolio's mean-variance characteristics, it can also be expected to lead to significantly lower skewness as well as higher kurtosis. Table 1.3 shows what happens to the standard deviation, skewness, and kurtosis of the portfolio return distribution if, starting with 50 percent stocks and 50 percent bonds, we introduce hedge funds (modeled by the average equally weighted random portfolio of 20 funds) in a traditional stock-bond portfolio. As expected, when hedge funds are introduced, the standard deviation drops significantly. This represents the still relatively low correlation of hedge funds with stocks and bonds. This is the good news. The bad news, however, is that a similar drop is observed in the skewness of the portfolio return. In addition, we also observe a rise in kurtosis.

TABLE 1.2 Individual Hedge Fund and Hedge Fund Portfolio Risks

	Individual Hedge Funds			Portfolio of Hedge Funds		
	Standard Deviation	Skewness	Correlation S&P 500	Standard Deviation	Skewness	Correlation S&P 500
Merger Arbitrage	1.75	−0.50	0.47	1.04	−2.19	0.56
Distressed Securities	2.37	−0.77	0.37	1.54	−2.60	0.47
Equity Market Neutral	2.70	−0.40	0.07	1.14	−0.41	0.19
Convertible Arbitrage	3.01	−1.12	0.19	1.64	−1.35	0.38
Global Macro	5.23	1.04	0.14	2.43	0.87	0.37
Long/Short Equity	5.83	0.00	0.35	2.95	−0.29	0.63
Emerging Markets	8.33	−0.36	0.44	6.15	−0.65	0.67

TABLE 1.3 Effects of Combining Hedge Funds with Stocks and Bonds

% HF	Standard Deviation	Skewness	Kurtosis
0	2.49	–0.33	–0.03
5	2.43	–0.40	0.02
10	2.38	–0.46	0.08
15	2.33	–0.53	0.17
20	2.29	–0.60	0.28
25	2.25	–0.66	0.42
30	2.22	–0.72	0.58
35	2.20	–0.78	0.77
40	2.18	–0.82	0.97
45	2.17	–0.85	1.19
50	2.16	–0.87	1.41

The skewness effect goes far beyond what one might expect given the hedge fund skewness results in Table 1.2. When things go wrong in the stock market, they also tend to go wrong for hedge funds. This is not necessarily because of what happens to stock prices (after all, many hedge funds do not invest in equity), but because a significant drop in stock prices often will be accompanied by a widening of credit spreads, a significant drop in market liquidity, and higher volatility. Since hedge funds are highly sensitive to such factors, when the stock market drops, hedge funds can be expected to show relatively bad performance as well. Recent experience provides a good example. Over the year 2002, the S&P 500 dropped by more than 20 percent with relatively high volatility and substantially widening credit spreads. Distressed debt funds, seen by many investors at the start of 2002 as one of the most promising sectors, suffered substantially from the widening of credit spreads. Credit spreads also had a negative impact on convertible arbitrage funds. Stock market volatility worked in their favor, however. Managers focusing on volatility trading generally fared best, while managers actively taking credit exposure did worst. Equity-market-neutral funds suffered greatly from a lack of liquidity, while long/short equity funds with low net exposure outperformed managers who remained net long throughout the year. As a result, overall hedge fund performance in 2002 as measured by the main hedge fund indices was more or less flat.

So here is the main problem: Individual hedge fund returns tend to exhibit some negative skewness. When combined into portfolios, however, this negative skewness becomes worse. When those portfolios are combined

with equity, skewness drops even further. The increase in negative skewness will tend to offset the lower standard deviation that results from the inclusion of hedge funds. In other words, when adding hedge funds, investors' downside risk will largely remain unchanged while at the same time part of their upside potential is diversified away. Unfortunately, this is the opposite of what we want a good diversifier to do.

The next sections discuss three possible ways to reduce this skewness effect, as well as the associated costs, while maintaining the benefits of the lower standard deviation.

PURCHASING OUT-OF-THE-MONEY PUTS

Since the increase in negative skewness that tends to come with hedge fund investing is highly undesirable, it is important to look for ways to neutralize this effect. One solution is to buy hedge funds in guaranteed form only. In essence, this means buying a put on one's hedge fund portfolio so that in down markets, the link between the hedge fund portfolio and the stock market is severed. Unfortunately, the market for put options on (baskets of) hedge funds is still in an early stage. As a result, counterparties for the required contracts are likely to be hard to find as well as expensive. With hedge funds so closely related to the ups and especially downs of the stock market, there is a very simple alternative, though: the purchase of out-of-the-money puts on a stock index. As discussed in Kat (2003a), over the last 10 years a strategy of buying and rolling over out-of-the-money S&P 500 puts would have generated returns with very high positive skewness. It therefore makes sense to use this option strategy to neutralize the negative skewness in hedge funds.

Suppose we added stock index put options to a portfolio of stocks, bonds, and hedge funds with the aim to bring the skewness of the overall portfolio return back to what it was before the addition of hedge funds. Obviously, there is a price tag attached to doing so. Since we are taking away something bad (negative skewness), we will have to give up something good. If we used leverage to keep overall portfolio volatility at the same level as before the addition of the puts (i.e., if we aimed to preserve the volatility benefit of the addition of hedge funds), this means we will have to accept a lower expected return. Economically, this of course makes perfect sense, as the puts that we add will not come for free and, since they are out-of-the-money, are unlikely to pay off (which of course is just another way of saying that the option strategy by itself has a highly negative expected return).

Assuming investors can leverage their portfolio at a rate of 4 percent and the expected returns on stocks, bonds, and hedge funds are equal to

their historical 10-year means, Table 1.4 shows the effect of using puts and leverage in a portfolio of stocks, bonds, and hedge funds (always with equal allocations to stocks and bonds). Starting with the situation shown in Table 1.3, adding puts to bring the skewness of the overall portfolio back to what it was before the addition of hedge funds (–0.33), while maintaining the volatility benefit, requires only a small allocation to options. As is also clear from the change in portfolio kurtosis, this small allocation, however, goes a long way in restoring the (near) normality of the return distribution. Unfortunately, the costs in terms of expected return (third column) are quite significant. For example, with a 25 percent hedge fund allocation, investors can expect to lose 61 basis points in expected return. This drop in expected return can be interpreted as the option market's price of the additional skewness introduced by hedge funds.

Of course, this conclusion depends heavily on the assumption that investors can leverage (either directly or through the futures market) their portfolios at 4 percent, which does not seem unrealistic in the current interest rate environment. Obviously, if the interest rate were higher, the costs of the skewness reduction strategy would be higher as well because the difference between the expected return on the unlevered portfolio and the interest rate (i.e., the pickup in expected return due to the leverage) would be smaller. A similar reasoning applies in case of a lower expected return on stocks, bonds, and/or hedge funds.

TABLE 1.4 Effects of Combining Portfolios of Stocks, Bonds, and Hedge Funds with Puts and Leverage

% HF	% Put	Change Mean PA* 50/50 Portfolio	Change Kurtosis	Change Mean PA* 33/66 Portfolio
0	0.00	0.00	0.00	0.00
5	0.12	–0.13	–0.05	–0.22
10	0.24	–0.27	–0.12	–0.48
15	0.36	–0.38	–0.20	–0.87
20	0.48	–0.51	–0.31	–2.26
25	0.60	–0.61	–0.44	–3.20
30	0.71	–0.70	–0.58	–3.43
35	0.80	–0.79	–0.75	–3.52
40	0.86	–0.85	–0.91	–3.41
45	0.88	–0.82	–1.04	–3.20
50	0.87	–0.80	–1.13	–2.83

*PA = per annum

Another important element of the analysis concerns the assumption that the allocations to stocks and bonds are always equal. If we assumed that investors always divided their money in such a way that one-third was invested in stocks and two-thirds in bonds (as opposed to the 50/50 portfolio discussed earlier, we will refer to such a portfolio as a 33/66 portfolio), our results would of course change. Under the assumptions made, a portfolio made up of one-third stocks and two-thirds bonds has a skewness of 0.03. With 25 percent hedge funds, the portfolio's skewness will come down to –0.43, while with 50 percent hedge funds, it will drop to –0.75. Because when hedge funds are introduced, skewness for a 33/66 portfolio drops faster than for a 50/50 portfolio, we will have to buy more puts and apply more leverage. Since the mean of the 33/66 portfolio is substantially lower than the mean of the 50/50 portfolio, however, the increased leverage will not be sufficient to rescue the expected return. As can be seen in the last column of Table 1.4, the costs of the skewness reduction strategy for a 33/66 portfolio are very substantial. With 25 percent hedge funds, the costs of skewness reduction will amount to 3.20 percent, as opposed to only 0.61 percent for the 50/50 portfolio.

In sum, after introducing hedge funds, purchasing out-of-the money puts can restore the (near) normality of the portfolio return distribution fairly easily. However, this may come at a substantial cost to the portfolio's expected return, especially for investors who are overweighted in bonds.

INVESTING IN MANAGED FUTURES

In principle, any asset or asset class that has suitable (co-)skewness characteristics can be used to hedge the additional skewness from incorporating hedge funds. One obvious candidate is managed futures. Managed futures programs are often trend-following in nature. What these programs do is somewhat similar to how option traders hedge a short-call position. When the market moves up, they increase exposure, and vice versa. By moving out of the market when it comes down, managed futures programs avoid being pulled in. As a result, the (co-)skewness characteristics of managed futures programs are more or less opposite to those of many hedge funds.

The term "managed futures" refers to professional money managers known as commodity trading advisors (CTAs) who manage assets using the global futures and options markets as their investment universe. Managed futures have been available for investment since 1948, when the first public futures fund started trading. The industry did not take off until the late 1970s, though. Since then the sector has seen a fair amount of growth, with currently an estimated $50 billion under management.

There are three ways in which investors can get into managed futures.

1. They can buy shares in a public commodity (or futures) fund, in much the same way as they would invest in a stock or bond mutual fund.
2. They can place funds privately with a commodity pool operator (CPO) who pools investors' money and employs one or more CTAs to manage the pooled funds.
3. They can retain one or more CTAs directly to manage their money on an individual basis or hire a manager of managers (MOM) to select CTAs for them. The minimum investment required by funds, pools, and CTAs varies considerably, with the direct CTA route open only to investors who want to make a substantial investment. CTAs charge management and incentive fees comparable to those charged by hedge funds (i.e., 2 percent management fee plus 20 percent incentive fee). Similar to funds of hedge funds, funds and pools charge an additional fee on top of that.

Initially, CTAs were limited to trading commodity futures (which explains terms such as public commodity fund, CTA, and CPO). With the introduction of futures on currencies, interest rates, bonds, and stock indices in the 1980s, however, the trading spectrum widened substantially. Nowadays, many CTAs trade both commodity and financial futures. Many take a very technical, systematic approach to trading, but others opt for a more fundamental, discretionary approach. Some concentrate on particular futures markets, such as agricultural, currencies, or metals, but most diversify over different types of markets.

In this study, the asset class managed futures is represented by the Stark 300 index. This asset-weighted index is compiled using the top 300 trading programs from the Daniel B. Stark & Co. database. All 300 of the CTAs in the index are classified by their trading approach and market category. Currently, the index contains 248 systematic and 52 discretionary traders, which split up in 169 diversified, 111 financial only, 9 financial and metals, and 11 nonfinancial trading programs.

As shown in Kat (2004b), historically managed futures returns have exhibited a lower mean and a higher standard deviation than hedge fund returns. However, managed futures exhibit positive instead of negative skewness and much lower kurtosis. In addition, the correlation of managed futures with stocks and hedge funds is extremely low, which means that managed futures make very good diversifiers. Table 1.5 shows the effect of incorporating either hedge funds or managed futures in a traditional 50/50 stock-bond portfolio.

From the table we again see that if the hedge fund allocation increases, both the standard deviation and the skewness of the portfolio return drop

TABLE 1.5 Return Statistics Portfolios of Stocks, Bonds, and Either Hedge Funds or Managed Futures

	Hedge Funds					Managed Futures			
% HF	Mean	SD	Skew	Kurt	% MF	Mean	SD	Skew	Kurt
0	0.72	2.49	–0.33	–0.03	0	0.72	2.49	–0.33	–0.03
5	0.73	2.43	–0.40	0.02	5	0.71	2.37	–0.28	–0.18
10	0.74	2.38	–0.46	0.08	10	0.71	2.26	–0.21	–0.30
15	0.76	2.33	–0.53	0.17	15	0.71	2.16	–0.14	–0.39
20	0.77	2.29	–0.60	0.28	20	0.71	2.08	–0.06	–0.42
25	0.78	2.25	–0.66	0.42	25	0.71	2.00	0.02	–0.40
30	0.80	2.22	–0.72	0.58	30	0.71	1.95	0.10	–0.32
35	0.81	2.20	–0.78	0.77	35	0.71	1.91	0.18	–0.20
40	0.82	2.18	–0.82	0.97	40	0.71	1.89	0.24	–0.06
45	0.84	2.17	–0.85	1.19	45	0.71	1.89	0.30	0.08
50	0.85	2.16	–0.87	1.41	50	0.71	1.91	0.34	0.19

substantially, while at the same time the return distribution's kurtosis increases. With managed futures, the picture is significantly different, however. If the managed futures allocation increases, the standard deviation drops faster than with hedge funds. More remarkably, skewness rises instead of drops, while the reverse is true for kurtosis. Although hedge funds offer a somewhat higher expected return (assuming future performance will resemble the past), from an overall risk perspective, managed futures appear much better diversifiers than hedge funds.

Now suppose we did the same thing as before: Choose the managed futures allocation such as to bring the skewness of the portfolio return back to what it was before the addition of hedge funds (–0.33), while at the same time preserving the volatility benefit of the addition of hedge funds by the use of some leverage. The results are shown in Table 1.6, which shows that for smaller hedge fund allocations of up to 15 percent, the optimal managed futures allocation will be more or less equal to the hedge fund allocation. Looking at the change in expected return, we see that as a result of the introduction of managed futures, the expected portfolio return increases significantly. With a 25 percent hedge fund allocation, for example, the investor stands to gain 205 basis points in annualized expected return. This of course compares very favorably with the results on out-of-the-money puts. One should, however, always keep in mind that the outcomes of analyses like this heavily depend on the inputs used. A lower expected return for managed futures and/or a higher borrowing rate (used to lever-

TABLE 1.6 Allocations and Annualized Change in Expected Return Portfolios of Stocks, Bonds, Hedge Funds, and Managed Futures

% HF	% MF	Change Expected Return PA*
0	0.00	0.00
5	5.48	0.66
10	9.95	1.15
15	13.60	1.53
20	16.55	1.83
25	18.91	2.05
30	20.80	2.23
35	22.33	2.37
40	23.32	2.46
45	24.04	2.53
50	24.40	2.60

*PA = per annum

age the portfolio volatility back to its initial level) could easily turn these gains into losses.

In addition, although the expected return does not seem to suffer from the use of managed futures to neutralize the unwanted skewness effect from hedge funds, this does not mean it comes completely for free. Investors pay by giving up the positive skewness that they would have had when they had invested only in managed futures.

SMART STRATEGY SELECTION

So far we have modeled the asset class hedge funds as a representative portfolio of 20 different individual funds, a proxy for the average fund-of-funds portfolio. Although this is what most investors currently invest in, it is interesting to investigate how far it is possible to eliminate the skewness effect of hedge funds simply by choosing another hedge fund portfolio (i.e., by allocating differently to the various hedge fund strategies available). This is the approach taken in Davies, Kat, and Lu (2004). Using a sophisticated optimization technique known as polynomial goal programming (PGP), they incorporate investor preferences for return distributions' higher moments into an explicit optimization model. This allows them to solve for multiple competing hedge fund allocation objectives within a mean-variance-skewness-

kurtosis framework. Apart from underlining the existence of significant differences in the return behavior of different hedge fund strategies, the analysis shows that PGP optimal portfolios for skewness-aware investors contain hardly any allocations to long/short equity, distressed securities, and emerging markets funds. Equity-market-neutral and global macro funds, on the other hand, tend to receive very high allocations, which is primarily due to their low covariance, high coskewness and low cokurtosis properties. Looking back at Tables 1.1 and 1.2, these conclusions do not come as a complete surprise. The strategies that the optimizer tends to drop are exactly the strategies that exhibit the most negative skewness. Global macro and equity-market-neutral strategies come with much more desirable risk characteristics. Global macro funds primarily act as portfolio skewness enhancers, while equity-market-neutral funds act as volatility and kurtosis reducers (which is especially important given the relatively high volatility and kurtosis of global macro).

An interesting byproduct of the analysis in Davies, Kat, and Lu (2004) is that introducing preferences for skewness and kurtosis in the portfolio decision-making process yields portfolios that are far different from the mean-variance optimal portfolios, with less attractive mean-variance characteristics. This underlines a point made earlier in Kat (2004a) that using standard mean-variance portfolio allocation tools when alternative investments are involved can be highly misleading. It also shows that in hedge fund diversification, there is no such thing as a free lunch. When substantially overweighting global macro and equity-market-neutral strategies, investors can expect more attractive skewness and kurtosis, but at the cost of a less attractive expected return and volatility.

Finally, it is interesting to note that many global macro funds tend to follow strategies that are similar to the strategies typically employed by CTAs. In fact, some of the largest global macro funds have their origins in managed futures. The difference between expanding into managed futures and overweighting global macro funds is therefore probably smaller than one might suspect.

CONCLUSION

The attractive mean-variance properties of typical hedge fund portfolios tend to come at the cost of negative skewness and increased kurtosis. Investors can neutralize the unwanted skewness and kurtosis by purchasing out-of-the-money equity puts, investing in managed futures, and/or by overweighting equity-market-neutral and global macro funds and avoiding distressed securities and emerging market funds. Hedge fund returns are not superior to the returns on other asset classes, they are just different.