Hedge funds diversification – fact or fable?

Marc Goodman, Kenneth Shewer and Richard Horwitz

This article analyses the benefits of hedge fund diversification and the efficiency of a fund of funds in capturing these benefits. We first explore whether hedge funds, as a group, represent a set of risks and returns that are statistically independent of and uncorrelated to the equity market. Next, we look at style categorisations of hedge funds and the related style indexes to determine if they represent a meaningful framework around which to effectively manage diversification within a portfolio of hedge funds. Finally, given this context, do funds of funds provide greater value than a diversified portfolio of hedge funds?

The power of diversification

Diversification is a valuable part of achieving superior, risk-adjusted returns. For example, if a fund investment has a history of 12% annual returns and a 10% annualised standard deviation, the fund would have a Sharpe ratio – [very brief explanation] – of 0.7 (assuming a 5% risk-free rate).

If an investment of equivalent size is made in a second fund with a similar performance history, and the second fund was 100% correlated with the first fund, the portfolio of the two funds would also have a Sharpe ratio of 0.7 (see table A, case 1).

However, if the performance of the two funds were uncorrelated – statistically independent – the standard deviation of a portfolio comprised of the two funds would decline to 7.1% compared with 10% for each of the individual funds. In addition, the resulting Sharpe ratio of the portfolio would be a far superior 1.0 (see table A, case 2).

Alternatively, if the performance of the two funds were again uncorrelated, an investor could select a second fund with an annual performance of only 8% and still achieve the same 0.7 Sharpe ratio (see table A, case 3) that they achieved by selecting a perfectly correlated fund with an annual performance of 12%. Diversification is so valuable that one can sacrifice 33% in performance – 8% versus 12% – and achieve an equivalent risk-adjusted return.

The characteristics of the first fund – 12% annual performance and 10% volatility – are similar to that of the S&P 500 over a long period of time. Most investors have a significant exposure to the US equity market. Therefore, the logic presented above is valid for an investor who already has S&P 500 exposure and seeks to invest in a hedge fund. The investor with equity exposure should be indifferent between investing in a hedge fund that is highly correlated to the S&P 500 and that will generate a 12% annual return, and investing in a hedge fund that is non-correlated and will generate an 8% annual return.

Table A. Title?

Case	Correlation between funds	Annual performance		Annual std dev	Sharpe ratio
		Second fund	Avg of both funds		
1	Correlated	12%	12%	10.0%	0.7
2	Independent	12%	12%	7.1%	1.0
3	Independent	8%	10%	7.1%	0.7

Note: Sharpe ratio assumes a 5% risk-free rate

A valuable diversification?

Most investors have significant exposure to the equity markets through traditional, long-only managers. Investing in alternative investments can provide risk diversification for an investment portfolio.

Portfolios have the potential for exposure to three different types of risks:

- Beta – correlation to the underlying markets.
- Factor – other structural/systematic risks.
- Idiosyncratic – security-specific risks.

Beta risk exposures include the key market risks of the equity and fixed-income markets. Factor risks include sector exposures (eg, technology, banking), style exposures in equities (eg, small/large cap, growth/value and financial leverage) and style exposures in fixed income (eg, credit, yield curve and prepayment). These factors are structural, or systematic, because of the tendency for these securities to behave synchronously based on their exposure to these underlying factors. Idiosyncratic risks represent security-specific risks after accounting for both beta and factor risks.

The capital asset pricing model (CAPM) assumes that only beta risks are rewarded because factor and idiosyncratic risks are diversified away and, consequently, are not rewarded by the market. This assumes that markets are 100% efficient. In fact, many hedge fund strategies are designed to capture profits through security-specific misvaluations.

We have decomposed both the performance and volatility of each hedge fund into these three categories of risk. This has been accomplished using 'style

analysis', that is, applying regression to statistically determine the sensitivities to specific risk factors. This analysis was conducted with a maximum of 58 months of data (January 1997 to October 2001), so the number of factors that can be statistically isolated is limited. Furthermore, both market conditions and the construction of the portfolio changed simultaneously during each month, further limiting the style analysis. Consequently, we were able to define two statistically significant factors: the S&P 500 and the relative performance of the S&P Small Cap index to the S&P 500.

The decomposition of risks into beta, factor and idiosyncratic risks is important because investors' ability to gain exposure to each risk classification differs significantly. Investors generally have significant exposure to beta risk through their traditional investments. While investors can achieve some exposure to factor risks (eg, by investing in small cap or long-only sector funds), gaining direct exposure to factor risks and actively managing this exposure through traditional investment products is more difficult than simply gaining exposure to the equity markets. Furthermore, investors can only gain exposure to idiosyncratic risks through hedge fund investments. Consequently, hedge funds can add significant value through exposure to the often well-rewarded factor and idiosyncratic risks.

In table B, we analyse the correlation of each hedge fund in the Hedge Fund Research (HFR) universe to various indexes and calculate the average correlation to each of the indexes for the available history for each hedge fund. The correlation of the average hedge fund to the S&P Small Cap index is greater than that to the broader-based S&P 500, demonstrating a small, but statistically significant, small cap bias.

What is the impact on both return and volatility of a hedge fund's correlation to the equity markets? Figures 1 and 2 have grouped hedge funds based upon their correlation with the S&P Small Cap index; the higher the correlation to the S&P Small Cap index, the higher the directional exposure to equity markets. During the period January 1997–October 2001, the average annual return of the hedge funds in the HFR Composite index was unrelated to the degree of directional exposure to the equity markets (see figure 1). However, the average annualised standard deviation was very sensitive to the amount of directional exposure to the equity markets (see figure 1). Consequently, an increased correlation to the equity markets resulted in significantly lower risk-adjusted returns (see figure 2).

Figure 3 illustrates the sensitivity to directional equity market exposure on performance. [does this read OK? Sensitivity of what? Is d.e.m.e.o.p. all one thing?] Not surprisingly, hedge funds with a high correlation to the equity market outperformed those with a low correlation to equity markets from January 1997–February 2000, when that market enjoyed a steady and significant increase, realised [realising?] an average return of 18.1% during this period. [Does not read] However, those same funds under-performed when the equity market declined (March 2000–October 2001), with average returns of 2.9%. Thus, hedge funds with a high degree of directional exposure to equity markets (ie, higher correlation with the S&P Small Cap index) ultimately gave back the outperformance they realised during the 'bubble' period, and increased overall volatility in the process.

Figure 1. Average annual performance: January 1997–October 2001

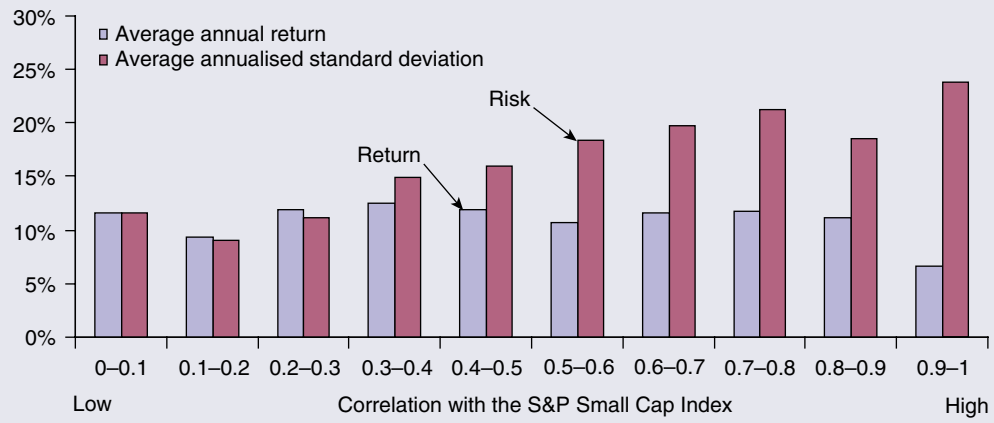
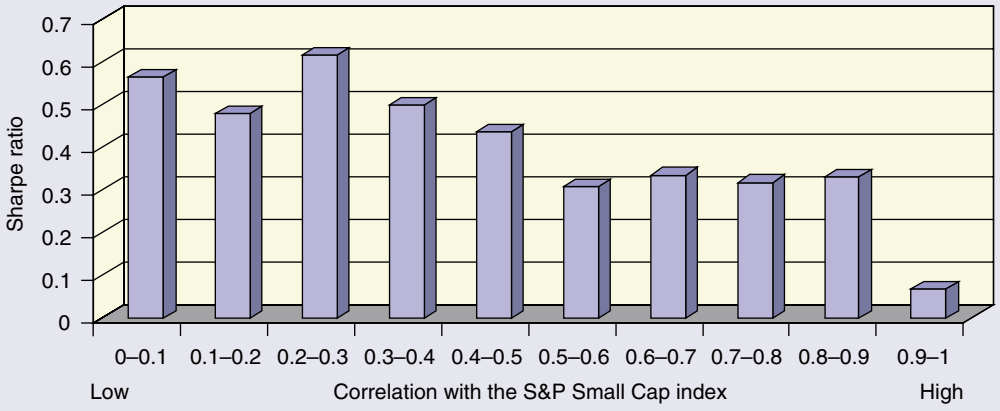


Figure 2. Average Sharpe ratio: January 1997–October 2001



Style categorisations and indexes

While there is some homogeneity in the performance of hedge funds in the same style categorisation, the relationship, for the period January 1997–October 2001, is statistically weak:

- The average correlation between an individual hedge fund and the index of its 'designated style' classification is slightly, but consistently, higher than its correlation with the 'next-best-fit' style index (the style index with which the fund had the next highest correlation). (See figure 4.)
- The average correlation of each hedge

Table B. Title?

Index	Average fund correlation
HFR Composite index	0.52
S&P 500 index	0.41
S&P Small Cap index	0.45
MSCI World index	0.43
Bond index	0.43
S&P 500/S&P Small Cap	0.51
S&P 500/Bond/S&P Small Cap	0.52

Figure 3. Sensitivity of average annual performance to equity market exposure

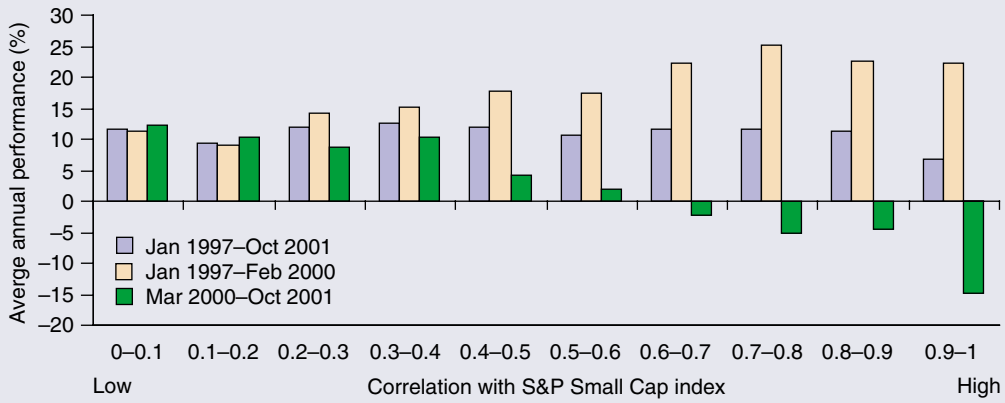


Figure 4. Correlation of individual funds and their designated style index vs. the 'next-best-fit' index

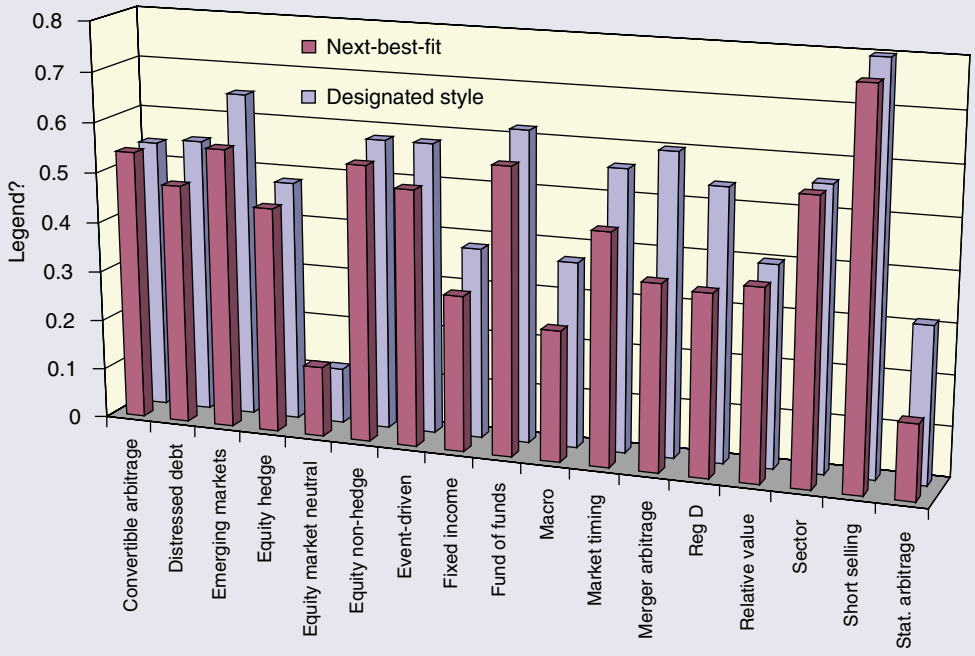
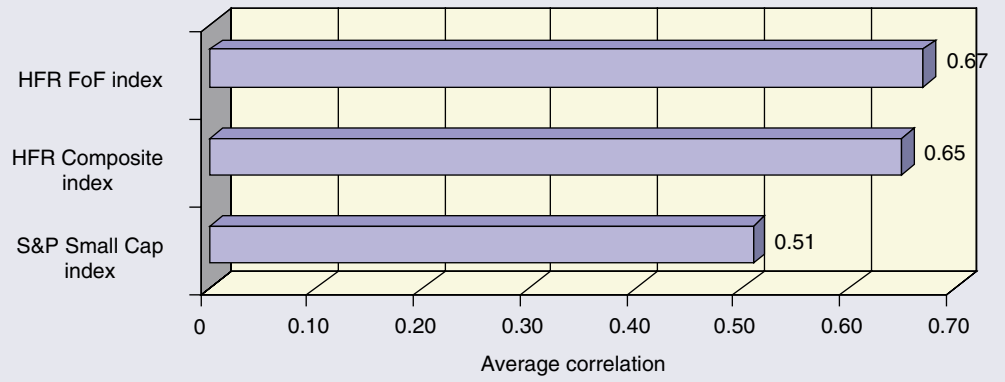


Figure 5. Correlation of fund of funds to various indexes



fund to its designated style index (0.58) is not significantly greater than the average correlation of each hedge fund to the HFR Composite index (0.52).

□ Only 35% of hedge funds behaved more like the designated style index than to the 'next-best-fit' style index (51%), while 14% correlated highest to one of the broad market indexes.

Moreover, focusing on the recent 20-month period of equity market decline (March 2000–October 2001), only 28% of hedge funds behaved more like their designated style index than like their 'next-best-fit' style index. During this period of equity market decline, an equal or larger percentage of funds correlated more closely with the HFR Composite (34%), the S&P 500 (29%), the S&P Small Cap (27%) and the MSCI World (29%) indexes than to the designated style index of each.

These results suggest that style indexes are not a statistically significant basis of hedge fund selection and portfolio construction. We argue that one needs to look deeper than style categorisation to construct a portfolio that is risk-efficient.

Do fund-of-fund managers add value?

Here, we analyse the diversification to the equity markets provided by a fund of funds, and the diversification among managers within a fund of funds.

As the number of hedge funds in a fund-of-funds portfolio increases, the correlation to the equity markets increases. This is because the factor and idiosyncratic risks – which represent the inherent value of the underlying investment strategies – get diversified away and what remains is the beta risk. Thus, an overly diversified fund of funds approaches the behaviour of an equity index fund (see table C).

The average correlation of a fund of funds to the HFR Fund of Funds index is not meaningfully greater than to the HFR Composite index, indicating that the performance of a fund of funds is similar to that of an index of the universe of hedge funds (see figure 5).

The HFR Fund of Funds index has under-performed the HFR Composite index over the past decade, although the gap has closed during the past five years. During January 1997–October 2001, the HFR Fund of Funds index under-performed the HFR Composite index by 2.6% a year (although almost half of this differential is attributable to the dramatic under-performance of funds of funds in the autumn 1998 crisis). (See table D.) However, the lower volatility of funds of funds versus individual hedge funds has offset the lower returns (see table E).

Consequently, funds of funds have produced risk-adjusted returns equivalent to those of the average individual hedge fund, and superior to those of the S&P 500 index. Fund-of-funds managers seem to have successfully offset the additional fees charged on the fund-of-funds level to achieve a net risk-adjusted return equivalent to that of the average hedge fund. At the same time, the correlation of the average fund of funds to the S&P 500 index has been lower than the average correlation of individual hedge funds to the S&P 500 index.

Individual funds of funds demonstrate significant differences in volatility and in their correlation to the S&P Small Cap index. We believe that the dramatic range in diversification results in part from how the individual funds of funds are constructed. Many are constructed by simply 'stacking' hedge funds that have demonstrated good performance, indicating a lack of consideration of the bets that individual hedge funds are making and the 'risk relationship' among those funds:

☐ How much of the risk and return resulted from having significant directional exposure to the equity markets during a period when such exposure was favourable?

☐ How much of the performance resulted from a consistent discipline rather than from opportunistic, and probably not replicable, style drift?

☐ Does the combination of hedge funds diversify risk, putting the portfolio near the 'efficient frontier'?

☐ Is there a concentration of risk factors across funds that would have produced a favourable return for the portfolio over some historical period but could result in extremely adverse performance during some crisis period?

Stacking funds often results in significant equity market directional exposure and a portfolio that does not efficiently diversify risk across funds.

Constructing a fund of funds by optimising the risks inherent in the underlying funds, rather than simply stacking funds, requires a fundamental understanding of the risks and returns of the underlying funds. Risk management systems represent a tool to quantify risks, which have been required on the sell-side for almost a decade and applied on the traditional buy-side for several decades. Limitations in hedge fund transparency have restricted the use of these rigorous analytics in the construction of a fund of funds. Greater acceptance (and use) of these systems by hedge fund managers will provide the fund-of-funds manager with the requisite analytics without compromising underlying position transparency.

However, we view the process of managing risk as part art and part science and believe that using a 'mathematical model' to find a unique, optimal solution is not realistic given the dynamic nature of markets and the real-world limitations of measuring risk and quantifying relationships. To create an optimal portfolio, a fund-of-funds manager must consider many 'perspectives' of the risks inherent in a portfolio and then apply judgement to construct a portfolio that provides the greatest overall balance.

Our analysis suggests that constructing 'risk-efficient' portfolios can add an additional 200–300 basis points at an equivalent level of risk. An understanding of the fundamental risks and rewards of the underlying hedge funds permits a fund-of-funds manager to combine them in a way that optimises the balance of the specific beta, factor and idiosyncratic risks to create a portfolio of funds that is near the 'efficient frontier'.

Conclusions

☐ While hedge funds can provide valuable diversification from the equity market, the performance of the majority of hedge funds is highly correlated with the equity market and demonstrates a statistically significant small cap bias.

☐ On average, the greater the directional exposure of a hedge fund to the equity markets (ie, the greater the correlation of a hedge fund to the equity markets), the worse the risk-adjusted return of that fund.

☐ Traditional measures of risk and return (eg, the Sharpe ratio) do not differentiate between risk that is correlated with the equity market, to which most investors have significant exposure through traditional investments, from risks that are not correlated with the market.

☐ Style categorisations and style indexes do not provide a statistically significant explanation of hedge fund behaviour.

☐ Over-diversifying a fund of funds is counterproductive as non-correlated, idiosyncratic risk is diversified away, and the fund resembles a long-only equity index fund.

☐ Funds of funds demonstrate diminished returns compared with the return of the average hedge fund (HFR Composite index) but enjoy significantly reduced volatility compared with that of the average hedge fund. The average fund of funds generates risk-adjusted net performance equivalent to that of the average hedge fund.

☐ Funds of funds that construct 'efficient' portfolios, rather than simply 'stacking' funds with good returns, can realise superior returns. Our analysis suggests that constructing a risk-efficient portfolio can add 200 to 300 basis points of performance versus 'stacking' funds, at an equivalent level of risk. ☐

Table C. Title?

	Correlation	
	S&P 500	S&P Small Cap
Average of each individual hedge fund	0.31	0.38
Average of each fund of funds	0.37	0.48
HFR Fund of Funds index	0.56	0.69
HFR Composite index	0.72	0.86

Table D. Title?

	HFR Fund of Funds index annual performance	HFR Composite index annual performance	HFR FoF index annual under-performance
Jan 1990–Oct 2001	11.0%	15.7%	4.2%
Jan 1997–Oct 2001	8.3%	11.1%	2.6%

Table E. Title?

	HFR universe		S&P 500
	Fund of funds	Individual hedge funds	
Average annual return	8.3%	11.1%	9.2%
Average annualised std dev	10.0%	18.1%	18.0%
Average Sharpe ratio	0.33	0.33	0.23
Correlation to S&P 500	0.31	0.37	1.00

Note: January 1997 through October 2001; Sharpe ratio assumes 5.0% risk-free rate

Marc Goodman is president, Kenneth Shewer is chairman and Richard Horwitz is senior vice-president, risk management at Kenmar Global Investment Management in ????????

The analysis presented in this paper is based on data from the Hedge Fund Research (HFR) database. There were 1,303 funds in the HFR database that had at least a 10-month return history. In addition, several of the analyses are based on a subset of 660 funds that had a performance history going back to January 1997. The HFR Composite Index is the HFR Fund Weighted Composite index. It represents the average (not the weighted average) of the returns of all the hedge funds in the HFR universe each month, net of all fees for those funds. It excludes fund-of-funds performance. The HFR Fund of Funds index is the average (not the weighted average) performance of the returns of all the funds of funds in the HFR universe each month, net of all fees for those funds