

# The Benefits of Hedge Funds

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#### ABSTRACT

Hedge funds have become a major part of the investment landscape with almost \$1.5 trillion dollars under management. In this annual update, the return and risk characteristics of various hedge fund strategies are reviewed. Results show that correlations of traditional market factors with various hedge fund strategies often depend on the markets in which hedge fund managers trade. While hedge funds may provide return and risk opportunities (e.g. diversification) to portfolios comprised principally of traditional stock and bond investments, the extent of that diversification depends both on the properties of the portfolio

as well as the hedge fund strategy itself. In addition, passive non-manager based, algorithmic models of hedge fund performances are available today which may be regarded as investible benchmarks for certain active manager based hedge fund strategies. Therefore, one can think of hedge fund returns as a combination of manager skill and an underlying return to the hedge fund strategy or investment style itself. Lastly, the stability of the return and risk parameters over time is analyzed as well as the performance of hedge funds in a variety of market conditions.

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# The Benefits of Hedge Funds

## INTRODUCTION

Hedge funds are generally regarded as investments that offer risk and return opportunities not easily obtained through traditional long-only stock and bond investment vehicles as well as non-traditional investments such as private equity, real estate, and managed futures. Such opportunities are made possible primarily through the ability of hedge funds to participate in a wide variety of financial instruments and global markets, typically unavailable to the traditional investor, as well as through their ability to take both long and short positions. Hedge funds are therefore capable of benefiting from a broader universe of profit opportunities within various economic environments. They are often structured as privately pooled investment vehicles that employ varying degrees of leverage and often charge a performance fee.

While it is impossible in a short synopsis to convey all the benefits of hedge funds, the following sections support hedge funds as a means to provide return enhancement as well as risk reduction opportunities relative to stock and bond investments, non-traditional investments such as private equity, real estate, and managed futures as well as to portfolios of traditional assets and various alternative investments. First, we discuss different ways in which investors can gain exposure to hedge funds. Second, we explore sources of hedge fund returns. Third, we evaluate the performance of hedge funds both on a standalone basis, as part of traditional stock and bond portfolios as well as part of portfolios including traditional and other alternative investments. Finally, we examine unique issues and current research in the hedge fund area.

## INVESTING IN HEDGE FUNDS

Hedge funds have often been described as being loosely regulated investment vehicles. Specifically, Rule 203(b)(3) of the Investment Advisors Act of 1940 dictates that advisors with fewer than fifteen clients are exempt from certain registration requirements. Subsequently, Rule 203(b)(3)-I of the act permitted managers to count each of their fund

entities as a single client, theoretically permitting managers to run up to fourteen funds without the need to register. In addition, Section 3(c)(1) of the Investment Company Act of 1940 allowed any investor to participate in the fund, provided that the fund did not violate a 100 person limit.<sup>1</sup> The aforementioned regulations affecting hedge funds have since been modified pursuant to two key amendments, the first being the National Securities Markets Improvement Act of 1996 (“NSMIA”) which ratified Section 3(c)(7) of the Investment Company Act of 1940. The importance of this new section is that it overrode 3(c)(1) (the 100 investor limit) and instead dictated that hedge funds could have an unlimited number of investors, so long as each investor met the guidelines of being a “Qualified Purchaser”. A “Qualified Purchaser” is defined as one who meets any of the following terms: 1) any natural person who owns at least \$5 million in investments, 2) any company that owns at least \$5 million in investments and that is owned directly or indirectly by or for 2 or more natural persons, 3) a trust fund managed by qualified purchasers that was not formed for the sole purpose of satisfying 3(c)(7), and 4) any person, acting on behalf of his own account or on behalf of other qualified purchasers, who owns and invests more than \$25 million in investments. In December of 2004, the Securities and Exchange Commission issued an amendment to Rule 203(b)(3)-I of the 1940 Advisors Act, disallowing managers to count each fund entity as a single client. However, on June 23, 2006, the United States Court of Appeals for the District of Columbia overturned this regulation.<sup>2</sup>

<sup>1</sup> This paper does not address all regulations and amendments pursuant to the Investment Advisors Act of 1940 or Investment Company Act of 1940, just those deemed most relevant to this topic. For more information on hedge fund regulation, please visit [www.sec.gov](http://www.sec.gov).

<sup>2</sup> This led to many hedge fund firms registering with the SEC to comply with the requirements, many of whom subsequently de-registered after the regulation was overturned.

There are generally five ways in which one can invest in hedge funds. First, one can directly invest in hedge funds by meeting “accredited investor” or “qualified purchaser” guidelines. Second, one can invest in a fund of hedge funds. Third, one can invest in an investible hedge fund index. Fourth, one can invest in hedge fund replication products. Finally, individual investors may indirectly invest in hedge funds by purchasing shares of the management company.

#### INVESTING DIRECTLY IN HEDGE FUNDS

A qualified investor may directly invest with a hedge fund manager through either fund-based accounts, managed accounts, or both. The key distinction between the two is that fund-based accounts require a pooling of investor funds (in which case the exposure of one investor is identical to that of any other investor), whereas managed accounts keep investor funds in separate accounts which may dictate unique risk and return objectives. As shown in Appendix I, the assets under management for hedge funds have grown from around \$40 billion in 1990 to over \$2 trillion in 2007 but declined to under \$1.5 trillion in 2008.<sup>3</sup> The growth in the hedge fund industry is also depicted in Appendix I. Since 1990, the number of hedge funds (not including Fund of Funds) has increased from an estimated 600 to over 9,000 at year-end 2007 but the number of funds declined in 2008.

#### INVESTING IN FUND OF FUNDS

The second vehicle available to gain hedge fund exposure is a fund of hedge funds which provides exposure to a basket of select hedge funds.<sup>4</sup> Fund of Funds may invest in a wide variety of underlying strategies or a single strategy. Therefore, they are deemed to be widely diversified and hence not exposed to serious losses of any one fund, should a fund fail due to market, operational or other risks. The “qualified purchaser” guidelines apply to Fund of Funds investors. Fund of Funds typically have lower minimum investment requirements, with their investors generally benefiting from the expertise of the fund manager and not having to conduct due diligence on the underlying funds, a process that requires a great deal of resources. However, the failure to conduct proper due diligence on Madoff Investment Securities by several major Fund of Funds managers has raised questions about the processes they employ, in particular, since outside investors are subject to an extra layer of fees charged by the Fund of Funds manager.

#### INVESTING IN INVESTIBLE HEDGE FUND INDICES

The third way to invest in hedge funds is through investible manager-based indices. Dow Jones, CSFB/Tremont, HFR, and others now offer active manager based hedge fund indices that reflect the performance of investible products. These products can be accessed through various firms that represent and/or support the investible platforms behind the relevant active manager-based index. There are few structural differences between investible hedge fund indices and Fund of Funds. Investible hedge fund indices invest in hedge funds through fund-based accounts or managed accounts much like Fund of Funds. However, investible hedge fund indices have not gained as much traction as Fund of Funds. The index provider and asset manager are independent from each other; they can either be the same (e.g. HFR) or distinct (e.g. Dow Jones and CASAM) in the case of hedge funds.

#### INVESTING IN HEDGE FUND REPLICATION PRODUCTS

Replication products use a variety of approaches, such as factor-based, security-based and distribution-based replication, to track return streams of hedge funds. Although these products have only recently come into existence, there are several providers that offer these products. These products generally offer relatively liquid access to both composite hedge fund returns as well as strategy-based returns.

<sup>3</sup> These numbers were calculated by CISDM, Isenberg School of Management, University of Massachusetts, Amherst, Massachusetts.

<sup>4</sup> A further example of the evolving market for hedge funds are ‘registered’ hedge funds which are constructed to meet additional regulatory guidelines and are available for investment from a variety of institutional platform providers.

## INVESTING IN PUBLICLY TRADED FUNDS

In 2007, several hedge fund management companies went public (e.g. Fortress Investment Group (NYSE: FIG) and Blackstone (NYSE: BX)), offering investors the opportunity to be shareholders of the management company and therefore profit from the investment advisory fees and compensation for the management firm.

## SOURCES OF HEDGE FUND RETURNS

The sources of hedge fund returns are often described as being based on the unique skill or strategy of the trader. Because hedge funds are actively managed, manager skill is important. However, academic research (Fung and Hsieh, [2002]; Schneeweis et al., [2003]) demonstrates that hedge fund returns are also driven systematically by market factors such as changes in credit spreads or market volatility, rather than exclusively by an individual manager's alpha. Therefore, one can think of hedge fund returns as a combination of manager skill and an underlying return to the hedge fund strategy or investment style itself. Similar to the equity and bond markets, passive security-based indices have been created which are designed to capture the underlying return to the hedge fund strategy (Schneeweis, et al., [2003]; Jaeger and Wagner, [2005]).<sup>5</sup> The performance of an individual manager can be measured relative to that 'strategy' return. If a manager's performance is measured relative to the passive security-based hedge fund index/benchmark, then the differential return may be viewed as the manager's 'alpha' (return in excess of a similar non-manager based replicate portfolio). If a manager's performance is measured relative to an index of other active managers, then the relative performance simply measures the over- or underperformance to that index of manager returns.

## EMPIRICAL RESULTS

There are currently a number of hedge fund manager based indices that can be used as benchmarks for hedge fund performance. Investors should note that each hedge fund return index has its own approach of performance presentation, manager selection and investment style classification.<sup>6</sup> In this article, CISDM hedge fund indices are used to explore the benefits of hedge fund investment. With the exception of the CISDM Equal Weighted Hedge Fund index, which reports the average performance of all underlying hedge fund managers, the CISDM indices reflect the median performance of all reporting managers within their respective strategies.<sup>7</sup> We use the CISDM Equal Weighted Hedge Fund Index to examine the performance of hedge funds both on a standalone basis as well as part of traditional stock, bond and alternative portfolios. We examine the performance of each of the individual hedge fund strategies later in the article.

Results in Exhibit I show the risk and return performance of hedge funds (measured using the total return on the CASAM/CISDM Equal Weighted Hedge Fund Index), traditional U.S. equity and bond indices (measured using the total return of the S&P 500 and the Barclays Capital Bond Aggregate Indices, respectively), managed futures (using the CASAM/CISDM Equal Weighted

<sup>5</sup> These security-based indices are available in tradable form from various platform providers. Public research has generally indicated that, depending on the hedge fund strategy, the correlation between the passive security-based index and the active trading manager based index is often greater than .75. However, public research has also indicated that the return to such passive security-based trading models often underperforms active trading manager based indices by 100 to 200 basis points depending on the strategy replicated. This lower return must, of course, be balanced with the additional benefits to passive security-based indices including greater transparency, capacity, and liquidity.

<sup>6</sup> Investors should note that there also exists a number of newly created security-based 'hedge fund' index products which attempt to provide systematic modeling procedures which track the performance of various hedge fund strategies. This is an evolving area. As the investment products evolve, additional INGARM research on the performance of these new passive index products will be provided.

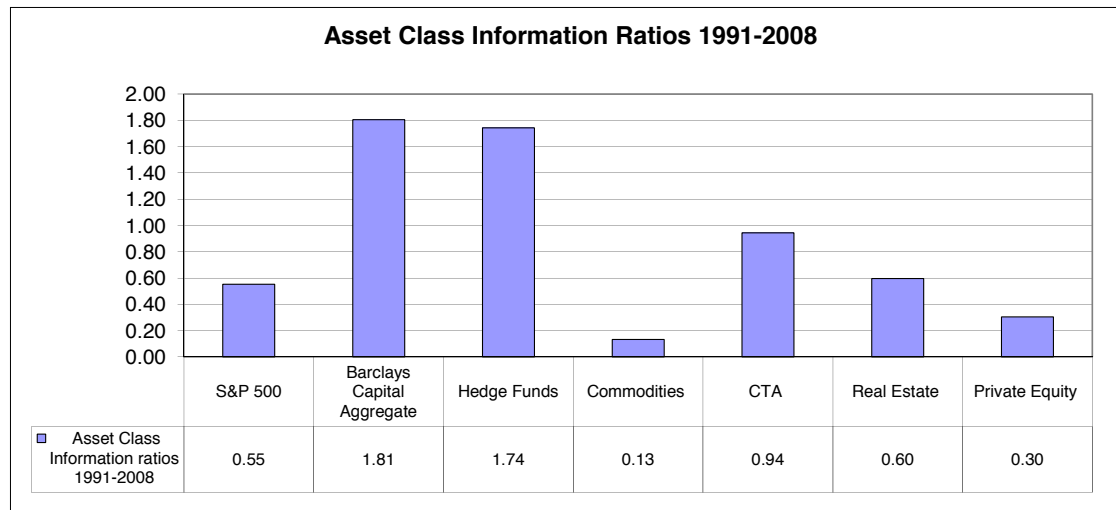
<sup>7</sup> The CISDM strategy level hedge fund indices utilize the performance of the median manager's performance in a given strategy as the measure of central tendency. While many other indices utilize the average performance as the measure of central tendencies, there are a number of reasons why the median is the preferred approach for hedge fund performance indices. The mean may not give the best estimates when the underlying distribution deviates considerably from the normal distribution. Furthermore, the greater the discrepancy from the normal distribution, the more likely it is that the median will provide a more precise estimate of the central tendency.

CTA Index), commodities (measured using the total return on the S&P-GSCI Commodity Index), real estate (measured using the FTSE NAREIT All REITs Index) and private equity (measured using a benchmark created by using companies in the S&P Listed Private Equity Index<sup>8</sup>). As shown in Exhibit 1, over the period 1991-2008, hedge funds exhibited lower volatility and less extreme drawdown compared to the S&P 500 Index while simultaneously generating higher returns. Similarly, the representative bond index, commodity index, managed futures, private equity and real estate underperformed hedge funds on a return basis over the period 1991-2008. On a risk-adjusted basis (information ratio), hedge funds outperformed stocks and other alternative assets such as managed futures, real estate, private equity and commodities. Exhibit 2a gives a comparison of information ratios for traditional and alternative investments. Exhibit 2b provides a graphical representation of the return to risk tradeoff for the assets in comparison and indicates a positive, though imperfect, relationship between the reported returns and standard deviations for traditional as well as alternative investments for the period of 1991-2008.

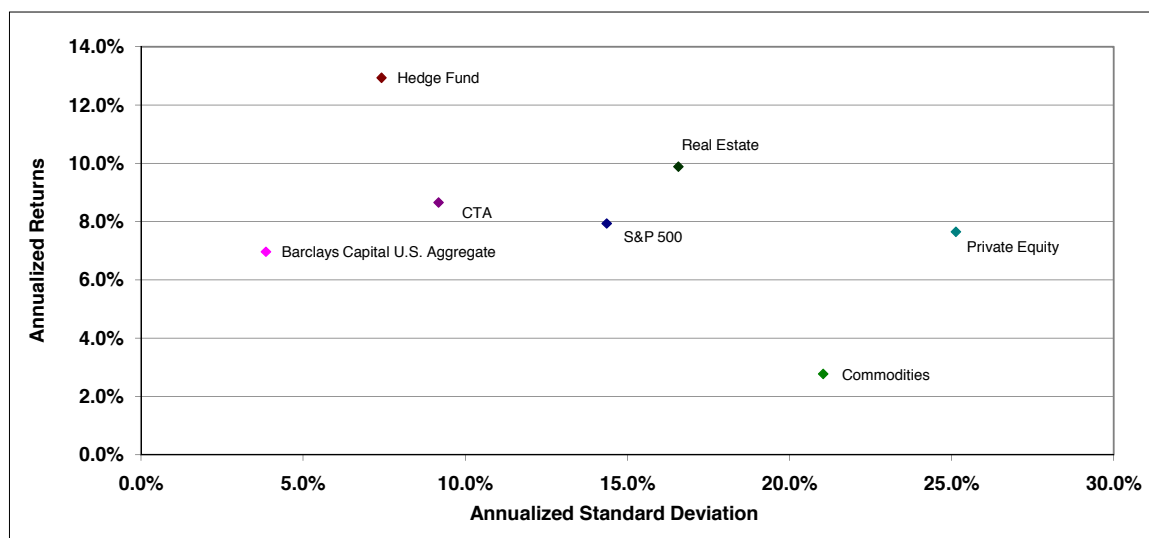
**Exhibit 1: Index Performance (1991-2008)**

| <b>Stock, Bond and Hedge Fund Performance</b> | <b>S&amp;P 500</b> | <b>Barclays Capital Bond Aggregate</b> |                    | <b>Hedge Funds</b>    |
|---|--------------------|--|--------------------|-----------------------|
| Annualized Total Return                       | 7.93%              | 6.96%                                  |                    | 12.93%                |
| Annualized Standard Deviation                 | 14.37%             | 3.86%                                  |                    | 7.42%                 |
| Information Ratio                             | 0.55               | 1.81                                   |                    | 1.74                  |
| Maximum Drawdown                              | -44.73%            | -5.15%                                 |                    | -21.12%               |
| Correlation with Hedge Funds                  | 0.73               | 0.09                                   |                    | 1.00                  |
|   |                    |  |                    |                       |
| <b>Alternative Asset Performance</b>          | <b>Commodities</b> | <b>CTA</b>                             | <b>Real Estate</b> | <b>Private Equity</b> |
| Annualized Total Return                       | 2.77%              | 8.65%                                  | 9.88%              | 7.65%                 |
| Annualized Standard Deviation                 | 21.04%             | 9.18%                                  | 16.57%             | 25.13%                |
| Information Ratio                             | 0.13               | 0.94                                   | 0.60               | 0.30                  |
| Maximum Drawdown                              | -62.16%            | -9.35%                                 | -58.79%            | -70.33%               |
| Correlation with Hedge Funds                  | 0.31               | -0.02                                  | 0.42               | 0.72                  |

**Exhibit 2a: Information Ratios of S&P 500, Barclays Capital Bond Aggregate, Hedge Funds, Commodities, CTA, Real Estate and Private Equity (1991-2008)**



<sup>8</sup> Monthly returns are based on the S&P Private Equity Index from Dec-03 onward. For the period prior to December 2003, firms which were listed in the June 2007 report were used to create an equal weighted monthly returns private equity index back to 1991. Other research has shown a high correlation between this constructed index and other private equity indices (e.g., Cambridge) which are based on non-public reported private equity non market based returns published quarterly.

**Exhibit 2b: Risk-Return Characteristics (1991-2008)**

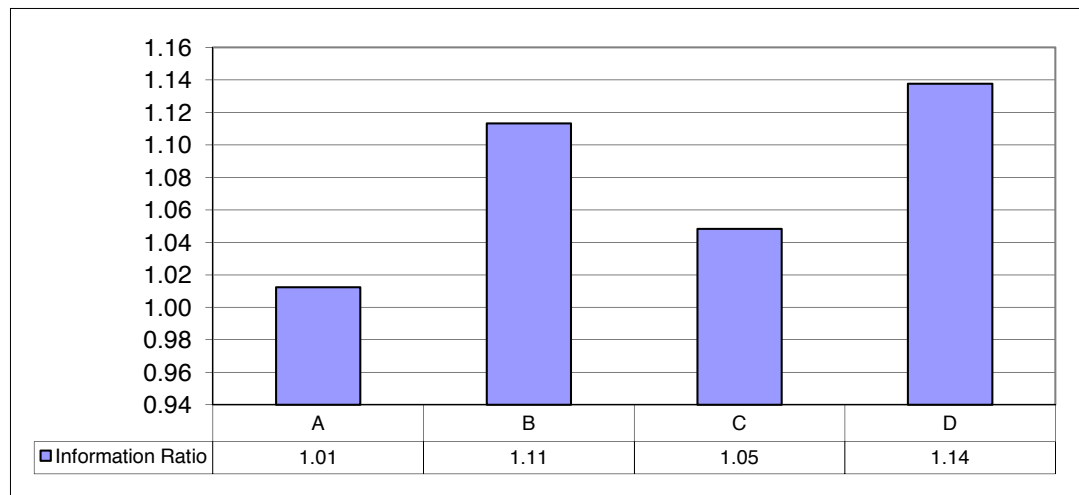
Modern portfolio theory, however, emphasizes that the benefits of individual assets should be evaluated based on their performance alongside other assets in investor portfolios. Exhibit 3 presents the impact of adding a small portion of hedge funds (10%) to both traditional stock and bond portfolios as well as portfolios which contain both traditional stocks and bonds and non-traditional investments (commodities, private equity, real estate, and managed futures). Whereas Portfolios A and C include different combinations of traditional stock, bond, and non-traditional investments, Portfolios B and D include those assets combined with hedge funds. As shown in Exhibit 3, when adding hedge funds to a traditional stock/bond portfolio, Portfolio B (which contains hedge funds) has a higher return with lower risk (as measured by standard deviation) than the pure stock and bond portfolio (Portfolio A). Similarly, on adding hedge funds to a portfolio which contains stocks, bonds, managed futures, real estate, commodities and private equity (Portfolio C), Portfolio D (containing hedge funds) exhibits a higher return with lower risk.

The information ratios for Portfolios B and D (these portfolios include at least a 10% investment in hedge funds) are shown in Exhibit 4. As one can see, the information ratios of those portfolios which contain hedge funds are found to dominate the information ratios of Portfolios A and C, respectively. Lastly, as seen in Exhibit 3 and graphically in Exhibit 5, maximum drawdowns for Portfolios A and B are the approximately the same, as are those of Portfolios C and D.

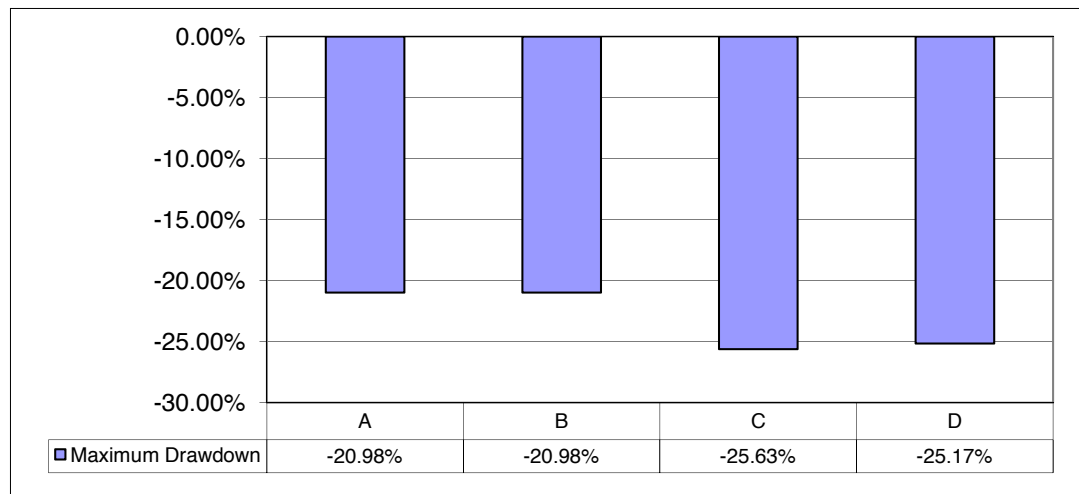
**Exhibit 3: Portfolio Performance (1991-2008)**

| Portfolios                   | A  | B       | C       | D       |
|------------------------------|--|---------|---------|---------|
| Annualized Returns           | 7.73%  | 8.26%   | 8.01%   | 8.50%   |
| Standard Deviation           | 7.64%  | 7.42%   | 7.64%   | 7.47%   |
| Information Ratio            | 1.01   | 1.11    | 1.05    | 1.14    |
| Maximum Drawdown             | -20.98%  | -20.98% | -25.63% | -25.17% |
| Correlation with Hedge Funds | 0.71   |         | 0.79    |         |
| Portfolio A                  | Equal Weights S&P 500 and Barclays Capital Bond Aggregate          |         |         |         |
| Portfolio B                  | 90% Portfolio A and 10% Hedge Funds                                |         |         |         |
| Portfolio C                  | 75% Portfolio A and 25% CTA/Commodities/Private Equity/Real Estate |         |         |         |
| Portfolio D                  | 90% Portfolio C and 10% Hedge Funds                                |         |         |         |

**Exhibit 4: Portfolio Information Ratio (1991-2008)**



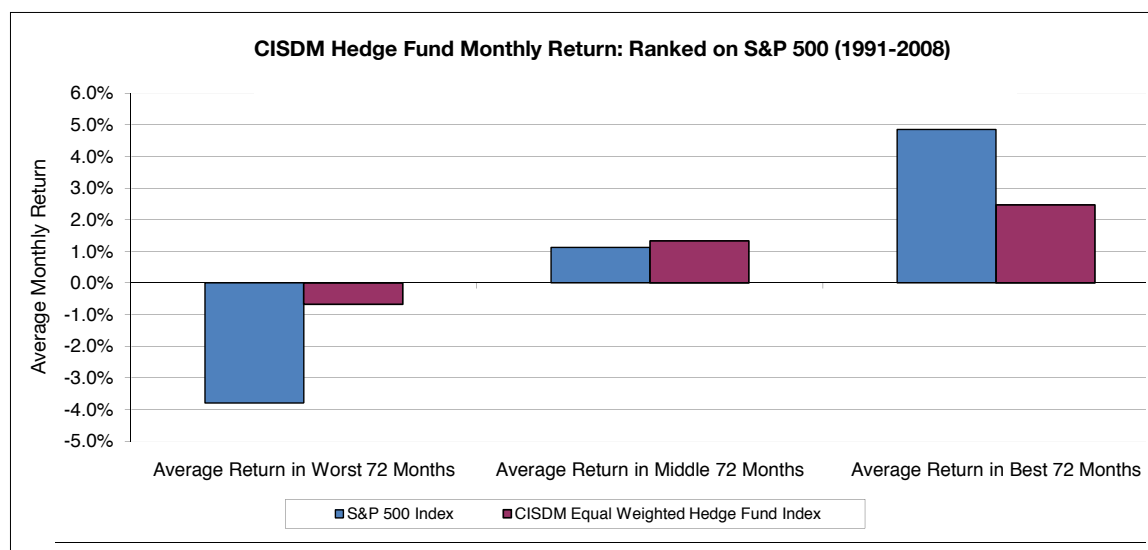
**Exhibit 5: Portfolio Maximum Drawdown (1991-2008)**



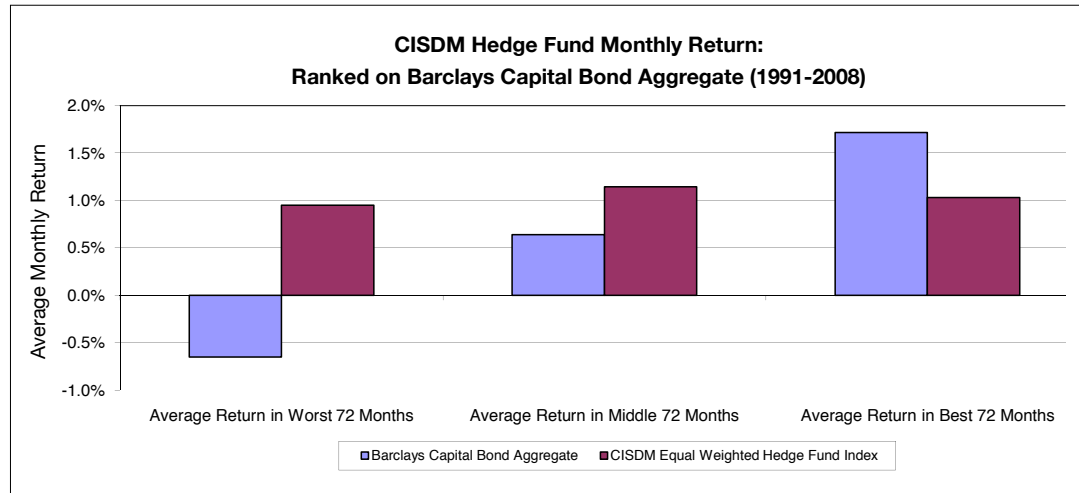


While Exhibit 1 shows that the composite hedge fund index has a relatively moderate to high correlation (0.73) with the S&P 500 and a low correlation (0.09) with the Barclays Capital Bond Aggregate Index, previous research (Schneeweis et. al, 2002, 2003) has also indicated that hedge funds may provide the opportunity for less negative returns in down stock and bond markets while providing the potential for positive returns in up stock and bond markets. The following exhibits depict hedge fund performances when ranked on the S&P 500 (Exhibit 6), Barclays Capital Bond Aggregate Index (Exhibit 7) and S&P 500/Barclays Capital Bond Aggregate Index Equal Weighted Portfolio (Exhibit 8). The ranked returns are grouped into three buckets (worst, middle and best) of 72 months each. Results show that, relative to the S&P 500, the overall hedge fund composite index (CISDM) provides diversification benefits in down S&P 500 by obtaining less negative returns than the S&P 500. In addition, the hedge fund composite index exhibits positive returns in up equity markets. On the contrary, when compared to the returns of the Barclays Capital Bond Aggregate Index (Exhibit 7), results show that the composite hedge fund index (CISDM) provides both positive returns in down as well as in up bond markets. Lastly, in Exhibit 8, results show that, compared to a S&P 500/Barclays Capital Bond Aggregate Portfolio, the CISDM composite hedge fund index provides significantly less negative returns in down S&P 500/Barclays Capital Bond Aggregate EW Portfolio markets as well as providing positive returns in up S&P 500/Barclays Capital Bond Aggregate EW Portfolio markets. This is as expected, given the relatively higher volatility for equity than bonds such that the stock/bond portfolio is dominated by the equity volatility.

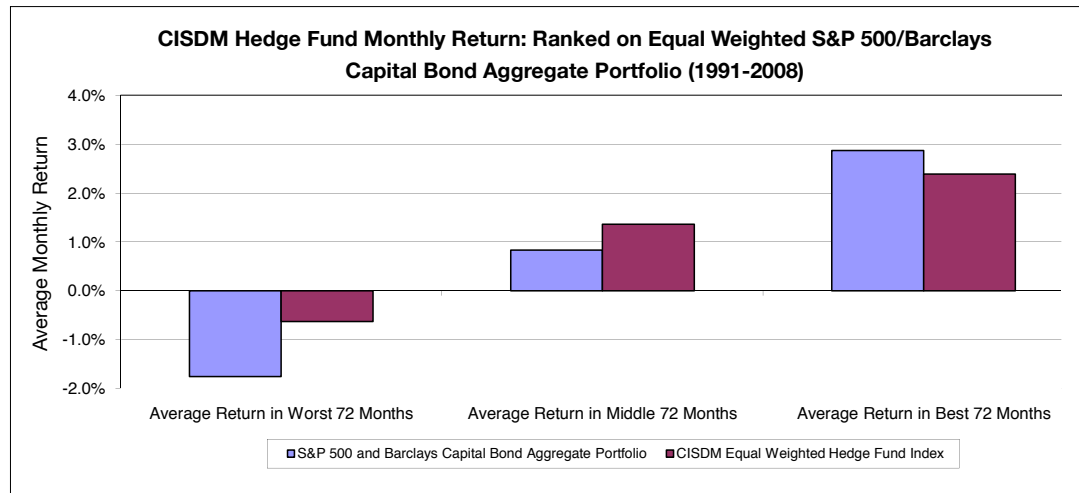
**Exhibit 6: Hedge Fund Monthly Returns: Ranked on S&P 500 (1991-2008)**



**Exhibit 7: Hedge Fund Monthly Returns: Ranked on Barclays Capital Bond Aggregate (1991-2008)**



**Exhibit 8: Hedge Fund Monthly Returns: Ranked on S&P 500/Barclays Capital Bond Aggregate Portfolio (1991-2008)**



## Hedge Fund Strategies

In the previous section, we examined hedge fund performance based on the CISDM Hedge Funds Equal Weighted Index which represents a composite of all reporting hedge fund managers. Hedge funds can be classified into different sub-strategies for which CISDM offers various indices. In this section we will examine these sub-strategies and their performance.

### RELATIVE VALUE

Relative value strategies emphasize the purchase of undervalued securities and the sale of overvalued securities within the context of minimizing the market exposure inherent in the underlying security market traded (e.g., equity markets for equity market neutral and fixed income markets for fixed income arbitrage). It is important to note, however, that each relative value strategy leaves open exposure to certain market factors (e.g., credit risk, industry sector exposure) that provide, in part, the basis for expected return.

- 1) **CISDM EQUITY MARKET NEUTRAL INDEX:** Represents strategies which take long equity positions and an approximately equal dollar-amount of offsetting short positions in order to achieve a net exposure as close to zero as possible.
- 2) **CISDM FIXED INCOME ARBITRAGE INDEX:** Represents strategies which attempt to take advantage of mispricing opportunities between different types of fixed income securities while neutralizing exposure to interest rate risk.<sup>9</sup>
- 3) **CISDM CONVERTIBLE ARBITRAGE INDEX:** Represents strategies which take long positions in convertible securities (usually convertible bonds) and try to hedge those positions by selling short the underlying common stock.

### EVENT DRIVEN

Event driven strategies emphasize the purchase of undervalued securities with appropriate risk management techniques (e.g. shorting individual securities or sectors to reduce market or firm exposure) in the context of event driven return opportunities (e.g. firm mergers and bankruptcies) that may be independent of general market movements.

- 4) **CISDM DISTRESSED INDEX:** Represents strategies which take positions in the securities of companies where the security's price has been, or is expected to be, affected by a distressed situation, such as an announcement of reorganization due to financial or business difficulties.
- 5) **CISDM EVENT DRIVEN INDEX:** Represents strategies which attempt to predict the outcome of corporate events and take the necessary position to make a profit. These trading managers invest in events like liquidations, spin-offs, industry consolidations, reorganizations, bankruptcies, mergers and acquisitions, recapitalizations, share buybacks and other corporate transactions.
- 6) **CISDM MERGER ARBITRAGE INDEX:** Represents strategies which concentrate on companies that are the subject of a merger, tender offer or exchange offer. While there are a number of different trading based approaches, Merger Arbitrage strategies often take a long position in the acquired company and a short position in the acquiring company.

<sup>9</sup> Data for the Fixed Income Arbitrage is available for the period after 1996 and therefore is not included in the following exhibit but results are available for the 2001-2008 period in the Appendix.

**OPPORTUNISTIC**

Opportunistic trading strategies emphasize the purchase of undervalued securities or markets (e.g., European versus U.S. fixed income, alternative energy sectors, etc.) and the sale of overvalued securities or markets without the constraint that the underlying market exposure will be systematically eliminated or minimized.

- 7) **CISDM EMERGING MARKETS INDEX**: Represents strategies which invest in the debt of sovereign nations, equities and/or debt of companies located in emerging or developing economies.
- 8) **CISDM EQUITY LONG/SHORT INDEX**: Represents strategies which take long and short equity positions varying from net long to net short, depending if the market is bullish or bearish. The short exposure can also be a put option on a stock index, which is used as a hedging technique for bear market conditions.
- 9) **CISDM GLOBAL MACRO INDEX**: Represents strategies which employ opportunistically long and short multiple financial and/or non-financial assets. Trading managers following Global Macro strategies might use systematic trend following models or discretionary approaches. For systematic trend-following global macro managers who trade primarily in futures and option markets, returns are similar to those of commodity trading advisors.

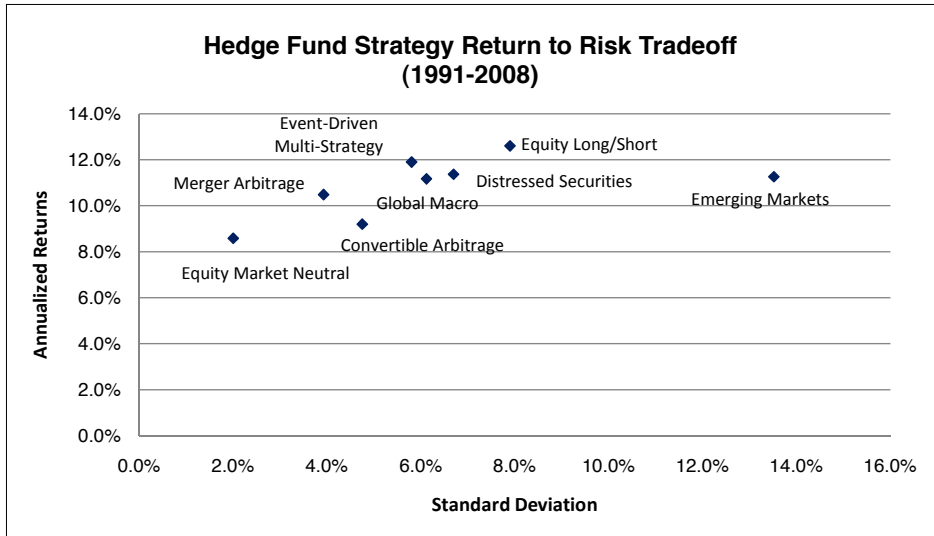
**RETURN AND RISK PERFORMANCE: HEDGE FUND STRATEGIES**

The risk and return characteristics of a wide range of hedge fund strategies and traditional asset classes from 1991-2008 are given in Exhibit 9a and 9b. Relative value strategies (such as Equity Market Neutral and Convertible Arbitrage) which attempt to minimize their inherent market exposures are shown to be less volatile compared to other hedge fund strategies, but have also posted lower annualized returns compared to other strategies. Event driven strategies such as Distressed Securities and Event Driven Multi Strategy had posted higher returns during the same period, but also with higher volatility. Opportunistic strategies such as Emerging Markets, Equity Long/Short and Global Macro exhibited returns comparable to those of event driven strategies during the period 1991-2008, but with greater volatility.

**Exhibit 9a: Risk and Return Characteristics of Various Hedge Fund Strategies (1991-2008)**

| Performance 1991-2008                   | Annualized Return | Standard Deviation | Information Ratio | Maximum Drawdown | Skew  | Kurtosis |
|---|-------------------|--------------------|-------------------|------------------|-------|----------|
| CISDM Equal Weighted Hedge Fund Index   | 12.9%             | 7.4%               | 1.74              | -21.17%          | 0.71  | 3.69     |
| CISDM Equity Market Neutral Index       | 8.6%              | 2.0%               | 4.28              | -2.8%            | -0.49 | 3.47     |
| CISDM Convertible Arbitrage Index       | 9.2%              | 4.8%               | 1.94              | -22.5%           | -4.79 | 37.24    |
| CISDM Distressed Securities Index       | 11.4%             | 6.7%               | 1.70              | -21.2%           | -1.68 | 8.56     |
| CISDM Event Driven Multi-Strategy Index | 11.9%             | 5.8%               | 2.05              | -20.2%           | -1.61 | 6.43     |
| CISDM Merger Arbitrage Index            | 10.5%             | 3.9%               | 2.67              | -5.7%            | -0.82 | 5.44     |
| CISDM Emerging Markets Index            | 11.3%             | 13.5%              | 0.83              | -44.8%           | -1.85 | 12.29    |
| CISDM Equity Long/Short Index           | 12.6%             | 7.9%               | 1.60              | -17.0%           | -0.20 | 2.37     |
| CISDM Global Macro Index                | 11.2%             | 6.1%               | 1.83              | -8.2%            | 1.17  | 3.78     |
| S&P 500 Total Return Index              | 7.9%              | 14.4%              | 0.55              | -44.7%           | -0.75 | 1.76     |
| Barclays Capital Bond Aggregate         | 7.0%              | 3.9%               | 1.81              | -5.1%            | -0.30 | 0.83     |
| Barclays Capital High Yield             | 7.5%              | 8.7%               | 0.86              | -33.3%           | -1.59 | 11.35    |

**Exhibit 9b: Return to Risk Tradeoff (1991-2008)**



Results in Exhibit 10 illustrate the correlations between the various hedge fund strategies. Relative value hedge fund strategies that attempt to reduce or eliminate market risk (i.e. Equity Market Neutral and Convertible Arbitrage) are found to generally have a low-to-moderate correlation (approximately 0.50) with other hedge fund strategies. Therefore, they may be regarded as diversifiers within existing hedge fund strategies. Conversely, event driven and opportunistic hedge fund strategies (with the exception of Global Macro) are mostly found to be moderate-to-highly correlated (>0.60) with most other hedge fund strategies and could be considered more as return enhancers<sup>10</sup> rather than diversifiers to existing hedge fund strategies.<sup>11</sup> This is especially true since the event and opportunistic strategies generally have a higher volatility than relative value strategies, with their return volatility dominating the return movement of mixed strategy hedge fund portfolios.

**Exhibit 10: Correlations between Various Hedge Fund Strategies (1991-2008)**

|  | EMN  | CA   | DS   | EDMS | MA   | EM   | ELS  | GM   | Avg. Correlation |
|--|------|------|------|------|------|------|------|------|------------------|
| CISDM Equity Market Neutral Index (EMN)        | 1.00 | 0.47 | 0.46 | 0.61 | 0.54 | 0.40 | 0.61 | 0.38 | 0.49             |
| CISDM Convertible Arbitrage Index (CA)         | 0.47 | 1.00 | 0.67 | 0.69 | 0.55 | 0.55 | 0.50 | 0.31 | 0.53             |
| CISDM Distressed Securities Index (DS)         | 0.46 | 0.67 | 1.00 | 0.82 | 0.67 | 0.70 | 0.76 | 0.50 | 0.65             |
| CISDM Event Driven Multi-Strategy Index (EDMS) | 0.61 | 0.69 | 0.82 | 1.00 | 0.83 | 0.73 | 0.80 | 0.45 | 0.70             |
| CISDM Merger Arbitrage Index (MA)              | 0.54 | 0.55 | 0.67 | 0.83 | 1.00 | 0.59 | 0.66 | 0.46 | 0.62             |
| CISDM Emerging Markets Index (EM)              | 0.40 | 0.55 | 0.70 | 0.73 | 0.59 | 1.00 | 0.71 | 0.49 | 0.60             |
| CISDM Equity Long/Short Index (ELS)            | 0.61 | 0.50 | 0.76 | 0.80 | 0.66 | 0.71 | 1.00 | 0.59 | 0.66             |
| CISDM Global Macro Index (GM)                  | 0.38 | 0.31 | 0.50 | 0.45 | 0.46 | 0.49 | 0.59 | 1.00 | 0.45             |
| Average correlation of each strategy           | 0.49 | 0.53 | 0.65 | 0.70 | 0.62 | 0.60 | 0.66 | 0.45 |                  |
| S&P 500 Total Return Index (STK)               | 0.41 | 0.45 | 0.62 | 0.68 | 0.53 | 0.57 | 0.75 | 0.41 |                  |
| Barclays Capital Bond Aggregate (BOND)         | 0.18 | 0.29 | 0.13 | 0.04 | 0.10 | 0.04 | 0.06 | 0.25 |                  |
| Barclays Capital High Yield (HY)               | 0.37 | 0.66 | 0.63 | 0.70 | 0.55 | 0.53 | 0.52 | 0.31 |                  |

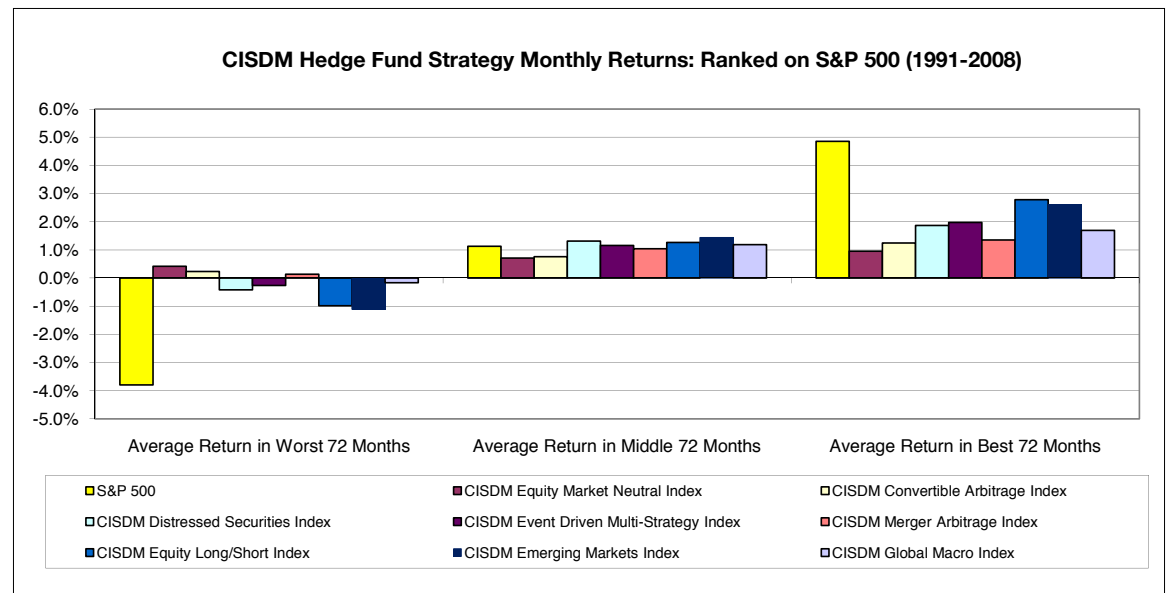
<sup>10</sup> Return enhancers are defined as assets with a correlation generally above 0.5 with the associated asset or portfolio.

<sup>11</sup> It is important to note that within a portfolio of hedge funds or hedge fund strategies, the strategy or the fund with the greatest standard deviation often has the greatest impact on volatility as well as correlation. For example, it is well known that a stock/bond portfolio has correlation with other investments more similar to that of a stock investment than a bond investment due to the dominance of equity volatility to bond volatility.

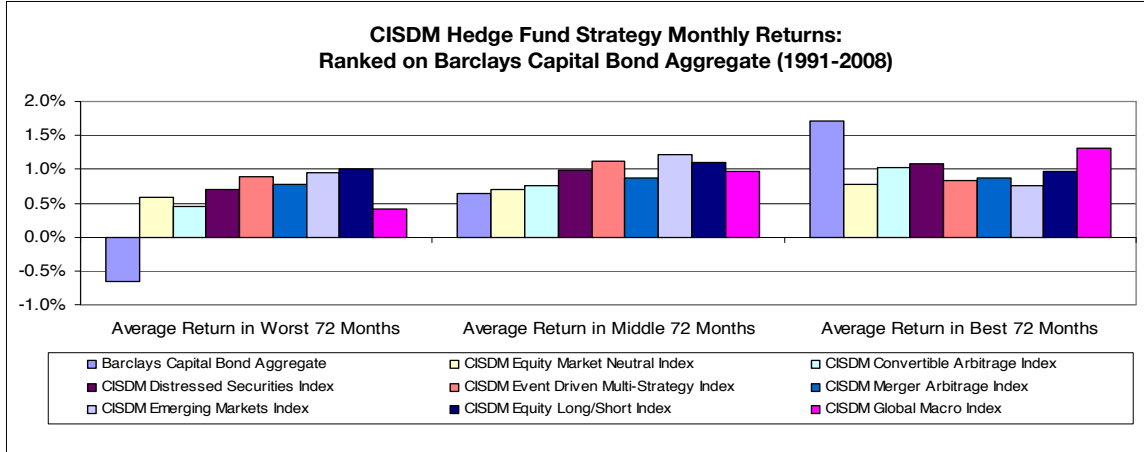
In Exhibit 10, the correlations between various hedge fund strategies and traditional market factors are also given. Hedge fund strategies with equity exposure (e.g., Equity Long/Short, Event Driven) have moderate correlation (above 0.6) with the S&P 500, while hedge fund strategies with credit exposure (e.g., Distressed Securities, Event Driven) have moderate correlation (above .60) with Barclays Capital High Yield Bond Index. In short, various hedge fund strategies should not be defined simply as risk diversifiers or as return enhancers to existing stock and bond portfolios without a further understanding of their correlation with the other traditional assets held in one's portfolio.

While Exhibit 10 shows that the various hedge fund strategies may have differing correlations with the S&P 500 and Barclays Capital Bond Aggregate Index, research has also indicated that various hedge funds may provide different opportunities in down and up stock, bond, and stock/bond portfolio months. The following exhibits depict hedge fund performance when ranked on the S&P 500 (Exhibit 11), Barclays Capital Bond Aggregate Index (Exhibit 12) and S&P 500/Barclays Capital Bond Aggregate Index Equal Weighted Portfolio (Exhibit 13). The ranked returns are grouped into three buckets (worst, middle and best) of 72 months each. In Exhibit 11, results show that, compared to the S&P 500, relative value strategies (Equity Market Neutral and Convertible Arbitrage) and Merger Arbitrage provided positive returns in down as well as positive returns in up S&P 500 markets. In contrast, the results in Exhibit 12 show that, when the various hedge fund strategies are compared to the returns of the Barclays Capital Bond Aggregate Index, all hedge fund strategies provided both positive returns in down as well as up bond markets. Lastly, in Exhibit 13, results show that, compared to a S&P 500/Barclays Capital Bond Aggregate Portfolio, the various strategies reflect similar results to those when they are compared strictly to the S&P 500; that is, relative value strategies (Equity Market Neutral and Convertible Arbitrage) and Merger Arbitrage provided positive returns in down as well as positive returns in up S&P 500/ Barclays Capital Bond Aggregate Portfolio markets. This is as expected given the relatively higher volatility for equity than bonds, such that the stock/bond portfolio is dominated by the equity volatility.

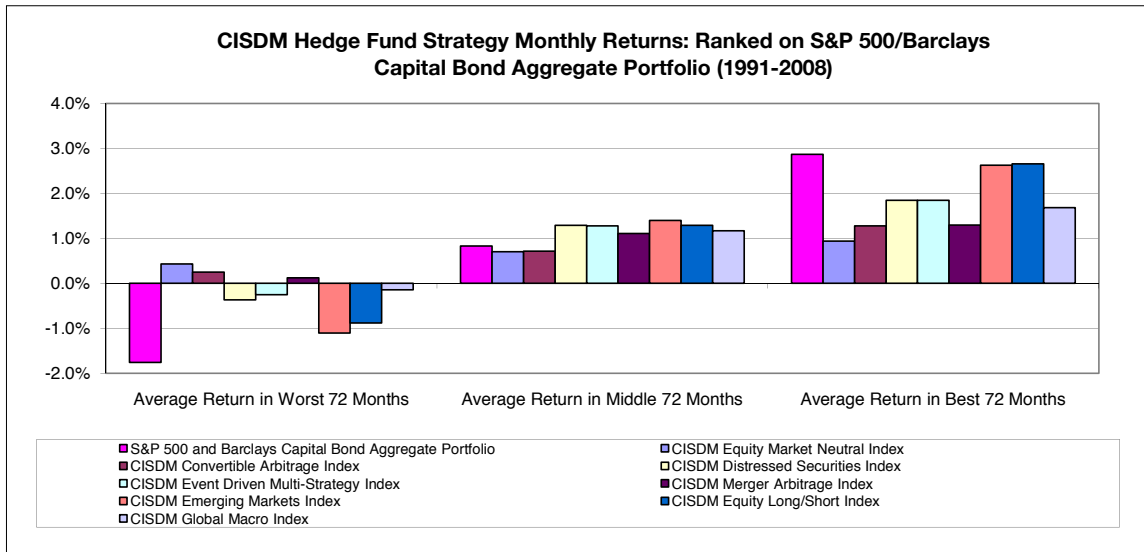
**Exhibit 11: Hedge Fund Strategy Monthly Returns: Ranked on S&P 500 (1991-2008)**



**Exhibit 12: Hedge Fund Strategy Monthly Returns: Ranked on Barclays Capital Bond Aggregate (1991-2008)**



**Exhibit 13: Hedge Fund Strategy Monthly Returns: Ranked on S&P 500/Barclays Capital Bond Aggregate Portfolio (1991-2008)**



## ANNUAL PERFORMANCE

Return and risk relationships over longer time frames may not reflect the return and risk relationships during other shorter time intervals. In the following exhibits, annual returns (Exhibit 14), annual standard deviation (Exhibit 15), and intra-year correlation (Exhibit 16) for the CISDM EW Hedge Fund Index and the S&P 500 are given. For the period 1991-2008, results in Exhibit 14 show a wide range of annual returns for the CISDM EW Hedge Fund Index, with 36.8% in 1999 and -19.2% in 2008, and the S&P 500 37.6% in 1995 and -37.0% in 2008. Results in Exhibit 15 show the relatively stable standard deviation for the HF index, with 12.1% in 1998 and 3.4% in 2003, in contrast to the relatively wider range of the annualized standard deviation of the S&P 500, with 21.5% in 1998 and 5.2% in 1995. Lastly, while the correlation between the CISDM EW HF Index and the S&P 500 is near 0.73 for the overall period, in individual years the correlation ranges widely (0.30 in 1992 and 0.93 in 1998).

Exhibit 14: CISDM EW Hedge Fund Index and S&amp;P 500 Annual Returns (1991-2008)

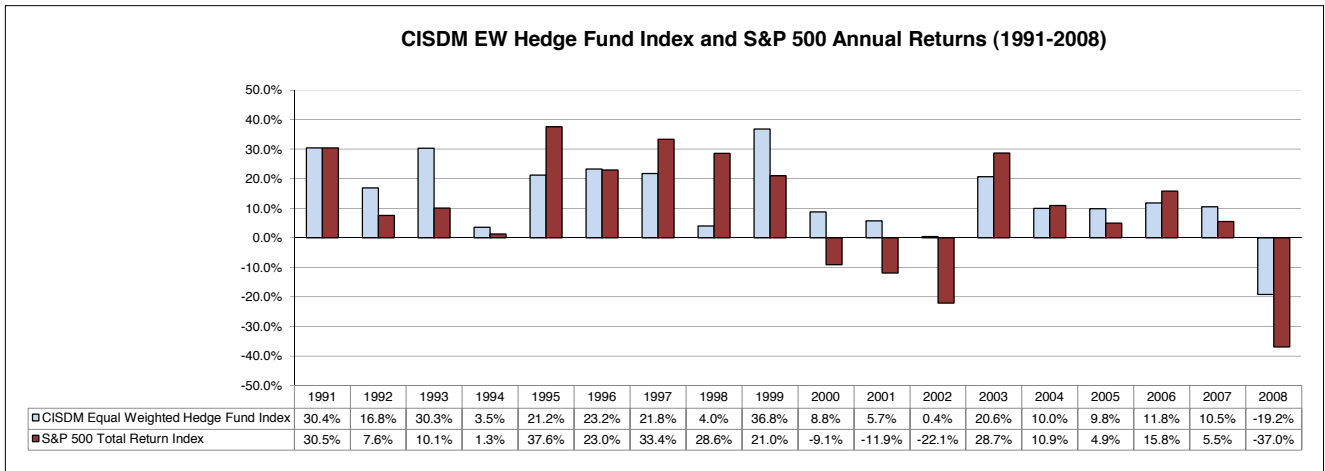
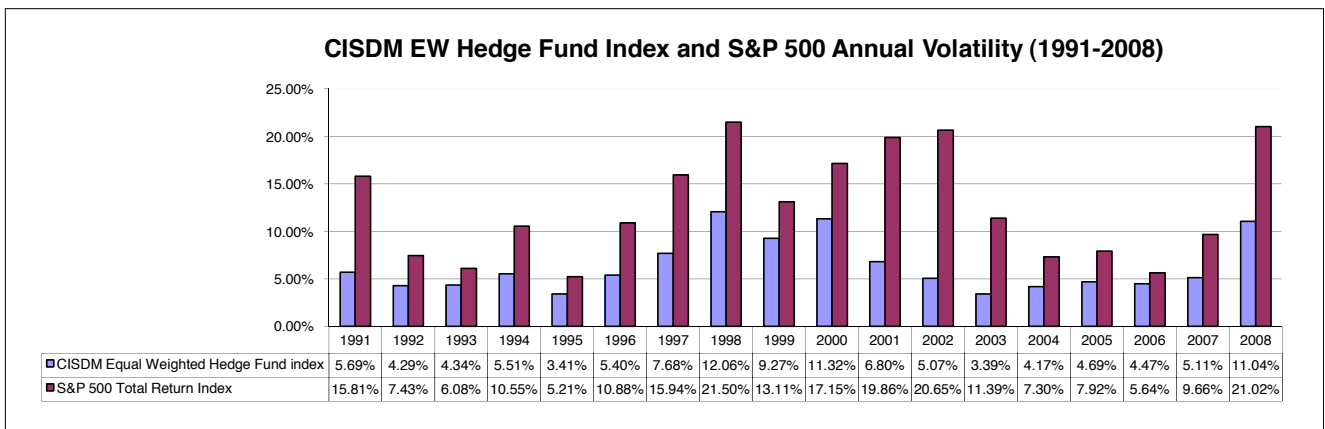
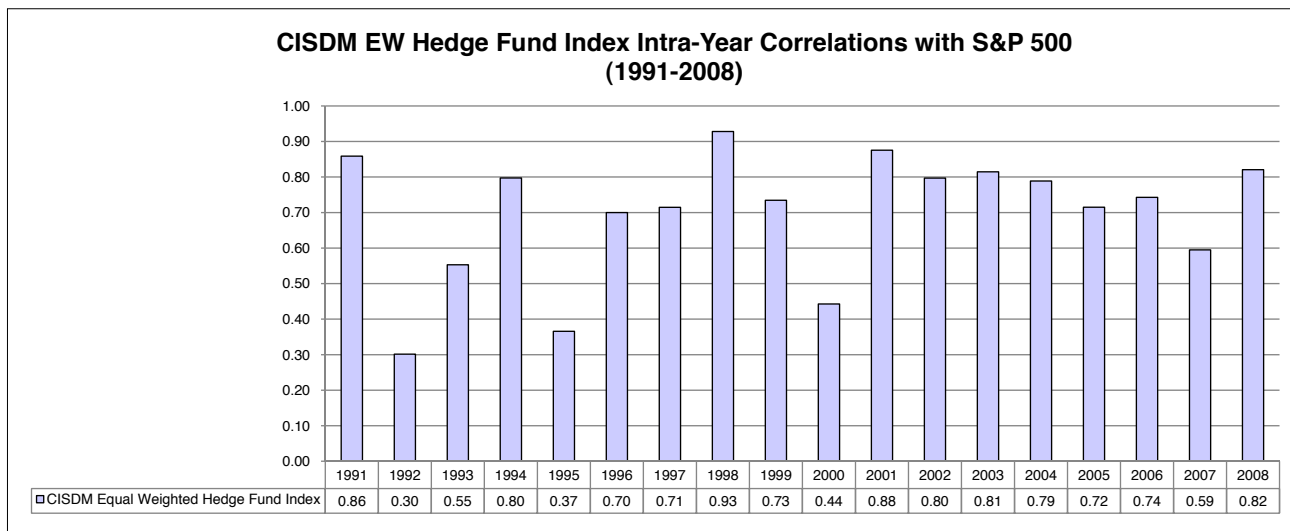


Exhibit 15: CISDM EW Hedge Fund Index and S&amp;P 500 Annual Volatility (1991-2008)



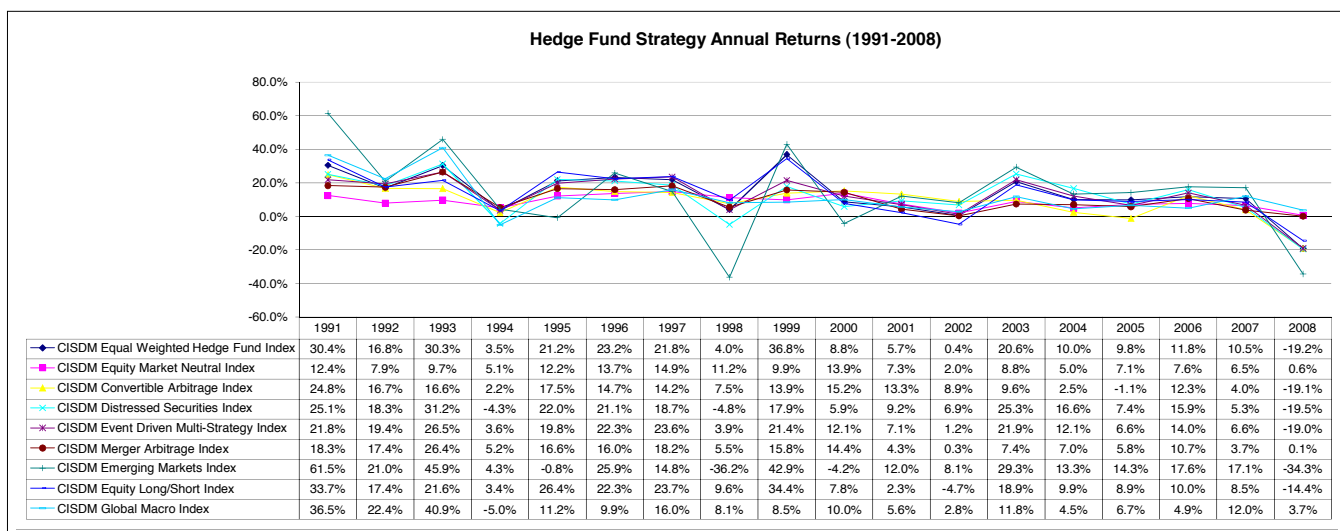


**Exhibit 16: CISDM EW Hedge Fund Index and S&P 500 Annual Intra-Year Correlations (1991-2008)**

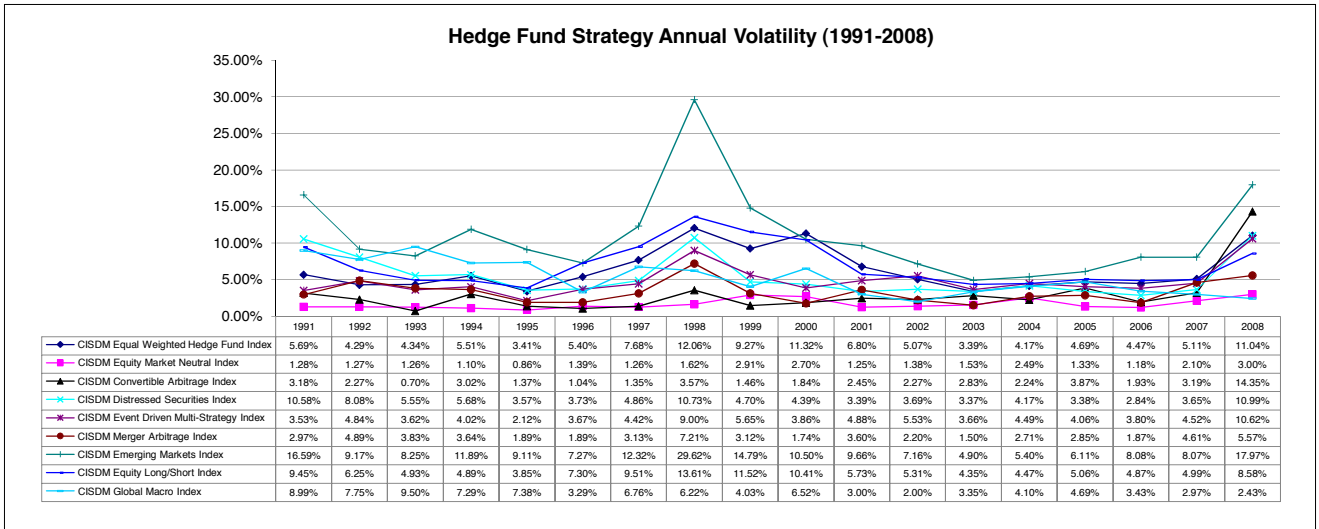


In Exhibit 17, 18, 19 and 20, the annual return, annual volatility, annual correlation and annual information ratios are given for individual hedge fund strategies. Results indicate that, for most strategies: 1) return was generally higher in the early 1990's than for the mid 2000's, 2) volatility was generally higher in the late 1990's than the mid 2000's, 3) correlation with the S&P 500 was generally higher in the mid 2000's compared to the early 1990's, and 4) the information ratio was generally higher in the 1990's than the period since 2000.

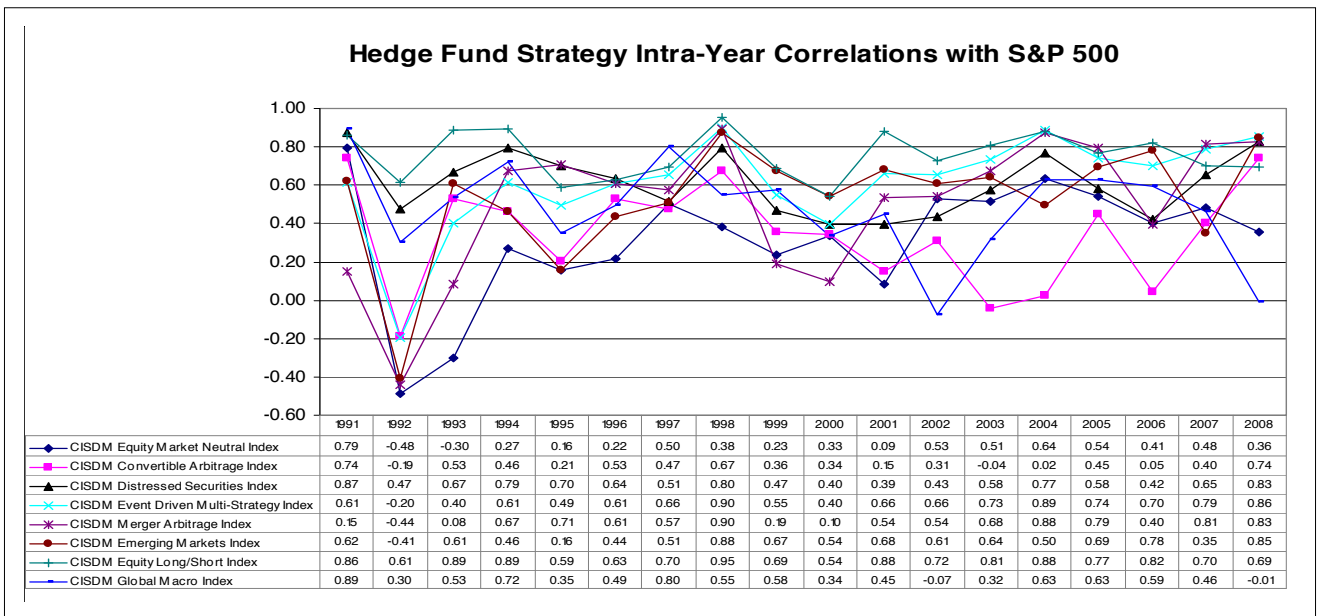
**Exhibit 17: Annual Returns by Hedge Fund Strategy (1991-2008)**



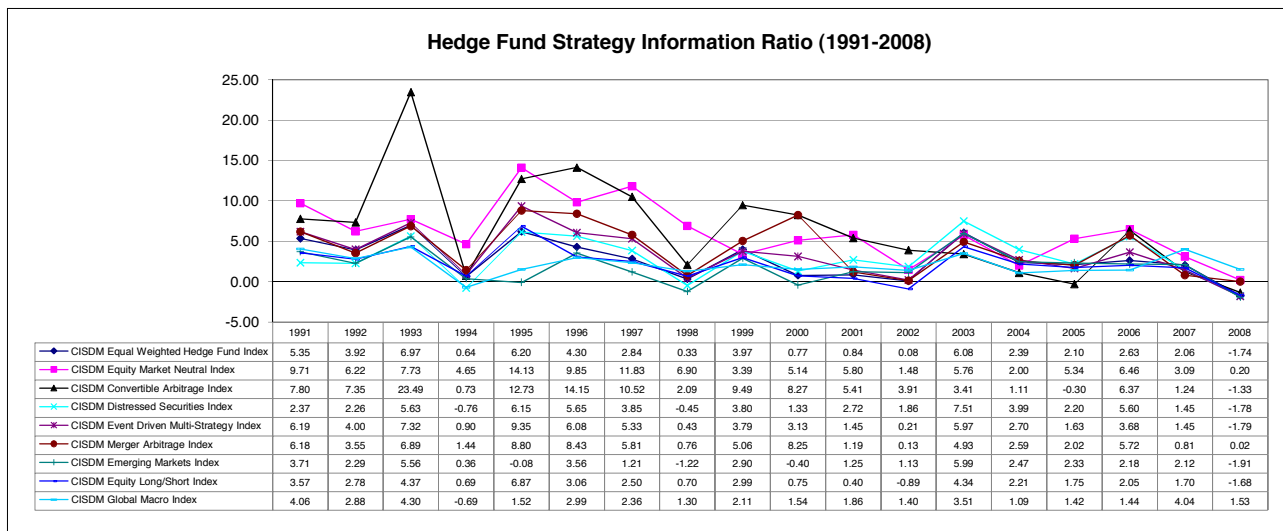
**Exhibit 18: Annual Volatility by Hedge Fund Strategy (1991-2008)**



**Exhibit 19: Annual Intra-year Hedge Fund Strategy Correlation S&P 500 (1991-2008)**



**Exhibit 20: Annual Information Ratio by Hedge Fund Strategy (1991-2008)**



**PERFORMANCE IN 2008**

Results in Exhibit 21 show the risk and return performance of hedge funds, traditional U.S. stocks and bonds and alternative assets for 2008. In 2008, hedge funds experienced their lowest return since major databases started tracking hedge fund data in 1991. When compared to the S&P 500, hedge funds reported higher returns and lower volatility. However, hedge funds reported a lower annualized return and higher volatility than the Barclays Capital Bond Aggregate Index. By comparing Exhibit I and 21, we can observe that the historically weak to moderate levels of correlations between hedge funds and traditional asset classes changed in 2008, with the CISDM Equal Weighted Hedge Fund Index reporting a higher positive correlation with the S&P 500. In short, in 2008, most hedge fund strategies, like traditional asset classes, were negatively impacted by the subprime crisis, the negative equity market performance and the rise in credit spreads (e.g., decline in high yield bond returns). This was especially true for hedge fund strategies with exposure to equity markets (e.g., Equity Long/Short) and credit markets (Distressed Securities, Convertible Arbitrage, Event Driven etc.). In contrast, certain hedge fund strategies which were designed to have little market exposure such as Equity Market Neutral and/or were discretionary in nature such as Global Macro provided positive returns. Summarizing the results of 2008, investors should be reminded that hedge funds encompass a number of strategies and that the performance of hedge fund strategies is based in part on their underlying exposure to the very markets in which they trade.

**Exhibit 21: Index Performance 2008**

| <b>Stock, Bond and Hedge Fund Performance</b> | <b>S&amp;P 500</b> | <b>Barclays Capital Bond Aggregate</b> |                    | <b>Hedge Funds</b>    |
|---|--------------------|--|--------------------|-----------------------|
| Annualized Total Return                       | -37.00%            | 5.24%                                  |                    | -19.16%               |
| Annualized Standard Deviation                 | 21.02%             | 6.09%                                  |                    | 11.04%                |
| Maximum Drawdown                              | -37.66%            | -3.83%                                 |                    | -19.92%               |
| Correlation with Hedge Funds                  | 0.82               | 0.38                                   |                    | 1.00                  |
| <b>Alternative Asset Performance</b>          | <b>Commodities</b> | <b>CTA</b>                             | <b>Real Estate</b> | <b>Private Equity</b> |
| Annualized Total Return                       | -46.49%            | 21.76%                                 | -37.34%            | -64.15%               |
| Annualized Standard Deviation                 | 42.85%             | 10.64%                                 | 43.40%             | 38.07%                |
| Maximum Drawdown                              | -62.16%            | -4.42%                                 | -49.20%            | -64.15%               |
| Correlation with Hedge Funds                  | 0.73               | -0.02                                  | 0.57               | 0.67                  |

## Special Issues in Individual Fund and Fund of Funds Performance

### INDIVIDUAL FUND PERFORMANCE

It is important to note that the results in this report reflect those hedge fund indices which track the performance of the portfolio of funds reporting as that strategy. Results at the individual fund level may not reflect the results of the relevant index to the degree that the fund does not represent the underlying performance of the index (e.g. portfolio) strategy. Previous research has shown that a portfolio of four to five funds is required for the portfolio to reflect that of the strategy index (Schneeweis et al., 2005). It was also shown that the relationships between individual funds and the underlying hedge fund strategy or the market factors which drive those strategies is impacted by the level of strategy or market returns. Research (Schneeweis et al., 2009) has shown that, when strategy returns or market returns are at their historical high or low, the percentage of individual funds with similar directional return movement is high (often above 80%). At the same time, when index returns or market returns are near zero, individual hedge fund returns are as likely to be positive as negative. In brief, individual funds may show little correlation with their underlying index or market factors when index or market factor returns are near zero, but are highly correlated with their underlying index or market factors when those returns are either highly positive or highly negative.

In addition, it is important to note that individual funds across and within hedge fund strategies may differ across a wide range of qualitative factors and quantitative factors. Funds may differ by asset size, leverage, years since inception, level of incentive fees, management fees, lockups, redemption periods, high watermarks, investment structure (e.g., partnership or corporate entity), currency, as well as a number of other factors. Research (Schneeweis et al., 2003) has indicated that some of these characteristics have little impact on fund performance (e.g., size) but other factors do seem to impact expected return and risk (e.g., lockups, years since inception). Investors should also be aware that a single database does not represent all funds across the industry and that multiple databases often are required to represent adequately the investment strategy universe. As important, investors should be made aware that the performances of funds currently reporting to major databases often do not reflect the average returns of funds which existed in the past, but no longer report in the current database. The often higher historical returns to hedge funds listing in the current database are often reported due to several biases (Fung and Hsieh, 2006) in database construction such as 1) backfill bias/incubation bias: the historical returns of new funds reporting to the database are included in the new database but not in historical databases. Since, in most cases, only funds with superior historical returns report their returns to databases, the returns before their database entry date may be biased upward relative to all those funds which do not report or funds which had been reporting for several years and 2) survivorship bias: funds which use to exist historically in the database are removed from the database when they stop reporting. Often these funds stop reporting because of poor returns. The often lower returns of these funds are not contained in the live portion of most databases and one must ask for the dead fund databases in order to measure the actual returns to investment in funds which may have existed in the past.

Other biases may also exist in any single database, such as selection bias (databases differ on their requirements for reporting) and reporting bias (managers may be in one strategy but report as in another). The extent of these biases may differ by strategy, time period, and database. One, therefore, must use proper due diligence in understanding the actual performance characteristics of a fund before considering investment into a fund. For example, research (Fund and Hsieh, 2006) has shown that, if one removes the first year or so of performance from a fund reporting to a database, the impact of backfill bias is removed dramatically. One should also remember that most hedge fund indices do not contain survivorship bias or backfill bias, as managers reporting to the database at any one time are used. Historical index returns are not changed when these managers are

removed from the database and therefore, do not reflect survivorship bias. Likewise, as new managers are added to the database, the historical index returns are not changed in order to reflect those new managers and corresponding historical index returns. Hence, no backfill bias is contained in the indices.<sup>12</sup> Various hedge fund indices may still differ due to differences in reporting managers or construction (e.g., median return, asset weighted) but these differences are similar to those existing in traditional asset indices.

#### Exhibit 22: Individual Fund Comparison (2000-2008)

| Period of Analysis 2000-2008     | Average Return | Standard Deviation | Correlation with |                             |                             |                 |
|----------------------------------|----------------|--------------------|------------------|-----------------------------|-----------------------------|-----------------|
|                                  |                |                    | S&P 500          | Barclays Capital Government | Barclays Capital High Yield | CISDM ELS Index |
| CISDM ELS Index Index            | 4.9%           | 6.6%               | 0.72             | -0.21                       | 0.57                        | 1.00            |
| CISDM ELS Funds EW Portfolio     | 7.8%           | 9.0%               | 0.72             | -0.25                       | 0.66                        | 0.94            |
| CISDM ELS Funds* Average         | 7.8%           | 15.9%              | 0.39             | -0.13                       | 0.36                        | 0.52            |
| CISDM ELS Funds* Stdev of Sample | 5.5%           | 9.1%               | 0.28             | 0.13                        | 0.22                        | 0.27            |

\* Analysis of individual funds that were used to construct the EW portfolio by taking the average in their return and standard deviation. Correlations between individual funds are not considered here, in contrast to the portfolio case.

The impact of survivorship bias, backfill bias as well as the impact of the use of hedge fund indices to reflect the performance of individual hedge funds is shown in Exhibit 22 for Equity Long/Short hedge funds (other strategies are not shown in this report but results for other strategies are similar and are available from authors) for the time period of 2000-2008. A portfolio of equal weighted ELS funds with complete return data for the time period is compared to the CISDM ELS Index, which includes all ELS funds regardless of their data completeness for the same time period. Results show that the equal weighted ELS EW Portfolio reports a higher return (7.8%) than that of the CISDM ELS index (4.9%) over the same period. This is consistent with both backfill and survivorship bias. (Note that the correlations with the S&P 500, Barclays Capital Government and High Yield indices and the CISDM ELS index are similar at the portfolio level). Of greater importance is that the average of the standard deviations of the individual ELS (15.9%) is higher than the standard deviation of the ELS EW Portfolio (9%) or of the CISDM ELS Index (6.6%). In addition, while the average return of the individual funds is the same as the portfolio mean, the average standard deviation of returns around the average return for individual ELS funds (5.5%) indicates that a wide variation in returns exists among the reporting ELS with complete information. Similar wide variations in standard deviations as well as correlations with the S&P 500, Barclays Capital Government and High Yield indices are also reported. In short, individual ELS managers on average may reflect the benefits illustrated in an ELS index or portfolio, but wide variations exist among reporting ELS managers.

#### FUND OF FUNDS INVESTMENTS

Most major hedge fund indices reflect the performance of a portfolio of hedge funds. However, the actual performances of Fund of Funds differ somewhat from a portfolio of hedge funds. First, funds of funds often add on an additional layer of fees to reflect their additional asset management and oversight role. Additionally, Fund of Funds managers often engage in more active management of funds within their strategy and do not employ the current composition of the composite hedge fund index or the style purity of the individual strategy indices. In Exhibit 23, the performance of the CISDM Fund of Funds Index is compared to the performance of the CISDM Equal Weighted Hedge Fund Index for the period of 1991-2008. The correlation between the two indices is high at 0.91. However, the return and the standard deviation of the CISDM Fund of Funds Index are lower than

<sup>12</sup> Note that the period before the data inception of an index may contain survivorship and backfill bias. For instance, if an index was started in 2002, returns pre 2002 would contain backfill bias and survivorship bias.

that of the CISDM Equal Weighted Hedge Fund Index. This is expected given: 1) the additional layer of fees existing on most Fund of Funds products; and 2) the tendency for Fund of Funds to create Fund of Funds profiles which have lower risk and lower expected return than the composite hedge fund index. This lower risk profile is also shown in Exhibit 23 where the standard deviation of the CISDM Fund of Funds Index is 5.1%, while the CISDM Equal Weighted Hedge Fund Index standard deviation is 7.4%. The lower equity market sensitivity profile for Fund of Funds is also demonstrated in Exhibit 23. The correlation between the CISDM Equal Weighted Hedge Fund Index and the S&P 500 is 0.73, while the correlation between the CISDM Fund of Funds Index and the S&P 500 is only 0.58.

**Exhibit 23: Performance of CISDM Fund of Funds Indices (1991-2008)**

| Performance of CISDM Fund of Funds (1991-2008) | Annualized Return | Standard Deviation | Information Ratio | Maximum Drawdown | Skew  | Kurtosis | Correlation with |             |
|--|-------------------|--------------------|-------------------|------------------|-------|----------|------------------|-------------|
|  |                   |                    |                   |                  |       |          | CISDM FOF        | CISDM EW HF |
| CISDM Fund of Funds Diversified Index          | 7.9%              | 5.1%               | 1.53              | -17.5%           | -0.89 | 4.93     | 1.00             | 0.91        |
| CISDM Equal Weighted Hedge Fund Index          | 12.9%             | 7.4%               | 1.74              | -21.1%           | -0.71 | 3.69     | 0.91             | 1.00        |
| S&P 500 Total Return Index                     | 7.9%              | 14.4%              | 0.55              | -44.7%           | -0.75 | 1.76     | 0.58             | 0.73        |
| Barclays Capital Bond Aggregate                | 7.0%              | 3.9%               | 1.81              | -5.1%            | -0.30 | 0.83     | 0.11             | 0.09        |
| Barclays Capital Corporate High Yield          | 7.5%              | 8.7%               | 0.86              | -33.3%           | -1.59 | 11.35    | 0.52             | 0.61        |

The impact of survival bias, backfill bias as well as the impact of the use of hedge fund indices to reflect the performance of individual hedge funds is shown in Exhibit 24 for Fund of Funds. In Exhibit 24, results show that a portfolio of Fund of Funds with complete return data for the period of 2000-2008 reports a higher return (4.9%) than that of the CISDM FOF Index (4.0%) over the same period. This is consistent with both backfill and survivorship bias. (Note that the correlations with the S&P 500, Barclays Capital Government and High Yield indices and the CISDM FOF Index are similar at the portfolio level). Of greater importance is that the average of the standard deviations of the individual Fund of Funds (7.6%) is higher than that of the portfolio of Fund of Funds (5.8%) or of the CISDM FOF Index (4.8%). The lower standard deviation of a portfolio of FOF in contrast to the average standard deviation of a sample of Fund of Funds is indicative of the diversification benefits of creating a portfolio of FOFs. In addition, while the average return of the sample is the same as the portfolio mean, the standard deviation of returns around the average return for the individual Fund of Funds manager (3.3%) indicates that a wide variation in returns exists among the reporting Fund of Funds with full information. Similar wide variations in standard deviations of correlations with the S&P 500, Barclays Capital Government and High Yield indices are also reported. In short, individual Fund of Funds managers on average may reflect the benefits illustrated in a Fund of Funds index or portfolio, but wide variations exist among individual reporting Fund of Funds managers.

**Exhibit 24: Fund of Funds Index and Individual Fund of Funds Comparison (2000-2008)**

| Period of Analysis 2000-2008 | Average Return | Standard Deviation | Correlation with |                             |                             |                 |
|------------------------------|----------------|--------------------|------------------|-----------------------------|-----------------------------|-----------------|
|                              |                |                    | S&P 500          | Barclays Capital Government | Barclays Capital High Yield | CISDM FOF Index |
| CISDM FOF Index              | 4.0%           | 4.8%               | 0.56             | -0.13                       | 0.59                        | 1.00            |
| CISDM FOF Portfolio          | 4.9%           | 5.8%               | 0.57             | -0.13                       | 0.60                        | 0.98            |
| CISDM FOF* Average           | 4.9%           | 7.6%               | 0.42             | -0.10                       | 0.46                        | 0.76            |
| CISDM FOF* Stdev of Sample   | 3.3%           | 3.5%               | 0.19             | 0.13                        | 0.17                        | 0.16            |

\* Analysis of individual Fund of Funds that were used to construct the EW Portfolio by taking the average in their return and standard deviation. Correlations between individual Fund of Funds are not considered here, in contrast to the portfolio case.

### INVESTIBLE HEDGE FUND INDICES

The growth in hedge fund investment has encouraged a number of firms to offer hedge fund index products. This group includes well-known index providers such as MSCI and Dow Jones, global investment banks such as CSFB, and firms that specialize in hedge fund investment such as HFR. These hedge fund indices differ in many ways. As a result, seemingly similar hedge fund indices may have different return and risk performance over similar time periods. However, previous studies [Schneeweis et al, 2006] show that despite differences in risk and return, the various hedge fund indices generally report similar correlations to each other as well as to major market factors such as stock and bond indexes.

In Exhibit 25, we emphasize the relationships between non-investible CISDM hedge fund indices and the investible Hedge Fund Research (HFRX) indices over the period 2004-2008<sup>13</sup>. The HFRX indices are based on a set of managers that provide daily transparency and follow a set of selection rules (e.g. size, years since inception) that are typically demanded by large institutional investors. Results show that the various investible indices have similar correlations to their non-investible counterparts, as well as similar correlations to market factors. For example, with the exception of Equity Market Neutral (for which no central driving market factor exists) and the Equal Weighted Hedge Fund Index, the correlation between the investible and non-investible indices is above 0.50. Likewise, the correlations between the non-investible CISDM indices with market factors and the corresponding investible HFRX indices with market factors are generally similar. For example, the correlations of the CISDM Distressed Securities Index with the S&P 500 (0.82), Barclays Capital Bond Aggregate (0.11), and Barclays Capital High Yield (0.81) are comparable to that for the HFRX correlation with the S&P 500 (0.61), Barclays Capital Bond Aggregate (-0.11), and Barclays Capital High Yield (0.54).

**Exhibit 25: Comparison on Non-Investable and Investable Indices (2004-2008)**

| Performances and Correlations<br>2004-2008 | Annualized<br>Return | Standard Information<br>Deviation | Ratio | Maximum<br>Drawdown | Skew  | Kurtosis | Correlation with           |         |                             |                         |
|--|----------------------|-----------------------------------|-------|---------------------|-------|----------|----------------------------|---------|-----------------------------|-------------------------|
|  |                      |                                   |       |                     |       |          | CISDM<br>Strategy<br>Index | S&P 500 | BarCap<br>Bond<br>Aggregate | BarCap<br>High<br>Yield |
| CISDM Equal Weighted Hedge Fund Index      | 3.82%                | 7.17%                             | 0.53  | -21.12%             | -1.78 | 4.52     | 1.00                       | 0.82    | 0.12                        | 0.74                    |
| HFRX Equal Weighted Strategies Index       | -1.67%               | 6.56%                             | -0.25 | -23.55%             | -2.90 | 12.45    | 0.93                       | 0.80    | 0.12                        | 0.75                    |
| CISDM Equity Market Neutral Index          | 5.33%                | 2.18%                             | 2.45  | -2.79%              | -1.50 | 4.09     | 1.00                       | 0.49    | 0.06                        | 0.37                    |
| HFRX Equity Market Neutral Index           | 1.43%                | 3.43%                             | 0.42  | -5.99%              | -0.71 | 1.08     | 0.29                       | 0.05    | -0.24                       | -0.11                   |
| CISDM Convertible Arbitrage Index          | -0.88%               | 7.36%                             | -0.12 | -22.47%             | -3.70 | 17.24    | 1.00                       | 0.69    | 0.37                        | 0.80                    |
| HFRX Convertible Arbitrage Index           | -15.71%              | 18.20%                            | -0.86 | -60.39%             | -5.03 | 29.21    | 0.88                       | 0.75    | 0.19                        | 0.80                    |
| CISDM Distressed Securities Index          | 4.23%                | 6.85%                             | 0.62  | -21.22%             | -3.14 | 15.67    | 1.00                       | 0.82    | 0.11                        | 0.81                    |
| HFRX Distressed Securities Index           | -2.73%               | 8.22%                             | -0.33 | -31.84%             | -3.10 | 11.96    | 0.80                       | 0.61    | -0.11                       | 0.54                    |
| CISDM Event Driven Multi-Strategy Index    | 3.29%                | 6.86%                             | 0.48  | -20.19%             | -1.95 | 5.74     | 1.00                       | 0.87    | 0.05                        | 0.76                    |
| HFRX Event Driven Index                    | -0.19%               | 7.25%                             | -0.03 | -25.80%             | -1.55 | 3.72     | 0.96                       | 0.86    | 0.04                        | 0.71                    |
| CISDM Merger Arbitrage Index               | 5.40%                | 3.77%                             | 1.43  | -5.65%              | -0.83 | 0.67     | 1.00                       | 0.77    | 0.10                        | 0.63                    |
| HFRX Merger Arbitrage Index                | 5.12%                | 3.80%                             | 1.35  | -3.40%              | -0.90 | 0.79     | 0.83                       | 0.55    | 0.28                        | 0.47                    |
| CISDM Equity Long/Short Index              | 4.08%                | 6.26%                             | 0.65  | -17.04%             | -1.06 | 1.01     | 1.00                       | 0.77    | 0.03                        | 0.60                    |
| HFRX Equity Hedge Index                    | -2.20%               | 8.61%                             | -0.26 | -28.51%             | -1.68 | 4.58     | 0.91                       | 0.83    | 0.06                        | 0.70                    |

### HEDGE FUND REPLICATION INDICES

The growth in hedge fund investment has encouraged a number of firms to offer the hedge fund products called replication indices/benchmark products. These products have to goal of providing returns which capture the underlying return of basic hedge fund strategies. Exhibit 26 presents performance results for various replication indices over the period Jan 2004 to Dec 2008. The annualized returns ranged from 1.6% (for JP Morgan Alternative Beta) to 4.7% (for Goldman Sachs Absolute Return Tracker Index USD). The volatilities of the hedge fund replication indices were comparable to the manager based investible indices in Exhibit 25. Further, the correlations of the

<sup>13</sup> HFRX investible indices have various inception dates between 2003 and 2005 and thus the comparison here is for the past 5 years.

replication indices with the CISDM Fund of Funds Index and the CISDM Equal Weighted Hedge Fund Index are fairly high. The Goldman Sachs Absolute Return Tracker Index showed correlations of 0.78 and 0.83 with the CISDM Fund of Funds Index and CISDM Equal Weighted Hedge Fund Index. Figures of information ratio, maximum drawdown, skew and kurtosis were comparable to the manager based investible indices as well.

**Exhibit 26: Performance of Hedge Fund Replication Indices 2004-2008**

| Performance of Hedge Fund Replication Indices 2004-2008 | Annualized Return | Standard Deviation | Information Ratio | Maximum Drawdown | Skew  | Kurtosis | Correlation with  |                 |         |                       |
|---|-------------------|--------------------|-------------------|------------------|-------|----------|-------------------|-----------------|---------|-----------------------|
|   |                   |                    |                   |                  |       |          | CISDM EW HF Index | CISDM FoF Index | S&P 500 | BarCap Bond Aggregate |
| Goldman Sachs Absolute Return Tracker Index             | 4.7%              | 6.8%               | 0.69              | -14.5%           | -1.02 | 1.91     | 0.83              | 0.78            | 0.76    | 0.17                  |
| JPMorgan Hedge Fund AltBeta                             | 1.6%              | 6.2%               | 0.26              | -20.6%           | -1.35 | 2.67     | 0.88              | 0.79            | 0.83    | 0.09                  |
| Merrill Lynch Factor Model                              | 3.9%              | 6.3%               | 0.63              | -17.4%           | -1.35 | 2.61     | 0.93              | 0.84            | 0.86    | 0.17                  |

**RESEARCH IN HEDGE FUNDS**

In recent years, academic and practitioner research on hedge funds have been extended in several new directions. Important recent results are outlined below:

One area of recent academic and practitioner research focus is hedge fund replication. For a critical overview of the various methodologies involved in passive hedge fund replication, see Amenc et al. [2008]. Hedge fund replication generally falls into two categories: factor-based approach and payoff-distribution approach. Factor-based approaches attempt to replicate hedge fund returns using hedge fund risk factors while the payoff distribution approach attempts to replicate hedge fund returns by matching higher moments (variance, skew and kurtosis) but not the first moment (mean). As shown in the previous section, the performance of replication indices is similar to investible indices albeit for a limited period of data 2004-2007. Amenc et al. [2008] argue that the factor-based approach has failed empirically to produce satisfactory results on an out-of-sample basis. Amenc et al. [2008] also argue that the payoff-distribution approach, while insightful and relatively robust out-of-sample, is unlikely to meet investors' expectations since the returns are documented to be inconsistent with the time series properties of hedge fund returns. It remains to be seen how replication products perform going forward into the future. A subtle distinction in the literature on replication is that a number of authors have actually attempted to construct actual strategies employed by hedge fund managers. This approach may be termed "security-based replication." Security-based approaches have been examined by Spurgin [1999], Gatev, Goetzmann and Rouwenhorst [2006] and Duarte, Longstaff and Yu [2007] among others. Spurgin [1999] constructs a popular momentum strategy to evaluate the performance of trend-followers, while Gatev, Goetzmann and Rouwenhort [2006] tests pairs trading. Duarte, Longstaff and Yu [2007] analyze the risk and return characteristics of various fixed-income arbitrage strategies.

Another area which has been the focus of academic and practitioner research is risk management. The focus of leverage is often on the magnified risk that it produces. Clearly, the most that Fund of Funds investors can lose in constituent funds is 100% of capital. Taking this into account, Christie [2007] suggests a simple formulation to correctly calculate leverage in a Fund of Funds. There is a plethora of hedging instruments to protect against market risk, interest rate risk, currency risk and credit risk. Liquidity risk in hedge funds, however, cannot be hedged as liquidity derivatives do not exist. Bhaduri et al [2007] introduce several liquidity derivatives that can be operationalized to hedge against liquidity risk. A major concern for risk managers has been the occurrence of major losses and subsequent hedge fund failures. During the week of August 6, 2007, several high profile and successful quantitative long/short equity hedge fund managers experienced unprecedented losses. Khandani and Lo [2007] hypothesize that the losses were initiated by the rapid unwinding of one or more sizable quantitative equity-market-neutral portfolios. They surmise, given the speed and price impact with which this occurred, that it was the result of a sudden liquidation by



a multi-strategy fund or proprietary-trading desk possibly due to margin calls or a risk reduction. Recent research has also examined the failures of certain hedge funds. Martin [2007] quantifies the substantial loss to investors due to the failure of Amaranth Advisors, LLC, while Gupta and Kazemi [2007] show that risk exposures derived from Amaranth's returns clearly showed a deviation from their stated strategy (Amaranth was classified as a multi-strategy fund). Further, Chincarini [2007] and Till [2007] have analyzed Amaranth's positions to characterize its risk profile. Gupta and Kazemi [2008] also examined several recent high profile failures and introduced a technique that examines deviations from stated fund exposures.

Finally, recent research has focused on hedge fund portfolio theory and performance measurement. While there are many articles on performance measurement, Martin and Pescatore [2007] have examined the performance of incubated funds. Incubated funds are defined as those that receive capital and operational infrastructure service from large service providers such as investment banks. While the sample used by the authors is relatively small, the results generally indicate that portfolios of managers with some form of institutional affiliation outperform hedge fund benchmarks, particularly on risk and factor-exposure adjusted bases. Another topic that has received considerable attention over the years is diversification and the optimal number of hedge funds in a Fund of Funds. While the results are quite heterogeneous, a common feature of previous research on this topic is the use of a time-series approach. Using a cross-sectional approach, Amo et al. [2007] re-examine this issue. They note that a major benefit of this approach is that the statistical bias inherent to hedge fund NAVs such as the under-estimation of risk can be contained.

Similarly, Schneeweis and Szado [2009] have reviewed the time series properties of various hedge fund strategies. In brief, their results show that the research on the benefits of various hedge fund strategies and hedge funds in general is dependent on the time period of analysis. Similarly, they show that many of the empirical conclusions, such as the benefits of various look back options or trend following factors to further explain hedge fund returns, are also time period dependent and that the traditional market factors such as equity markets, bond markets, and credit markets remain the primary market factors driving hedge fund returns.

## CONCLUSIONS

Hedge funds offer access to unique risk and return opportunities, in part, due to the expanded universe of securities and strategies which they trade. Hedge funds managers can access both financial and non-financial (e.g. commodity) markets and can easily take long, short, spread, and option positions in any of these markets. In this annual update, the return and risk characteristics of various hedge fund strategies are reviewed, as are the risk and return impacts of adding hedge funds to traditional stock and bond portfolios as well as to combinations of traditional assets and other alternative investments. In addition, results are presented on the impact of market factors such as the S&P 500, Barclays Capital Bond Aggregate, and Barclays Capital High Yield indices on hedge fund returns.

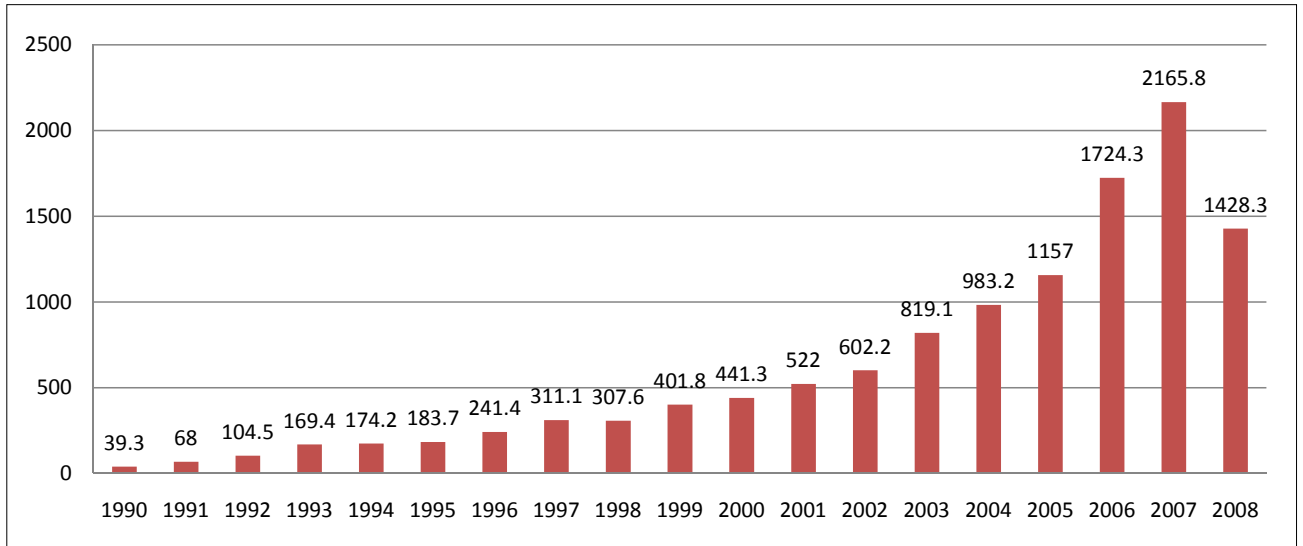
Results show that one can think of hedge fund returns as a combination of manager skill and an underlying return to the hedge fund strategy or investment style itself based on its exposure to various traditional market factors. Lastly, the stability of the return and risk parameters changes over time such that one must consider the current economic climate when determining the expected return and risk characteristics or benefits of any particular hedge fund strategy.

# Appendix

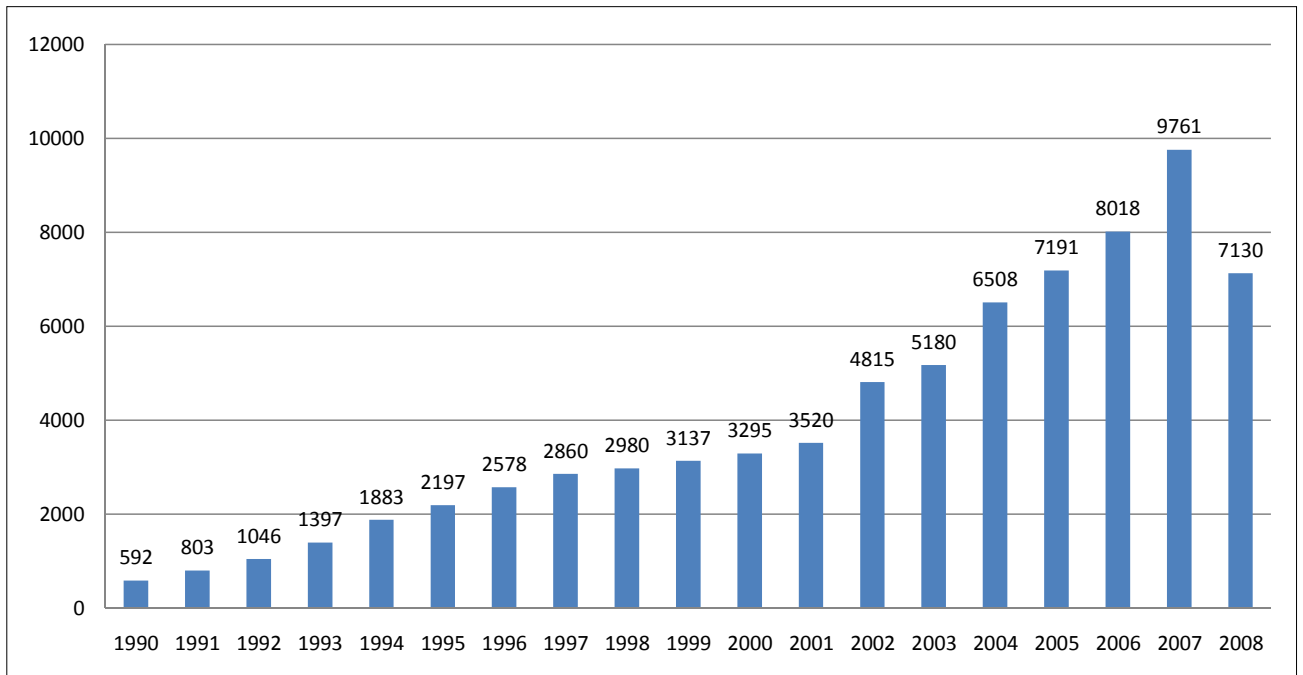
## APPENDIX I: GROWTH OF HEDGE FUNDS

The following charts depict the growth of the industry both in terms of assets under management as well as number of funds. These charts have been reproduced from the CASAM CISDM Industry Report.

**Growth of Hedge Fund Assets Under Management (in billions USD)**



**Growth in the Number of Hedge Funds**



## APPENDIX II: PERFORMANCE 2001-2008

Since 2001, a number of new regulatory (growth of home mortgages), economic (post-2001 technology bubble), market structure (e.g., credit spreads) and technological developments have occurred, such that the recent return and risk relationships may not reflect that of the longer period of 1991-2008. The following table shows the risk and return performance of hedge funds, traditional U.S. stocks and bonds, managed futures, real estate, commodities and private equity for the period of 2001-2008. Portfolio combinations which include traditional assets and/or alternative investments (e.g., hedge funds, CTAs, commodities, real estate and private equity) for the most recent eight year period 2001-2008 are also reviewed. Over the period of analysis, hedge funds reported a higher annualized return and lower volatility than the S&P 500. Compared to the returns of the Barclays Capital Bond Aggregate Index, hedge funds reported slightly lower rates of return with higher volatility. Compared to managed futures and real estate, hedge funds reported a lower return but significantly lower volatility as well. Lastly, compared to commodities and private equity, hedge funds reported higher returns and lower volatility. It can be observed that the information ratios for portfolios which include at least a 10% investment in hedge funds dominate those that invest in a pure stock/ bond/ managed futures/ commodities/ real estate/ private equity portfolio.

### Index Performance 2001-2008

| <b>Stock, Bond and Hedge Fund Performance</b> | <b>S&amp;P 500</b> | <b>Barclays Capital Bond Aggregate</b> |                    | <b>Hedge Funds</b>    |
|---|--------------------|--|--------------------|-----------------------|
| Annualized Total Return                       | -2.89%             | 5.74%                                  |                    | 5.58%                 |
| Annualized Standard Deviation                 | 15.05%             | 3.99%                                  |                    | 6.62%                 |
| Information Ratio                             | -0.19              | 1.44                                   |                    | 0.84                  |
| Maximum Drawdown                              | -40.68%            | -3.83%                                 |                    | -21.12%               |
| Correlation with Hedge Funds                  | 0.79               | 0.00                                   |                    | 1.00                  |
|   |                    |  |                    |                       |
| <b>Alternative Asset Performance</b>          | <b>Commodities</b> | <b>CTA</b>                             | <b>Real Estate</b> | <b>Private Equity</b> |
| Annualized Total Return                       | -0.47%             | 9.17%                                  | 6.41%              | -3.67%                |
| Annualized Standard Deviation                 | 25.57%             | 8.75%                                  | 20.95%             | 26.43%                |
| Information Ratio                             | -0.02              | 1.05                                   | 0.31               | -0.14                 |
| Maximum Drawdown                              | -62.16%            | -8.75%                                 | -58.79%            | -70.33%               |
| Correlation with Hedge Funds                  | 0.45               | 0.02                                   | 0.52               | 0.80                  |

### Portfolio Performance 2001-2008

| <b>Portfolios</b>            | <b>A</b>   | <b>B</b> | <b>C</b> | <b>D</b> |
|------------------------------|--|----------|----------|----------|
| Annualized Returns           | 1.68%  | 2.07%    | 2.42%    | 2.74%    |
| Standard Deviation           | 7.51%  | 7.30%    | 8.36%    | 8.10%    |
| Information Ratio            | 0.22   | 0.28     | 0.29     | 0.34     |
| Maximum Drawdown             | -20.98%  | -20.98%  | -25.63%  | -25.17%  |
| Correlation with Hedge Funds | 0.79   |          | 0.78     |          |
|                              |  |          |          |          |
| Portfolio A                  | Equal Weights S&P 500 and Barclays Capital Bond Aggregate          |          |          |          |
| Portfolio B                  | 90% Portfolio A and 10% Hedge Funds                                |          |          |          |
| Portfolio C                  | 75% Portfolio A and 25% CTA/Commodities/Private Equity/Real Estate |          |          |          |
| Portfolio D                  | 90% Portfolio C and 10% Hedge Funds                                |          |          |          |

## APPENDIX III: INDIVIDUAL HF INDEX RETURNS BY PROVIDER

The performance characteristics of the major hedge fund indices are given for the period 2001-2008. In addition, correlations with S&P 500, Barclays Capital Bond Aggregate and the CISDM Hedge Fund indices for each strategy are shown. It is worth noting that, while the various return and risk characteristics of the indices are similar by strategy, differences do exist (note CSFB EMN and FIA). This is in part due to the different approaches to index construction (e.g., CSFB is asset-weighted, HFRI is fund-weighted and CISDM is median-return weighted at the strategy level).

| Performance and Correlations<br>2001 - 2008      | Annualized<br>Return | Standard<br>Deviation | Information<br>Ratio | Maximum<br>Drawdown | Skew  | Kurtosis | Correlation with |                             |                               |
|--|----------------------|-----------------------|----------------------|---------------------|-------|----------|------------------|-----------------------------|-------------------------------|
|  |                      |                       |                      |                     |       |          | S&P 500          | BarCap<br>Bond<br>Aggregate | CISDM HF<br>Strategy<br>Index |
| Barclays Hedge Fund Index Hedge Fund             | 5.14%                | 6.63%                 | 0.78                 | -23.14%             | -1.79 | 5.53     | 0.78             | 0.01                        | 0.99                          |
| CISDM Equal Weighted Hedge Fund Index            | 5.58%                | 6.62%                 | 0.84                 | -21.12%             | -1.55 | 4.14     | 0.79             | 0.00                        | 1.00                          |
| CSFB/Tremont Hedge Fund Index                    | 5.37%                | 5.56%                 | 0.97                 | -19.68%             | -1.86 | 6.06     | 0.62             | 0.05                        | 0.91                          |
| HFRI Fund Weighted Composite Index               | 4.99%                | 6.44%                 | 0.78                 | -20.51%             | -1.21 | 2.47     | 0.80             | -0.03                       | 0.99                          |
| Barclays Hedge Fund Index Equity Market Neutral  | 4.14%                | 3.09%                 | 1.34                 | -6.08%              | -1.01 | 1.93     | -0.13            | -0.03                       | 0.57                          |
| CISDM Equity Market Neutral Index                | 5.58%                | 1.97%                 | 2.84                 | -2.79%              | -1.33 | 4.13     | 0.44             | 0.00                        | 1.00                          |
| CSFB/Tremont Equity Market Neutral Index         | 0.37%                | 14.67%                | 0.03                 | -42.73%             | -9.46 | 91.60    | 0.21             | -0.22                       | 0.07                          |
| HFRI Equity Market Neutral Index                 | 3.31%                | 2.85%                 | 1.16                 | -8.26%              | -1.10 | 2.81     | 0.02             | -0.07                       | 0.59                          |
| Barclays Hedge Fund Index Fixed Income Arbitrage | 1.26%                | 6.42%                 | 0.20                 | -28.60%             | -4.91 | 31.92    | 0.50             | 0.11                        | 0.85                          |
| CISDM Fixed Income Arbitrage Index               | 3.58%                | 4.83%                 | 0.74                 | -19.34%             | -4.68 | 26.97    | 0.56             | 0.11                        | 1.00                          |
| CSFB/Tremont Fixed Income Arbitrage Index        | 0.79%                | 7.07%                 | 0.11                 | -29.02%             | -4.51 | 25.96    | 0.44             | 0.19                        | 0.89                          |
| Barclays Hedge Fund Index Convertible Arbitrage  | 1.75%                | 7.46%                 | 0.23                 | -31.53%             | -3.91 | 21.63    | 0.48             | 0.25                        | 0.97                          |
| CISDM Convertible Arbitrage Index                | 3.27%                | 6.18%                 | 0.53                 | -22.47%             | -4.26 | 24.64    | 0.46             | 0.32                        | 1.00                          |
| CSFB/Tremont Convertible Arbitrage Index         | 1.20%                | 7.93%                 | 0.15                 | -32.88%             | -3.72 | 18.00    | 0.45             | 0.21                        | 0.93                          |
| HFRI Convertible Arbitrage Index                 | 0.70%                | 8.25%                 | 0.08                 | -35.32%             | -4.70 | 27.60    | 0.49             | 0.26                        | 0.97                          |
| Barclays Hedge Fund Index Event Driven           | 6.62%                | 6.28%                 | 1.05                 | -19.62%             | -0.86 | 1.11     | 0.72             | -0.08                       | 0.94                          |
| CISDM Event Driven Multi-Strategy Index          | 5.65%                | 6.30%                 | 0.90                 | -20.19%             | -1.78 | 5.77     | 0.76             | 0.00                        | 1.00                          |
| CSFB/Tremont Event Driven Index                  | 7.63%                | 5.60%                 | 1.36                 | -18.86%             | -1.55 | 3.31     | 0.62             | -0.04                       | 0.92                          |
| HFRI Event-Driven Index                          | 6.03%                | 7.09%                 | 0.85                 | -23.92%             | -1.35 | 3.44     | 0.77             | -0.04                       | 0.96                          |
| Barclay Hedge Fund Index Merger Arbitrage        | 5.68%                | 3.78%                 | 1.50                 | -7.18%              | -0.89 | 2.25     | 0.62             | 0.06                        | 0.86                          |
| CISDM Merger Arbitrage Index                     | 4.85%                | 3.38%                 | 1.43                 | -5.65%              | -0.78 | 1.03     | 0.66             | 0.05                        | 1.00                          |
| CSFB/Tremont Risk Arbitrage Index                | 4.06%                | 3.90%                 | 1.04                 | -8.19%              | -0.72 | 2.20     | 0.56             | 0.14                        | 0.67                          |
| HFRI Merger Arbitrage Index                      | 4.34%                | 3.73%                 | 1.16                 | -8.08%              | -0.77 | 0.99     | 0.66             | 0.06                        | 0.90                          |
| Barclay Hedge Fund Index Distressed Securities   | 6.65%                | 7.34%                 | 0.91                 | -34.30%             | -1.90 | 5.11     | 0.58             | -0.02                       | 0.87                          |
| CISDM Distressed Securities Index                | 7.61%                | 6.03%                 | 1.26                 | -21.22%             | -3.05 | 17.88    | 0.65             | 0.10                        | 1.00                          |
| CSFB/Tremont Distressed Index                    | 8.48%                | 6.06%                 | 1.40                 | -21.47%             | -1.66 | 3.57     | 0.58             | -0.07                       | 0.83                          |
| HFRI Distressed Securities Index                 | 7.72%                | 6.56%                 | 1.18                 | -26.94%             | -1.74 | 5.34     | 0.58             | -0.01                       | 0.91                          |
| Barclays Hedge Fund Index Equity Long Short      | 4.81%                | 5.43%                 | 0.89                 | -13.98%             | -0.79 | 0.60     | 0.77             | -0.11                       | 0.98                          |
| CISDM Equity Long/Short Index                    | 4.43%                | 6.03%                 | 0.73                 | -17.04%             | -0.86 | 0.66     | 0.77             | -0.10                       | 1.00                          |
| CSFB/Tremont Long/Short Equity Index             | 4.47%                | 7.22%                 | 0.62                 | -21.63%             | -1.16 | 2.77     | 0.68             | 0.04                        | 0.91                          |
| HFRI Equity Hedge Index                          | 2.77%                | 8.20%                 | 0.34                 | -28.54%             | -1.35 | 3.01     | 0.81             | -0.07                       | 0.96                          |
| Barclays Hedge Fund Index Global Macro           | 7.67%                | 5.22%                 | 1.47                 | -6.42%              | 0.11  | 0.12     | 0.30             | 0.12                        | 0.81                          |
| CISDM Global Macro Index                         | 6.44%                | 3.34%                 | 1.93                 | -2.60%              | 0.22  | 0.61     | 0.30             | 0.11                        | 1.00                          |
| CSFB/Tremont Global Macro Index                  | 11.64%               | 5.54%                 | 2.10                 | -14.94%             | -1.55 | 6.31     | 0.21             | 0.30                        | 0.45                          |
| HFRI Macro Index                                 | 8.80%                | 5.14%                 | 1.71                 | -4.93%              | 0.24  | 0.73     | 0.13             | 0.12                        | 0.76                          |
| Barclays Hedge Fund Index Emerging Markets       | 9.67%                | 12.59%                | 0.77                 | -40.09%             | -1.58 | 4.09     | 0.75             | 0.05                        | 0.98                          |
| CISDM Emerging Markets Index                     | 7.88%                | 10.45%                | 0.75                 | -35.33%             | -2.25 | 8.50     | 0.69             | 0.09                        | 1.00                          |
| CSFB/Tremont Emerging Markets Index              | 8.69%                | 10.30%                | 0.84                 | -30.95%             | -1.67 | 5.38     | 0.69             | 0.10                        | 0.95                          |
| S&P 500 Total Return Index                       | -2.89%               | 15.05%                | -0.19                | -40.68%             | -0.89 | 1.72     | 1.00             | -0.14                       | 0.69                          |
| Barclays Capital Bond Aggregate                  | 5.74%                | 3.99%                 | 1.44                 | -3.83%              | -0.37 | 1.35     | -0.14            | 1.00                        | 0.09                          |
| Barclays Capital High Yield                      | 3.19%                | 10.96%                | 0.29                 | -33.31%             | -1.84 | 7.90     | 0.68             | 0.22                        | 0.71                          |

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100 University Drive  
Amherst, Massachusetts 01002  
TEL: 413-548-7950  
FAX: 413-549-0327  
EMAIL: [info@ingarm.org](mailto:info@ingarm.org)  
WEB: [www.ingarm.org](http://www.ingarm.org)