DiMeo Schneider & Associates, L.L.C.

GUIDE TO HEDGE FUNDS

DIMEO SCHNEIDER & ASSOCIATES, L.L.C.

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EXECUTIVE SUMMARY

HEDGE FUNDS

Opportunities, Challenges and Market Evolution

May 2019

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Institutional investors have shifted significant assets into hedge funds over the past four decades. According to Preqin, a London-based data firm providing analysis for alternative asset professionals, there are over 8,000 active hedge funds with nearly $3.6 trillion in assets under management. Despite a recent slowdown in launches, today's hedge fund landscape has a plethora of new and specialized strategies and the demand from investors remains robust. While an effective hedge fund allocation may improve the overall risk-adjusted performance of an investment portfolio, the asset class also introduces risks that must be diligently managed.

While technical definitions vary across borders, hedge funds can be broadly defined as actively managed pools of capital following unconventional investment strategies. These are typically unregistered investment vehicles intended for sophisticated institutional investors and high net worth individuals. In the truest sense, "hedge funds" is not an asset class, but rather a legal structure facilitating an amalgam of strategies invested across various asset classes. The term "hedge fund" serves as a catchall phrase for private investment partnerships that can invoke short-selling, or betting the price of a security will fall, regardless of whether true hedging techniques are actually employed.

This paper will delve into the evolution of the hedge fund space broadly, decipher popular sub-strategies, discuss how portfolio managers are typically evaluated and highlight the role and associated risks of hedge funds in an investment portfolio.

THE EVOLUTION OF HEDGE FUNDS

Alfred Winslow Jones created the first hedge fund in the late 1940s and is widely regarded as the father of the modern hedge fund industry. Jones' thought to combine speculative tools to create what he considered a more conservative or "hedged" investment strategy. He used leverage to buy shares, but also employed short selling to reduce exposure to market risk. He bought as many stocks as he sold short, so that up and down market moves offset one another. His objective was to render the market's direction irrelevant and generate positive returns by buying undervalued stocks and selling overvalued stocks.

Jones' pioneering fund avoided the requirements of The Investment Company Act of 1940 by restricting itself to 99 investors in a limited partnership structure and charged a 20 percent incentive fee on portfolio gains. The private partnership structure, the incentive fee and the blending of long and short positions remain core elements of the hedge fund industry today.

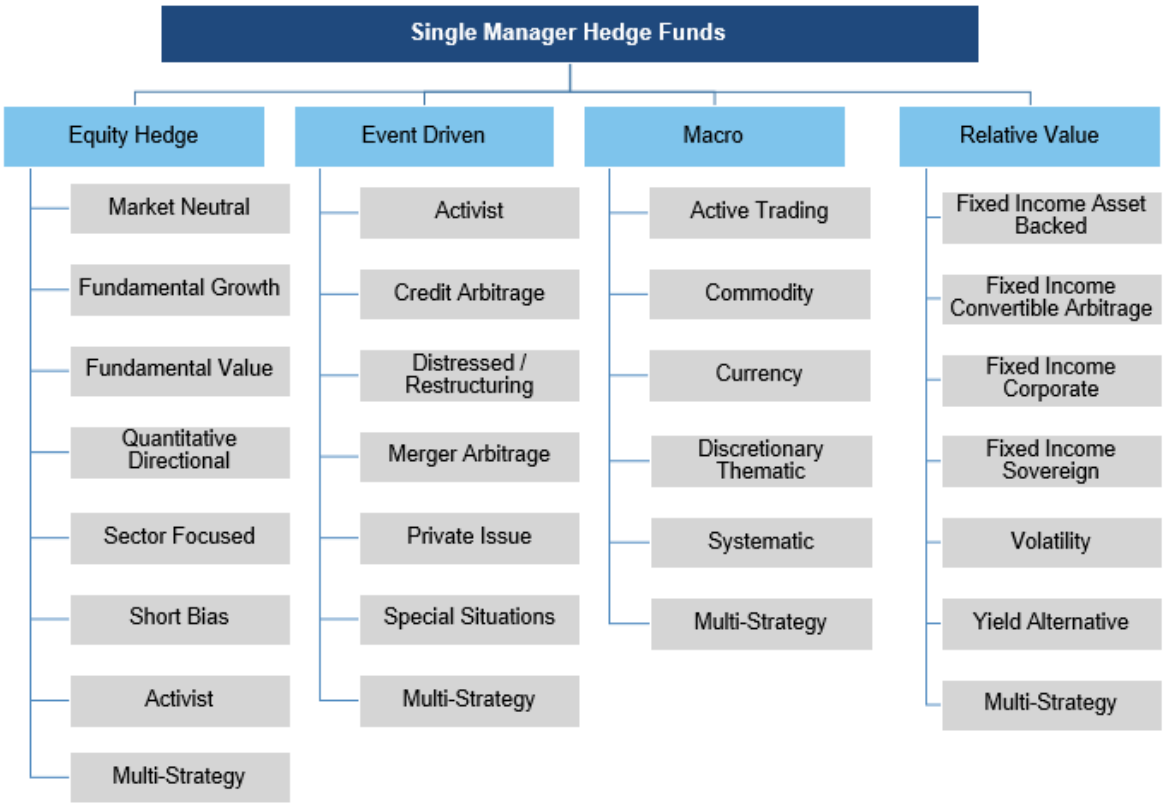
Hedge funds spent the 30 years between 1950 and 1980 in relative obscurity. However, by the mid-1980s, long/short equity and global macro managers dominated the landscape as hedge fund legends Julian Robertson, George Soros and others seized headlines in the financial press. Media attention venerated such managers and drove many high net worth investors to seek out hedge funds for the first time.

The industry became popular and grew considerably in the 1990s. In 1992 George Soros made a famous and massively profitable short bet on the British pound that "broke the Bank of England." Long Term Capital Management's hazardous implosion in 1998 remains infamous. According to Hedge Fund Research, hedge fund assets grew from $39 billion in 1990 to $539 billion by 2001. Over the same period, the total number of hedge funds increased more than seven fold from 610 to 4,454.

MODERN HEDGE FUND STRATEGIES

The first decade of the 21st century was eventful for hedge funds. By the end of 2018, Preqin counts over 8,000 total hedge funds with nearly $3.6 trillion in assets. Despite a recent slowdown in launches, today's hedge fund landscape has a plethora of new and specialized strategies. Exhibit I shows Hedge Fund Research's classification system. There are four broad strategies: Equity Hedge, Event Driven, Macro and Relative Value. Each strategy is composed of several underlying sub-strategies with varying styles. Many of these strategies, sub-strategies and styles overlap.

Exhibit I
Hedge Fund Strategy Classification[1]



EQUITY HEDGE

Equity hedge managers maintain long and short positions primarily in equity and derivative securities. Portfolio selection can be driven by either quantitative or fundamental analysis. Strategies can be broad (generalist) or narrow (sector specific) and fund profiles vary greatly depending on net exposure, leverage, holding periods and portfolio construction.

Equity hedge sub-strategies:

- Market neutral managers often use quantitative techniques to build long/short portfolios, but maintain little directional exposure to the market.
- Quantitative directional managers are similar to market neutral managers, but they have greater leeway to maintain directional market exposure.

[1] *Source: HFR Global Industry Report – Year End 2010*

- Fundamental growth and value managers follow stock selection processes similar to traditional growth and value managers, but can also employ leverage and short-selling.
- Sector specialists concentrate on specific sectors, such as healthcare, technology, or energy and usually maintain net positive market exposure.
- Short-biased strategies are similar to traditional long/short, but typically maintain varying levels of net short exposure.
- Multi-strategy equity hedged managers employ multiple hedged equity strategies within a single portfolio.

EVENT DRIVEN

Event driven managers take positions in companies involved in corporate transactions such as mergers, restructurings, tender offers, shareholder buybacks, debt exchanges, management or board changes, security issuance or other capital structure events. Security types can include equity, debt and derivatives. The investment theses are typically fundamentally driven and range from hard catalyst situations to soft catalyst situations.

Event driven sub-strategies:

- Activist managers seek to gain control to change management or the strategic direction of a company to maximize shareholder value.
- Credit arbitrage managers seek to exploit mispricing among debt securities of an issuer.
- Distressed managers seek to profit from purchasing deeply discounted credit securities or related instruments as a result of a company's actual or impending bankruptcy.
- Merger arbitrage managers seek opportunities in equity and equity related instruments of companies engaged in ownership transactions.
- Private issue strategies buy equity and equity related instruments that are primarily private or illiquid securities of companies.
- Special situation managers focus on opportunities in equity, credit and related instruments of companies which are engaged in a corporate transaction, security issuance/repurchase, asset sales, division spin-off or other catalysts.
- Multi-strategy event-driven managers employ multiple event-driven strategies within a single portfolio.

MACRO

Macro managers take a top-down, economic world view. They engage in strategies where economic and political change impacts equity, fixed income, currency and commodities markets.

Macro sub-strategies:

- Active trading strategies employ either discretionary or systematic trading in multiple asset classes. Systematic means that mathematical, algorithmic and technical models drive portfolio positioning. Discretionary strategies rely on fundamental evaluation of markets.
- Single commodity managers trade a single commodity type (e.g. metals, energy, agriculture) using a fundamental, systematic, or technical process.

- Multi-commodity managers include both discretionary and systematic commodity strategies. The systematic commodity trading strategies are often used by Commodity Trading Advisors (CTAs). Discretionary commodity strategies rely on fundamental evaluation of markets, supply/demand relationships and other influences as they relate to commodity markets.
- Currency discretionary strategies rely on fundamental evaluation of market data to trade currency markets. They generally use top-down macroeconomic analysis of variables.
- Currency systematic strategies are driven by mathematical, algorithmic and technical models.
- Discretionary thematic strategies trade in equity, interest rates, fixed income, currency and commodity markets. They rely on the evaluation of market relationships and influences and a top down analysis of macroeconomic variables.
- Systematic diversified strategies trade multiple asset classes and are driven by mathematical, algorithmic and technical models.
- Multi-strategy macro managers employ a variety of macro strategies within a single portfolio.

RELATIVE VALUE

Relative Value managers seek to exploit pricing discrepancies between securities. They employ a variety of fundamental and quantitative techniques to develop investment theses. They trade equities, fixed income, convertible bonds and derivatives.

Relative value sub-strategies:

- Fixed income asset backed strategies seek to exploit mispriced spread relationships between related fixed income instruments backed by physical collateral or other financial obligations such as loans, mortgages and credit cards.
- Fixed income convertible arbitrage strategies seek to exploit mispricing between a convertible bond and the stock of the issuer. They also may arbitrage spreads between other related instruments.
- Fixed income corporate strategies seek to exploit the spread between multiple related corporate fixed income instruments. Fixed income corporate strategies differ from event driven credit arbitrage in that the former uses general market hedges. Event driven credit arbitrage typically has little or no net credit market exposure.
- Fixed income sovereign strategies seek to exploit spreads between a sovereign fixed income instrument (foreign government bond) and some related instrument (a corporate bond or a derivative contract).
- Volatility strategies trade implied volatility as an asset class. They use derivative instruments such as options and swaps on the volatility index (VIX) or some other measure of volatility. Volatility exposures can be long, short, neutral or variable to the direction of implied volatility.
- Yield alternatives energy infrastructure strategies seek to exploit valuation discrepancies between master limited partnerships (MLPs), utilities or power generators.
- Alternatives real estate strategies seek to exploit the valuation differences between related instruments with exposure to real estate. Strategies are typically fundamentally driven.
- Multi-strategy relative value seeks to arbitrage spread relationships among any of the above.

MULTI-STRATEGY

Multi-strategy funds allocate capital opportunistically among various hedge fund categories, strategies and styles. Multi-strategy managers typically lever the whole portfolio. Total portfolio assets back the obligations of each specific underlying leveraged position. There is an important difference between single multi-strategy manager and multi-strategy fund of funds. Cross collateralization within a single multi-strategy manager theoretically allows one errant highly levered strategy or trade to bring down the entire portfolio. A multi-strategy fund of hedge funds allocates capital to several hedge fund firms so this cross collateralization does not occur.

FUND OF HEDGE FUNDS

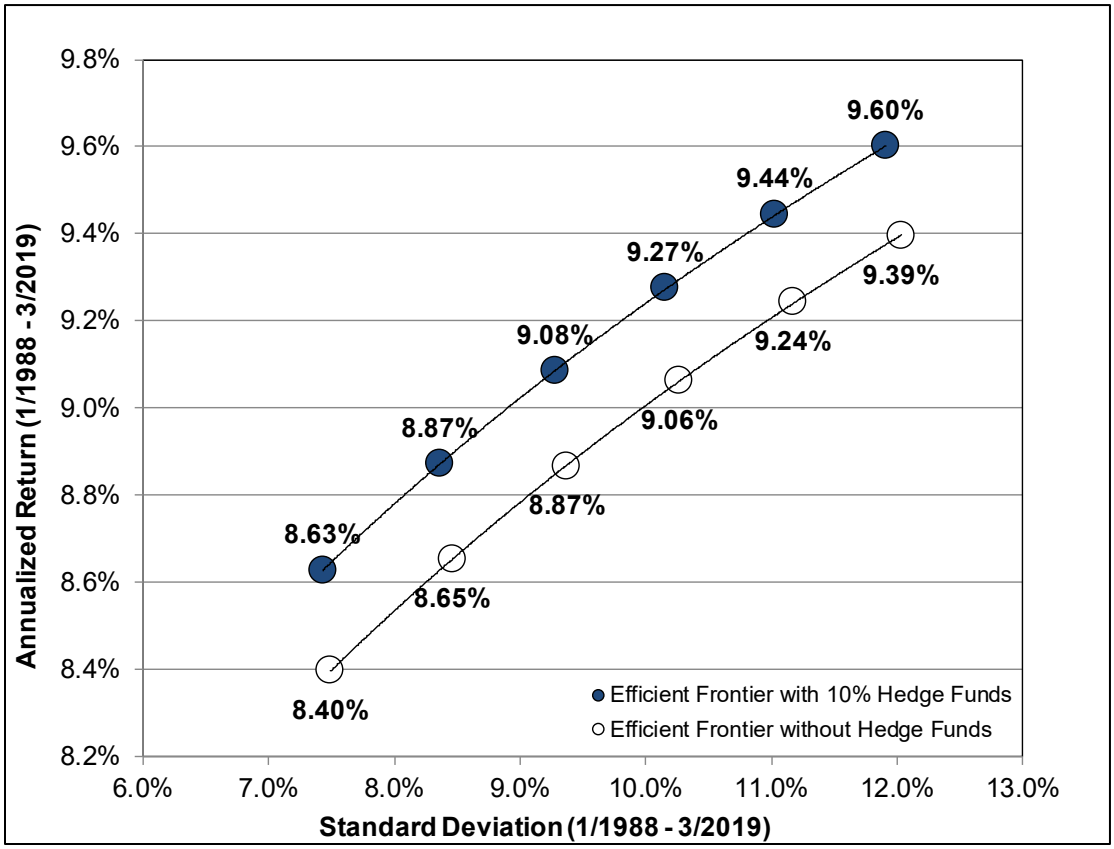
Fund of hedge funds managers invest in other hedge funds or managed account programs. A fund of hedge funds provides investors with a “one-stop-shop” to achieve strategy and manager diversification. A fund of hedge funds may also tactically weight the portfolio toward the strategies and managers that are best positioned for the future. The portfolio will typically diversify across a variety of investment managers, investment strategies and sub-strategies. Fund of hedge funds have a double layer of fees.

WHY INVEST IN HEDGE FUNDS?

Hedge funds play a specific role within an investment portfolio, which is to improve risk-adjusted performance. That can be achieved by either increasing the expected return without increasing the expected risk or reducing the expected risk without decreasing the expected return. Exhibit II illustrates a theoretical 31-year performance history (January 1988 to March 2019) for six well-diversified portfolios along two frontiers - one that includes and one that excludes a 10 percent allocation to hedge funds. The six portfolios on each frontier represents a range from 11 percent fixed income to 70 percent fixed income with the remainder allocation to equities or other non-hedge fund alternative investments. This range is meant to illustrate a spectrum of investment objectives and risk constraints applicable to different types of investors. Aside for hedge funds, both frontiers include the following asset classes; cash, TIPS, U.S. investment grade bonds, foreign developed bonds, high yield bonds, U.S. equities (all-cap), international developed equities, emerging markets equities, real estate and MLPs. Indices were used for asset class proxies and monthly rebalancing was used for illustrative purposes (see Exhibit III for details).

We must note that investing directly in indices is impossible. However, for the purpose of this exercise, we do use inidices to illustrate historical risk-adjusted performance with as few biases as possible. The **HFRI Fund Weighed Index** was used as the performance proxy for a diversified portfolio of hedge fund strategies. This index represents a peer group of funds invested across strategies. As we’ll discuss later, hedge fund indices have uniquely flawed construction methods that lead to performance biases. The performance history of any hedge fund index should be viewed with a healthy amount of skepticism.

Exhibit II
Efficient Frontier Including and Excluding Hedge Funds (1/1988 – 3/2019)



Historical returns and metrics for the portfolios displayed above are hypothetical and were simulated using the weighted average returns of indices that represent various asset classes. The portfolios do not represent client portfolios and the historical returns/metrics associated with each do not represent actual returns earned by a client. The portfolios displayed do not represent an investment proposal or recommendation. As with all back tested performance, there are inherent limitations which are derived from the retroactive application developed with the possible benefit of hindsight, including the risk that certain factors such as material economic and market conditions could have contributed to materially different (either higher or lower) performance results than those depicted. The portfolio returns displayed do not deduct fees, which would reduce the returns displayed.

As Exhibit II illustrates, a 10 percent hedge fund index allocation increased the historical returns along the entire frontier by approximately 0.20 percent annually, without increasing volatility. Over a 31 year period, the difference between annual compounding at a 9.27 percent vs. 9.06 percent for a $100 million portfolio is nearly $90 million.

From January 1988 to March 2019, The **HFRI Fund Weighted Index** earned an annualized return of 10.2 percent with a standard deviation of 7 percent. Over the same period, the S&P 500 Index returned 10.5 percent with a 14.1 percent standard deviation and the Barclays Aggregate Bond Index returned 6.2 percent with 3.7 percent standard deviation. Hedge funds had an R^2 of 0.55 to the S&P 500 Index, meaning approximately 55 percent of the return variance could be explained by large cap U.S. stocks. Although the R^2 has increased over the last decade, the beta of hedge funds to the S&P 500 Index remains low at 0.35. Hedge funds had an R^2 of

0.02 to Barclays Aggregate U.S. Bond Index, meaning approximately 2 percent of the return variance could be explained by U.S. investment grade bonds.

Exhibit III shows the index proxies used to represent each asset class and their historical performance from 1988 to March 2019. Allocating to hedge funds over this period improved the risk-adjusted performance of a portfolio, regardless of where that portfolio falls on the risk/reward spectrum. The historical outperformance was driven by the hedge fund index's relatively high Sharpe Ratio, or return per unit of risk, as well as its relatively low correlation to other asset classes in the portfolio.

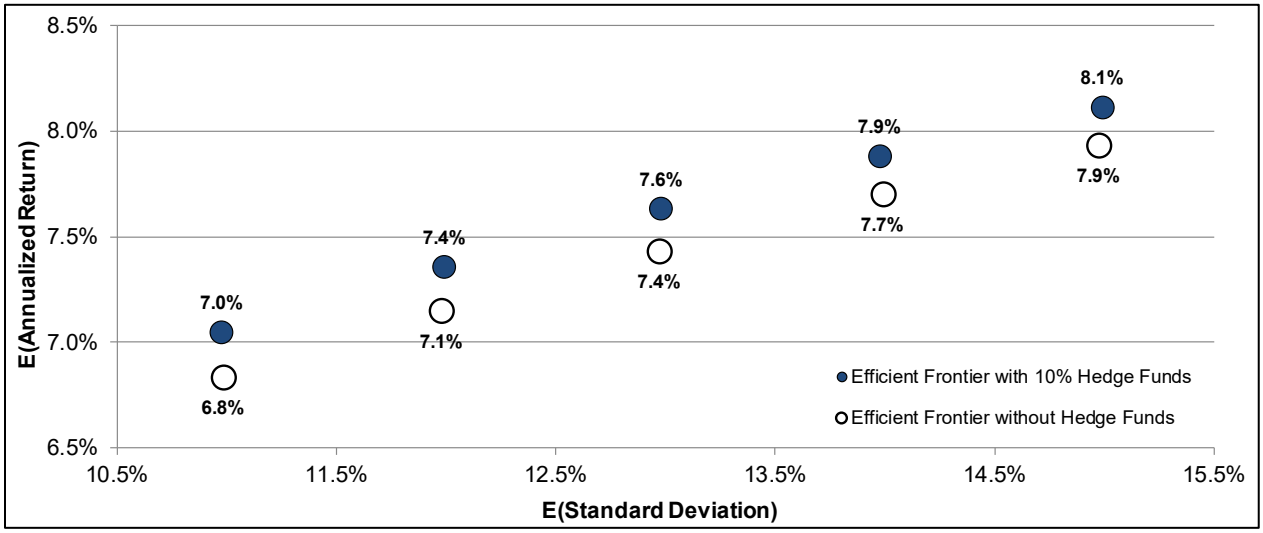
Exhibit III
January 1988 to March 2019 Performance Metrics

	Hedge Funds	Cash	TIPS	U.S. Bonds	Foreign Developed Bonds	High Yield Bonds	U.S. Equity All-Cap	International Developed Equity	Emerging Market Equity	Real Estate	MLPs
Annualized Returns	**10.2%**	3.1%	6.3%	6.2%	5.7%	8.2%	10.6%	5.6%	10.7%	9.0%	13.4%
Annualized Standard Deviation	**7.0%**	0.7%	5.2%	3.7%	5.1%	8.4%	14.3%	16.7%	22.5%	18.8%	15.8%
Maximum Calendar Year Return	**32.2%**	8.6%	18.5%	18.5%	18.7%	58.2%	36.8%	39.2%	79.0%	37.1%	76.4%
Minimum Caendar Year Return	**-19.0%**	0.0%	-8.6%	-2.9%	-2.0%	-26.2%	-37.3%	-43.1%	-53.2%	-39.8%	-36.9%
Maximum Drawdown	**-21.4%**	0.0%	-12.2%	-5.1%	-6.8%	-33.3%	-51.2%	-56.4%	-61.4%	-70.9%	-48.5%
Drawdown Start Date	**Oct-07**	N.A.	Feb-08	Jan-94	Jul-16	May-07	Oct-07	Oct-07	Oct-07	Jan-07	Aug-14
Drawdown End Date	**Feb-09**	N.A.	Oct-08	Jun-94	Dec-16	Nov-09	Feb-09	Feb-09	Feb-09	Feb-09	Feb-16
Duration of Drawdown (Years)	**1.4**	N.A.	0.8	0.5	0.5	1.6	1.4	1.4	1.4	2.2	1.6

Please see appendix for detailed index information in Exhibit III.

In Exhibit III above, it is clear that an allocation to hedge funds added value within a diversified portfolio. However, past performance is not indicative of future returns. In order to determine if hedge funds can add value going forward, we constructed a forward looking asset allocation model. This model quantifies the ten year return forecast for various portfolio combinations by aggregating the risks, returns and correlation coefficients of all underlying assets. Exhibit VI summarizes the 2019 to 2029 forecast assumptions.

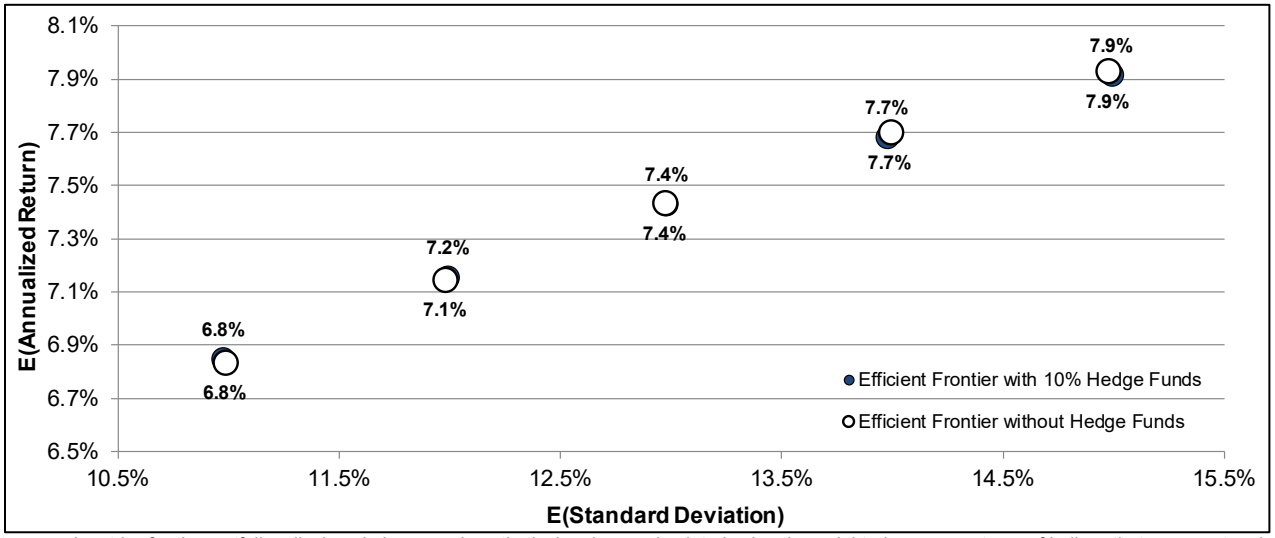
Exhibit IV
Efficient Frontier Forecast Including and Excluding Hedge Funds (2019 – 2029)
Assumes 8 percent Expected Hedge Fund Return



Historical returns and metrics for the portfolios displayed above are hypothetical and were simulated using the weighted average returns of indices that represent various asset classes. The portfolios do not represent client portfolios and the historical returns/metrics associated with each do not represent actual returns earned by a client. The portfolios displayed do not represent an investment proposal or recommendation. As with all back tested performance, there are inherent limitations which are derived from the retroactive application developed with the possible benefit of hindsight, including the risk that certain factors such as material economic and market conditions could have contributed to materially different (either higher or lower) performance results than those depicted. The portfolio returns displayed do not deduct fees, which would reduce the returns displayed.

Exhibit IV illustrates a 10 year forecast for the same portfolio combinations illustrated in Exhibit II. In the forecast model, U.S. equities have an expected return of 6.2 percent. Investment grade U.S. bonds have an expected return of 3.5 percent, reflecting the average yield-to-maturity of the Barclays Aggregate U.S. Bond index as of March 31, 2019. In Exhibit IV, the expected portfolio return for a diversified portfolio of hedge funds is 8.0 percent. If these forecasts are reasonably accurate, hedge funds should improve the expected annualized return of the portfolios along the frontier by 0.20 percent to 0.30 percent without increasing the expected risk.

Exhibit V
Efficient Frontier Forecast Including and Excluding Hedge Funds (2019 – 2029)
Assumes 6 percent Expected Hedge Fund Return



Historical returns and metrics for the portfolios displayed above are hypothetical and were simulated using the weighted average returns of indices that represent various asset classes. The portfolios do not represent client portfolios and the historical returns/metrics associated with each do not represent actual returns earned by a client. The portfolios displayed do not represent an investment proposal or recommendation. As with all back tested performance, there are inherent limitations which are derived from the retroactive application developed with the possible benefit of hindsight, including the risk that certain factors such as material economic and market conditions could have contributed to materially different (either higher or lower) performance results than those depicted. The portfolio returns displayed do not deduct fees, which would reduce the returns displayed.

Exhibit V depicts the efficient frontier using a 6.0 percent return forecast for a diversified multi-strategy portfolio of hedge funds, while holding all other variables constant (i.e., returns for non-hedge fund asset classes, volatility for all assets and correlations for all assets). In this illustration, hedge funds, with a 6 percent expected return, neither add nor detract significantly from the portfolio in terms of risk or reward.

Therefore, one threshold for investing in hedge funds may be whether or not a diversified multi-strategy hedge fund portfolio will be able to generate at least a 6.0 percent return over a market cycle. The greater the expected return above this threshold level, the stronger the rationale for allocating to hedge funds. This 6 percent return threshold may be applicable in a 2019 capital markets environment, but may not be applicable in five or ten years. A simple heuristic for predicting future market performance is to average the U.S. equity and U.S. investment grade bond forecasts - currently at 4.8 percent. If a diversified hedge fund portfolio cannot outperform that proxy, with average volatility, then an investment in the asset class may not be warranted.

Exhibit VI
Forecast Assumptions (2019 – 2029)

Returns and Volatility

Asset Class	Expected Geometric Annual Return	Expcted Risk (σ)
Hedge Funds	Varied	10.6%
Cash	2.3%	0.0%
TIPS	3.1%	10.7%
U.S. Bonds	3.5%	7.0%
Foreign Developed Bonds	2.7%	9.1%
High Yield Bonds	5.9%	14.4%
U.S. Equities All-Cap	6.2%	16.9%
International Developed Equity	8.0%	22.2%
Emerging Market Equity	10.3%	29.3%
Real Estate	6.1%	21.2%
MLPs	11.5%	20.7%

Correlation Matrix

Asset Class	Hedge Funds	Cash	TIPS	U.S. Bonds	Foreign Developed Bonds	High Yield Bonds	U.S. Equities All-Cap	International Developed Equity	Emerging Market Equity	Real Estate	MLPs
Hedge Funds	1	0	0.11	0.09	0.07	0.64	0.78	0.68	0.79	0.45	0.35
Cash	0	1	0	0	0	0	0	0	0	0	0
TIPS	0.11	0	1	0.76	0.57	0.28	0.03	0.1	0.15	0.23	0.14
U.S. Bonds	0.09	0	0.76	1	0.54	0.29	0.19	0.16	0.03	0.21	0.08
Foreign Developed Bonds	0.07	0	0.57	0.54	1	0.09	0.03	0.38	0.11	0.1	0.04
High Yield Bonds	0.64	0	0.28	0.29	0.09	1	0.6	0.52	0.57	0.59	0.42
U.S. Equities All-Cap	0.78	0	0.03	0.19	0.03	0.6	1	0.67	0.68	0.64	0.32
International Developed Equity	0.68	0	0.1	0.16	0.38	0.52	0.67	1	0.7	0.48	0.3
Emerging Market Equity	0.79	0	0.15	0.03	0.11	0.57	0.68	0.7	1	0.45	0.3
Real Estate	0.45	0	0.23	0.21	0.1	0.59	0.64	0.48	0.45	1	0.24
MLPs	0.35	0	0.14	0.08	0.04	0.42	0.32	0.3	0.3	0.24	1

ALPHA-BETA FRAMEWORK, HEDGE FUNDS AND FEES

The alpha-beta divide is a confusing and often misconstrued concept. It seems simple - "beta is risk" and "alpha is skill". The term "beta," derived from the Capital Asset Pricing Model (CAPM), describes the component of an investment's total return that is explained by its exposure to a market (systematic) risk factor. For example, if a large cap stock portfolio has a beta of 1.0 to the S&P 500 index; it has the same market risk as the S&P 500 index. If this stock portfolio generates a 10.75 percent return when the S&P 500 returns 10 percent, the beta component of total return was 10 and the alpha component was 0.75. Investors can capture beta passively as it requires minimal skill. Beta is viewed as a commodity and should not command a pricing premium.

Hedge funds, as opposed to index funds, are pricing alpha not beta. Hedge funds have significantly higher fees than passive investing vehicles and traditional active long-only money managers. A common criticism is that hedge funds charge unreasonably high management fees. Exhibit VII provides a hypothetical framework for comparing two managers; **Manager A** is a traditional long-only large cap mutual fund with a 0.75 percent management fee and **Manager B** is a long/short equity hedge fund with a traditional 2 percent management fee and a 20 percent performance fee on profits.

Exhibit VII

Metrics	Manager A Long-Only Mutual Fund	Manager B Long/Short Hedge Fund
Manager Fee	0.75%	2% Base + 20% on Performance
Manager Beta to S&P 500 Index	1.00	0.40
Gross Manager Return (Before Fees)	9.00%	7.30%
Positive Alpha Hurdle Adjusted for Beta	8.00%	3.20%
Total Management Fee	0.75%	3.06%
Manager Return Net of Fees	8.25%	4.24%
Alpha Net of Fees	0.25%	1.04%
Alpha Net of Fees / Total Return	3.00%	24.50%
Total Fee / Alpha Net of Fees	3.00	2.94

S&P 500 Index Return	8.00%
Treasury Bill Return	0.00%

In this example, the S&P 500 Index returns 8 percent. **Manager A** returns 9.0 percent before and 8.25 percent after fees. **Manager A** has a beta of 1.0, which translates into an 8 percent alpha hurdle and +0.25 percent of net alpha. **Manager B** returns 7.3 percent before and 4.24 percent after fees. **Manager B** has a lower 0.40 beta, which lowers the alpha hurdle to 3.2 percent, which translates to 1.04 percent of net alpha generation.

So which manager is more expensive? **Manager A** has the lower absolute fee (0.75 percent vs. 3.06 percent). However, **Manager A** has a higher fee if measured in terms of fee per unit of alpha. **Manager A** has a fee 3x its net alpha, while **Manager B** has a fee 2.94x its net alpha. Only 3 percent of **Manager A**'s total net return is alpha (.25 percent / 8.25 percent = 3 percent), while 24.5 percent of **Manager B**'s total net return is alpha (1.04 percent / 4.24 percent = 24.5 percent). The beta component of total return is a commodity that can be generated passively and inexpensively. Alpha is the only component of return that warrants a pricing premium.

The vast majority of the total return generated by an investment portfolio is derived from exposure to risk premia. Risk premia, or betas, are a valuable and essential component of total return, but they are also fungible commodities that can be inexpensively replicated with passive management. It may not be difficult to gain exposure to various betas, but effectively incorporating those betas in a diversified portfolio requires skill and knowledge. Adding an asset class like commodity futures to a portfolio can improve the risk adjusted performance, but asset classes are sources of betas and not sources of alpha. Which is why it is important to identify and incorporate alpha-generating managers into an investment portfolio.

Deciphering alpha versus beta as it relates to hedge funds can be challenging. For example, perhaps a hedge fund bets on commodity price increases by allocating more capital to commodities. The hedge fund then profits when stock prices fall and commodity prices rise. Subsequently, the hedge fund presents its return stream relative to the S&P 500 Index and alpha is positive. Is this outperformance actually alpha or is it simply high beta relative to the commodity index? It could very well be beta disguised as alpha.

If we look back at Exhibit VII, it is difficult to know whether or not **Manager B**'s outperformance is alpha or beta, or if the fee per unit of outperformance is meaningful. **Manager A** is a large cap mutual fund and we have access to its underlying holdings, therefore, we can see how it generated alpha – either through sector and/or security selection. The problem with sometimes opaque hedge funds is that typically one doesn't have sufficient information to make the alpha versus beta judgment. Investors in hedge funds require a much greater understanding of the strategies, styles and alpha theses to objectively assess manager skill.

While a skilled hedge fund manager may generate alpha, a significant portion of return can still be derived from beta. If hedge funds were alpha-only vehicles, then the average multi-strategy fund of hedge funds would not have lost over 20 percent in the 2008 financial crisis. Quantifying beta at the top-down hedge fund industry level is fairly easy. However, it is challenging to quantify it at the individual manager level as some managers are very skilled at dressing up beta to look like alpha.

HEDGE FUND INDICES AND BENCHMARKS

The purpose of any index is to serve as a useful benchmark, enabling investors to objectively evaluate manager performance. It is helpful to understand the minimum requirements for an index to be considered a useful benchmark. This is outlined below:

- The index must be representative of the mandate.
- The index holdings and weights within the benchmark must be identifiable and unambiguous.
- An investor should be able to replicate the index benchmark passively.

- The index benchmark's performance must be measurable on a regular basis.
- The index constituents classification or strategy in the benchmark must be formulated from public information and be consistent with market opinions.
- The index benchmark must be constructed before the measurement period begins.

Hedge fund indices seek to represent the performance of hedge fund peer groups. There are two types of hedge fund index categories and both struggle to meet the above requirements. The first type is an investable index, which only includes funds that are accepting new capital and excludes funds that are closed to new capital. In addition to serving as a hedge fund performance benchmark, investable hedge fund indices are able to be passively replicated. Therefore, they meet at least one of the useful benchmark requirements. However, by excluding managers that are closed to new investments, these indices do not fully represent the population of hedge funds. The second type of hedge fund index is a non-investable index. Non-investable indices also fail to meet the definition of a useful benchmark. These indices include hedge funds that are closed to new capital and therefore cannot be passively replicated. While non-investible indices are perhaps more representative of hedge fund peer groups, they suffer from certain biases.

Index providers screen the universe on broad metrics such as assets under management and length of track record in order to establish minimum inclusion requirements. Once the index providers have applied these screens, each fund is classified by investment style (equity long/short, global macro, relative value and more). Each index provider applies unique style screens. Because index providers have differing definitions and methodologies for classifying strategies, fund categorization can be inconsistent. For example, a fund may be classified as "event-driven" by one provider and "merger arbitrage" by another. Further complicating matters, some index providers use equal weightings while others use asset-based weightings to construct an index. The index providers are also inconsistent in the timing of assumed rebalancing, some rebalance monthly and others rebalance quarterly.

Due to the private, unregistered nature of hedge funds, databases and indices have several other imperfections. Calculating index returns based on the performance of funds still operating at the end of a reporting period leads to survivorship bias. This bias may positively skew index performance because funds no longer operating are often liquidated as a result of poor performance and excluded from the index. Established indices typically have less survivorship bias once back-filled data is no longer used. Once a fund reports to an index, historical returns remain in the index even if fund is liquidated.

Liquidation bias occurs when funds in the process of liquidating stop reporting prior to a full liquidation; the index loses several months of performance as the hedge fund winds down operations. This bias tends to skew index performance upward as a poorly performing fund is removed from the index before it is finished inflicting damage on investors. Selection bias occurs when selection criteria differs by index provider and construction methods vary. Self-reporting bias occurs when there is no official hedge fund database and participation is voluntary. Managers with poor track records often do not report performance, or only begin reporting once performance has improved. Larger and more successful funds have less incentive to report given they no longer need to attract new investors. Backfilling bias occurs when there is a lag between a fund's inception and the date it begins

reporting results to a database. This bias can lead to funds entering a database for the first time only after they have established a strong performance track record. Presumably, unsuccessful funds may never report performance and simply disappear as if they never existed.

Two of the more widely recognized index providers are *Hedge Fund Research, Inc. (HFRI)* and *Dow Jones*. HFR was established in 1992 and specializes in hedge fund indices, database management and analytics. HFR produces over 100 hedge fund indices, ranging from an industry level down to specific, niche sub-strategies as well as strategies with a regional focus. With performance history dating back to 1990, the HFRI Fund Weighted Composite Index is a widely recognized benchmark. The HFRI suite of products leverages the HFRI database to provide detailed, current, comprehensive and relevant aggregate reference points for all facets of the hedge fund industry. The Dow Jones Credit Suisse Hedge Fund Indexes are a family of hedge fund indices that include broad market and investable indexes. The indices are constructed from a database of more than 9,000 hedge funds. The database consists of approximately twenty indexes, including a range of geographical and strategy-specific hedge fund indexes.

HEDGE FUND TERMS AND STRUCTURES

The most common structures used for hedge funds are limited partnerships (LP) and limited liability companies (LLC). Both structures limit the liability of investors to the value of their investment. Within the LP structure, the general partner is typically the hedge fund manager while the investors are the limited partners.

As it relates to tax considerations, hedge funds are structured either as offshore or onshore vehicles. Onshore funds may be more suitable for U.S. taxpayers as offshore funds raise complex tax issues. Investing in an offshore fund can be advantageous for tax-exempt U.S. investors because hedge funds may generate “unrelated business taxable income” also known as UBTI. UBTI is taxable even for tax-exempt investors.

Hedge funds have complicated expense structures. Fees are higher than most mutual funds and the general partner normally shares in profits. However, there are also several less publicized and often meaningful expenses, including legal and administration fees. Management fees are meant to cover operating costs, typically ranging from 1 percent to 2 percent of the fund net asset value. In recent years, many managers have reduced fees, particularly if that manager has created a new fund or a share class with more restrictive liquidity terms. However, most pedigreed managers operating at or near capacity are unlikely to offer reduced fees. Hedge funds also charge a performance fee. Performance fees are calculated as a percentage of the fund’s profits over a pre-determined period. Performance fees are customarily 20 percent of the profit, but can range from 0 percent to 50 percent. Some managers have been pressured into marginally lowering performance fees; that is less common than a reduction in management fees.

Some hedge funds must outperform a high water mark or a previously achieved return threshold before they can collect a performance fee. This attribute prevents managers from collecting a performance fee until investors recoup previous losses. This is also referred to as a loss carry-forward.

Hedge funds are typically open-ended vehicles, meaning investors contribute and redeem capital at net asset value on a periodic basis. Most funds allow for contributions at least as often as redemptions. Redemptions can

be monthly, quarterly, annually and sometimes longer. In order to minimize disruption, most managers require notification for contributions or redemptions anywhere from 30 to 90 days in advance of the next liquidity window. Depending on terms, some managers charge redemption fees as a percentage of invested assets, if an investor withdraws capital prior to a predetermined date.

Hedge fund managers often have initial lock up periods. This lock up can be specific to each individual contribution or just the initial investment. The lock-up period varies but usually ranges from one to three years. Funds may also have redemption gates that limit the amount of capital withdrawn on the redemption date. Gates can be used to delay or suspend withdrawals in order to prevent a run on the fund's capital. During the 2008 financial crisis, many managers imposed gates to the dismay of investors. However, managers are moving away from portfolio-level gates and towards investor-level gates, which allow investors to redeem a portion of assets even in a period of market turmoil.

FUND OF HEDGE FUNDS VERSUS DIRECT INVESTMENT

There are a number of ways investors can access hedge funds, much of which is dependent on the investor's asset size and manager evaluation or investment acumen. One option is to invest directly and build a diversified portfolio of hedge funds. A direct investment can make sense when the investor allocates greater than $10 million to hedge funds and has the ability to effectively evaluate and monitor hedge fund managers. It can be challenging to build a diversified portfolio of direct hedge funds with less than $10 million regardless of the investor's manager evaluation and due diligence capabilities. For smaller hedge fund investors, it is preferable to invest through a fund of hedge funds vehicle, where an outside manager selects and diversifies among multiple hedge fund managers and strategies.

For investors allocating between $5 and $10 million to hedge funds, a hybrid "core-satellite" model may be appropriate. This core-satellite approach has a "core" investment in a hedge fund of funds, but also allocates capital directly to "satellite" hedge funds. This enables the core to be diversified among multiple managers and strategies, while at the same time concentrating capital in higher conviction managers and strategies.

The decision to invest directly or through a fund of hedge funds can be challenging. If an investor elects to build out a direct portfolio, he or she only pays one layer of fees. If an investor elects to allocate to a fund of hedge funds, a second layer of fees exist. Exhibit VIII compares direct investing and fund of hedge fund investing.

Exhibit VII
Direct Hedge Funds vs. Fund of Hedge Funds

Characteristic	Direct Hedge Funds	Fund of Hedge Funds (FOHF)
Fees / Expenses	Single Layer	Double Layer
Manager Evaluation	Evaluation and due diligence required for all underlying managers	Evaluation required for one FOHF manager who performs underlying manager due diligence
Diversification	Investor must diversify among many managers and strategies	Single FOHF manager can diversify among many underlying managers and strategies
Liquidity Management	Managed by an investor	Managed by FOHF
Portfolio Control	Investor builds and controls hedge fund portfolio	FOHF manager controls overall investment strategy and investor has no control in building portfolio
Investor Minimum	Requires higher asset levels to build diversified portfolio	Can diversify with significantly lower asset levels
Customization	Bespoke portfolio to fit specific risk and return parameters	One size fits all approach

HEDGE FUND INVESTMENT DUE DILIGENCE

Hedge fund investors must have a comprehensive due diligence program in place to successfully evaluate managers. The first step in the process is sourcing. With so many options, investors must use their networks efficiently to identify and source attractive opportunities. A strong network is a competitive advantage if investors effectively use sourcing relationships. Sharing ideas and thoughts with like-minded investors is a great use of time. It is also important to have strong relationships with capital introduction groups at both small and large prime brokerage firms. Investors typically expand their network by attending capital introduction sessions, networking events and being active on the conference circuit.

This process of analyzing hedge funds is both an art and a science and the qualitative analysis is equally as important as the quantitative analysis. Typically, a fund can initially be screened by the following metrics:

- Historical Returns, Drawdowns and Volatility
- Risk Metrics and Risk-Adjusted Returns
- Exposures and Attribution
- Upside / Downside Capture Ratios
- Correlation to Various Asset Classes
- Correlation to Peers or Hedge Fund Indices

Once the quantitative results are thoroughly analyzed and are determined to be attractive, an investor should review the educational and professional history of the portfolio managers, analysts, back-office and risk management professionals. Investors must assess the ownership structure to ensure that interests are properly aligned. The investor should review how much of the portfolio manager's liquid net worth is invested in the fund as this is a strong indication of alignment of incentives with investors.

After the investor feels comfortable with the team and organizational structure, he or she should analyze the fund strategy and determine exactly what makes the group of individuals unique within their peer group. The goal is to identify how and why the strategy will generate alpha and understand the types of market environments that will favor or impair the strategy. The portfolio manager should walk through the investment process from idea generation to trade execution and portfolio implementation.

Risk management is a key discussion point. An investor should spend time meeting with an organization's head of risk management, such as a Chief Risk Officer. Most successful hedge funds have a robust risk management process. For many firms, this is in the form of an independent risk management group that reviews position level risks and stress tests the portfolio under a variety of scenarios and market conditions. The risk management team should provide copies of completed risk reports and be able to demonstrate their process.

The final step in investment due diligence is an evaluation of portfolio construction methodology including concentration, leverage, liquidity, factor exposures and other constraints such as maximum sector and/or position level exposures.

Financial leverage inherently increases risk. Leverage amplifies gains, but it also magnifies losses. The appropriate level of leverage varies by hedge fund strategy. Explicit leverage requires borrowing, but hedge funds can also implicitly lever assets by buying or selling futures and options, entering into swaps, or trading other derivatives. Given hedge funds employ leverage, trade derivatives and invest in less liquid areas of the market, they can be prone to "fat left tail" events. Certain strategies exhibit return profiles similar to poorly underwritten flood insurance. They collect a steady stream of "insurance premiums" until the flood hits and they collapse. An example of this type of asymmetric risk-reward profile is selling out-of-the-money options. Most options expire worthless. As long as the options finish out of the money, they expire unexercised and the seller pockets the premium received. Low month-to-month volatility gives the false impression of low risk. Similarly, the non-normality of hedge fund return distributions and unstable correlation coefficients make a single hedge fund or a portfolio of hedge funds difficult to model. The best one can do is thoroughly understand the strategy and approach to risk management.

Liquidity is another important consideration. Some instruments and markets are very liquid while others are not. There is a classification system to identify the fair value of assets per Accounting Standards Codification (ASC) 820. The assets are recorded as Level 1, Level 2 and Level 3, from most liquid to least liquid. Level 1 assets are regularly marked to market meaning that there is a readily observable and reliable price or fair market value. Level 2 assets are not marked regularly but can be approximated via some type of model based on observable and comparable prices in the market. Level 3 assets are the most illiquid and are not often traded, therefore it is challenging to identify a fair market value. Hedge funds may trade Level 1, Level 2 and sometimes Level 3 assets

which is why the fund's investor liquidity profile must match the fund's investment liquidity profile. It would be worrisome to see a major asset/liability mismatch.

It is helpful to have the manager describe how the portfolio is currently constructed but it is also essential to review historical construction. A shift in strategy, for example, that results in a move away from a portfolio manager's core competency is disconcerting. Back-channel reference checks with current investors and past employees are often a crucial part of the review process in order to get a sense of what parts of the competitive advantage thesis are worth pursuing in even greater detail. In terms of timing, evaluating a hedge fund manager is a dynamic process that typically takes three to nine months to complete.

HEDGE FUND OPERATIONAL DUE DILIGENCE

Operational due diligence is often overlooked in the hedge fund space. However, operational failure is a major risk. Just because a hedge fund manager may be a talented investor does not mean he or she is necessarily adept or capable of running a business enterprise. Many impatient or preoccupied hedge fund managers lack the expertise and commitment to run a business with proper systems and controls. Outright fraud is also a serious risk, given the opaque and loosely regulated nature of the hedge fund industry.

On December 11, 2008, Bernard L. Madoff was arrested and later pled guilty to 11 felonies for running the largest Ponzi scheme in history. Estimates of the fraud have been as high as $65 billion! Madoff asserts his Ponzi scheme began in the early 1990's, but federal investigators suspect the fraud began much earlier, perhaps in the 1970's. As the Madoff disaster demonstrates, longevity and reputation are no substitute for the requisite independent operational due diligence.

As with all successful frauds, Madoff seemed reputable. He was well known in the industry and had even served as the head of NASDAQ. He was well connected, with a reputation for brilliance. He was also affable. However, even a modest operational due diligence effort should have raised numerous red flags. All of the following pieces of information could be found in the marketing materials of a least one of Madoff's feeder fund:

- Madoff's administration, brokerage and custody were done internally.
- Madoff's firm charged no investment management (or incentive) fee, so it presumably only made money on brokerage commissions charged for trading client accounts.
- Lastly, the auditor was a small and unknown accounting firm.

Without digging any deeper, this short list of operational red flags was more than enough to warrant elimination, but investors relied on word of mouth references. While spectacular failures and frauds like the Madoff debacle make the front page, most hedge fund failures are not spectacular. They result from simple operational failures. Hedge fund managers that are very good at executing their investment strategy may not have the time or expertise to establish and run a well-controlled business. Investors need to perform strong operational due diligence that focuses on the non-investment aspects and the associated risks of running a hedge fund.

An investor must be comfortable with the controls around the process of trading, reconciling and valuing holdings. Operational due diligence should examine controls across the entire trading process from the time the portfolio manager initiates the trade with their trading desk, through the settlement and reconciliation process and ultimately through valuation and the striking of a net asset value.

Outside service providers perform many of the key operational processes. Service providers for hedge funds include the following:

- Prime Brokers provide leverage to hedge funds, execute and clear trades and lend securities (for shorting).
- Administrators provide critical middle and back office services, as well as key client servicing functions.
- Auditors examine holdings and provide an opinion as to whether the fund's financial statements meet Generally Accepted Accounting Principles (or GAAP).

Due to the importance of these functions, hedge fund investors must determine if the service provider is reputable and has the resources to service the hedge fund's strategy. The investor must then learn the role of each service provider and verify the independence of their work. This requires the hedge fund investor to interact with all service providers.

In addition, operational due diligence should also include other risk mitigation activities performed by non-investment personnel. As the Securities and Exchange Commission polices insider trading, it has become paramount for hedge fund investors to vet compliance functions. The compliance function must be robust enough to ensure that firm personnel adhere to all regulatory provisions. There should be a strong information technology team as well as a disaster recovery plan that has successfully been tested. Also, interview information technology personnel to review the firm's disaster recovery plan. Has it been successfully tested? It is important to evaluate the operations staff who manages counter-party risk and determines what plans are in place if a counterparty's financial strength begins to deteriorate. Operational due diligence should be performed prior to an investment and throughout the tenure of the investment.

THE CURRENT STATE OF HEDGE FUNDS

The market dynamics are different today than they were ten to fifteen years ago when the universe of hedge fund managers delivered consistently strong returns and money poured into the space. Demand remained strong in the aftermath of the Great Recession as investors sought hedge funds to protect against another left tail event that ultimately did not arrive. Since the early 2009 stock market trough, however, the asset class has somewhat fallen out of favor during one of the greatest bull markets in history as hedge funds have significantly underperformed U.S. stocks on a relative basis.

There are a number of reasons why this occurred. All asset classes and strategies are susceptible to the whims of investor demand and swing in and out of favor. Hedge funds were viewed as a panacea for many years and attracted too much capital relative to the opportunity set, which squeezed alpha opportunities. Furthermore, one cannot ignore the role that central banks have played in repricing risk assets. Quantitative easing and the Fed's aggressive positioning created distortions across virtually all asset classes. This regime has favored long-only and long-biased managers rather than value, contrarian and more market neutral mandates. Lastly, passive

investing has gained significant market share versus active strategies during the last decade. Active managers argue that retail investors are agnostic to fundamentals and that technical drivers have become increasingly impactful on performance. Low-cost and easily accessible exchange traded funds attracted significant capital at the same time that algorithmic and quantitative strategies gained popularity. The trading speed of quantitative managers plays an important role into how quickly an opportunity dissipates and ultimately disappears.
There have also been positive transformations in the industry since the 2008 financial crisis. Investors have demanded greater transparency and have prodded managers to lower fees. While most hedge funds have adopted new standards, others have not succumbed to the pressure. Still, there have been significant regulatory changes. All funds with greater than $150 million in assets are required to register with the SEC, creating additional regulatory burden. Hedge funds have increasingly turned to third party administrators to provide independent monitoring and reconciliation of hedge fund books with prime brokers and custodians. Many managers have increased operational staff to provide more timely responses to client demands. Hedge funds also provide greater investment process clarity.

Redemption restrictions, also known as gates, implemented by hedge funds during the credit crisis have brought liquidity to the forefront. Liquidity terms are now better aligned with the underlying strategies. As an example, a U.S. equity long-short manager that trades in highly liquid securities may provide greater liquidity terms than a distressed debt fund that allocates to illiquid credit instruments. Hedge fund managers often offer multiple liquidity options via various share classes. The share class with the longest lock-up may entice investors with a lower fee structure. Another share class may have a “soft” lock-up that permits earlier redemptions for a fee. There has been a move towards shorter notice periods for redemptions, from annually or biannually to quarterly or monthly.

Additionally, there has been a shift toward lower fees. A 1.5 percent management fee level is more common for new hedge funds versus the standard 2.0 percent management fee. However, a 20 percent performance fee is still quite common. Overall, tighter regulation and investor demand has certainly led to improvements as it relates to transparency, liquidity terms and fund fees, while also increasing barriers to entry.

CONCLUSION

Investing in hedge funds presents unique challenges and risks, however, a compelling argument can be made for their inclusion in a broadly diversified portfolio. Hedge funds have many roles within an investment portfolio but the overall goal is to improve risk-adjusted performance by primarily protecting capital and generating uncorrelated returns during periods of stress. Investors should always approach the asset class with sufficient analyses and a healthy amount of skepticism. If an organization does not have the time, resources, or knowledge to perform the necessary investment and operational due diligence, one should either hire an expert or avoid the asset class altogether.

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APPENDIX

Historical performance statistics were generated from the following indices:

Asset Class	Most Recent Index Proxy	Date Used	Previous Index Proxy	Date Used
Hedge Funds	HFRI Fund Weighted Composite USD	1/1/1990	HFN Hedge Fund Aggregate Average	1/1/1979
Cash	FTSE Treasury Bill 3 Mon USD	1/1/1979	N/A	N/A
TIPS	BBgBarc US Treasury US TIPS TR USD	3/1/1997	BBgBarc US Agg Bond TR USD	1/1/1979
U.S. Bonds	BBgBarc US Agg Bond TR USD	1/1/1979	N/A	N/A
Foreign Developed Bonds	50% CITI WGBI NonUSD Hdg 50% CITI WGBI NonUSD	1/1/1985	BBgBarc US Agg Bond TR USD	1/1/1979
High Yield Bonds	BBgBarc US Corporate High Yield TR USD	7/1/1983	BBgBarc US Agg Bond TR USD	1/1/1979
U.S. Equities All-Cap	Russell 3000 TR USD	1/1/1979	N/A	N/A
International Developed Equity	MSCI EAFE GR USD	1/1/1979	N/A	N/A
Emerging Market Equity	MSCI EM GR USD	1/1/1988	MSCI EAFE GR USD	1/1/1979
Real Estate	Wilshire US RESI TR USD	1/1/1979	N/A	N/A
MLPs	Alerian MLP TR USD	1/1/1996	BCI+AGG-CASH	1/1/1991