

## Occasional Paper No. 1

### Enhancing Traditional Asset Allocation with Hedge Funds: A Quantitative Motivation

#### Summary

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This paper investigates the financial performance of the alternative asset class - in the form of Hedge Funds - within a typical low risk investment portfolio. Hedge fund investment strategies are divided into three broad groups:

- Directional
- Non-directional
- Event Driven

There are twelve separate hedge fund styles under these groups. Using information gathered from the well developed global markets (Datastream), the paper compares the performance and related risk of investment portfolios which include hedge funds and those that do not.

The paper finds that the inclusion of the alternative asset class - in the form of hedge funds - in investment portfolios does enhance the risk adjusted returns to investors. The combination of hedge funds from each investment strategy with US and international bonds and equities, is the most efficient investment portfolio for investors with all levels of risk tolerance.

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## Introduction

Hedge funds have attracted growing attention from financial market participants and the general public due to their relative financial performance and as a consequence of their rapid growth and substantial scale, their importance to financial institutions and the impact of their trading activity on global capital markets (Ferguson & Laster, 2007). According to estimates by the Hedge Fund Research (HFR), the industry grew from 610 funds managing USD 39 billion of assets in 1990 to 9,426 funds with USD 1.5 trillion in June 2007. However, this still represents less than 3% of all investment portfolios.

It is a widely mooted proposition that including hedge funds in a traditional investment portfolio holds the potential to significantly improve the portfolio's mean – variance characteristics. In the early 2000s, a number of papers showed that by adding hedge funds to US traditional investments the risk – return trade offs could be improved (e.g., Rzepczynski, Neubauer, & Henry, 2001, and Amin and Kat, 2003).

The asset allocation of New Zealand's largest fund manager, the New Zealand Superannuation Fund (2007), illustrates the recent trend of an increase in the allocation of the alternative (private) asset class. In this case it grew from 7% in 2005 to 13% currently, and is anticipated to be 25% of the portfolio in the long term. The other characteristic of this fund is the importance of the international weighting in a well diversified portfolio - well in excess of 50% (decisions relating to managing the currency risk are a separate matter).

For managers of client portfolios with a conservative risk appetite, there is merit in reviewing the empirical evidence relating to the inclusion of alternative assets within investment portfolios.

The objective of this paper is to test the data, present the evidence and to examine the portfolio diversification value of the inclusion of hedge funds in a traditional investment portfolio. The desire to test the proposition in fully developed and mature financial markets and limits on data availability led to the analysis being conducted in USD with information relating to USA and International securities. The comparable fully covered NZD returns require the addition of approximately 2.3% per annum to the USD returns reported in this study.

## Methodology

This study employs Markowitz's (1952) mean-variance optimization framework as a way to create optimal portfolios based on risk and return trade-offs. Given asset weight constraints, the optimization uses return, risk and correlation to combine assets into portfolios that maximize return for different levels of risk.

Twelve most representative hedge funds styles which contain 90% of total number of hedge funds in the HFR database are examined; specifically: short selling, market timing, Macro, Fixed Income Convertible Bond, Distressed Securities, Convertible

Arbitrage, Equity Market Neutral, Fixed Income Arbitrage, Relative Value Arbitrage, Event Driven, and Managed Futures (CTA).

These hedge funds styles are divided into three broad investment strategies:

- Directional
- Non-directional
- Event-driven

A brief explanation of each of the strategies is summarised in Table 1.

**Table 1: Category and style classification of hedge funds**

Category	Style	Style Description
<b>Directional Strategies</b>	Market Timing	Market Timing refers to allocating assets into investments that are beginning to have an uptrend, and moving out of investments that appear to have a downtrend. Usually this consists of moving between mutual funds and money markets.
	Macro	Macro investing involves investing by making leveraged bets on anticipated price movements of stock markets, interest rates, foreign exchange and physical commodities. These positions reflect their views on overall market direction as influenced by major economic trends and/or events. Most funds invest globally in both developed and emerging markets.
	Managed Futures	Managed Futures strategy trades on the world wide futures markets ranging from financial and commodity futures markets, currency markets, metals, grains, soft commodities, equity indexes, foreign currency and US government bond futures.
	Short Selling	Short Selling involves the sale of a security not owned by the seller; a technique used to take advantage of an anticipated price decline. The procedure is that the seller borrows securities from a third party in order to make delivery to the purchaser. The seller returns the borrowed securities to the lender by purchasing the securities in the open market.
<b>Non-Directional Strategies</b>	Convertible Arbitrage	Convertible Arbitrage involves purchasing a portfolio of convertible securities, generally convertible bonds, and hedging a portion of the equity risk by selling short the underlying

		common stock.
	Fixed Income Arbitrage	Fixed Income Arbitrage managers attempt to exploit the relative mispricing between related sets of fixed income securities.
	Merger Arbitrage	Merger Arbitrage is about investment in event-driven situations such as leveraged buy-outs, mergers and hostile takeovers. These strategies generate returns by purchasing stock of the company being acquired, and in some instances, selling short the stock of the acquiring company.
	Relative Value	Relative Value Arbitrage attempts to take advantage of some securities that are mispriced relative to the underlying security, related securities, groups of securities, or the overall market.
	Equity Market Neutral	Equity Market Neutral investing seeks to gain profit by exploiting pricing inefficiencies. Managers will match long positions of outperforming stocks with short positions of under-performing stocks. As such, equity market neutral managers hedge their fund from systemic shock or events that may affect the valuation of the market.
<b>Event-Driven Strategies</b>	Distressed Securities	Distressed Securities strategies invest in, and may sell short, the securities of companies where the security's price has been, or is expected to be, affected by a distressed situation.
	Merger Arbitrage	Merger Arbitrage is about investment in event-driven situations such as leveraged buy-outs, mergers and hostile takeovers. These strategies generate returns by purchasing stock of the company being acquired, and in some instances, selling short the stock of the acquiring company.
	Event – driven	Event-Driven involves purchasing or selling securities of companies undergoing substantial changes.

These different hedge funds categories are added to the traditional assets (equity and bonds), US and International, to test portfolio optimization.

The specific portfolios are set out as follows:

- Directional hedge funds and US traditional investments
- Directional hedge funds and International traditional investments
- Non-Directional hedge funds and US traditional investments

Non-Directional hedge funds and International traditional investments  
 Event-Driven hedge funds and US traditional investments  
 Event-Driven hedge funds and International traditional investments  
 All hedge funds and International traditional investments

## Data

The primary source of the data for hedge funds and US and International equities and bonds comes from Datastream. The hedge fund database reports equally weighted monthly returns from performance of actual managers; therefore to be consistent, monthly returns of the equities and bonds are used in the study. The Hedge Fund Research Indices (HFRI) was employed by each respective investing style from January 1996 to July 2007. The S&P 500 and Lehman US Aggregate serve as a proxy for the US equity and bond respectively. The International equity investment is proxied by the MSCI World Total Return Index and the bond investment by the JP Morgan Global Government Bond Index. Managed futures performance is derived from CS/Tremont Management Futures Index.

Table 2 presents descriptive statistics for 16 asset classes: the average monthly return and volatility.

Generally, the traditional asset class, equity, has higher volatility than hedge funds, but does not necessarily have a higher return. In bond investments, the volatility is approximately at a similar level with most hedge funds; however, the returns are significantly lower.

The pure short selling style is the most volatile asset studied here, followed by traditional asset classes, equity, S&P 500 and MSCI World respectively. In terms of monthly return, most of the hedge funds styles achieve higher or similar returns as the equity markets. Among all the assets, the event driven style hedge funds have the highest average monthly return followed by market timing and distressed securities.

**Table 2: Descriptive statistics**

	Hedge Funds												Traditional Assets			
	Short Selling	MKT Timing	Macro	Fixed Income Conv. Bonds	Distressed Securities	Conver. Arb.	Equity MKT Neutral	Fixed Income Arbitrage	Merger Arb.	Relative Value	Event Driven	CTA	S&P 500	US Bond	MSCI World	Glob Bond
Mean Monthly Return (%)	0.26	1.00	0.80	0.79	1.00	0.77	0.63	0.45	0.77	0.79	1.05	0.64	0.70	-0.04	0.62	0.05
Std Dev (%)	5.93	2.12	1.90	3.57	1.54	0.97	0.87	1.07	1.08	0.90	1.84	3.41	4.25	1.06	4.02	1.94
Mean / Std Dev	0.04	0.47	0.42	0.22	0.65	0.79	0.72	0.42	0.71	0.88	0.57	0.19	0.16	-0.04	0.15	0.02
Max Return	22.84	6.06	6.82	14.42	5.06	3.33	3.59	3.04	3.12	2.80	5.13	9.95	9.67	2.36	14.53	6.10
Min Return	-21.21	-3.67	-3.77	-11.51	-8.50	-3.19	-1.67	-6.45	-5.69	-5.80	-8.90	-8.62	-14.58	-3.99	-10.57	-4.98
Min-Max Range	44.05	9.73	10.59	25.93	13.56	6.52	5.26	9.49	8.81	8.60	14.03	18.58	24.25	6.35	25.10	11.07

Note: Table 2 summarises the monthly mean, standard deviation, maximum return, minimum return, and min – max range of 12 styles of hedge funds and the US and international equity and bonds investments. The statistics are computed for an 11 year period from January 1996 to July 2007.

The correlation between asset classes is important when allocating weights to different assets within a diversified portfolio. Table 3 below represents the correlations between asset classes.

The entire hedge fund styles except short selling, fixed income arbitrage, and managed futures have a positive correlation with S&P 500 and MSCI world. Short selling is generally negatively correlated to other asset classes except for the fixed income arbitrage, managed futures and bonds.

Within the alternative assets, the hedge fund strategies are generally correlated to each style apart from short selling which is negatively correlated with them which is consistent with Liang (2003) and Capocci (2007).

The findings are similar to some previous studies (e.g Liang, 1999, Amin and Kat, 2003, and Capocci, 2007) that the correlation between hedge funds and other asset classes are generally weak; therefore by adding hedge funds to a traditional portfolio is likely to improve the risk-return trade-off.

**Table 3: Correlation between asset classes**

	Hedge Funds											Traditional Assets				
	Short Selling	Market Timing	Macro	FI Convnt Bonds	Distressed Securities	Cont. Arb.	Equity MKT Neutral	Fixed Income Arb.	Merger Arb.	Relative Value	Event Driven	CTA	S&P 500	US Bond	MSCI World	Global Bond
HFRI Short Selling	1.00	-0.68	0.46	-0.73	-0.54	-0.27	-0.12	0.02	-0.39	-0.44	-0.69	0.13	-0.69	0.11	-0.69	0.03
HFRI Market Timing		1.00	0.55	0.58	0.40	0.27	0.24	-0.04	0.44	0.37	0.61	0.17	0.68	-0.03	0.75	-0.01
HFRI Macro			1.00	0.48	0.50	0.34	0.31	0.21	0.31	0.41	0.59	0.47	0.36	0.19	0.38	0.12
HFRI FI Convertible Bond				1.00	0.64	0.50	0.06	0.08	0.51	0.59	0.79	-0.18	0.70	-0.10	0.70	-0.10
HFRI Distressed Securities					1.00	0.57	0.19	0.35	0.53	0.72	0.83	-0.11	0.45	-0.08	0.47	-0.07
HFRI Convertible Arbitrage						1.00	0.26	0.25	0.51	0.75	0.54	-0.07	0.26	0.01	0.23	-0.11
HFRI Equity MKT Neutral							1.00	0.10	0.42	0.35	0.31	0.19	0.14	0.10	0.14	0.02
HFRI Fixed Income Arbitrage								1.00	0.04	0.23	0.19	-0.08	-0.11	0.02	-0.04	-0.05
HFRI Merger Arbitrage									1.00	0.72	0.75	-0.03	0.50	-0.09	0.48	-0.11
HFRI Relative Value										1.00	0.73	-0.11	0.47	-0.02	0.42	-0.14
HFRI Event Driven											1.00	-0.05	0.66	-0.11	0.67	-0.11
Tremont Managed Futures												1.00	-0.09	0.30	-0.05	0.29
S&P 500													1.00	-0.06	0.89	-0.09
LEHMAN US Aggregate														1.00	-0.10	0.64
MSCI World															1.00	0.00
JPM Global Govt. Bond																1.00

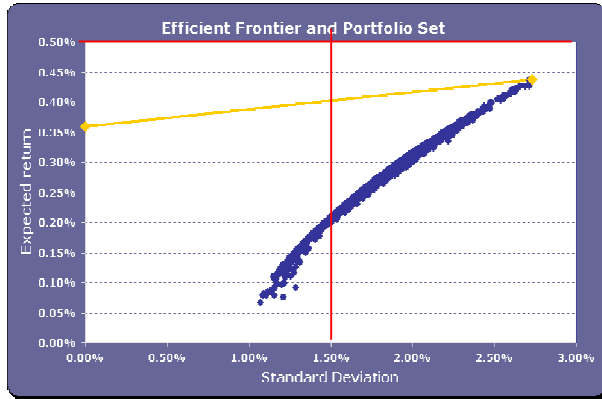
## Results

In mean-variance analysis, expected return is plotted against risk (the standard deviation of asset returns) for a given portfolio presented in the methodology section. Random combinations of portfolio weights were generated and used to produce a scatter plot of the expected return and risk for each portfolio. Each blue dot represents the mean and standard deviation of each portfolio. Portfolios on the efficient frontier have a maximum return for a given level of risk or, alternatively, a minimum risk for a

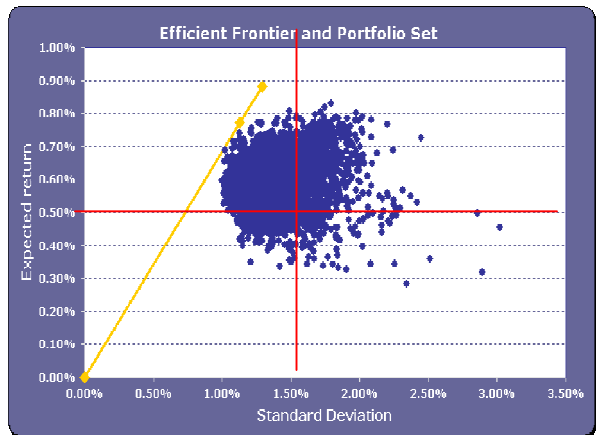
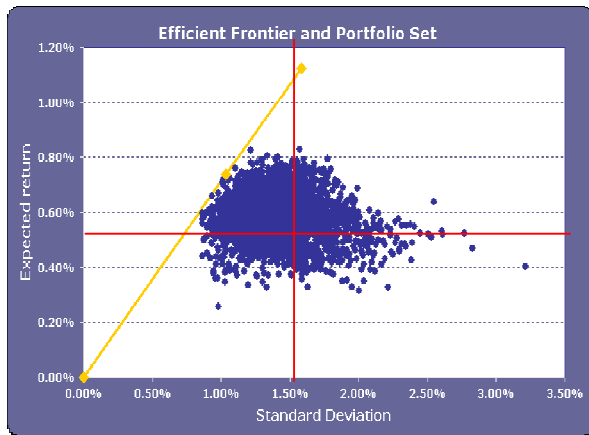
given level of return. The red line represents a standard deviation of 1.50% and a return of 0.50% for a clear comparison.

**Figure 1: Efficient frontiers of all the portfolios**

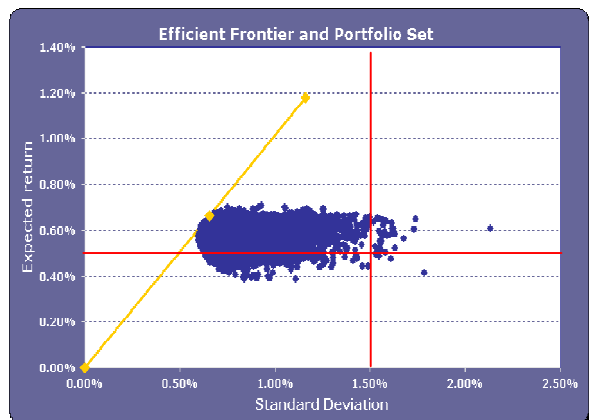
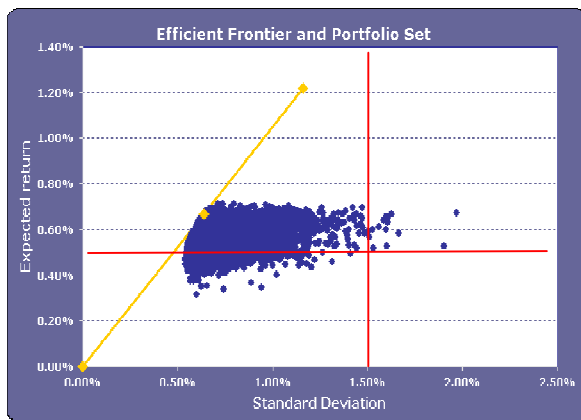
Traditional assets (equity and bonds): US and International

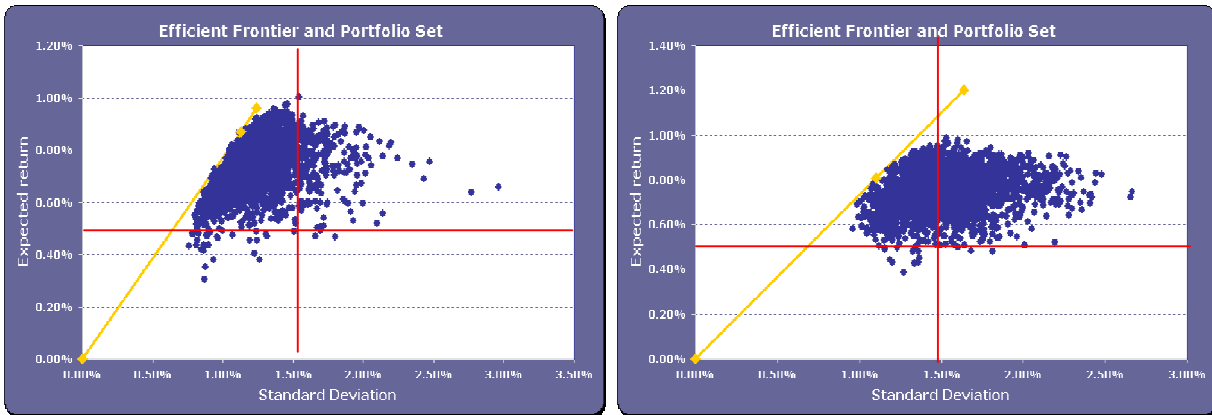


Directional strategies vs. US traditional investments vs. International traditional investments



Non-directional strategies vs. US traditional investments vs. international traditional investments

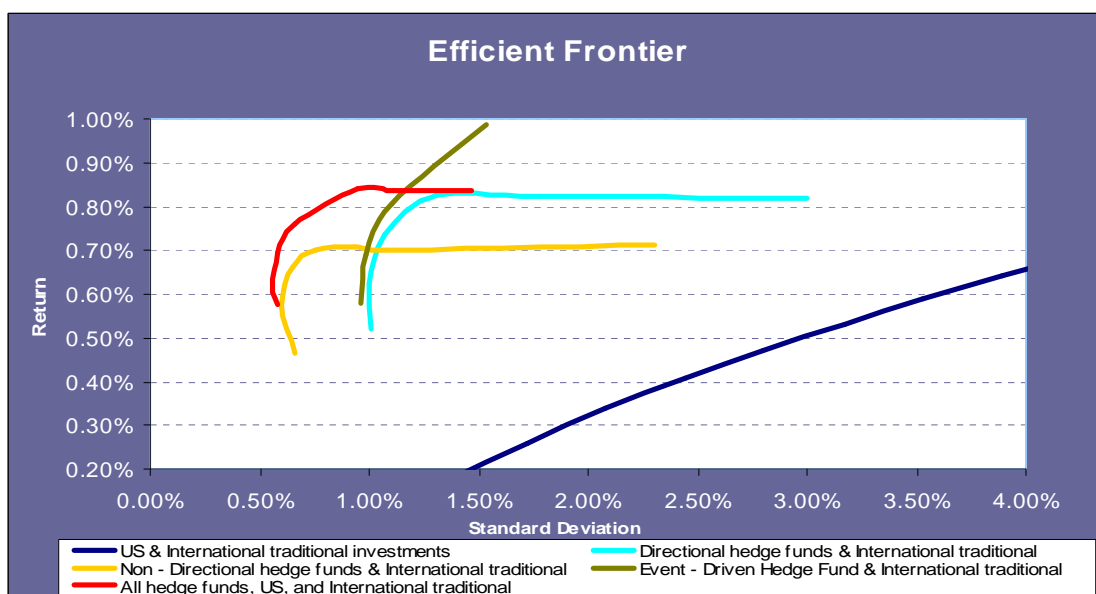


**Event - Driven vs. US traditional investments vs. international traditional investments**


The graphs above show a consistent trend. The mix of traditional assets shows the least efficient frontier, with all the population of possible portfolios well below the line of 0.50% monthly average returns and well to the right (higher) of the 1.50% monthly standard deviation, with a median concentrated around a monthly standard deviation of 2.00%. The addition of any hedge fund style improves the frontier, shifting more than a good half of the population above the 0.50% monthly returns and to the left (lower) of the 1.50% volatility.

The notable groups are both the non - directional and event driven strategies combined with traditional investments, these both push higher and to the left the populations of possible portfolios, i.e. to higher risk adjusted returns.

Figure 2 below combines 5 portfolios' efficient frontiers together for a clearer comparison. The portfolio which contains all hedges funds, the US and international traditional assets shows the significant diversification value of hedge funds. The addition of hedge funds enhances return at a given level of risk.

**Figure 2: Comparison of Efficient Frontiers for Different Portfolios**


The results confirm the previous observations: the most efficient frontier which is identified in red includes all hedge funds together with USA and international bonds and equities.

The impact of adding directional, non-directional, and event-driven funds to a portfolio is significant. The addition of non-directional funds will substantially add to the set of opportunities for conservative investors who have lower risk tolerance. Investors with higher risk tolerance would also benefit from allocating part of their assets to event driven or directional style hedge funds.

The combination of event driven hedge funds and traditional investments could even achieve a higher level of expected return than the combination of all the hedge funds with USA and international bonds and equities at a higher risk level. This opens the door to a very flexible products distribution among, particularly, for portfolios with diversified customer needs.

Table 4 compares the expected return and risk from an optimal asset allocation against an equally weighted portfolio. This is a theoretical exercise completed by running a Monte Carlo simulation of 256,000 different notional portfolios. Each portfolio is based on mean historical monthly returns, volatilities, and correlation between each asset class and then determining different weightings for each asset class.

**Table 4: Asset allocation**

Asset Class		Optimal	Equal
		Weighting	Weighting
Directional Strategies	HFRI Short Selling	16.76%	6.25%
	HFRI Market Timing	32.29%	6.25%
	HFRI Macro	0.05%	6.25%
	CS/Tremont Managed Futures	0.33%	6.25%
Non-Directional Strategies	HFRI Convertible Arbitrage	4.50%	6.25%
	HFRI Fixed Income Arbitrage	4.18%	6.25%
	HFRI Relative Value	3.59%	6.25%
	HFRI Equity Market Neutral	0.92%	6.25%
Event-Driven Strategies	HFRI Merger Arbitrage*	7.18%	6.25%
	HFRI Distressed Securities	16.21%	6.25%
	HFRI Event Driven	6.92%	6.25%
Traditional Investments	S&P 500	0.25%	6.25%
	LEHMAN US Aggregate	0.58%	6.25%
	MSCI World	0.72%	6.25%
	JPM Global Govt. Bond	0.16%	6.25%
	HFRI Fixed Income Convertible Bond	5.34%	6.25%
<b>Total</b>		<b>100%</b>	<b>100%</b>
<b>Mean</b>		<b>0.80%</b>	<b>0.64%</b>
<b>Volatility</b>		<b>0.77%</b>	<b>0.93%</b>

\* Merger arbitrage style is in both the non-directional and event-driven categories.



Directional hedge funds account for nearly half of the total asset allocation with the market timing style having the highest weight of 32.29%.

## Conclusion and Discussion

A well diversified investment portfolio which includes hedge funds has the potential to earn enhanced returns with less risk than equities and equities/bonds balanced strategies. This study found that alternative assets - hedge funds - have a meaningful impact on the efficient frontier for investors who usually hold only equities and bonds.

Furthermore, the combination of hedge funds with traditional investments enhances the expected returns for investors across different levels of risk tolerance. The portfolio gains from holding hedge funds are significantly greater than gains earned through international diversification alone. However, investors or their agents need to be careful in managing the risk complexity associated with hedge funds. The risks related to traditional investments are typically linear in their performance impact and are directly related to the underlying financial markets. In contrast, the risks associated with hedge funds can be non-linear or have other features which require appropriate risk management techniques (Bacmann & Scholz, 2004).

The hedge fund strategies, “fund of funds”, is not covered in the data in order to avoid duplication with the underlying constituent investment strategies. This fund of funds construction provides a proxy for an investment portfolio with higher levels of diversification and less volatile returns than equity, unit trusts, mutual funds, or individual hedge funds. Depending on the fund of funds manager, it can substantially reduce individual fund and manager volatility and risk.



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