

EXPLORING THE IMPLICATIONS OF
HEDGE FUNDS IN THE MARKET

by

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HEDGE FUNDS IN THE MARKET

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Abstract

The purpose of this study is to investigate the behavior of hedge funds in the global financial market during both bear and bull markets since 2000. Specifically, I analyzed hedge fund returns and measured correlation coefficients during the bear markets of 2000-2002 and 2008-2009, and the bull markets of 2003-2007 and 2009-2014. I used the Hedge Fund Research Database to collect hedge fund data for specific strategies and used the S&P 500 Index and the MSCI World Index as a proxy for the domestic and global market, respectively. The results indicate that hedge fund behavior has shifted over the last 15 years, and a focus on specific hedge fund strategy has become increasingly important to investors.

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Hedge Fund Risk & Return

Introduction

In recent years, hedge funds – unregulated, private investment partnerships that are open to a limited number of investors and require a large initial investment – have become increasingly relevant in the scope of the global financial market. With \$2.5 trillion in assets under management (Barclay Hedge, 2014), hedge funds contribute a significant amount of liquidity to the public equity and bond markets, and their unregulated, risk-taking nature often raises questions about their effect on markets, especially in times of financial stress.

Major market events such as the collapse of Long Term Capital Management – a large hedge fund with positions worth over \$1 trillion that employed high-risk leveraged arbitrage strategies – that nearly collapsed the global financial system in 1998, confirmed fears that major losses by a large hedge fund could significantly impact the liquidity in the global market. Over the years, hedge funds have been under siege by the investor community for applying high-risk strategies that have the potential to damage the broad market. As a result, there has been an influx of quantitative research examining the effects of hedge fund returns as they relate to risk, leverage and market liquidity.

More recently, throughout the global financial crisis in 2008, investors saw many hedge funds implode, some of which had been operational since the 1990s. Long-standing funds such as Highland Capital Management (Crusader Fund), Peloton Capital, Satellite Capital, Atticus Global and Bernard L. Madoff Investment Securities, all saw their demise between 2008 and 2010. While this seems relatively normal in the context of the global crisis during these years, it is important to remember the definition of a hedge fund, and what these funds offer to investors.

A hedge fund is an alternative investment vehicle available only to accredited investors, such as institutions and individuals with significant assets (net worth more than \$1 million).

Hedge funds are not currently regulated by the U.S. Securities and Exchange Commission, and as a result, have the ability to invest in securities and employ strategies that regulated funds are prohibited from investing in or using, such as derivative instruments, short-selling and leverage. As a result, hedge funds are typically more risky – that is in terms of counterparty, concentration and operations – than their regulated counterpart, mutual funds, and are far less liquid forms of investment. In return for this, investors in hedge funds are supposed to be provided with a solid alternative to traditional investments.

At their core, hedge funds market themselves as vehicles offering the possibility of differentiated returns that are uncorrelated to the stock and bond markets. The prospect of generating returns from market-neutral exposure is especially popular with institutions that must put a significant amount of capital to work. These institutions include large pension and retirement funds that wish to diversify their assets across the breadth of available investments. Large pension funds must be able to withstand market volatility, and generate stable growth over the long term, as they are ultimately responsible for employee pensions when they reach the end of their working years. For this reason, investing in hedge funds is an important aspect of managing a pension fund, as hedge funds are supposed to provide consistent returns, regardless of market conditions.

However, when evaluating hedge fund returns, it is especially important to focus on time periods in which investors could have benefited from market-neutral exposure in their portfolios. These time periods include bear markets, where systematic market risk caused the broad equity market to decline. Theoretically, assuming hedge funds adhere to their strategy of being

uncorrelated to the stock market, portfolios with hedge fund exposure should perform better than portfolios without hedge fund exposure, during cycles of stock market weakness. As mentioned above, this was not the case during the global financial crisis of 2008, as many hedge funds posted returns consistent with the broad equity market.

This finding implies the need to reexamine the investment opportunities that hedge funds claim to provide. If hedge funds truly protect investors from stock market exposure, then why did many hedge funds suffer the same fate that mutual funds experienced throughout 2007-2009? If hedge funds fail to execute on a core aspect of their investment thesis, then there seems to be no additional benefit of hedge fund exposure in a portfolio seeking returns uncorrelated with the stock market. To answer this question, I will be examining the possible reasons why many hedge funds experienced returns consistent with the stock market during the global financial crisis.

It is unfair to group all hedge fund returns under one broad umbrella, so I will first examine returns broadly, by using data from the HFRX Global Hedge Fund Index, a standard for performance measurement across all aspects of the hedge fund industry. The HFRX returns will be a proxy for performance in the global hedge fund industry since the late 1990s. Secondly, I will separate hedge fund returns by their investment strategy, in an effort to evaluate specific returns in relation to the broad market. In this way, I will be able to objectively measure the statistical relationship that various hedge fund investment strategies had to the stock market. In order to address this question about relative risk, I will separate the time periods examined into times of market strength and weakness, in an effort to generate possible explanations for higher than normal correlations. This analysis will seek to clarify the rhetoric surrounding the hedge fund industry, and distinguish facts about hedge fund risk and return from common misconceptions that have arisen in recent years.

Literature Review

One of the quantitative measures that has been studied is the correlation between various hedge fund strategies and how it relates to comovement, covariance and volatility. In the April 2007 edition of *Current Issues in Economics and Finance*, Tobias Adrian attempted to measure the risk in the hedge fund sector by analyzing the market risk surrounding the collapse of Long Term Capital Management in 1998 and comparing it with the risk at the time this article was written in 2007. To measure risk, Adrian (2007) used a cross-sectional dispersion of returns, “which is the volatility of returns across funds at each point in time” (p. 3). This measure of risk varies from the traditional common alternative approach of calculating risk by measuring the average volatilities over twelve or twenty-four month periods and then averaging across funds. A disadvantage of this traditional measure is that it “averages periods of high and low volatility, making it difficult to determine the precise timing of shocks to risk” (Adrian, 2007, p. 3). Adrian stated that his measure of risk had two advantages over the traditional measure. The first advantage of using cross-sectional volatility is “that it captures the exact timing of spikes in risk,” and the second advantage is “that it captures idiosyncratic risk as well as systematic risk” (Adrian, 2007, p. 3).

The outcome of Adrian’s study was that there is “no statistical evidence that increases in hedge fund correlations precede rises in hedge fund volatility. However... increases in hedge fund covariances tend to precede elevations in volatility” (Adrian, 2007, p. 7). This result suggests that covariance is a more relevant indicator of risk than covariance normalized by volatility. Additionally, the study identified a unique relationship between the broad equity market and hedge fund returns during the Long Term Capital Management crisis: “While the correlations of financial assets such as equities spiked at the same time as volatility shot up,

hedge fund return correlations were not unusually high at the beginning of the crisis and they declined sharply as it unfolded" (Adrian, 2007, p. 7).

Adrian's study in 2007 introduces an important measure of risk in the hedge fund industry – cross-sectional dispersion of returns – and lays the foundation for additional analysis. However, Adrian focused his analysis on the correlation of returns and risk during the Long Term Capital Management failure, and the time period shortly thereafter. In order to gain a better understanding of the hedge fund risk environment, it would be helpful to conduct a similar test over a longer time period, including the global financial crisis.

Adrian's analysis provides an effective starting point for understanding the correlation between hedge funds, and how this relates to volatility in hedge fund returns. In order to answer the question, "Is there a statistical relationship between Hedge Fund returns and the returns of the S&P 500, and what does this tell us about the risks of investing in Hedge Funds," there must be more data collected on the relationship between hedge fund returns and the returns of the broad equity market. This topic is briefly discussed in Adrian's study, but more depth is required to truly answer the aforementioned question. Additionally, Adrian's study was published in April 2007, a few short months before the precipice of the global financial crisis. The global financial crisis fundamentally changed the way investors and academics thought about the market, so there in lies an inherent flaw in Adrian's study, as it was conducted too early to provide relevant data. To fill this gap, a more recent study – a measurement that includes the effect of the global financial crisis – must be examined. The results that Adrian provided will function as an important contrast in the way hedge funds behaved during the Long Term Capital Management failure versus the more far-reaching global financial crisis in 2008.

In 2013, Brio, Mora-Valencia, & Perote conducted a report that supplemented the existing hedge fund literature, and supported some of the claims made in Adrian's 2007 study. In their study, *Semi-nonparametric VaR forecasts for hedge funds during the recent crisis*, Brio, Mora-Valencia, & Perote (2013) noted that "It was not until the collapse of Long Term Capital Management in 1998 and the Nasdaq crash that hedge fund investors were aware of the need for implementing risk management techniques" (p. 330). It is interesting to note that six years after Tobias Adrian's study, the consensus in the hedge fund management literature continues to identify the Long Term Capital Management collapse as the fundamental moment of realization among hedge fund managers that risk – specifically counterparty risk and liquidity risk – must be more carefully considered. In this way, it is not as important to analyze hedge fund risk-return relationships prior to the Long Term Capital Management failure, as this event caused a key shift in hedge fund management. Therefore, Adrian's study in 2007 can be relied on with confidence for its data and analysis following the Long Term Capital Management failure. However, the data preceding and throughout the collapse becomes less relevant, as hedge fund managers were forced to reevaluate their risk controls.

Following the Global Financial Crisis, the literature on hedge fund risk tolerance has evolved, with an influx of empirical analysis attempting to explain the risk measures and liquidity characteristics of funds preceding and throughout the crisis. As a result of the global systemic failure of financial institutions, the concept of connectedness has been revealed as an important indicator of financial stability. In a 2012 study, Bussière, Hoerova, & Klaus analyze an important characteristic that hedge funds are theoretically expected to offer: whether or not hedge funds provide diversification benefits to the financial system, a topic that had not received attention in the literature prior to this study. They found that "commonality rose almost twofold

between May 2002 and December 2006... which makes the period between 2003 and 2006 a unique setting to identify the drivers of increased commonality" (Bussière, Hoerova, & Klaus, 2012, p. 2). Based on the empirical analysis in this study, Bussière, Hoerova, & Klaus conclude that "during the upmarket period from 2003 until 2006 hedge funds substantially increased their investment into assets with high downside and illiquidity risk exposure to provide investors with a high return and attract new capital" (2012, p. 14). As a result, commonality in returns increased, and "funds did not provide the diversification benefits to the financial system and to investors that hedge funds are generally considered to offer" (Bussière, Hoerova, & Klaus, 2012, p. 14).

This study helps approach the question, "Do hedge funds put investors at risk by making high-risk investments," as it addressed the investing behavior of a large number of hedge funds prior to and during the global financial crisis, a unique period that seems to expose several anomalies that may not be as obvious during calm market conditions. A key component of the Bussière, Hoerova, & Klaus study is that it conducts empirical analysis between January 1994 and June 2009 with a database of 6400 hedge funds. This analysis contributes to the literature because it uses a large sample of individual hedge funds, as opposed to the hedge fund index used in Adrian's analysis (Adrian, 2007), which results in a more precise measure of hedge fund commonality.

In order to dive deeper into the topic of hedge fund risk/return compared to the broad market, it is important to note that not all hedge fund strategies are created equal. For example, a Global Macro hedge fund strategy bases its holdings on broad economic and political factors of various countries. Whereas a Convertible Arbitrage fund seeks to profit from a possible pricing error made in the conversion factor of a convertible security. In this way, a side-by-side

comparison of these two hedge fund returns would not be comparing apples to apples, as they each employ a drastically different strategy. In order to accurately examine returns, each fund strategy must be independently observed during both uptrends and downtrends in the market.

Izabela Pruchnicka-Grabias conducted several empirical studies during 2009 and 2010, aiming to assess hedge fund returns employing various strategies during both the bull market of 2007 and the bear market of 2008. For each strategy, she chose 20 funds at random from the database prepared by BarclayHedge and Global Fund Technologies, and collected data in order to interpret various measures of risk/return during both a bear and bull market. She found that, “Hedge Funds, no matter which strategy they followed, during the bear market of 2008, did not manage to generate attractive investment results measured by such measures as rates of return, risk measured by standard deviation, risk measured by beta, the level of alpha, the correlation of the examined funds with traditional assets and the Sharpe ratio” (Grabias, 2010, p. 162).

The results that Grabias produced in her studies contribute to the literature on hedge funds as they produce evidence that defies the fundamental allure of these alternative investments, which is their claim to protect investors in down markets, and provide higher risk-adjusted returns over time. By analyzing the alpha, or the excess return of an investment over its expected return or the return of the overall market, during both an uptrend and a downtrend in the market, Grabias presents data that can help answer the question: “Is there a statistical relationship between Hedge Fund returns and the returns of the S&P 500, and what does this tell us about the risks of investing in Hedge Funds?” Furthermore, by revealing that the strategy employed by a hedge fund was negligible in providing attractive investment results during a bear market, a holistic analysis of the hedge fund industry seems to be more acceptable when analyzing risk/return characteristics.

One must ask, however, if the analysis of the 2008 bear market is an acceptable time period to track hedge fund return data. The beginning of the global financial crisis may not be the most effective time period to examine, as a number of market anomalies occurred that could skew the data. For example, the systemic failure of financial institutions on a global scale would affect both a Global Macro strategy and an Event Driven strategy, as a large majority of stocks in the financial sector of the market produced negative returns.

The opposite side of that argument is that the 2008 bear market is the best time period to evaluate fund returns. For years, hedge funds have been advertising their ability to protect against downside in the market by structuring their investments to be market neutral, or have a beta close to zero. The general idea is that during uptrends in the market, hedge funds will not necessarily be able to outperform the market benchmark, but their true value as an asset class will be realized in times of high market volatility and negative market returns. To endorse this side of the argument is to admit that hedge funds essentially failed in their objective of providing a market neutral investment. This contention requires a comprehensive analysis as to why hedge funds failed to serve their investment purpose.

When discussing the hedge fund industry, it is important to consider some of the major hedge fund failures in recent years, as these events have ultimately played a significant role in shaping the public opinion of the industry. The most recent example that many people cite is the Bernie Madoff investment scandal that unwound in December 2008 at the height of the global financial crisis. Over decades of fraud, Madoff had accumulated over \$50 billion in assets under management by promising low-risk returns of 18% - 20% though an elaborate Ponzi scheme. When it was all said and done, Madoff pleaded guilty to 11 federal crimes, admitted to operating

the largest private Ponzi scheme in history and was sentenced to 150 years in prison with restitution of \$17 billion. This scandal was also the largest accounting fraud in American history.

Although the Madoff failure was an extraordinary event in the hedge fund industry, there have been other hedge fund failures that have hurt the reputation of the industry. Most notably, the collapse of Long Term Capital Management in 2000, and the closure of Tiger Fund, Aman Capital, Amaranth Advisors, Atticus Global and a number of other large funds over the next ten years would shape the way in which those without extensive knowledge of the sector would view the industry. In this way, it may seem unfair to label hedge funds as “dangerous investments” that employ “extremely high-risk strategies,” (which seems to be the sentiment in most finance classrooms and general discussion about the industry), just because of a few bad funds. However, such events (especially those that have occurred in recent years) are worth examining for the possibility of shady financial practices, if not to defend the industry then to simply educate the public and provide clarification.

In this way, it is important to ask the question: Do hedge funds, or at least some of them, follow a scheme of Ponzi finance? Ponzi finance describes a situation where operating cash flow is insufficient to cover either principal or interest payments, which can only be financed by a new inflow of funds (Semmler & Chappe, 2012, p. 2). Hedge funds attract investors by promising high returns, and in this way should be as optimistic as possible when estimating unrealized gains. According to Semmler & Chappe, “If payments to investors are based on inflated unrealized P&L, in the long run it is possible that investors withdrawing early might get better returns than subsequent investors, so that there could be a little Ponzi scheme in every hedge fund” (2012, p. 2). The literature on Ponzi finance in the hedge fund industry is important

to consider and progressive to the broad literature on the hedge fund industry, especially in light of the financial crisis and the subsequent public distrust of financial institutions.

As Semmler & Chappe point out, the “high (double-digit) returns historically earned by hedge funds may well present underlying risk exposures that are not well identified and managed by traditional risk management tools” (2012, p. 3). Additionally, in the context of illiquidity exposure (an inherent risk to hedge funds due to their highly leveraged investments), the closure of large positions in a short period of time can create substantial market disturbances and a systemic failure of the entire financial system. In an effort to identify the use of Ponzi financing in the hedge fund industry, Semmler & Chappe developed a dynamic portfolio model of wealth accumulation, which can be seen to reflect the risk taking operations of hedge funds.

The model that Semmler & Chappe developed “can be used to describe situations in asset management where the promise of above-average returns to investors can result in some hedge funds following a pattern of Ponzi financing” (2012, p. 21). Their simulations show that the higher the difference between promised return and actual return, the higher the likelihood that the hedge fund might eventually collapse. Given that hedge funds are investing in every kind of financial asset, and that the size of assets under management has grown significantly over the last ten years, this situation may carry systemic risk that is not properly understood or measured. As a result, it seems that increased regulation, including a more extensive disclosure of assets, investment strategy and audited financials, is inevitable in the industry, and the response to such regulations by hedge fund managers will also become an important facet of the constantly-evolving literature in this space.

Data & Methodology

To evaluate the statistical relationship between hedge fund returns and the returns of the broad stock market, I use data from the Hedge Fund Research Database, a tool that aggregates data on more than 7500 funds throughout various investment strategies. I use several different indices to evaluate hedge fund returns, ranging from a broad index to more specific indices based on investment strategy:

1. **HFRX Global Hedge Fund Index:** The HFRX Global Hedge Fund Index is designed to be representative of the overall composition of the hedge fund universe. It is comprised of all eligible hedge fund strategies; including but not limited to convertible arbitrage, distressed securities, equity hedge, equity market neutral, event driven, macro, merger arbitrage, and relative value arbitrage. The strategies are asset weighted based on the distribution of assets in the hedge fund industry.
2. **HFRX Event Driven Index:** Event Driven Managers maintain positions in companies currently or prospectively involved in corporate transactions of a wide variety including but not limited to mergers, restructurings, financial distress, tender offers, shareholder buybacks, debt exchanges, security issuance or other capital structure adjustments. Security types can range from most senior in the capital structure to most junior or subordinated, and frequently involve additional derivative securities. Event Driven exposure includes a combination of sensitivities to equity markets, credit markets and idiosyncratic, company specific developments. Investment theses are typically predicated on fundamental characteristics (as opposed to quantitative).
3. **HFRX Equity Hedge Index:** Equity Hedge strategies maintain positions both long and short in primarily equity and equity derivative securities. A wide variety of investment

processes can be employed to arrive at an investment decision, including both quantitative and fundamental techniques; strategies can be broadly diversified or narrowly focused on specific sectors and can range broadly in terms of levels of net exposure, leverage employed, holding period, concentrations of market capitalizations and valuation ranges of typical portfolios. Equity Hedge managers would typically maintain at least 50%, and may in some cases be substantially entirely invested in equities, both long and short.

4. **HFRX Macro/CTA Index:** Macro strategy managers trade a broad range of strategies in which the investment process is predicated on movements in underlying economic variables and the impact these have on equity, fixed income, hard currency and commodity markets. Managers employ a variety of techniques, both discretionary and systematic analysis, combinations of top down and bottom up theses, quantitative and fundamental approaches and long and short term holding periods. Although some strategies employ relative valuation techniques, Macro strategies are distinct from RV strategies in that the primary investment thesis is predicated on predicted or future movements in the underlying instruments, rather than realization of a valuation discrepancy between securities. In a similar way, while both Macro and equity hedge managers may hold equity securities, the overriding investment thesis is predicated on the impact movements in underlying macroeconomic variables may have on security prices, as opposed to EH, in which the fundamental characteristics on the company are the most integral to investment thesis.
5. **HFRX Equity Market Neutral Index:** Equity Market Neutral strategies employ sophisticated quantitative techniques of analyzing price data to ascertain information

about future price movement and relationships between securities, select securities for purchase and sale. These can include both Factor-based and Statistical Arbitrage/Trading strategies. Factor-based investment strategies include strategies in which the investment thesis is predicated on the systematic analysis of common relationships between securities. In many but not all cases, portfolios are constructed to be neutral to one or multiple variables, such as broader equity markets in dollar or beta terms, and leverage is frequently employed to enhance the return profile of the positions identified. Statistical Arbitrage/Trading strategies consist of strategies in which the investment thesis is predicated on exploiting pricing anomalies which may occur as a function of expected mean reversion inherent in security prices; high frequency techniques may be employed and trading strategies may also be employed on the basis on technical analysis or opportunistically to exploit new information the investment manager believes has not been fully, completely or accurately discounted into current security prices. Equity Market Neutral Strategies typically maintain characteristic net equity market exposure no greater than 10% long or short.

6. **HFRX Merger Arbitrage Index:** Merger Arbitrage strategies employ an investment process primarily focused on opportunities in equity and equity related instruments of companies which are currently engaged in a corporate transaction. Merger Arbitrage involves primarily announced transactions, typically with limited or no exposure to situations which pre-, post-date or situations in which no formal announcement is expected to occur. Opportunities are frequently presented in cross border, collared and international transactions which incorporate multiple geographic regulatory institutions, with typically involve minimal exposure to corporate credits. Merger Arbitrage strategies

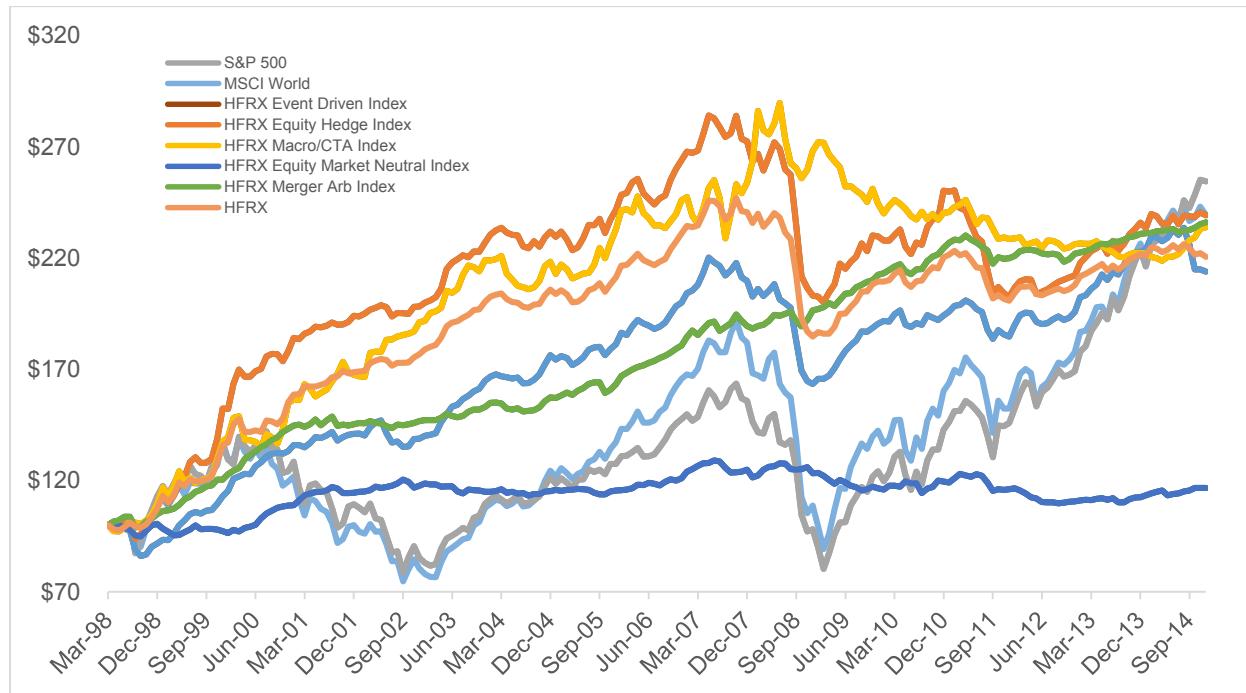
typically have over 75% of positions in announced transactions over a given market cycle.

To measure returns in the equity market, I use the S&P 500 Index, Standard and Poor's capitalization-weighted index that is designed to measure performance of the broad U.S. economy through changes in the aggregate market value of 500 stocks representing all major industries. Additionally, I use the MSCI World Index, which captures large and mid-cap representation across 23 developed countries. The index includes 1635 constituents, and covers ~85% of the free float-adjusted market capitalization in each country. I include a global index in my analysis to provide evidence of correlation outside the U.S. equity market.

I collected monthly return data for each index listed above, starting in March 1998 and going through December 2014. In order to accurately compare each index return, I assumed an investment of \$100 in each index, and grew that investment over time. For the S&P 500 Index and MSCI World Index, I assumed dividends would be reinvested in the index.

Results & Discussion

1998 – 2014 Return Analysis



Return Analysis

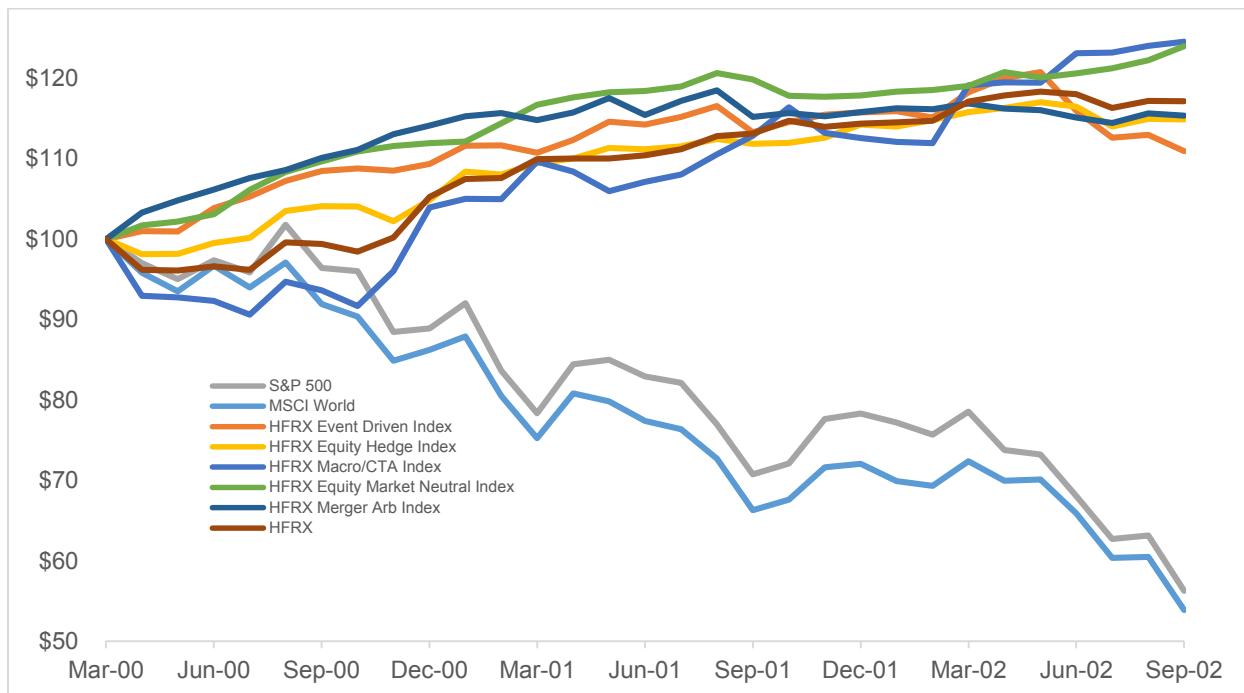
S&P 500	MSCI World	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral	Merger Arb
154%	139%	121%	114%	139%	134%	17%	136%

Correlation Analysis

Correlation '98 - '14	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral	Merger Arb
S&P 500	0.484	0.680	0.378	0.293	0.069	0.663
MSCI World	0.615	0.788	0.511	0.454	0.215	0.750

The analysis of relative return and correlation from 1998-2014 illustrates the relationship that exists between market returns and hedge fund returns over a 16 year period. It is interesting to note that regardless of the hedge fund strategy chosen, the S&P 500 outperformed every index over the long term. This conclusion identifies a fact that may surprise investors, in that over a long-term time horizon, the investment vehicle that provides the best return is not found through investing in a hedge fund, it is achieved through investing in the broad U.S. stock market. Additionally, the correlation between the HFRX Indices and the broad stock market reveals a higher-than-expected statistical relationship, which becomes stronger when the MSCI World Index is used as a proxy for the equity market.

March 2000 – September 2002 Bear Market Return Analysis

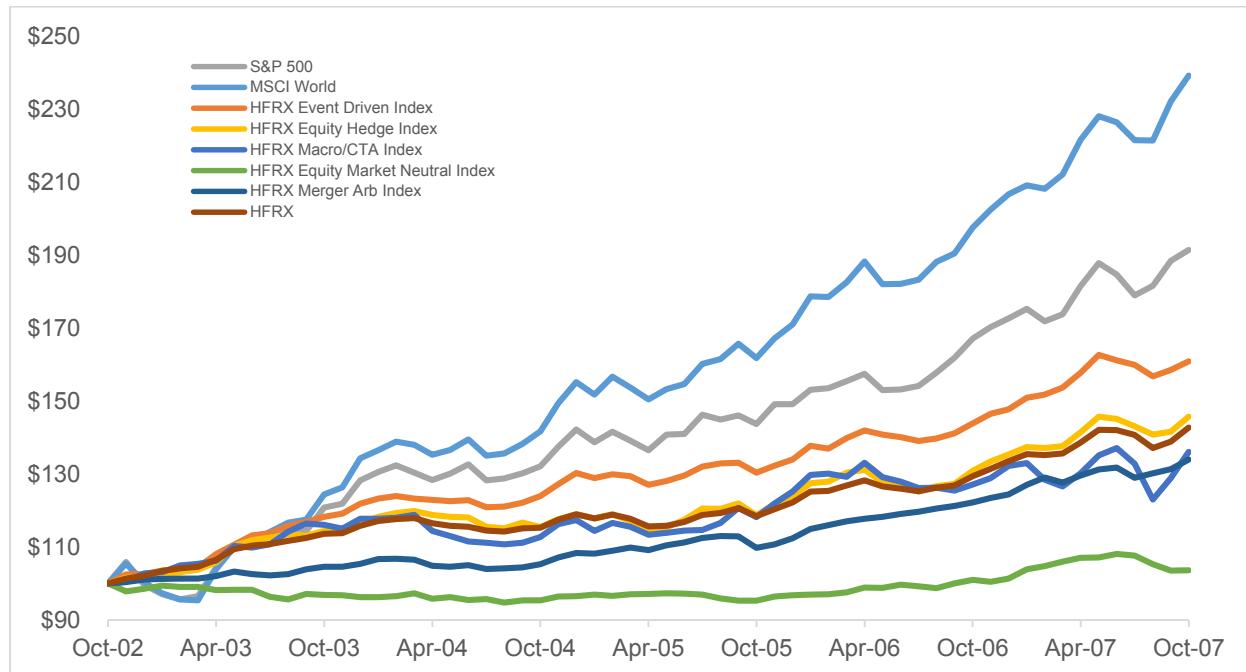


Return Analysis								
S&P 500	MSCI World	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral		Merger Arb
-44%	-46%	17%	11%	15%	25%	24%		15%

Correlation Analysis							
Correlation Mar '00 - Sep '02	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral	Merger Arb	
S&P 500	-0.901	-0.685	-0.860	-0.938	-0.886	-0.696	
MSCI World	-0.927	-0.755	-0.903	-0.934	-0.928	-0.766	

The bear market between March 2000 and September 2002 was caused by the collapse of the technology bubble as well as world economic effects arising from the September 11 attacks. During this time period, the U.S. stock market and the global stock market experienced large declines, while each hedge fund index experienced positive returns. The correlation during this bear market was widely negative, as hedge fund returns moved in the opposite direction of stock market returns. This time period provides a great example of why investors should invest in hedge funds, as exposure to the strategies above would have provided a safe haven for investors during this time of economic turmoil.

October 2002 – October 2007 Bull Market Return Analysis

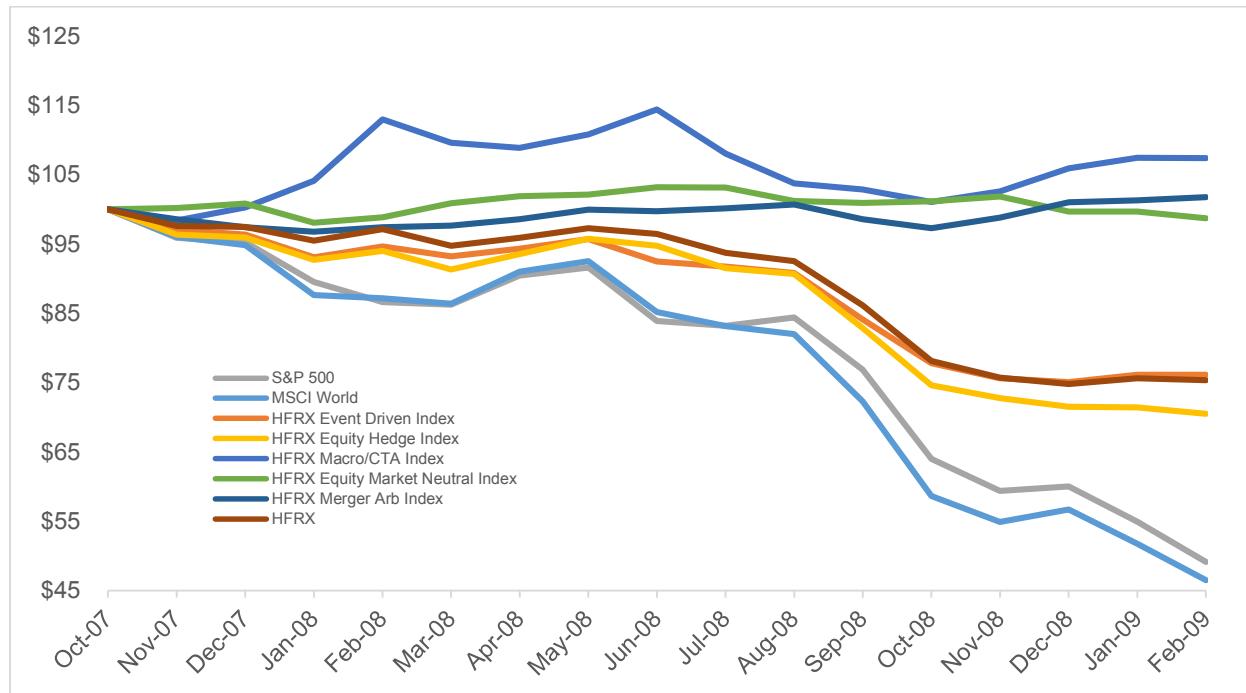


Return Analysis									
S&P 500	MSCI World	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral		Merger Arb	
91%	139%	43%	61%	46%	36%	4%		34%	

Correlation Analysis							
Correlation Oct '02 - Oct -07	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral	Merger Arb	
S&P 500	0.981	0.993	0.975	0.916	0.653	0.960	
MSCI World	0.983	0.992	0.975	0.922	0.689	0.976	

The five year bull market from the end of 2002 until the end of 2007 reveals an interesting statistical trend. The correlation of each hedge fund strategy with the domestic and global market was extremely high during this period, with all but one index correlated above 92%. Even the market neutral index was correlated over 65% with both market indices. The data strengthen the argument that hedge funds are, in fact, positively correlated to the broad market. In times of economic prosperity, investing in hedge funds becomes less attractive than investing in the broad equity market from a risk-return perspective. The above data lend credence to the finding in Bussiere, Hoerova & Klaus's study that revealed an increase in commonality during this time period between hedge funds and the broad equity market.

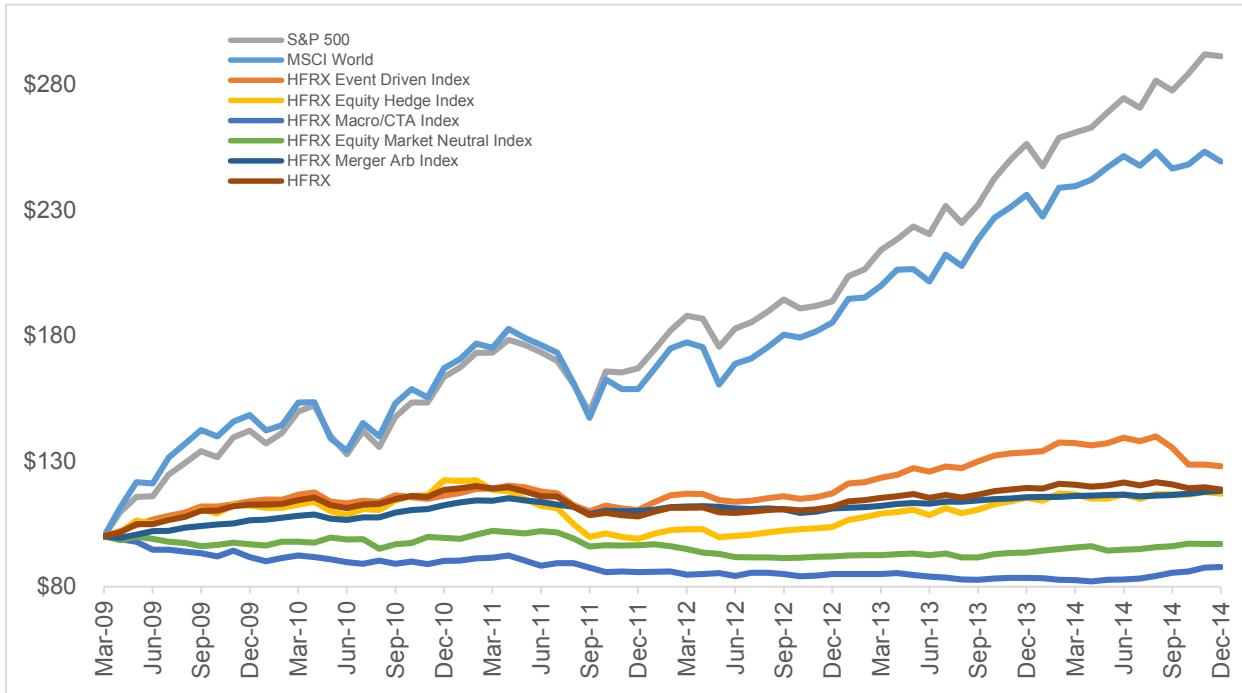
October 2007 – February 2009 Bear Market Return Analysis



Return Analysis								
S&P 500 -51%	MSCI World -54%	HFRX -25%	Event Driven -24%	Equity Hedge -30%	Macro/CTA 7%	Market Neutral -1%	Merger Arb 2%	

Correlation Analysis							
Correlation Oct '07 - Feb '09	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral	Merger Arb	
S&P 500	0.973	0.977	0.980	-0.068	0.184	-0.454	
MSCI World	0.984	0.988	0.989	-0.005	0.195	-0.421	

Unlike the bear market of 2000 – 2002, the global financial crisis affected hedge funds and the broad market similarly for the HFRX Global Hedge Fund Index, the Event Driven Index and the Equity Hedge Index. The correlations of these three indices with the broad market was at its highest point in my analysis during this time period, with each correlation coefficient exceeding .97. It seems as though the Market Neutral, Merger Arbitrage and Macro/CTA hedge fund strategies were able to effectively provide investors with returns uncorrelated with the equity market. It is important to examine this time period in the context of the last major bear market, and note the differences that have evolved throughout the bull market that followed.

March 2009 – December 2014 Bull Market Return Analysis**Return Analysis**

S&P 500	MSCI World	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral	Merger Arb
191%	149%	19%	28%	17%	-12%	-3%	18%

Correlation Analysis

Correlation Mar '09 - Dec '14	HFRX	Event Driven	Equity Hedge	Macro/CTA	Market Neutral	Merger Arb
S&P 500	0.751	0.928	0.393	-0.780	-0.447	0.879
MSCI World	0.810	0.954	0.464	-0.774	-0.405	0.900

In the time since the global financial crisis, the U.S. equity market has been a great place for investors to put money, with the S&P 500 returning 191% through the end of 2014. As illustrated above, investing in the best hedge fund strategy during this time period would return just 28%, or 4.38% per annum. Furthermore, the correlation of strong hedge fund strategies with the broad equity market during this period was high, and would not have offered investors much in the way of portfolio diversification. In comparing returns in this bull market with returns in the 2003 – 2007 bull market, it seems that hedge funds were even less able to provide attractive returns over the last five years.

Conclusion

The global financial crisis exposed weakness in many financial institutions and illustrated the idea of market contagion. As a result, an increased amount of regulation and controls has changed the financial market landscape, and investors have become especially weary of high correlations that can cause systemic risk. In this paper, I have studied the correlation of various hedge fund strategies with the U.S. and global equity markets, and analyzed this coefficient in the context of return performance over given time periods.

I find that as hedge funds have evolved over the last 16 years, their behavior during bear and bull markets has experienced a shift. During the 2000 – 2002 bear market, hedge funds offered a clear benefit to investors by delivering positive returns and negative equity market correlations. This behavior is consistent with the expectations of hedge funds, as they offered a safe, yet attractive vehicle for investors to earn a return during a market decline. Over the bull market from 2003 – 2007, however, we begin to see a clear change in hedge fund strategy. During this period of market strength, hedge funds were pressured to offer returns that would continue to attract investors, which became increasingly difficult as the broad equity market performed well. As a result, hedge funds seemed to gear their strategy toward returns, as opposed to an investment uncorrelated with the equity market.

This type of short-term strategy unraveled during the global financial crisis for the Global Hedge Fund Index (HFRX), the Event Driven Index and the Equity Hedge Index, as all three strategies suffered from their high correlations that developed over the previous three-year bull market. The Merger Arbitrage Index, the Macro/CTA Index and the Equity Market Neutral Index all performed strongly during the this bear market, and had low or negative correlations with the S&P 500 and the MSCI World Index. It seems that despite having relatively high

correlations with the market during the 2003 – 2007 bull market, these three strategies were able to offer a safe haven, much like the bear market from 2000 – 2002. This finding reveals an important point that investors must keep in mind when evaluating possible hedge fund exposure. Much like picking a stock for a portfolio, picking a hedge fund requires an in-depth analysis of strategy, market exposure and return characteristics.

This analysis has revealed that while certain hedge funds failed to deliver on their investment thesis of being uncorrelated to the market and exposed investors directly to the equity market during the financial crisis in 2008, this was not a problem with every hedge fund. This is an important addition to the literature on hedge funds, as much of the research and public perception has focused on the inability of funds to deliver during bear markets. The hedge funds that survive in the long term will be those that continue to stay disciplined in their investment strategy, and refuse to give in to the pressure of attracting investors away from the broad market during times of economic prosperity.

A possible area for further research could be conducted on a larger scale, using a greater number of hedge fund return data, or using statistical analysis to predict future performance during the next bear market. There is an inherent reporting bias that exists when one analyzes hedge fund returns, as reporting results is not required by funds. The implication is that hedge funds could report performance in positive years, and refuse to disclose performance in negative years. However, as regulation increases and hedge fund indices are relied on more heavily, reporting bias will inherently decline.

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