



The value of the hedge fund industry to investors, markets, and the broader economy

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By the Centre for Hedge Fund Research
Imperial College, London

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Foreword

Hedge funds, their role within financial markets and the returns they generate have been under considerable debate since the global financial crisis. Some policymakers have been quick to blame hedge funds for market failures, while some critics have questioned their performance.

A newly-published study from Imperial College's Centre for Hedge Fund Research, however, uses compelling, empirical data backed by detailed analysis to contribute some much-needed objectivity to the debate about the merits of hedge funds.

KPMG and the Alternative Investment Management Association (AIMA) are pleased to present the following report, titled, "The value of the hedge fund industry to investors, markets, and the broader economy."

This is the first of an in-depth two-part series on the current state of the global hedge fund industry. Part I of the report, presented here, is based upon the Centre's research and uses both detailed quantitative metrics and a review of recent literature from a number of hedge fund experts to draw conclusions about the industry and its role in contemporary financial markets.

Part II of the report will feature in-depth analysis of a global survey of hedge fund managers. This second and final section of this joint report from KPMG and AIMA will examine the impact of a changing investor base on the hedge fund industry, as well as the continuing institutionalization of the industry.

In the following pages, we examine the Centre's analysis of aggregated hedge fund industry data from 1994 to 2011.

This detailed analysis indicates that during the sample period from 1994 to 2011, hedge funds outperformed traditional asset classes (such as bonds and equities) and did so with low levels of volatility – a finding that proved true even in difficult economic times. And that the hedge fund industry continues to play a vital role in global financial markets, providing liquidity and having an overall positive impact on a wide range of factors, including price discovery, financial stability, portfolio diversification and more.

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The value of the hedge fund industry to investors, markets, and the broader economy

By the Centre for Hedge Fund Research, Imperial College

Executive Summary

This report examines and summarizes the value provided by the hedge fund industry to investors, to markets, and to the broader economy. The analysis is divided into two parts, a quantitative analysis of hedge fund performance and a literature review.

The Centre for Hedge Fund Research at Imperial College London has created a unique aggregate hedge fund and benchmark index database. The database represents a careful aggregation of all the current information from multiple leading sources about hedge fund performance globally. Survivorship bias is not a factor because both active and inactive funds are included.

Using HFR (Hedge Fund Research) hedge fund index data from 1994 to 2011, our performance analysis shows that hedge funds have significantly outperformed equities, bonds and commodities on a risk adjusted basis.

The research found that hedge funds achieved an average return of 9.07 percent in the period 1994–2011 after fees compared to 7.18 percent for stocks, 6.25 percent for bonds and 7.27 percent for commodities. Hedge funds achieved these returns with considerably lower volatility and Value-at-Risk (VaR) than stocks and commodities, close to bonds in both categories. The research also demonstrated that hedge funds were significant generators of “alpha,” creating an average of 4.19 percent per year from 1994–2011.

An equal-weighted hedge fund index returned five times the initial investment after fees, over the period 1994–2011.

We find that hedge funds provide economically important, risk-adjusted performance that provides investors with diversification benefits, even during the most difficult macroeconomic environment.

We also show explicitly that the equal weighted portfolio policy in hedge funds, global stocks, and bonds outperforms the conventional 60/40 allocation to stocks and bonds with significantly higher Sharpe ratio and lower tail risk.

Specifically, we show that an institutional investor, who adds hedge funds to the conventional 60/40 portfolio policy, can gain economically important benefits of diversification.

The research also finds that investors received approximately 72 percent of all investment profits over this period, compared to 28 percent for hedge fund managers.

Importantly, hedge funds’ ability to generate superior performance is not associated with significant risk-taking as measured by volatility or Value-at-Risk. Indeed, we document that hedge fund volatility is reasonably low across investment strategies, compared to conventional asset classes.

We find that correlations between hedge funds and main asset classes are only slightly higher during recessions, suggesting that hedge funds are unlikely to threaten the stability of the financial system.

Our review of the literature on the value of the industry to investors, to markets, and to the broader economy shows that hedge funds are important liquidity providers in the markets that they are active in.

Moreover, hedge fund activity has beneficial effects for price discovery, the efficient allocation of capital, financial stability, shareholder value, diversification and the broader economy.

Part 1: Hedge fund performance

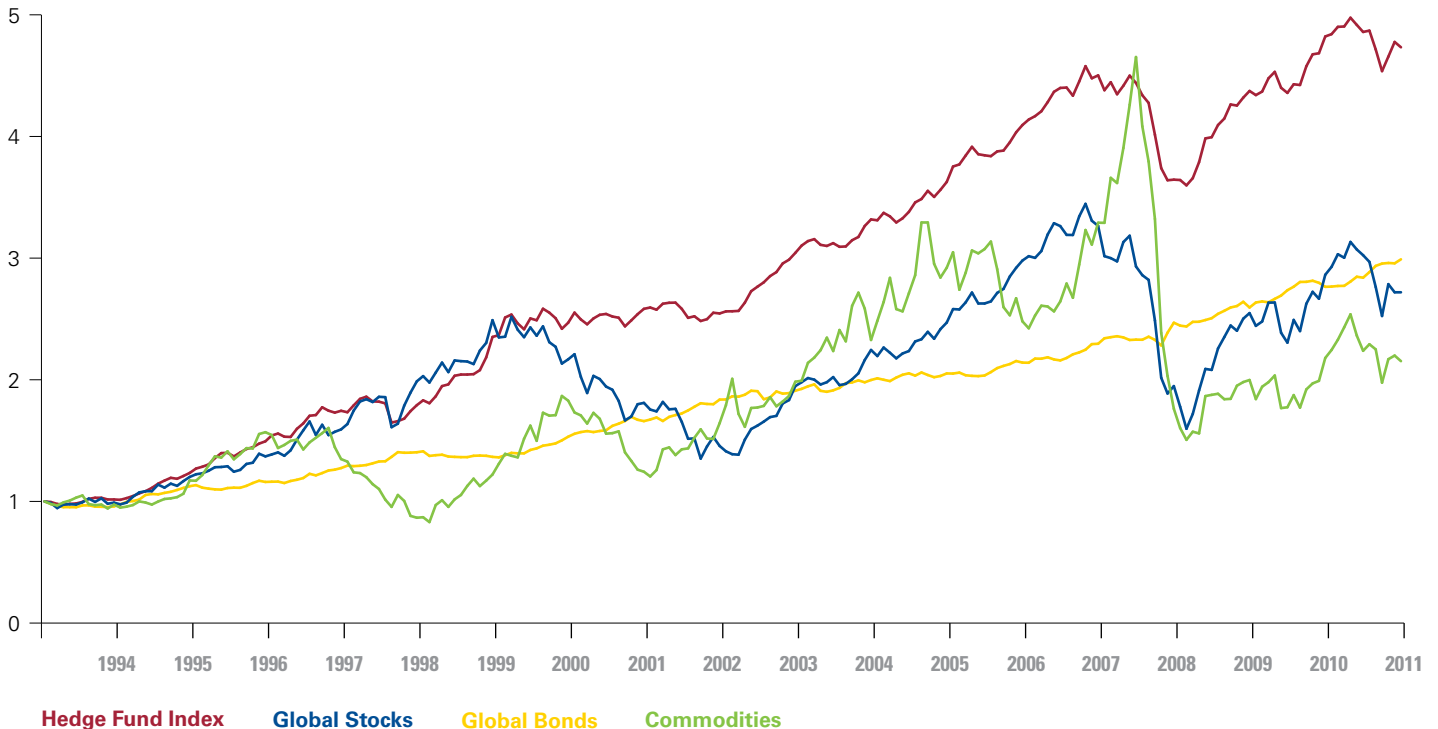
First, we examine the return and risk characteristics of hedge funds and the main conventional asset classes over multiple business cycles. Second, we focus on the correlation between certain hedge fund styles and the main conventional asset classes. Third, we look at hedge fund risk-adjusted returns across strategies and the business cycle. Finally, to examine whether investors can gain significant diversification benefits, we add hedge funds to a conventional portfolio, including equities and bonds.

The empirical results show that hedge funds outperform the main conventional asset classes such as global stocks, bonds and commodities. Specifically, during our sample, hedge funds deliver the highest average return and Sharpe ratio with relatively low tail risk (see Figure 1).

An examination of the alpha generated by hedge funds suggests that they provide superior performance, even on a risk-adjusted basis. Our findings suggest that hedge funds provide significant diversification benefits, since they have low correlations with conventional asset classes over business cycles. As Markowitz (1952) showed in his seminal paper, investors can obtain steadier returns by combining assets with roughly similar expected returns but low correlations in the same portfolio. In particular, hedge fund strategies such as CTA, macro and market neutral have a low correlation with the main conventional

asset classes, on average, and even during recessions. Using equal-weighted hedge fund index data from 1994 to 2011, we demonstrate that an equal weighted allocation to hedge funds, stocks and bonds delivers significantly higher Sharpe ratio and lower tail risk than the institutional investor's standard 60/40 allocation in stocks and bonds. Overall, the results suggest that hedge funds deliver superior risk-adjusted performance and provide diversification benefits over the business cycles and even during recessions.

To define recessions, the report uses the NBER classification available at <http://www.nber.org/cycles.html>. Over the sample period from January 1994 to October 2011, there have been two recessions. The first one started at March 2001 and ended at November 2001 lasting eight months, while the second one took place between December 2007 and June 2009 spanning 18 months.

Figure 1: Hedge fund returns compared to stocks, bonds and commodities

Source: Centre for Hedge Fund Research

The results of the report are consistent with recent academic literature that shows that hedge funds deliver superior risk-adjusted performance over the long-term. Using sophisticated econometric approaches, Jagannathan, Malakhov and Novikov (2010), and Kosowski, Naik and Teo (2007) show that the abnormal performance of the top decile of hedge funds persists even at annual horizons. Hedge funds are therefore capable of delivering economically significant performance persistence, that is, funds delivering superior performance (based on certain metrics) in the past continue to do well in the future.

There are four sections to this part of our paper. Section 1 presents the data used in the analysis. Section 2 examines the risk and return characteristics of hedge funds and the main asset classes

over business cycles. Section 3 studies whether hedge funds generate superior risk-returns and provide diversification benefits for investors. In section 4, we provide concluding remarks.

To explore how investors and hedge fund managers share profits with each other, we estimate hedge fund gross returns by assuming that hedge funds charge on average a 1.75 percent management fee and a 17.5 percent performance fee. We find that aggregate level hedge fund annualized gross returns are 12.61 percent, of which 9.07 percent is the investors' share, whereas hedge fund managers get 3.54 percent of returns. Indeed, hedge fund investors earn around 72 percent of the profits, while the managers' proportion is significantly lower being 28 percent of total returns.

We find that hedge funds provide economically important, risk-adjusted performance that provides investors with diversification benefits, even during the most difficult macroeconomic environment.

Index (1994-2011)	Annualized gross returns (%)	Net returns to the investor (%)	Costs to the investor/ Returns to the hedge fund manager (%)	Investor share (%)	Manager share (%)
HFRI	12.61	9.07	3.54	71.93	28.07

Source: Centre for Hedge Fund Research

Description of hedge fund and common asset class data

We measure hedge fund performance from January 1994 to December 2011 using the HFR equal-weighted index and strategy indices. The HFR index is based on a database containing 9,648 unique hedge funds, for which 3,822 are active, while 5,826 are inactive. Joenväärä, Kosowski and Tolonen (2012) compare different commercially available databases and show that an equal weighted index of hedge funds in the HFR hedge fund database has a high correlation with their aggregate database comprising five databases. This supports our choice of the HFR

database for our analysis. We use net-of-fee returns implying that the results show the performance that a hedge fund investor would earn before taxes. Table 1 presents the hedge fund return on a monthly basis.

We examine the performance of the following hedge fund strategies in detail: equity hedge, emerging markets, event driven, CTA and macro, relative value, short bias strategies. These strategies are the most popular and contain the majority of assets managed by hedge funds.

Hedge fund activity has beneficial effects for price discovery, the efficient allocation of capital, financial stability, shareholder value, diversification and the broader economy.

Table 1: Monthly returns on equal-weighted Hedge Fund Research index

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Final aggregated annual return
1994	2.50	-0.55	-1.51	-0.59	0.68	0.27	1.35	2.46	0.89	-1.27	-0.03	-0.08	4.12
1995	-0.22	1.31	1.65	2.10	1.70	2.48	3.20	2.20	1.96	1.89	-0.65	2.08	19.7
1996	2.89	1.23	1.46	3.96	3.05	0.18	-2.08	2.28	2.07	2.08	0.98	1.33	19.43
1997	3.17	1.03	-1.64	-0.11	4.38	2.70	3.87	0.34	3.72	-0.93	-1.53	0.88	15.88
1998	-0.71	3.27	3.00	0.96	-2.08	-0.13	-0.79	-8.70	0.69	3.71	1.22	2.79	3.23
1999	2.24	-1.32	3.14	4.50	0.72	3.63	0.52	-0.01	0.16	5.06	1.60	7.65	27.89
2000	0.64	6.16	0.93	-2.85	-1.96	3.68	-0.60	3.81	-1.24	-3.49	-1.79	2.07	5.36
2001	3.39	-2.21	-1.59	1.95	1.19	0.29	-0.83	-0.41	-2.83	2.07	2.01	1.71	4.74
2002	0.45	-0.70	1.91	0.28	0.04	-1.94	-2.86	0.53	-1.55	2.12	0.59	-0.21	-1.34
2003	0.65	0.02	0.14	2.64	3.58	1.35	1.30	1.83	1.16	1.06	2.45	1.87	18.05
2004	1.98	1.19	0.51	-1.48	-0.31	0.75	-0.96	0.12	1.65	2.84	0.84	1.65	8.78
2005	-0.21	1.83	-0.87	-1.50	1.04	1.59	2.30	0.82	1.93	1.66	-1.41	1.82	9
2006	3.49	0.45	1.95	1.87	-1.56	-0.24	-0.18	1.01	0.18	2.07	1.77	1.48	12.29
2007	1.10	0.68	0.96	1.78	1.99	0.73	0.08	-1.53	2.69	-2.20	2.85	0.53	9.66
2008	-2.69	1.50	-2.24	1.63	1.87	-1.33	-2.29	-1.44	-6.13	-2.67	-6.84	0.15	-20.48
2009	-0.09	-1.21	1.66	3.60	5.15	0.25	2.50	1.30	2.79	1.52	-0.20	1.28	18.55
2010	-0.76	0.66	2.49	1.19	-2.89	-0.95	1.61	-0.13	3.48	0.19	2.14	2.95	9.98
2011	0.41	1.23	0.06	1.48	-1.20	-1.18	0.23	-3.18	-3.80	-0.92	2.60	-0.41	-4.68

Source: Centre for Hedge Fund Research

Following the standard methodology in hedge fund performance evaluation studies, we examine the post-1994 period. The reason is that commercial database vendors such as HFR and Lipper TASS started to collect information about inactive hedge funds at the beginning of 1994. Put differently, our hedge fund performance analysis is executed using both active and inactive hedge funds, suggesting that we can obtain accurate estimates for hedge fund performance¹. This is important, since the previous literature suggest that survivorship bias can lead to an upward bias in hedge fund performance measures. Survivorship bias however is not a factor in our data because both active and inactive funds are included.

Importantly, self-selection bias may arise if a larger proportion of good or bad performing hedge funds systematically avoid reporting to commercial databases. In particular, hedge funds

with superior performance may not choose to publish their returns, due to the fact that they already reached their target size or they prefer not to reveal their returns to their competitors. Based on this reason, the average returns in commercial databases should be downward biased. On the other hand, poor performing hedge funds may not have incentives to publish their returns in commercial databases. Hedge funds can also stop reporting to them when they suffer poor performance. This may cause upward bias to hedge fund returns inferred from commercial databases. A recent study by Edelmann, Fung and Hsieh (2011) shows that self-selection bias is negligible in commercial hedge fund databases, since the impact of these two opposite biases is roughly similar to their magnitude.

As main asset classes, the report uses global stocks, bonds and commodities. The performance of the asset classes

is measured using MSCI World Total Return Index (henceforth, Global Stocks), J.P. Morgan Global Aggregate Bond Total Return Index (henceforth, Global Bonds), and S&P GSCI Commodity Total Return Index (henceforth, commodities) from January 1994 to October 2011. All the returns are expressed in US dollars and converted using appropriate exchange rates.

Our findings suggest that hedge funds provide significant diversification benefits, since they have low correlations with conventional asset classes over business cycles.



¹ Inactive funds are funds that stopped reporting returns but are still included in the database.

Hedge funds' return and risk characteristics

In this section, we examine the performance of hedge fund index and strategy indices over the business cycles. We start by showing that hedge funds outperformed the main asset classes from January 1994 to December 2011.

Figure 1 (on page 5) presents the cumulative returns to hedge funds, global stocks and bonds, and commodities. It provides clear evidence that the cumulative returns are significantly higher for hedge funds compared to the other main asset classes. Specifically, Figure 1 shows that a hedge fund investor, who invested in the hedge fund index in January 1994 and held that investment until December 2011, would have quintupled their investment even after fees. In contrast, the respective investor who invested in global stocks or bonds only tripled their investment. This also suggests that during the time span global stocks were not able to deliver significant premium over global bonds. The commodity investor would have obtained the lowest cumulative return, that is, over two times lower compared to one that a hedge fund investor would have earned. According to Figure 1, commodities faced a huge drawdown at the end of the 2008 during the recent financial crisis 2007 – 2009, while hedge funds and global bonds seemed to deliver quite steady returns compared to other asset classes.

Panel A in Table 2 presents the descriptive statistics for hedge funds and the main asset classes. The overall results show that hedge funds have the highest average return and Sharpe ratio among the main global asset

classes. It also seems hedge funds do not generate superior performance by taking excessive tail risk, since their value-at-risk is remarkably low relative to their average return.

Specifically, Panel A in Table 2 shows that an average hedge fund delivers 9.07 percent per annum with a volatility of 7.20. An average hedge fund provides a high Sharpe ratio of 0.76 per annum. The Sharpe ratio is defined as hedge fund excess return divided by the standard deviation of hedge fund returns. The shortcoming of the Sharpe ratio is that it does not take into account fat tails or non-normality in returns. However, an average hedge fund's 5 percent Value-at-Risk is 2.69 per month, which could be interpreted as suggesting that hedge funds do not seem to generate superior performance by taking excessive left tail risk.

To compare the performance of hedge funds to other asset classes, Panel A in Table 2 shows that hedge funds outperform other asset classes in terms of average return and Sharpe ratio, while global bonds exhibit the lowest risk measured using volatility and Value-at-Risk. Since hedge funds deliver over one-third higher average returns and significantly higher Sharpe ratio than global bonds, we conclude that hedge funds generate superior performance over conventional asset classes.

Next, the report analyses correlations between an average hedge fund and conventional asset classes over business cycles. The overall findings suggest that hedge funds exhibit relatively low correlations with other asset classes even during recessions. Panel B1 in Table 2 presents the average correlations between hedge funds and the main asset classes. The average correlation between hedge funds and global stocks is quite high, while hedge funds exhibit a negative correlation of -0.06 with global bonds and a positive correlation of 0.41 with commodities. Panel B2 of Table 2 presents correlations when the observations during recessions (as defined by NBER) are excluded, while Panel B3 displays correlations during recessions. Correlations between hedge funds and main asset classes are only slightly higher during recessions, suggesting that hedge funds are unlikely to threaten the stability of the financial system. This finding is also supported by recent academic studies, since they fail to document a causal link between hedge fund actions and systemic risk. Although there is evidence that hedge funds are affected by financial market stresses, there is no academic evidence that shows that hedge funds cause economic instability. In particular, Getmansky et al. (2011) show that hedge funds exhibit exposure to systemic risk, but they do not cause or contribute to it.

Table 2: Statistics for hedge funds and main asset classes**Panel A: Descriptive statistics for hedge funds and main asset classes**

	Hedge Funds	Global Stocks	Global Bonds	Commodities
Mean	9.07	7.18	6.25	7.27
Std	7.20	15.72	3.95	22.47
Sharpe	0.76	0.23	0.68	0.16
Value-at-Risk at 5%	2.69	10.71	1.19	8.42

Panel B: Correlations between hedge funds and main asset classes**B1: All observations**

	Hedge Funds	Global Stocks	Global Bonds	Commodities
Hedge Funds	1.00			
Global Stocks	0.80	1.00		
Global Bonds	-0.06	-0.03	1.00	
Commodities	0.41	0.33	0.00	1.00

B2: Outside of recessions

	Hedge Funds	Global Stocks	Global Bonds	Commodities
Hedge Funds	1.00			
Global Stocks	0.77	1.00		
Global Bonds	-0.10	-0.09	1.00	
Commodities	0.28	0.17	0.04	1.00

B3: During recessions

	Hedge Funds	Global Stocks	Global Bonds	Commodities
Hedge Funds	1.00			
Global Stocks	0.87	1.00		
Global Bonds	0.12	0.21	1.00	
Commodities	0.73	0.63	-0.06	1.00

Source: Centre for Hedge Fund Research

Panel B1 in Table 2 presents average correlation between hedge funds and the main asset classes. The average correlation between hedge funds and global stocks is quite high, while hedge funds exhibit a negative correlation of

- 0.06 with global bonds and a positive correlation of 0.41 with commodities. Panel B2 of Table 2 presents the respective correlations when the observations during the recessions are excluded, while Panel B3 displays

the correlations during recessions. The correlations between hedge funds and main asset classes are only slightly higher during recessions, suggesting that hedge funds do not threaten the stability of the financial system.

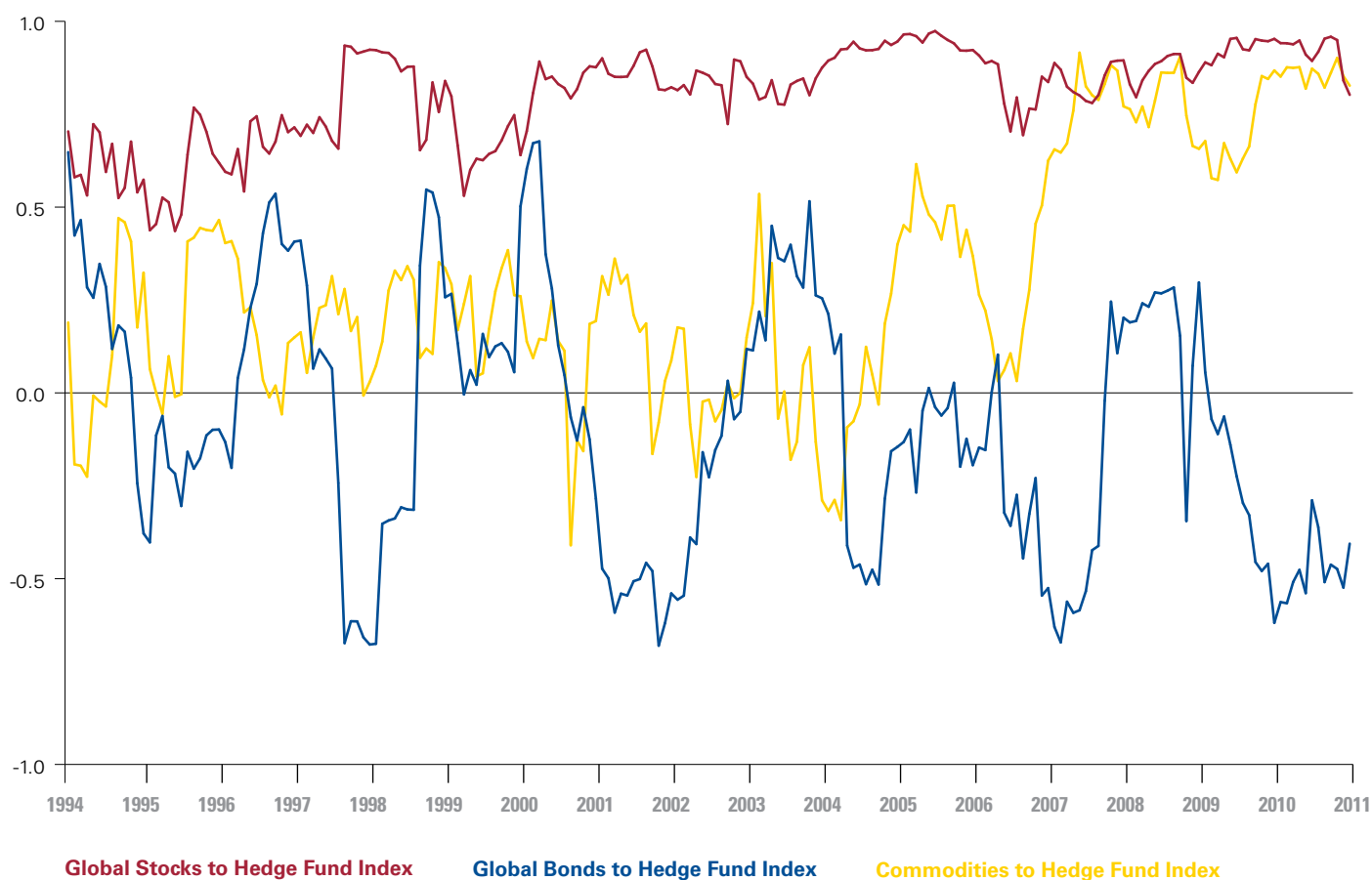
As Figure 2 shows, the correlations between an average hedge fund and main asset classes are highly time-varying suggesting that hedge fund investment strategies are dynamic based on the innovative use of different kinds of financial instruments. Specifically, Figure 2 displays the rolling 12-month correlations between a hedge fund index and main asset classes. The red line in Figure 1 shows the time-varying correlation between hedge funds and global stocks. It remains quite stable around the average correlation between hedge funds and global bonds, while the black and yellow lines show that the correlation between hedge funds and global bonds, as well as the correlation between hedge funds and commodities, are highly time-varying. Indeed, the correlation between hedge

funds and global bonds seems to be negative during economic expansion phases, while it is positive during the recessions when volatility tends to be higher. This suggests that hedge funds may have exposure to global bonds during the times when bonds tend to outperform.

Hedge funds employ innovative trading strategies. Therefore, the statistical properties of individual hedge funds differ significantly from each other. This implies that the performance of hedge funds and correlations between conventional asset classes should be very different across hedge fund investment strategies. Our empirical findings in Table 3 and Figure 3 support this hypothesis.

Although there is evidence that hedge funds are affected by financial market stresses, there is no academic evidence that shows that hedge funds cause economic instability.

Figure 2: Rolling 12-month correlation between hedge funds and main asset classes



Source: Centre for Hedge Fund Research

Table 3 presents performance measures across hedge fund strategies, while Figure 3 shows the cumulative returns to hedge fund strategies and global stocks. Table 3 shows that hedge fund strategies that have exposure to equity markets and take directional bets deliver the highest returns, while strategies relying on relative bets generate more stable returns, but smaller returns in this sample. Equity hedge, event driven, emerging markets, CTA and macro funds generate higher returns than relative value and market neutral funds. Among equity-oriented and directional strategies, equity hedge funds have the highest annual average return of 10.58 percent, while short bias delivers the lowest return (1.04 percent per year). The relative value strategy index has the highest Sharpe ratio of 1.06 per year. This suggests that they are able to deliver stable returns. Overall, the short bias strategy provides, as expected, the lowest returns and the highest volatility among hedge fund strategies. However, the average return for the short bias strategy is positive in absolute terms, suggesting that by taking short positions it delivers on average positive returns, and not only during recessions when short positions are often profitable.

Finally, we examine the correlation between individual hedge fund

strategies and the main asset classes. The overall findings suggest that hedge fund strategies' correlation with the main asset classes differs significantly depending on the strategy, suggesting that some strategies may be particularly attractive during the macroeconomic cycle. Put differently, the correlations between hedge fund strategies and conventional asset classes vary significantly across strategies and over the business cycle.

Table 4 presents correlations between hedge fund strategies and the main asset classes. Panel A in Table 4 shows the average correlations, suggesting that CTA/macro as well as market neutral exhibit a low correlation between global stocks, while all of the hedge fund strategies have a negligible correlation with global bonds. In addition, the correlation between hedge funds and commodities is positive at around 0.30. Again, short bias strategy provides an exception, since it has a highly negative correlation between global stocks and commodities, and positive, but almost zero, correlation with global bonds. Panel B and C in Table 4 present the correlations between hedge fund strategies and the main asset classes during different business cycles. The results in these panels show that market neutral, CTA

and macro styles have a lower correlation with global stocks during recessions than during expansions. These strategies exhibit a low correlation with global bonds and commodities over the business cycle. This indicates that these strategies may provide diversification benefits when they are needed the most. Figure 4 confirms this interesting correlation pattern between these hedge fund strategies and main asset classes. Specifically, Figure 4 shows the rolling 12-month correlations between hedge fund strategies and global stocks. Indeed, market neutral, CTA and macro typically have the lowest correlation with global stocks during adverse macroeconomic conditions, implying that they may provide diversification benefits.

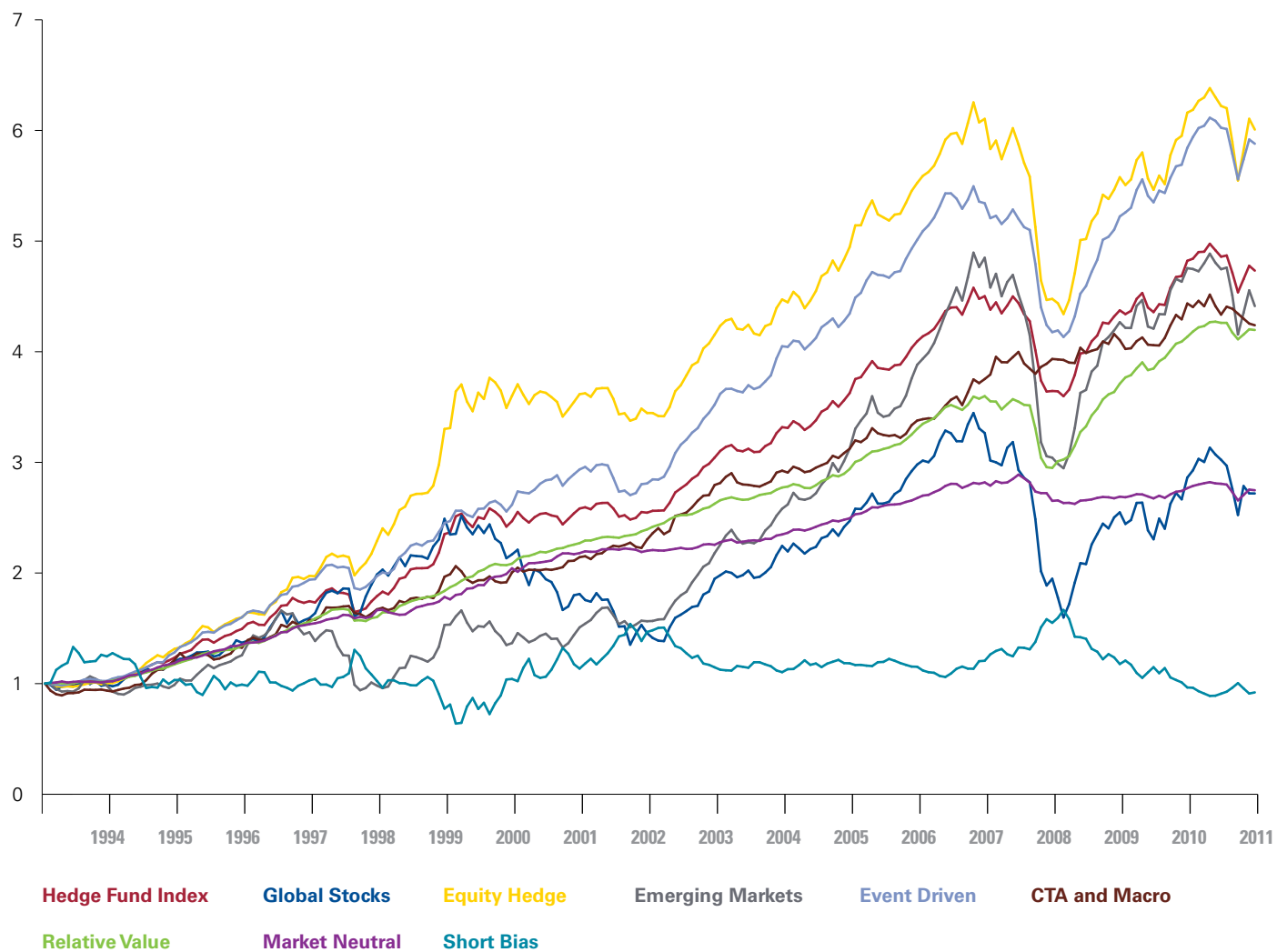
It is interesting to note that the short bias style has a high negative correlation between global stocks during recessions, suggesting that they outperform when stock markets are likely to suffer. Figure 4 shows a striking fact that the correlation between short bias and global stocks is almost -1 at December 2007 and January 2008 when stock markets faced a significant drawdown.

Table 3: Statistics for hedge fund strategies

	Equity Hedge	Emerging Markets	Event Driven	CTA and Macro	Relative Value	Market Neutral	Short Bias
Annualized Mean	10.58	9.60	10.32	8.39	8.23	5.73	1.04
Annualized Std	9.49	14.25	6.97	6.69	4.35	3.30	18.96
Annualized Sharpe	0.74	0.42	0.97	0.72	1.06	0.65	-0.13

Source: Centre for Hedge Fund Research

Figure 3: Cumulative returns to hedge fund strategies

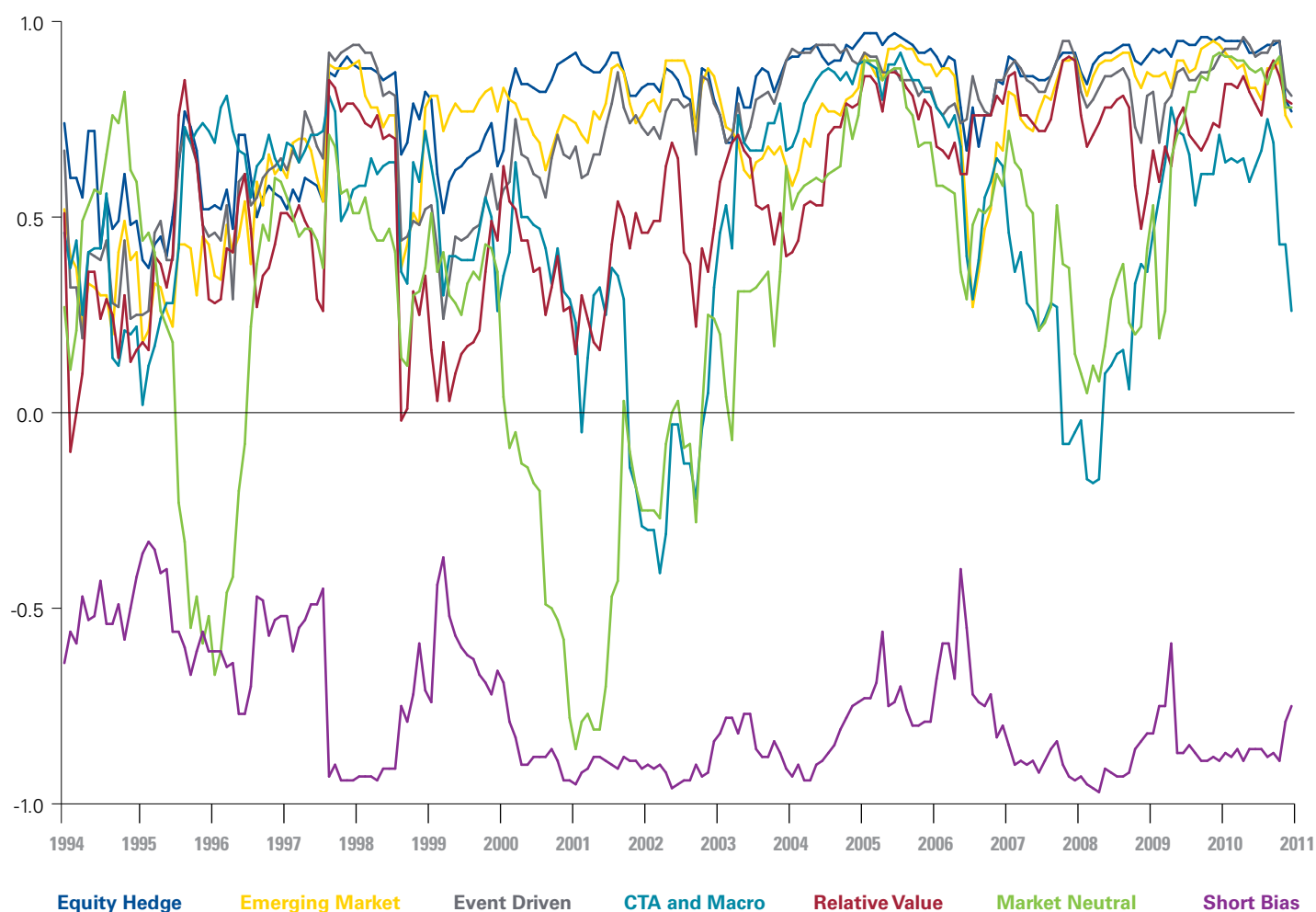


Source: Centre for Hedge Fund Research

Table 4: Correlations between global asset classes and hedge fund strategies

	All observations			Outside recessions			During recessions		
	Global Stocks	Global Bonds	Global Com	Global Stocks	Global Bonds	Global Com	Global Stocks	Global Bonds	Global Com
Equity Hedge	0.79	-0.06	0.42	0.73	-0.10	0.29	0.91	0.09	0.73
Emer. Markets	0.71	-0.09	0.35	0.66	-0.14	0.21	0.86	0.13	0.71
Event Driven	0.76	-0.08	0.36	0.72	-0.11	0.19	0.81	0.08	0.73
CTA and Macro	0.37	0.20	0.29	0.44	0.22	0.29	0.07	0.13	0.36
Relat. Value	0.61	0.01	0.41	0.53	-0.04	0.22	0.72	0.14	0.68
Market Neutral	0.31	0.03	0.33	0.34	0.05	0.25	0.10	-0.05	0.52
Short Bias	-0.69	0.08	-0.19	-0.68	0.08	-0.14	-0.84	0.04	-0.35

Source: Centre for Hedge Fund Research

Figure 4: Rolling 12-month correlation between hedge fund strategies and global stocks

Source: Centre for Hedge Fund Research

Hedge funds' diversification benefits

This section investigates whether hedge funds are able to deliver superior performance on a risk-adjusted basis. We tackle this issue by deconstructing hedge fund returns into abnormal (alpha) and systematic returns. As systematic risk factors, we use the returns of conventional asset classes. The advantage of this approach is that we can interpret the abnormal return as a return that an investor would earn over conventional asset classes by investing in hedge funds. We show explicitly that the equal weighted portfolio policy in hedge funds, global stocks and bonds outperforms the conventional 60/40 allocation of stocks and bonds with significantly higher Sharpe ratio and lower tail risk. Overall, the findings suggest that by adding hedge funds to a conventional portfolio of stocks and bonds, investors can gain economically important diversification benefits.

To measure risk-adjusted performance of an average hedge fund and across strategies, we regress hedge fund excess returns on the excess returns on conventional assets classes. We use the same three asset classes as above. The intercept in the regression measures the abnormal performance of an average hedge fund or hedge fund strategy. The regression slope coefficients on conventional asset classes measure whether hedge funds have taken risk exposures to specific asset class.

Figure 5 shows that most of the hedge fund performance is explained by alpha, not beta (that is exposure to systematic risk). Specifically, we deconstruct hedge fund returns into active returns that depend on manager skill and passive returns that could be obtained by investing in passive ETFs or index funds. According to Figure 5, hedge funds' alpha returns are larger than their passive beta returns, suggesting that hedge funds are able to provide economically significant value for their investors.

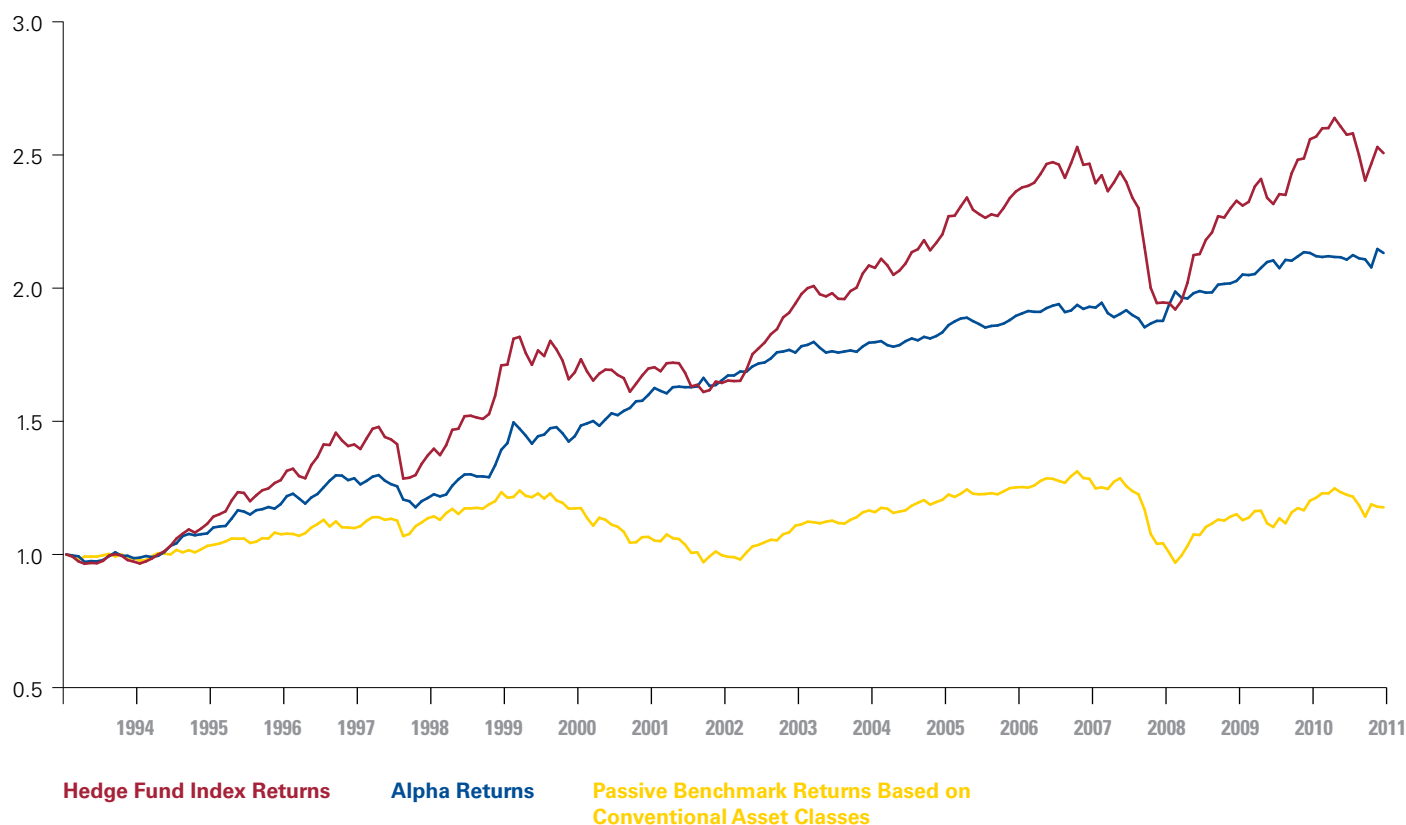
Figure 5: Deconstructing hedge fund returns

Table 5 presents the accurate cumulative returns for hedge funds and main asset classes. In addition, the table shows the proportion of hedge fund returns that are generated by manager skill or alpha. The results provide clear evidence that hedge fund alpha is more important than beta – systematic risk – in explaining

hedge funds' superior performance. Indeed, around 76 percent of hedge fund performance is due to alpha, and 24 percent of performance can be explained by beta. This really suggests that hedge funds add value on top of pure passive index funds that track aggregate returns of conventional asset classes.

Table 6 presents hedge fund alphas and risk loadings on average and over the business cycle. Overall we find that hedge funds are able to deliver economically important abnormal performance, on average, across strategies, and even during the recessions.

Table 5: Deconstructing hedge fund performance to active and passive

	Cum. Return 1994–2011		Annualized Mean Excess			(%) Alpha /
	(%) Raw	(%) Excess	Total Return	Alpha	Systematic Risk	Total return
Hedge Funds	385.18	156.27	5.51	4.19	1.32	76.04
Global Stocks	189.87	52.75	3.62			
Global Bonds	189.87	59.61	0.76			
Commodities	132.83	22.52	2.69			

Source: Centre for Hedge Fund Research

In addition, hedge funds' risk exposures to conventional asset classes are low and these low correlations imply diversification benefits. In particular, Panel A1 in

Table 6 shows that an average hedge fund has an annual alpha of 4.19 percent, suggesting significant abnormal performance. The risk exposures are low across conventional asset classes. The coefficient for global stocks is the highest (0.34), while the coefficients for global stocks and commodities are even lower with a magnitude of -0.08 and 0.05. Hence, an average hedge fund has very low risk exposures to conventional asset classes. Our results are in line with academic studies that measure hedge fund performance using the Fung and Hsieh (2004) 7-factor model, which contains two equity- and bond-oriented

factors, and three option-based trend following factors. Kosowski, Naik and Teo (2007), for example, conclude that the average abnormal return across hedge funds from 1994 to 2002 is 5.04 percent per annum. We opt not to use the Fung and Hsieh (2004) model, since we aim to show explicitly whether hedge funds are capable of providing diversification for institutional investors focusing on the main asset classes.

Panel A2 and A3 in Table 6 present the representative hedge fund alphas and risk exposures conditional on the macroeconomic environment. An average hedge fund generates a positive, but slightly lower, alpha during the recession than during the run-up phase. The risk exposures to conventional asset classes remain at a similar magnitude over the business

cycle. The coefficient for global stocks is even lower during the recession, suggesting that hedge funds may offer market timing skills, since they reduce aggregate stock market exposure. Panel B1 in Table 6 displays hedge fund alphas and risk exposures across hedge fund strategies. On average, all of the hedge fund strategies except short bias are able to deliver alpha over conventional asset classes. The event driven strategy delivers the highest alpha of 5.74 per year, while the respective alpha for short bias is -0.17. The risk exposures differ significantly across strategies. As expected, the emerging market strategy has the highest positive risk exposure to global stocks being 0.61, while the short bias style exhibits a significantly negative coefficient for global stocks with magnitude of -0.86.

Table 6: Hedge fund alpha and risk exposures

Panel A: Aggregate hedge fund alpha and risk exposures

	A1: All observations				A2: Outside recessions				A3: During recessions			
	Annualized Alpha	Risk			Annualized Alpha	Risk			Annualized Alpha	Risk		
	12*a	b_stocks	b_bonds	b_com	12*a	b_stocks	b_bonds	b_com	12*a	b_stocks	b_bonds	b_com
Hedge Fund Index	4.19	0.34	-0.08	0.05	4.13	0.36	-0.07	0.05	2.28	0.260	-0.02	0.082

Panel B: Hedge fund strategy alphas and risk exposures

	B1: All observations				B2: Outside recessions				B3: During recessions			
	Annualized Alpha	Risk Exposures			Annualized Alpha	Risk Exposures			Annualized Alpha	Risk Exposures		
	12*a	b_stocks	b_bonds	b_com	12*a	b_stocks	b_bonds	b_com	12*a	b_stocks	b_bonds	b_com
Equity Hedge	5.56	0.44	-0.13	0.08	5.76	0.44	-0.13	0.08	1.78	0.39	-0.06	0.09
Emerging Markets	4.12	0.61	-0.21	0.08	3.86	0.63	-0.25	0.07	2.86	0.49	0.10	0.15
Event Driven	5.74	0.32	-0.10	0.04	6.14	0.33	-0.09	0.03	1.74	0.23	-0.01	0.09
CTA and Macro	3.21	0.13	0.35	0.05	1.63	0.22	0.04	0.07	2.91	-0.07	0.26	0.08
Relative Value	3.87	0.15	0.03	0.05	4.69	0.12	0.01	0.02	2.43	0.16	0.16	0.10
Market Neutral	1.87	0.05	0.00	0.04	1.90	0.07	0.02	0.03	-1.67	-0.06	0.06	0.09
Short Bias	-0.17	-0.86	0.22	0.04	3.16	-0.94	0.05	-0.03	-12.13	-0.87	1.09	0.21

Source: Centre for Hedge Fund Research

The coefficients for global stocks across other strategies are low, ranging from 0.05 (market neutral) to 0.44 (equity hedge). The hedge fund strategies' risk exposures to global bonds and commodities are negligible. The coefficients for commodities range from 0.04 to 0.08, while the respective coefficients for global bonds range from -0.21 to 0.35 being highest to CTA/macro. Panels B2 and B3 in Table 6 show hedge fund strategy alphas and risk loadings over the business cycle. The results show that hedge fund strategies generate superior performance on a risk-adjusted basis during recessions. Five of the seven strategies are able to deliver positive alpha consistently over the business cycle. In addition, hedge funds' risk exposures to global stocks are lower during recessions, suggesting that hedge fund strategies reduce equity loadings at such times. The CTA/

macro strategy is the only one that has a higher alpha during times of recession than economic expansion periods. In addition, this strategy has time-varying exposure to the global equity market with higher loadings in expansion than recession periods. Finally, the short bias strategy's alpha is negative during recessions and the coefficient for global stocks is -0.94. This implies that the short bias strategy delivers higher raw returns when a recession occurs.

To show explicitly whether hedge funds are able to deliver diversification benefits, we form two imaginary portfolios. The first one is based on an equal weighted allocation between hedge funds, global stocks and bonds. The second has a 60/40 asset allocation between stocks and bonds, a common benchmark allocation for institutional investors.

The results show that hedge fund strategies generate superior performance on a risk-adjusted basis during recessions.

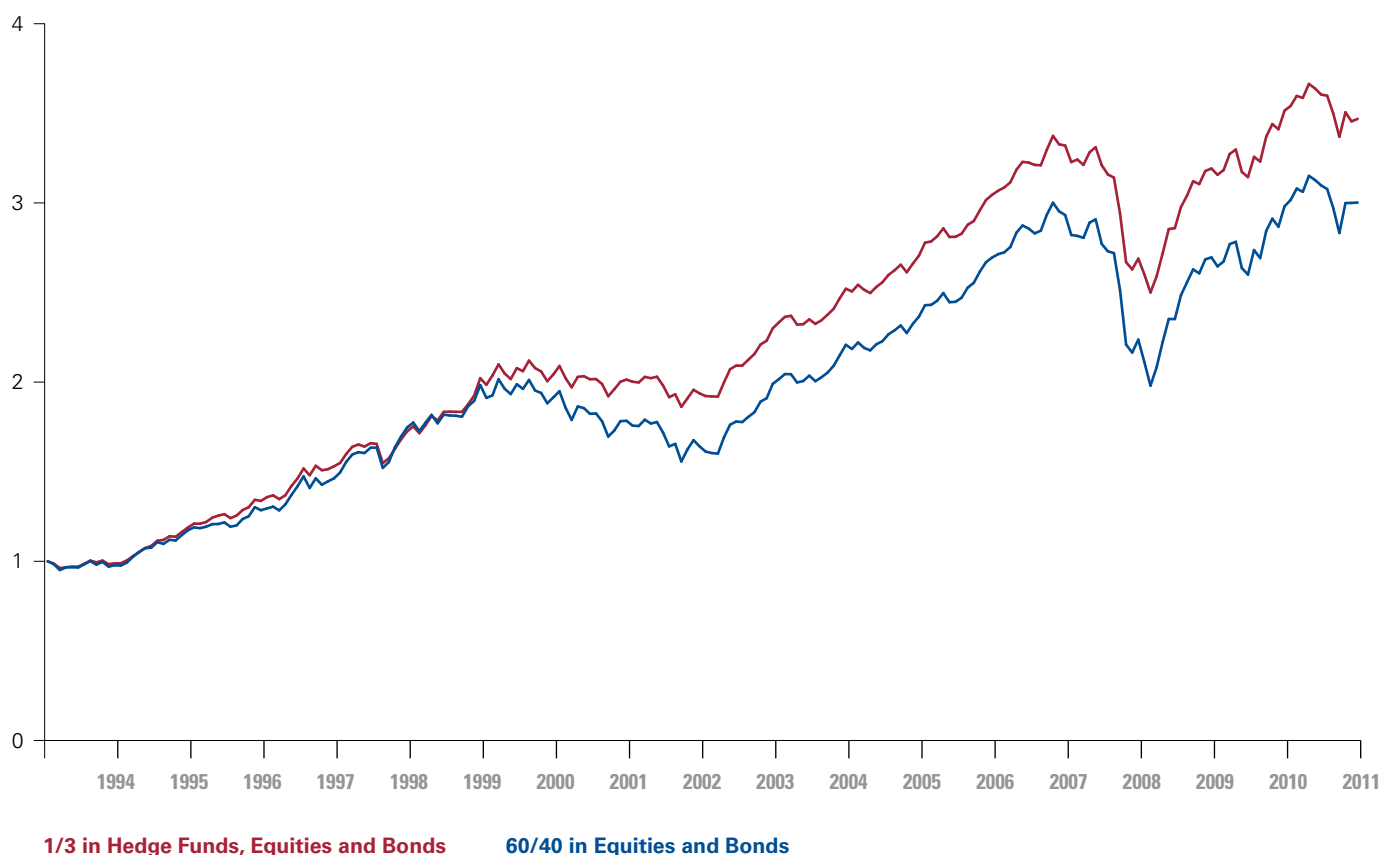


The cumulative returns to both portfolio policies in Figure 6 and the performance measures in Table 7 suggest that adding hedge funds to the conventional 60/40 asset allocation leads to economically important diversification benefits. Specifically, as Figure 6 shows, the cumulative returns to an equal-weighted portfolio are higher than for the conventional 60/40 allocation of stocks and bonds. The figure also suggests that tail risk may be higher for 60/40 portfolios. To examine formally the performance difference between an equal-weighted strategy containing hedge funds and the conventional

60/40 portfolio policy, we look at both portfolio strategies' returns, Sharpe ratio and two tail risk measures, namely Value-at-Risk and maximum drawdown. Table 7 presents the results showing that a portfolio policy based on the equal weighting between hedge funds, stocks and bonds significantly outperforms a conventional 60/40 strategy. A portfolio policy containing hedge funds delivers significantly higher returns with a lower tail risk, since it generates almost 9 percent higher returns and over one-third higher Sharpe ratio with about 30 percent lower maximum drawdown.

The superior performance of hedge funds implies that they have an important role in asset liability management.

Figure 6: Cumulative returns to asset allocation with and without hedge funds



Source: Centre for Hedge Fund Research

Table 7: Hedge funds' diversification benefits

	1/3 in hedge funds, stocks and bonds	60/40 in stocks and bonds	Difference	p-value
Mean	7.52	6.80	0.72	
Std	7.36	9.52	-2.16	
Skewness	-0.83	-0.72	-0.11	
Kurtosis	1.94	1.73	0.21	
Sharpe	0.53	0.34	0.19	0.001
Max Drawdown (%)	-0.28	-0.36	0.08	
Value-at-Risk at 5%	3.55	4.67	-1.12	

Source: Centre for Hedge Fund Research

Concluding remarks

In this review of hedge fund performance, we demonstrate that hedge funds provide superior risk-adjusted returns even during recessions. In particular, the analysis shows that hedge funds outperformed the main asset classes such as global stocks, bonds and commodities in terms of average returns and Sharpe ratios during the sample period from January 1994 to December 2011.

Importantly, hedge funds' ability to generate superior performance is not associated with significant risk-taking as measured by volatility or Value-at-Risk. Indeed, we document that hedge fund volatility is reasonably low across investment strategies compared to conventional asset classes. The only exception is the risk level for global bonds, which have a lower risk than hedge funds. However, global bonds deliver significantly lower returns and Sharpe ratios, suggesting that hedge funds' risk-taking is compensated by higher average return.

The superior performance of hedge funds implies that they have an important role in asset liability management. This is supported by our empirical findings, since we document a low correlation of hedge fund returns with other asset classes such as bonds, equities and commodities over the business cycle. To highlight the issue, the performance of some hedge fund strategies including CTA, macro and short bias is often counter-cyclical. Therefore, hedge funds are particularly well suited in providing diversification benefits. Specifically, we show that an institutional investor who adds hedge funds to a conventional 60/40 portfolio, can gain economically important diversification benefits. We document that an equal weighted portfolio containing hedge funds, stocks and bonds has significantly higher performance with lower tail risk than a conventional portfolio based on the 60/40 allocation of stocks and bonds. Overall, this review supports the view that hedge funds provide economically important risk-adjusted performance that provides investors with diversification benefits even during the most difficult macroeconomic environments.



Part 2: Literature review

In this section we review the literature on hedge funds and the value of the hedge fund industry to investors, markets, and the broader economy.

1) Hedge fund performance. In one of the most comprehensive recent studies of hedge fund performance, Joenväärä, Kosowski and Tolonen (2012) examine the five main commercially available hedge fund databases. They find clear evidence that investors deliver, on average, economically and statistically significant abnormal performance on an equal- and value-weighted basis, as well as across investment strategies, domiciles, size categories and time-periods, a finding that is consistent with previous studies such as Kosowski, Naik and Teo (2007). Apart from average performance over a given time period, a crucial question for investors is whether performance can be exploited successfully by picking funds that performed well in the past and will perform well in the future. In other words, investors are interested in whether there is performance persistence over time. The recent literature on hedge fund performance (e.g., Kosowski, Naik, and Teo (2007) and Jagannathan, Malakhov and Novikov (2010)) has shown, using the sophisticated econometric methods, that hedge fund performance persists at annual horizons, while earlier studies (e.g., Brown, Goetzmann and Ibotson (1999), Agarwal and Naik (2000), and Liang (2000)) document that hedge fund performance persists

only at quarterly horizons. Using their consolidated database, Joenväärä, Kosowski and Tolonen (2012) confirm that hedge fund performance persists at annual horizons even when just using unsophisticated econometric methods. This suggests that hedge funds can exploit hedge fund performance by selecting funds with superior past performance. The use of advanced econometric techniques is particularly relevant since although the average hedge fund appears to add value over long sample periods, there is evidence that investors could improve the timing of their entry and exit decisions into individual hedge funds.

Dichev and Yu (2011) examine so-called dollar-weighted, instead of time-weighted, returns. Dollar-weighted returns should be interpreted as reflecting the ability of investors to time their investments into hedge funds since they weight each monthly return by the amount of capital invested, instead of equally over time as a simple time-average would do. One would expect most investments to start with a low investor base that gradually increases over time, thus always leading to a divergence between dollar-weighted and time-weighted returns.

Indeed Dichev and Yu (2011) find that time-weighted returns are higher than dollar-weighted returns, which indicates

that although there are funds that outperform their benchmarks, investors could improve their timing ability in allocating to funds.

2) Hedge funds and financial stability. Although there is evidence that hedge funds are affected by financial market stresses, there is no rigorous academic evidence that shows that hedge funds cause economic instability. Many studies that examine this question often do not distinguish between (i) causality and correlation or between (ii) a contemporaneous correlation and a lead-lag relationship. Boyson, Stahel and Stulz (2010) find evidence that adverse funding and liquidity shocks significantly affect hedge fund performance but they do not find evidence that hedge funds adversely affect funding or liquidity conditions. In related research, Getmansky et al. (2011) find that hedge funds have exposure to systemic risk, but they do not cause or contribute to it. They propose several econometric measures of systemic risk to capture the interconnectedness among the monthly returns of hedge funds, banks, brokers and insurance companies, based on principal components analysis and Granger-causality tests. The authors find no evidence of this. They find that hedge funds suffer from, rather than cause, forced liquidations. In fact, it could be argued that rather than

causing financial instability and creating systemic risk, hedge fund trading actually reduces instability and mitigates systemic risk because of its essentially counter-cyclical nature, i.e. hedge funds are often trading in an opposite direction to the market, and provide significant diversity of market reaction. Brunnermeier and Nagel (2005) examine the trading behaviour of hedge funds during the technology bubble and document periods when hedge funds took portfolio positions that were different from the rest of the market. Also, hedge fund closures were orderly during the crisis, in stark contrast to failures of other market participants, and there was no need for government intervention, support or bail-outs to rescue hedge funds.

3) Contribution of hedge funds to the efficient functioning of financial markets: liquidity provision.

There is evidence that hedge funds are important providers of liquidity in various financial markets. One example

of this evidence is research that shows that hedge funds are subject to funding constraints and occasional forced deleveraging in periods of financial stress, which may lead them to liquidate their portfolios. These studies examine hedge funds' equity holdings and corroborate the view that hedge funds are important providers of liquidity in stock markets. Aragon and Strahan (2009) use the 15 September 2008 bankruptcy of Lehman Brothers as an exogenous shock to funding costs, and show that hedge funds act as liquidity providers. The authors find that hedge funds who used Lehman as their prime broker could not trade after the bankruptcy, and these funds were twice as likely to fail as similar funds after 15 September (but not before). Stocks traded by the Lehman-connected hedge funds in turn experienced greater declines in market liquidity following the bankruptcy than other stocks; and, the effect was larger for ex ante illiquid stocks. The authors conclude that shocks to traders' funding liquidity

reduce the market liquidity of the assets that they trade. Several studies document the role of hedge funds as liquidity providers in the convertible bond market. Although the convertible bond market is relatively small in terms of market capitalization compared to the bond or equity market, hedge funds play a disproportionately large role as liquidity providers in it. Mitchell et al. (2007) point out that convertible arbitrage and other hedge funds make up about 75 percent of the convertible market. Pulliam (2004) notes that in 2003, convertible arbitrage hedge funds purchased about 80 percent of newly issued convertible bonds.

Choi, Getmansky, Henderson and Tookes (2010) show that hedge funds are crucial providers of liquidity in the convertible bond market. The authors estimate a simultaneous equations model of supply and demand, that allows them to link convertible bond issuance to convertible bond arbitrage hedge fund flows and other variables



reflecting potential sources of capital supply. The authors use the ban on short selling in September and October, 2008 as an exogenous shock to the supply of capital from convertible bond arbitrageurs. Because short selling plays an important role in convertible bond arbitrage strategies, the inability to short sell can be expected to reduce arbitrageurs' willingness to supply convertible bond capital to firms. The authors' analysis of convertible bond issuance patterns near the short sales ban reveals a significant decline in issuance, even after controlling for issuance of other types of securities. Overall these results can be interpreted as strong evidence that the supply of capital from convertible bond arbitrageurs impacts issuance, and are inconsistent with the view that only demand matters for issuance. Since convertible bond arbitrage funds are

also active in stock markets, research on convertible bond arbitrage funds has demonstrated their important contribution to liquidity provision in stock markets. Choi, Getmansky and Tookes (2009) examine the activity of convertible bond arbitrage fund activity and find evidence that convertible bond arbitrage activity tends to positively affect equity markets. This occurs through arbitrage activity (i.e., short selling in the stock at the date of bond issuance), which is shown to lead to increased equity market liquidity following bond issuance. The authors find a significant effect on equity market liquidity, but not equity market volatility or autocorrelation. Cao, Chen, Liang and Lo (2011) show that certain hedge funds have an ability to time market liquidity and that this group of funds generates higher risk-adjusted performance risk for investors than other funds (more

research like this would be very helpful). In related research, Cao and Petrasek (2011) find that after controlling for institutional preferences for stock characteristics, stocks held by hedge funds as marginal investors are more sensitive to changes in aggregate liquidity than comparable stocks held by other types of institutions or by individuals.

4) Improvements in operational risk. Recent changes in the hedge fund industry mean that operational infrastructure including risk reporting and compliance has improved. These improvements are likely to increase costs, but there is evidence that suggests that attention to risk management and operational risk is important for performance. Cassar and Gerakos (2011) investigate the determinants and effectiveness of methods that hedge funds use to



manage portfolio risk. They find that funds in their sample that use formal models performed better in the extreme down months of 2008 and, in general, had lower exposures to systematic risk. Furthermore, funds employing Value-at-Risk and stress testing had more accurate expectations of how they would perform in a short-term equity bear market. Their results suggest that models of portfolio risk increase the accuracy of managers' expectations and assist managers in reducing exposures to both systematic and downside risk. Brown, Goetzmann, Liang and Schwarz (2009) use a complete set of SEC filing information on hedge funds (Form ADV) and find that while operational risk is more significant than investment risk in explaining fund failure, there is a significant and positive interaction between operational risk and investment risk.

5) Short selling and price discovery.

There is evidence that hedge funds provide liquidity through short sales. Although aggregate data on hedge funds short-sale positions around the world is not publicly available, one indirect way of quantifying the role that hedge funds play in price discovery and liquidity provision is to look at research on the effect of short sale bans. Beber and Pagano (2011) examine the consequences of short-sale bans around the world during the 2007-2009 crisis. They find that bans had negative effects on liquidity, especially for small cap stocks and stocks without listed options. Moreover, they find that the bans slowed down price discovery, especially in bear markets and failed to support prices in the vast majority of markets. These results can be interpreted as evidence supporting the role of hedge funds. Some researchers found that by trading on their extensive research, hedge funds help to reveal some of that information to less-

informed investors, which brings assets closer to their fundamental values, increases competitive pressure on spreads, and helps combat bubbles. March and Payne (2010) study the effects that the ban on short sales of shares in financial firms, introduced in late 2008 and removed in early 2009, had on the microstructure and the quality of UK equity markets. The authors show that the ban had little effect on order flows. Financial stocks were being more aggressively sold off than their peers pre-ban and this situation persisted through the ban period. Trading volume in financials was massively reduced, however. The ban also decimated order book liquidity for financials. The authors find that, through the period of the ban, markets for financial stocks were substantially less efficient and that the role of the trading process aiding in price discovery was greatly reduced. The effects identified above were largely reversed once the ban was lifted. Based on these findings, the authors conclude that the ban had detrimental effects on the quality of UK equity markets and that, far from being stabilizing, the ban exacerbated problems of volatility in the prices of and uncertainty in the values of UK financial stocks. Brunnermeier and Nagel (2004) examine stock holdings of hedge funds during the time of the technology bubble on the NASDAQ. Although they find that hedge funds were riding the technology bubble and not attacking it, they also report that hedge funds assisted price discovery with their selling decisions as they reduced their exposure before prices collapsed, which they interpret as evidence that hedge fund managers understood that prices of these stocks would eventually decrease.

6) Institutionalization of the industry.

A study by Preqin estimates that 61 percent of hedge fund assets in 2011 come from the institutional sector,

Short-sale bans during the 2007-2009 crisis had negative effects on liquidity, especially for small cap stocks and stocks without listed options.

a 36 percent rise from 2008 when the figure stood at 44 percent.¹ A recent AIMA/KPMG global survey of hedge fund managers found 57 percent of AUM was institutional.

This 'institutionalization' of the industry is significant because it means that the industry is increasingly responsible for allocations from socially valuable investors such as pension funds, university endowments, charities and annuities. Because of the ability of hedge funds to deliver superior better risk-adjusted returns and better capital protection and downside protection, hedge funds can play an important social role as guardians of these investments.

7) Contribution of hedge funds to the broader economy. The hedge fund industry makes a significant contribution to job creation around the world. In 2010 the first global assessment of the number of jobs created by the hedge fund industry was carried out by AIMA, which surveyed 1,200 members in 40 countries (AIMA, 2010). The survey found that the world's hedge fund industry employs an estimated 300,000 people. The figure of 300,000 can be further broken down regionally as follows: 240,000 in North America, 50,000 in Europe and 10,000 in Asia-Pacific. These numbers include both those employed

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¹ 2011 Preqin Global Investor Report Hedge Funds'. HYPERLINK "<http://www.preqin.com>" www.preqin.com



directly within the hedge fund sector and those jobs generated by the industry among service providers such as administrators, lawyers and accountants. AIMA reports that the ratio of direct jobs to indirect jobs was generally 1:2, so the number of direct jobs within the industry globally is 100,000 with a further 200,000 indirect jobs generated by the industry. Another important metric that can be used to quantify the broader economic contribution of the hedge fund industry is the industry's contribution to tax revenue. In 2009, Open Europe, an independent think-tank, surveyed the members of AIMA and the British

Private Equity and Venture Capital (BVCA) association. The survey found that the hedge fund and private equity industries contribute €9 billion (£7.9 billion) in tax revenues to European Union (EU) governments (Open Europe (2009)). According to Open Europe, this would be enough to pay for more than 200,000 nurses, 45,000 hospital consultants or 165,000 teachers. The survey provides further regional breakdown and estimates that in the UK alone the hedge fund industry contributes £3.2 billion to tax revenue.

Conclusion

Our review of the literature on the value of the industry to investors, to markets, and to the broader economy shows that hedge funds are important liquidity providers in the markets that they are active in. Moreover, hedge fund activity has beneficial effects for price discovery, the efficient allocation of capital, financial stability, diversification and the broader economy.



Glossary

Alpha is defined as the abnormal performance of a fund manager that cannot be explained by systemic risk factors or passive benchmark returns.

Excess return is calculated as the difference between the raw return and the risk-free rate.

Sharpe ratio is defined as the hedge fund's average excess return divided by its standard deviation.

Value-at-Risk (VaR) is defined as the maximum potential change in the value of a portfolio with a given probability over a certain horizon.

Volatility is defined as the annualized standard deviation of raw returns.

Equity Hedge strategies maintain positions in primarily equity and equity derivative securities. Equity Hedge managers would typically maintain at least 50 percent exposure to, and may in some cases be entirely invested in, equities - both long and short.

Equity Market Neutral strategies employ sophisticated quantitative techniques to analyze price data to ascertain information about future price movement and relationships between securities, select securities for purchase and sale. Equity Market Neutral Strategies typically maintain characteristic net equity market exposure no greater than 10 percent long or short.

Short-Biased strategies employ analytical techniques in which the investment thesis is predicated on assessment of the valuation characteristics on the underlying companies with the goal of identifying overvalued companies.

Event Driven investment managers maintain positions in companies currently or prospectively involved in corporate transactions of a wide variety including but not limited to mergers, restructurings, financial distress, tender offers, shareholder buybacks, debt exchanges, security issuance or other capital structure adjustments.

Macro investment managers trade in a broad range of strategies in which the investment process is predicated on movements in underlying economic variables and the impact these have on equity, fixed income, hard currency and commodity markets. Managers employ a variety of techniques, both discretionary and systematic analysis, combinations of top down and bottom up theses, quantitative and fundamental approaches and long and short term holding periods.

Relative Value investment managers maintain positions in which the investment thesis is predicated on realization of a valuation discrepancy in the relationship between multiple securities. Managers employ a variety of fundamental and quantitative techniques to establish investment theses, and security types range broadly across equity, fixed income, derivative or other security types.

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