

AN ANALYSIS OF INTERNATIONAL HEDGE FUND RISK AND RETURN

by

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**ABSTRACT**

This paper is a meta-analysis of several hedge fund studies. In this paper, I look at the different metrics used to analyze risk and return of hedge funds. After looking at these metrics, I analyze hedge fund risk and return using traditional market risk and return metrics like beta, Sharpe ratio, standard deviation, etc.

From my study, I have found that hedge fund indices replicating the entire hedge fund industry do not provide superior returns to an investor's portfolio on a risk adjusted basis. Hedge funds may outperform the board market index in the short run, but in the long run, the market will outperform the hedge fund index on a risk adjusted basis.

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## INTRODUCTION

The first hedge funds was started by Alfred Jones in 1949. He came up with the idea of hedge funds while he was investigating financial strategies for an article for the Fortune Magazine. Jones' used leverage and short-selling strategies to hedge the risk of holding securities and many hedge funds use the same strategies today. Hedge funds, however, did not gain popularity until the 1960s when investors like Warren Buffet and George Soros adopted Jones' strategy and attracted an elite group of investors to invest in hedge funds.

The short-selling strategy employed by hedge funds reduced the correlation of hedge funds to the S&P 500 thereby helping them provide investors with absolute returns. But the possibility of earning absolute returns was not available to everyone because the minimum investment requirement in a hedge fund is \$1 million. Absolute market returns have made hedge funds even more attractive and have incentivized managers to charge performance fees on the returns. Today, performance fees changes by hedge funds is about 20%. In addition, to performance fees mangers usually charge investors a management fee of about 1% to 2%.

In most hedge funds today, managers are guaranteed management fee. However, a huge portion of a mangers salary comes from their performance fee. Over the past two decades, there has been a lot of debate about hedge fund performance fees. Hedge funds have received bad press for intentionally inflating performance metrics. By inflating metrics, hedge fund managers can attract more investors which increases their amount of profit in the future. Additionally, hedge fund investors are an elite group of private

investors. Therefore, even though hedge funds are obligated to report their holding to the Securities and Exchange Commission (SEC), they are not required to disclose their fund performance to the public. Lack of disclosure requirements does increase a hedge fund manager's ability to manage earnings.

Recently, the investment options in hedge funds have changed allowing investors make investments below \$1 million dollars into hedge funds. The way this works is that funds called fund-of-funds (FOF) have adopted the mutual fund strategy in which they pool together capital from several investors and invest the capital in hedge funds. Due to these kind of funds, hedge funds have a lot more investors which have magnified the incentive for hedge fund managers to manipulate earnings to being in more capital.

Increased incentive to actively manage hedge fund returns and the lack of disclosure requirement by hedge funds made me question, "Do hedge funds really add value to an investor's portfolio?" Several studies have looked at hedge fund earnings management, lack of disclosure, and hedge fund performance metrics. This study is a meta-analysis of the existing literature to see if there is a connection between those three factors. Analyzing the statistical significance of these three connection will help determine whether hedge funds truly add value to an investor's portfolio on a risk-adjusted basis.

After analyzing several fund-of-funds risk and return profile, I have come to believe that the hedge fund industry as a whole could diversify an investor's portfolio. However, it does not provide excess return over the broad market on a risk-adjusted basis.

## **LITERATURE REVIEW**

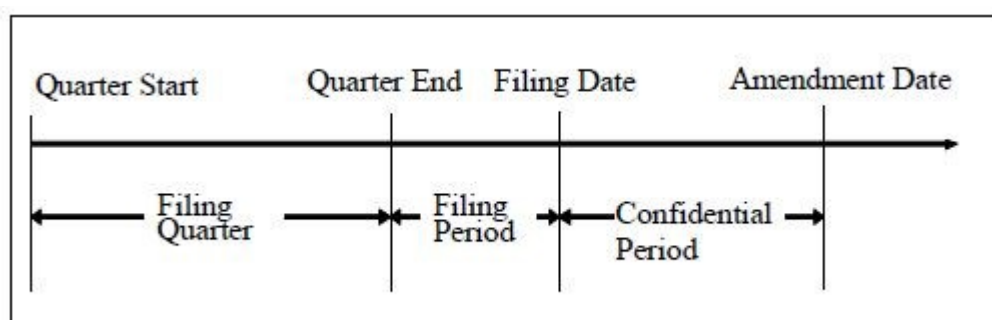
### *Hedge Fund Disclosures*

Most hedge funds are required to file Form 13F. Form 13F is a quarterly filing with the Securities and Exchange Commission (SEC) required by institutional investment managers with over \$100 million in qualifying assets. Form 13F provides investors with a list of holdings by the institution. Form 13F, also known as Information Required of Institutional Investment Managers, became popular after the Madoff scandal.

Aragon, Hertz, and Shi, 2012 reviewed the importance of reduced disclosure and transparency in hedge fund reporting, the extent to which the liquidity of individual holdings affects the disclosure decision, the contribution of confidential treatment to the success of the advisor's hedge fund investors. The study states that increased disclosure provides transparency to investors; however, increased disclosure also discloses proprietary information held by the fund to other fund managers. This will discourage hedge fund managers from using skill to pick long-term investments since its information will be public information in a few months reducing or eliminating the alpha of the strategy. On the other hand, it will allow some fund managers to emulate other hedge fund portfolios giving them a free ride.

Such disclosures might also encourage hedge managers to be front-runners with the expectation that other investors will copy their portfolio and drive the price of their investment up. The study also claimed that managers seeking to dispose out illiquid positions want to keep results confidential to prevent a significant change in price. The SEC is aware of these issues and allows hedge fund managers to delay release of Form

13F. The SEC still requires hedge funds to file the form within 45 days after the end of every quarter. The increased confidentiality helps managers hide winners from public for longer. A hedge fund's return is positively related to the amount of extension hedge fund's can receive before their investments are public (Aragon, Hertz, and Shi 2012). Finally, Aragon et al, 2012 did not find any evidence to show that hedge fund advisors seek confidentiality to hide poorly performing fund positions.



### *Hedge Fund Earnings Management*

A lot of hedge fund earning management literature adds to the existing literature on earning management (Agarwal, Daniel, & Naik 2009). Prior research analyzes hedge fund earnings management considering two factors: (i) earnings management for a reward for good performance (ii) earnings management to avoid punishment of withdrawal following poor performance. Both these factors lead to a phenomenon called the December spike. The December spike is the return in December over the average return from January to November. Agarwal *et al*, 2009 shows that hedge funds with more opportunity to inflate their results will observe that the returns in December are significantly higher than returns during the rest of the year after controlling for risk in both time-series and the cross-section variance and the December spike is also greater for funds with higher incentive to inflate results. They also show strong evidence that hedge funds increase their December returns



by underreporting prior month earnings and a weak evidence that hedge funds borrow returns from January by making trades in the last minutes of the last trading day in December.

Earnings management for a hedge fund has very similar characteristics to earnings management for a corporation. Several hedge funds set a hurdle rate before hedge fund manager can claim performance fee. This makes the payoff of hedge fund performance fee similar to the payoff of a call diagram in which the strike price is the set hurdle rate. The hedge fund performance fee is also very similar to executive stock option. When executives are given stock options, they have a stake in the performance of a company. Similarly, hedge fund managers have a stake in the performance of hedge funds because they have a claim to a percent of the hedge funds profits. However, this kind of compensation increases the risk of earnings management because hedge fund managers are given an incentive to manipulate their earnings in order to get a higher performance fee.

Earnings management for a reward for good performance factor in the pay-performance delta and moneyness of the earnings. The pay-performance delta is the amount of additional fees a hedge fund manager will get for every basis point increase in performance return. And moneyness is a measure of how close the current hedge fund returns is to the hurdle rate that allows the hedge fund manager to claim a performance fee. Agarwal, et al. 2009 show that the higher the pay-performance delta, the higher the December spike. Additionally, Burns and Kedia, 2006 find that the delta of a CEO's option portfolio is positively related to the propensity of misreporting. Also, the closer the current performance of the fund is to the hurdle rate, the higher the December spike.

Earnings management to avoid punishment of withdrawal following poor performance factors in investor lockup in hedge funds and early withdrawal fee charged by hedge funds. Agarwal et. al, 2009 show that investors are more likely to invest in hedge funds that show consistent returns. Investors are also more likely to withdraw their investment from hedge funds that show negative or no-growth. This incentivized managers to smoothen hedge fund returns in from January to November and add back the additional returns to December for the fiscal year audit. These findings are consistent with the greater spike in earnings in December.

Other studies have been consistent with the findings of Agarwal et al, 2009 and have showed that hedge fund use smoothing tactics to avoid unrealistic expectations from investors. The smoothing tactics are used intra-month and year-end results are reported accurately. Smoothing is important because intentional smoothing can reduce observed volatility of reruns, thereby distorting commonly used risk-adjusted performance metrics (Cassar and Gerakos 2011). Additionally, fund managers have an incentive to increase their risk-adjusted return because their management fee and performance fee is based on the fund's asset under management and the fund's asset under management increases when the fund's risk adjusted return increases. A major factor in a fund's risk-adjusted return is the fund's pricing control.

Pricing controls as mechanisms used to value, verify, and disclose the level and change in a fund's investment positions and official NAV. Pricing controls into four categories: (i) The sources of prices used to value the fund's investment positions (ii) who prices the individual investment positions (iii) who calculates and reports the portfolio's

NAV to investors (iv) the reputation of the service providers who prepare and review the valuations and financial statements provided to fund investors

The study claims that funds using less verifiable pricing sources and funds that provide managers with greater discretion in pricing investment positions are more likely to have returns consistent with intentional smoothing. The returns are smoother for funds that provide managers with greater discretion in sourcing the prices used to value the fund's investment positions. Furthermore, returns are smoother for funds in which the manager prices investment positions with no external oversight. Finally, reputable auditors and administrators are not associated with lower levels of smoothing because many auditors review the consistency of how funds value investment positions, they do not review the validity of valuations (Lhabitant, 2008). When auditors do review how funds value their assets, the sampling tests are less comprehensive than the standards for registered investment companies.

#### *Hedge Fund Performance and Risk Metrics*

Hedge fund indices are skewed because hedge funds are not required to report their results. Thus hedge fund managers can report their results when their fund does well and not report their results when their fund performs poorly. Also, hedge funds cannot be benchmarked against the market since most hedge funds seek absolute results. This means that they have no correlation with the market.

Due to smoothing results and correlation risk, there is no good benchmark for hedge funds. Several studies have benchmarked hedge funds using alpha and beta from the market. But the correlation of hedge funds to the market make the results of these studies

invalid. Some suggest a good way to measure hedge fund results will be to conduct a cross-section analysis. However, hedge funds follow several combinations of strategies so there is no fair way to measure hedge fund performance.

Correlation is important for hedge funds because hedge funds aim for absolute return which means they have to have zero correlation to the market. To achieve these results hedge funds reduce market beta by using market neutral strategies like long short arbitrage with low net exposure to the market. This requires the use of dynamic hedge ratios to implement risk immunization. When correlations are not constant, these strategies can generate a potential additional exposure to correlation shocks because time varying hedge ratios are not observable and need to be estimated. Hedge funds use their legal structure because this gives them flexibility. They can lock in clients and use strategies that are more long term. Hedge funds tend to de-lever when counterparty risk increases. They also increase collateral requirement and mandate haircuts when counterparty risk increases. Hedge funds can trade options and derivatives which expose them directly to correlation and volatility shocks (Buraschi, Kosowski, Trojani, 2014). A lot of literature has documented that option-implied volatilities and correlation are larger than are realized volatilities and correlation (eg. Bakshi and Kapadia 2009, Bollen and Whaley 2004).

However, hedge funds are not always successful at creating these zero correlation positions. The ability of hedge funds to create market-neutral returns is often associated with a significant exposure to correlation risk. Correlation risk arises because of an unexpected change in the correlation of the returns between different assets or asset classes, which can be linked to an adverse evolution of portfolio diversification opportunities.

Buraschi, et al, 2014, used a benchmark proposed by Fung and Hsiesh. The Fung-Hsiesh model adds a correlation risk factor to the existing seven factor model to calculate hedge fund returns.

$$r_{i,t} = \alpha_i + \beta_i^1 SNPMRF_t + \beta_i^2 SCMLC_t + \beta_i^3 BD10RET_t \\ + \beta_i^4 BAAMTSY_t + \beta_i^5 PTFSD_t + \beta_i^6 PTFSTFX_t \\ + \beta_i^7 PTFSCOM_t + \beta_i^8 CR_t + \varepsilon_t^i,$$

where  $r_{i,t}$  is the monthly return on portfolio  $i$  in excess of the one-month Treasury-bill return; SNPMRF is the S&P 500 excess return; SCMLC is the Wilshire small cap minus large cap return; BD10RET is the change in the constant maturity yield of the 10-year treasury; BAAMTSY is the change in the spread of Moody's Baa – 10-year treasury and PTFS is a trend following strategy (Fung and Hsiesh, 2004); PTFSD is the bond PTFS; PTFSTFX is the currency PTFS; and PTFSCOM is the commodities PTFS (Buraschi, et al. 2014).

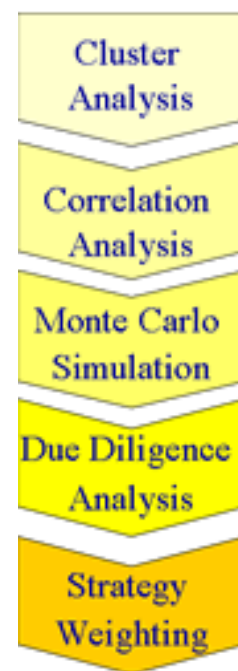
After using this eight factor model, also called the BKT benchmark model, and controlling for correlation risk exposure, Buraschi et al., 2014 observed that funds with significant alphas had insignificant alphas. For example, alphas from long-short equity funds dropped from 4.64% to 2.80%, option trader funds dropped from 8.96% to 3.91%, and fund-of-funds dropped from 6.05% to 0.95%.

## DATA SOURCES

Gathering data for the paper was very difficult. Hedge funds are not required to publically report their returns so getting access individual hedge fund data was not possible. In order to deal with this issue, I use the HFR (Hedge Fund Research) database that aggregates monthly hedge fund returns for various hedge fund strategies. HFR breaks down their data by strategy and by region.

Hedge Fund Research uses UCITS methodology to construct their hedge fund indices. Their indices are based on defined and predetermined rules and objective criteria to select and rebalance components to maximize components of the hedge fund universe (Hedge Fund Research Inc., 2015)

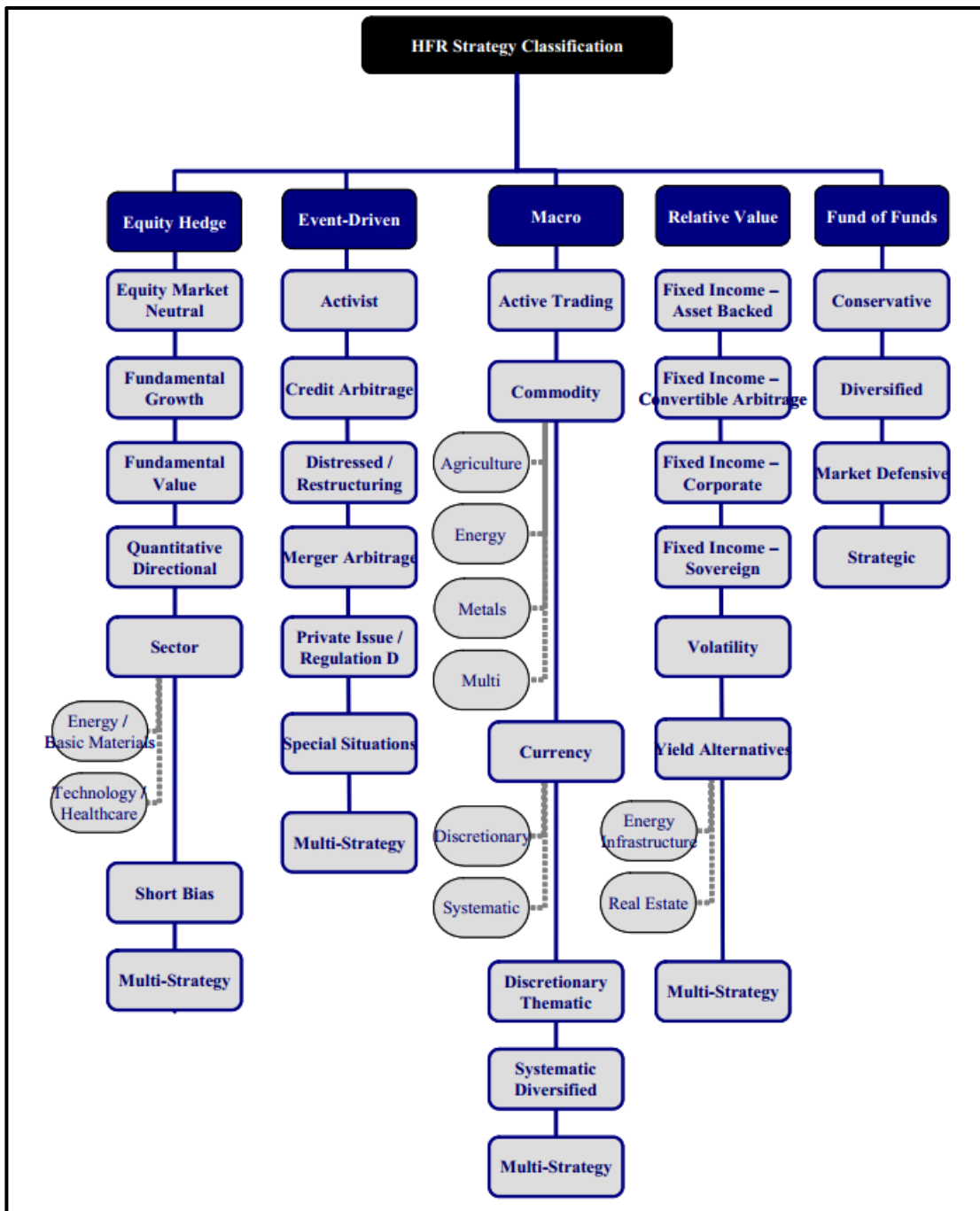
These indices utilize quantitative techniques and analysis; multi-level screening, cluster analysis, Monte-Carlo simulations, and optimization techniques ensure each index represents its investment focus. Every hedge fund in the index is selected from a pool of the more than 7,500 hedge funds that report to the HFR Database. These funds are screened for various reporting characteristics, assets and duration of track record qualities, fund strategy, and whether they are open to accepting new investment via a fully transparent format. Hedge Fund Research uses four weighting methodologies and each Strategy, Sub-Strategy and Regional Investment focus in the HFR Database has a corresponding index. Each of the four constituent weighting methodologies draws from the same sample.



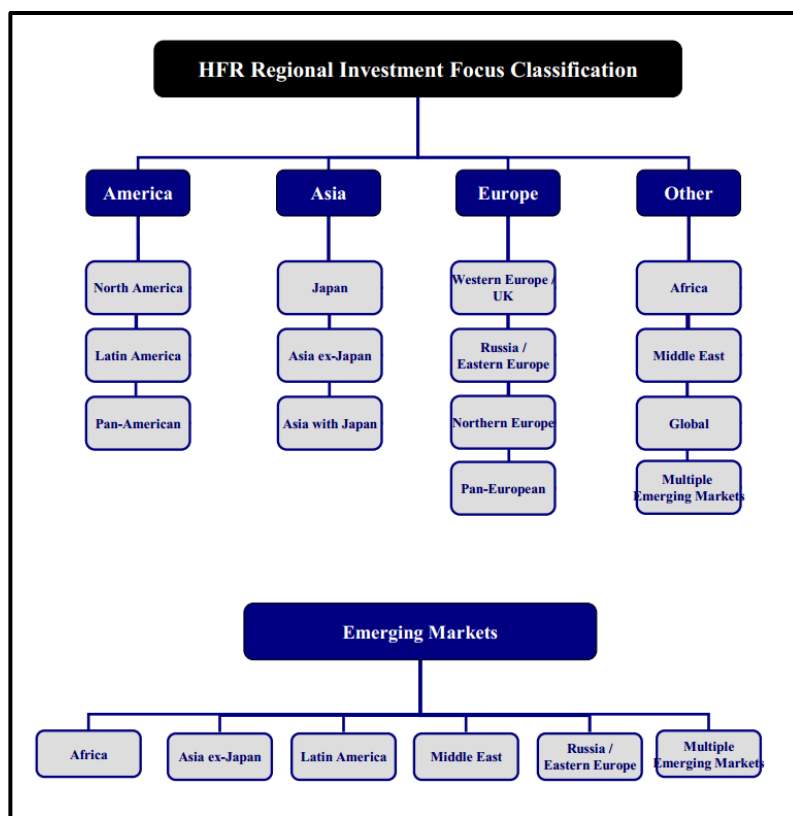
The four weighting methodologies are:

1. Global Hedge Fund Index
2. Equally Weighted Index
3. Absolute Return
4. Market Directional Index

The Global Hedge Fund Index is designed to be representative of the overall composition of the hedge fund universe. It is comprised of all 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 underlying constituents and indices are asset weighted based on the distribution of assets in the hedge fund industry. The Equal Weighted Strategies Index applies an equal weight to all selected hedge funds. The Absolute Return Index selects hedge funds that exhibit lower volatilities and lower correlations to standard directional benchmarks of equity market and hedge fund industry performance. The Market Directional Index selects hedge funds that characteristically exhibit higher volatilities and higher correlations to standard directional benchmarks of equity market and hedge fund industry performance. All Hedge Fund Research Indices are rebalanced quarterly.







The samples of indices I have used provide monthly returns with variable inception dates. The earliest data sample dates back to 1998 and each index is weighted differently. All the returns are reported net of fees which does create a bias since hedge funds may or may not charge exorbitantly high fees depending on their monthly, quarterly, or annual performance. Since Hedge Fund Research compiles an index using several funds, there will be some funds which charged a high performance fee because of superior performance and therefore have a low net return. There will also be some funds that did not charge a performance fee because their return might not have met the hurdle rate. Using an index does not distinguish between these two types of returns. You could have two funds with different gross performance numbers but the same net performance values. Therefore, my study could have a higher standard error from other similar studies.

The indices I considered are rebalanced quarterly which exposes market neutral funds to higher than reported and anticipated correlation risk. In a market neutral fund, the sum of the long positions and the short positions need to equal zero. By rebalancing these positions every quarter, these indices run the risk of being more correlated than anticipated. The higher correlation makes the index slightly long or slightly short, thereby not replicating the true returns of a market neutral strategy.

When Hedge Fund Research selects funds for their index, the basic screen for every index looks for hedge funds that have over \$50 million in AUM and at least a 24 month track record. This eliminates a lot of new and growing hedge funds that enter the space. These indices therefore consist of survivorship bias. Finally, Hedge Fund Research has the incentive of picking the best performing hedge funds for their index because Hedge Fund Research Asset Management, Hedge Fund Research's Asset Management division, constructs investible products that track these indices. Therefore, their sample might not truly represent the returns of the hedge fund universe.

## **STUDY**

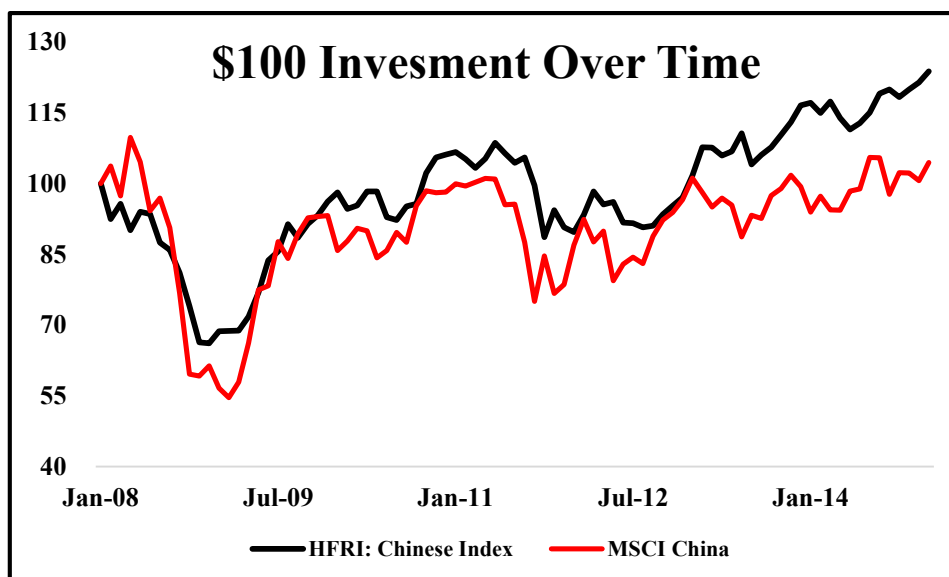
In my study, I wanted to look at hedge funds globally to see whether, historically, have hedge funds added value to an investor's portfolio on a risk adjusted basis. My study analyzed hedge fund returns from five countries and two continents. The hedge fund indices I studied included:

1. The Chinese Index
2. The Indian Index
3. The Japanese Index
4. The London Index
5. The North American Index
6. The Russian Index
7. The Western European Index

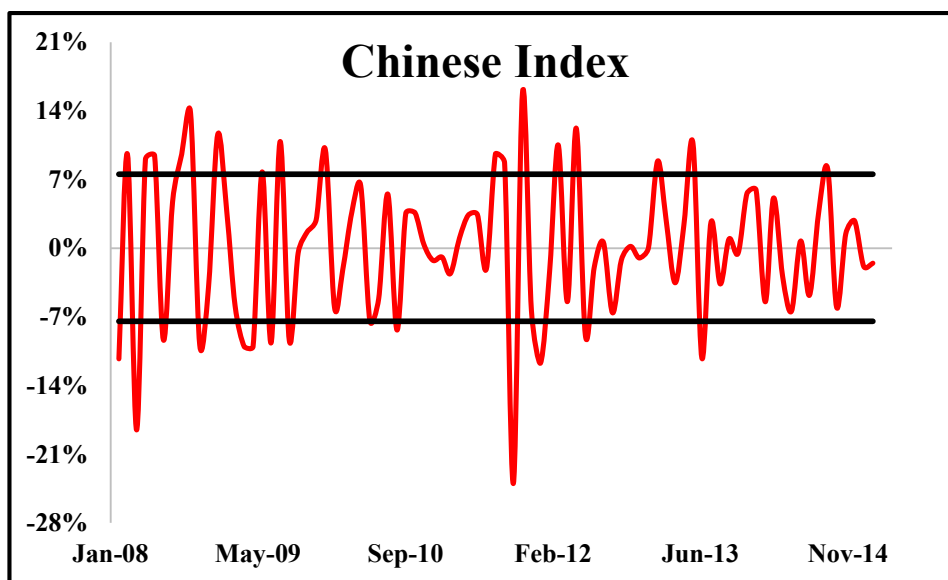
### *The Chinese Index*

The Chinese Index was created to closely track the performance of the hedge fund universe in China. Hedge funds in this index are based on different criteria set by Hedge Fund Research Inc. According to Hedge Fund Research Inc., the Chinese Index replicates risk and return profile of the hedge fund industry in China.

After gathering the performance data for from the Chinese Index, I benchmarked it against the iShares MSCI China Index which tracks the performance of the Chinese broad market. I tracked a \$100 investment in both those indices from January 2008 until December 2014.



From the chart above, we see that the Chinese Index has performed better than the Chinese board market index. This chart, however, measures only the return on an investment. It does not take into account the risk taken by both these indices to provide this return. In order to measure the risk, I looked at the Sharpe Ratio and the Beta. The Sharpe ratio for the Chinese Index was 0.02 and the Sharpe ratio for the MSCI China Index was 0.007. So on a risk adjusted basis, the Chinese Index outperformed the MSCI China Index. The beta of the Chinese Index was 0.014 when benchmarked against the MSCI China Index which showed that the Chinese Index was not significantly exposed to a lot of macroeconomic risk within China. Thus, the Chinese Index did meet the purpose of a hedge fund and, to a great extent, mitigated the macroeconomic risk of the Chinese market.



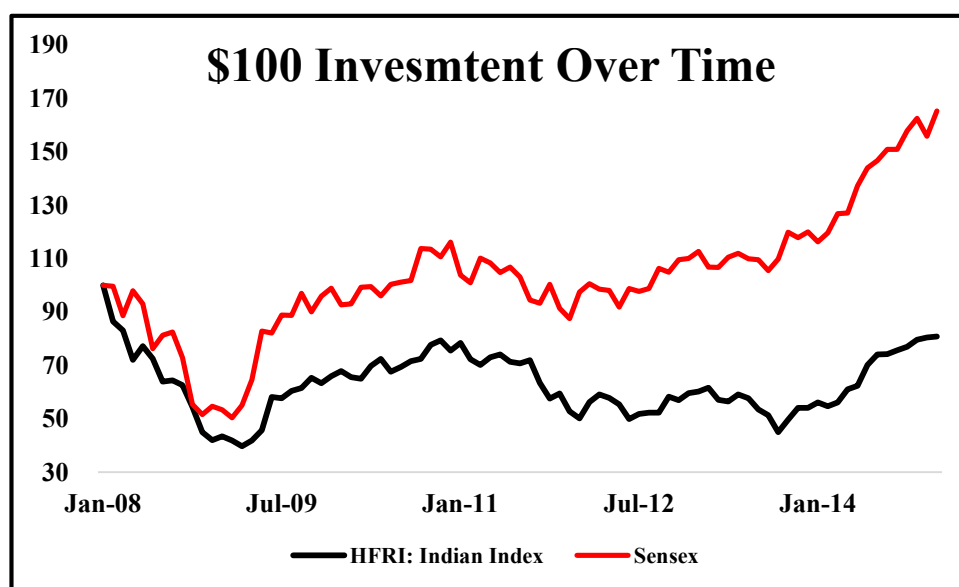
This chart shows the excess return of the hedge fund index over the broad market. Any value above 0% indicates that the hedge fund beat the broad market. The horizontal lines represent one standard deviation marks which show that about 65% of the returns are between the bars assuming a normal curve. These values are not the hedge fund index's alpha because these returns have not been adjusted for risk. However, looking at the Chinese index's beta and Sharpe ratio shows us that the Chinese Index has outperformed the Chinese board market.

Another thing to consider, is the exchange rate risk that neither the beta or Sharpe ratio take into consideration. The returns of the Chinese market is stated in the Chinese Yuan whereas the returns of the Chinese hedge fund index is stated in United States Dollars. I will address the issue of exchange rate risk in another section.

### *The Indian Index*

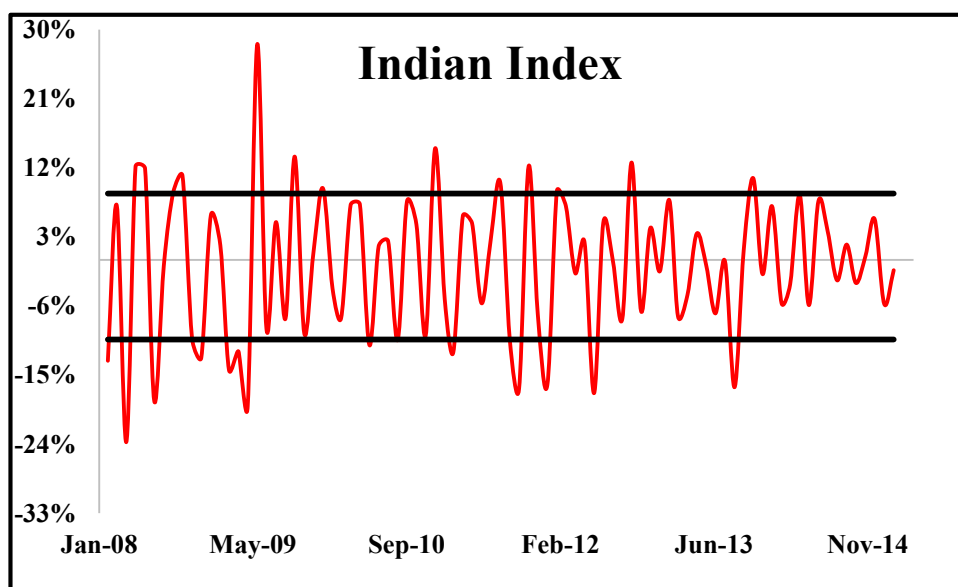
The Indian Index was created to closely track the performance of the hedge fund universe in India. Hedge funds in this index are based on different criteria set by Hedge Fund Research Inc. According to Hedge Fund Research Inc., the Indian Index replicates risk and return profile of the hedge fund industry in India.

After gathering the performance data for from the Indian Index, I benchmarked it against the Sensex which tracks the performance of the Chinese broad market. I tracked a \$100 investment in both those indices from January 2008 until December 2014.



From the chart above, we see that the Sensex has performed better than the Indian hedge fund index. This chart, however, measures only the return on an investment. It does not take into account the risk taken by both these indices to provide this return. In order to measure the risk, I looked at the Sharpe Ratio and the Beta. The Sharpe ratio for the Sensex was 0.10 and the Sharpe ratio for the Indian Index was -0.02. So on a risk adjusted basis, the Sensex outperformed the Indian hedge fund index. The beta of the Indian Index

benchmarked against the Sensex was 0.11 which showed that the Indian Index was not exposed to a lot of macroeconomic risk within India. Thus, the Indian Index did meet the purpose of a hedge fund and, to a great extent, mitigated the macroeconomic risk of the Indian market.



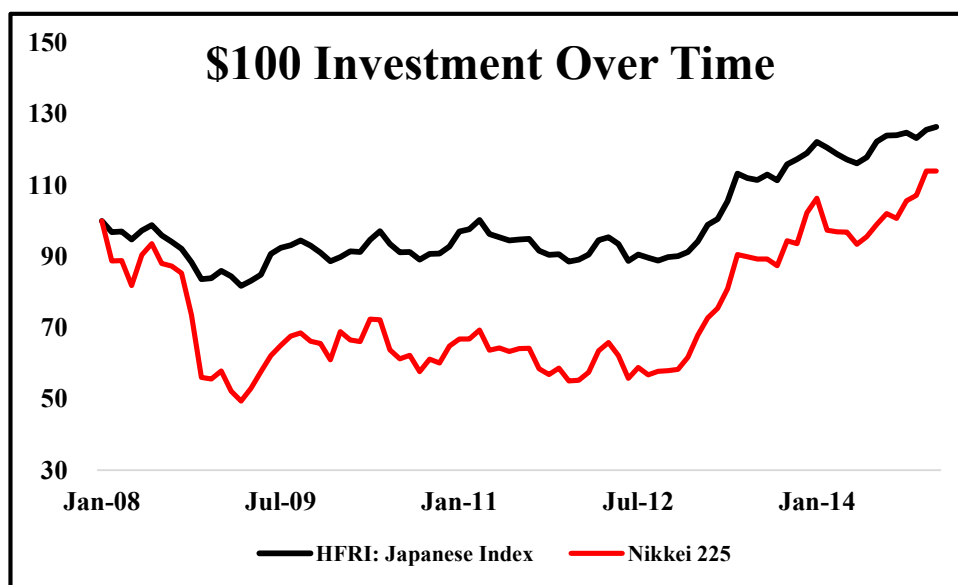
This chart shows the excess return of the hedge fund index over the broad market. Any value above 0% indicates that the hedge fund beat the broad market. The bars are one standard deviation marks which show that about 65% of the returns are between the bars assuming a normal curve. These values are not the hedge fund index's alpha because these returns have not been adjusted for risk. However, looking at the Indian Index's Sharpe ratio shows us that the Sensex has outperformed the Indian hedge fund index.

Another thing to consider, is the exchange rate risk that neither the beta or Sharpe ratio take into consideration. The returns of the Indian market is stated in Indian Rupees whereas the returns of the Indian hedge fund index is stated in United States Dollars. I will address the issue of exchange rate risk in another section.

### *The Japanese Index*

The Japanese Index was created to closely track the performance of the hedge fund universe in Japan. Hedge funds in this index are based on different criteria set by Hedge Fund Research Inc. According to Hedge Fund Research Inc., the Japanese Index replicates risk and return profile of the hedge fund industry in Japan.

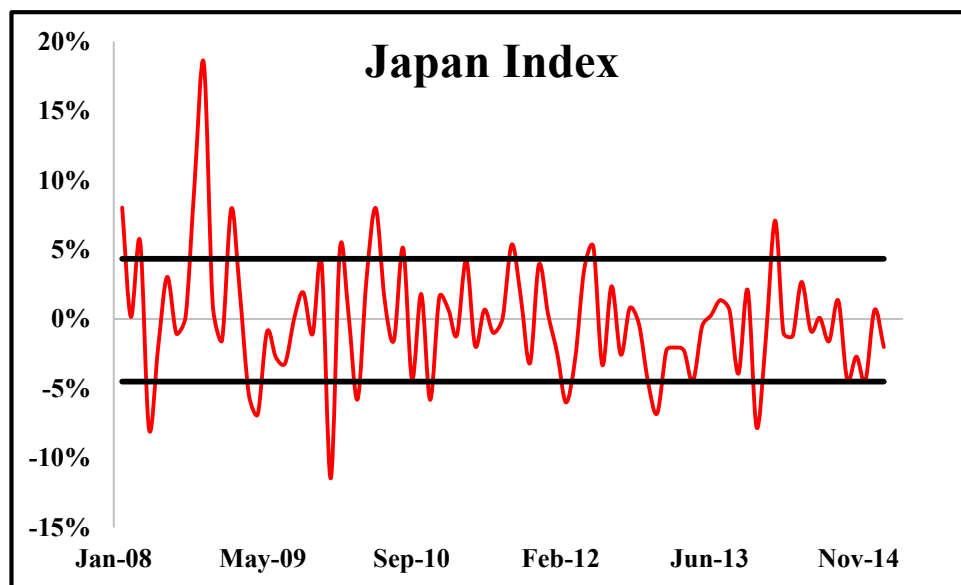
After gathering the performance data for from the Japanese Index, I benchmarked it against the Nikkei 225 which tracks the performance of the Japanese broad market. I tracked a \$100 investment in both those indices from January 2008 until December 2014.



From the chart above, we see that the Japanese hedge fund index has performed better than the Nikkei 225. This chart, however, measures only the return on an investment. It does not take into account the risk taken by both these indices to provide this return. In order to measure the risk, I looked at the Sharpe Ratio and the Beta. The Sharpe ratio for the Japanese Index was 0.024 and the Sharpe ratio for the Nikkei 225 was 0.022. So on a risk adjusted basis, the Japanese Index outperformed the Nikkei 225. The beta of the Japanese



Index benchmarked against the Nikkei 225 was 0.34 which showed that the Japanese Index was fairly exposed to the macroeconomic risk within Japan. Thus, the Japanese Index did meet the purpose of a hedge to mitigate the macroeconomic risk of the Japanese market.



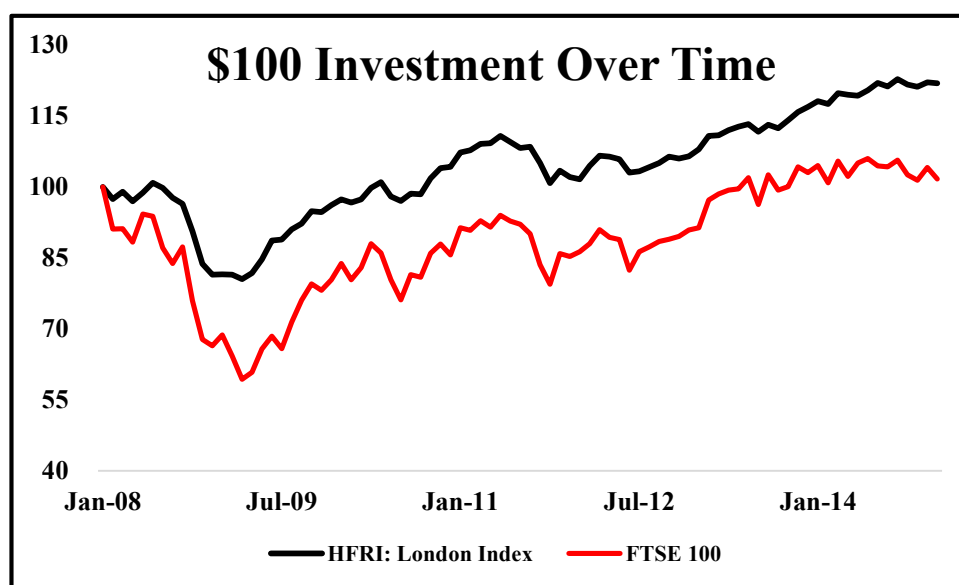
This chart shows the excess return of the hedge fund index over the broad market. Any value above 0% indicates that the hedge fund beat the broad market. The bars are one standard deviation marks which show that about 65% of the returns are between the bars assuming a normal curve. These values are not the hedge fund index's alpha because these returns have not been adjusted for risk. However, the Japanese Index's and Nikkei 225's Sharpe ratio shows us that the Japanese Index has outperformed the Nikkei 225 on a risk-adjusted basis.

Another thing to consider, is the exchange rate risk that neither the beta or Sharpe ratio take into consideration. The returns of the Nikkei 225 market is stated in Japanese Yen whereas the returns of the Japanese hedge fund index is stated in United States Dollars. I will address the issue of exchange rate risk in another section.

### *The London Index*

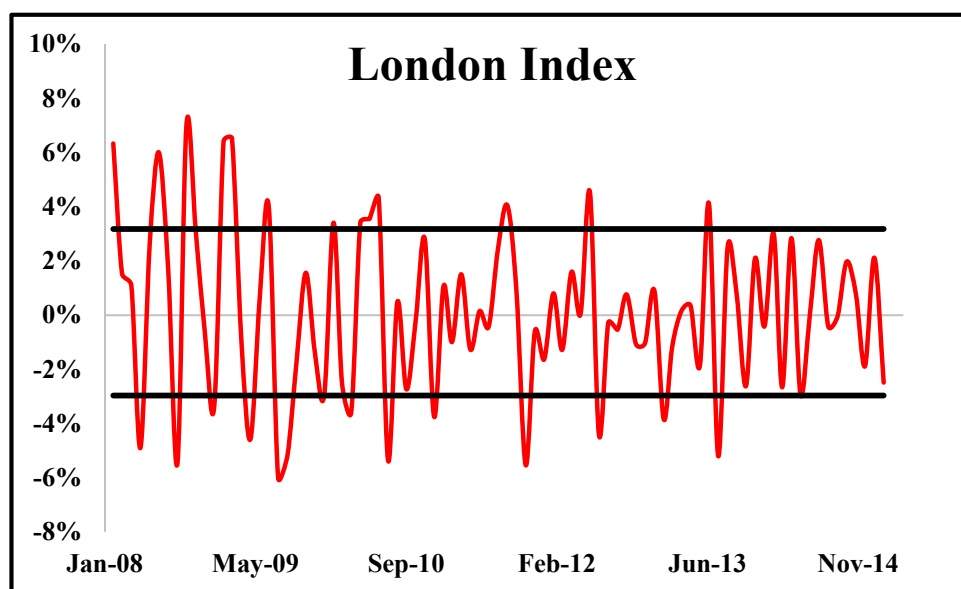
The London Index was created to closely track the performance of the hedge fund universe in the United Kingdom. Hedge funds in this index are based on different criteria set by Hedge Fund Research Inc. According to Hedge Fund Research Inc., the London Index replicates risk and return profile of the hedge fund industry in London.

After gathering the performance data for from the London Index, I benchmarked it against the FTSE 100 which tracks the performance of the United Kingdom broad market. I tracked a \$100 investment in both those indices from January 2008 until December 2014.



From the chart above, we see that the London hedge fund index has performed better than the FTSE 100. This chart, however, measures only the return on an investment. It does not take into account the risk taken by both these indices to provide this return. In order to measure the risk, I looked at the Sharpe Ratio and the Beta. The Sharpe ratio for the London Index was 0.01 and the Sharpe ratio for the FTSE 100 was -0.02. So on a risk adjusted basis, the London Index outperformed the FTSE 100. The beta of the London

Index benchmarked against the FTSE 100 was 0.36 which showed that the London Index was fairly exposed to the macroeconomic risk within the United Kingdom. Thus, the London Index not did meet the purpose of a hedge fund to fully mitigate the macroeconomic risk of the United Kingdom market.



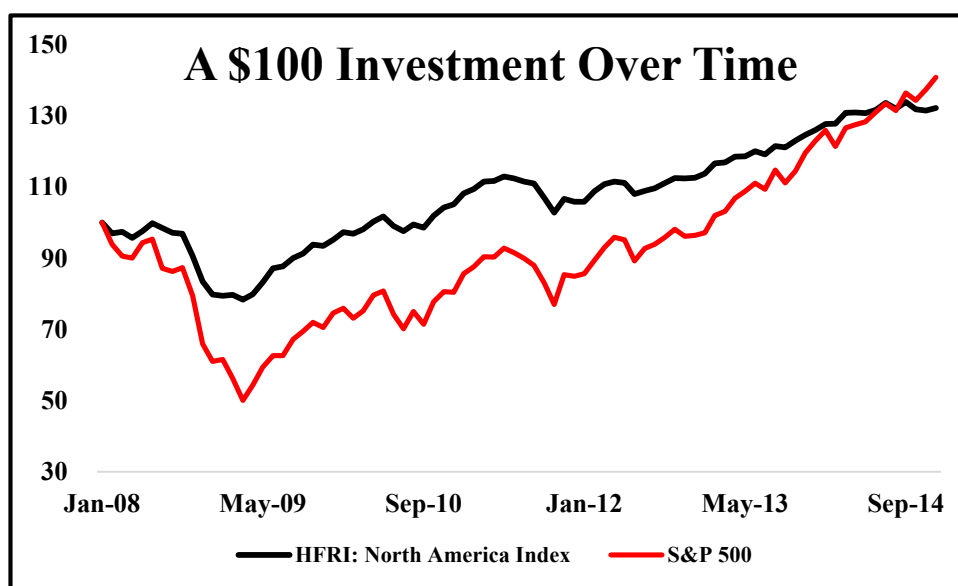
This chart the excess return of the hedge fund index over the broad market. Any value above 0% indicates that the hedge fund beat the broad market. The bars are one standard deviation marks which show that about 65% of the returns are between the bars assuming a normal curve. These values is not the hedge fund index's alpha because these returns have not been adjusted for risk. However, the London Index's and FTSE 100's Sharpe ratio shows us that the London Index has outperformed the FTSE on a risk adjusted basis.

Another thing to consider, is the exchange rate risk that neither the beta or Sharpe ratio take into consideration. The returns of the FTSE 100 is stated in British Pounds whereas the returns of the London hedge fund index is stated in United States Dollars. I will address the issue of exchange rate risk in another section.

### *The North American Index*

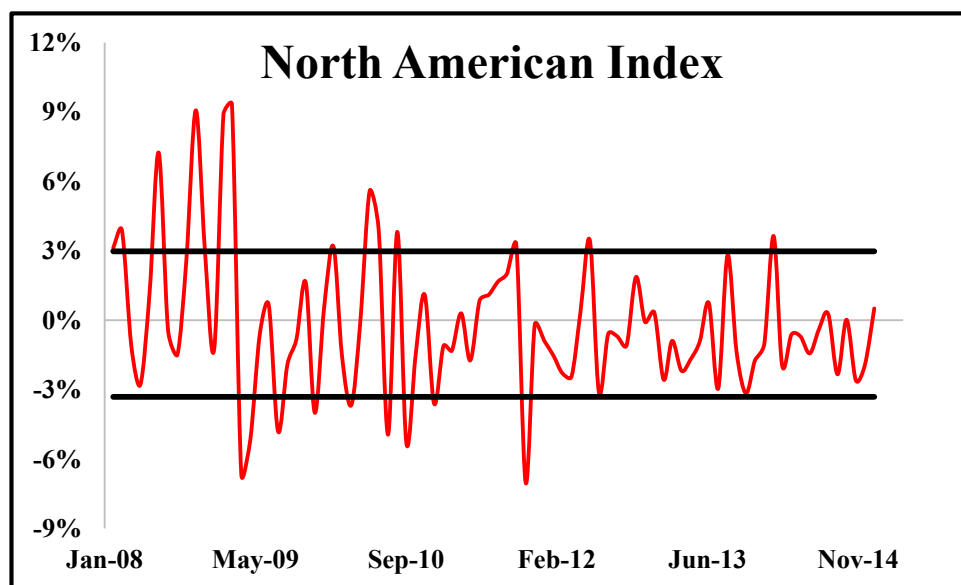
The North American was created to closely track the performance of the hedge fund universe in North America with a focus on the United States. Hedge funds in this index are based on different criteria set by Hedge Fund Research Inc. According to Hedge Fund Research Inc., the North American Index replicates risk and return profile of the hedge fund industry in the United States.

After gathering the performance data for from the North American Index, I benchmarked it against the S&P 500 which tracks the performance of the United States broad market. I tracked a \$100 investment in both those indices from January 2008 until December 2014.



From the chart above, we see that the North American hedge fund index underperformed the S&P 500. This chart, however, measures only the return on an investment. It does not take into account the risk taken by both these indices to provide this return. In order to measure the risk, I looked at the Sharpe Ratio and the Beta. The Sharpe ratio for the North American Index was 0.05 and the Sharpe ratio for the S&P 500 was 0.06. So on a risk

adjusted basis, the S&P 500 outperformed the North American Index. The beta of the North American Index benchmarked against the S&P 500 was 0.38 which showed that the North American Index was fairly exposed to the macroeconomic risk within the United States. Thus, the North American Index did not meet the purpose of a hedge fund to fully mitigate the macroeconomic risk of the United States market.

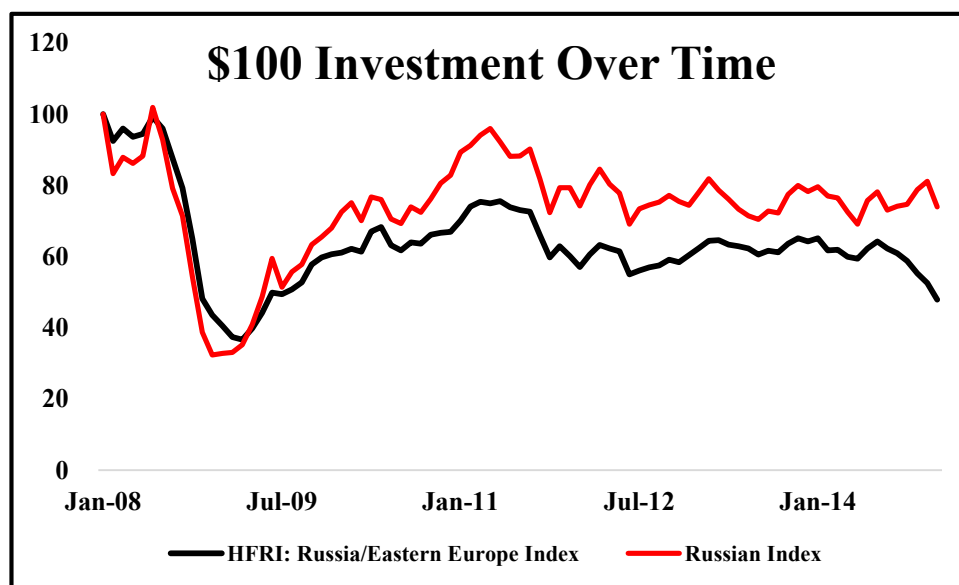


This chart shows the excess return of the hedge fund index over the broad market. Any value above 0% indicates that the hedge fund beat the broad market. The bars are one standard deviation marks which show that about 65% of the returns are between the bars assuming a normal curve. These values is not the hedge fund index's alpha because these returns have not been adjusted for risk. However, the S&P 500's and the North American Index's Sharpe ratio shows us that the S&P 500 has outperformed the North American Index on a risk adjusted basis.

### *The Russian Index*

The Russian Index was created to closely track the performance of the hedge fund universe in Russia. Hedge funds in this index are based on different criteria set by Hedge Fund Research Inc. According to Hedge Fund Research Inc., the Russian Index replicates risk and return profile of the hedge fund industry in Russia.

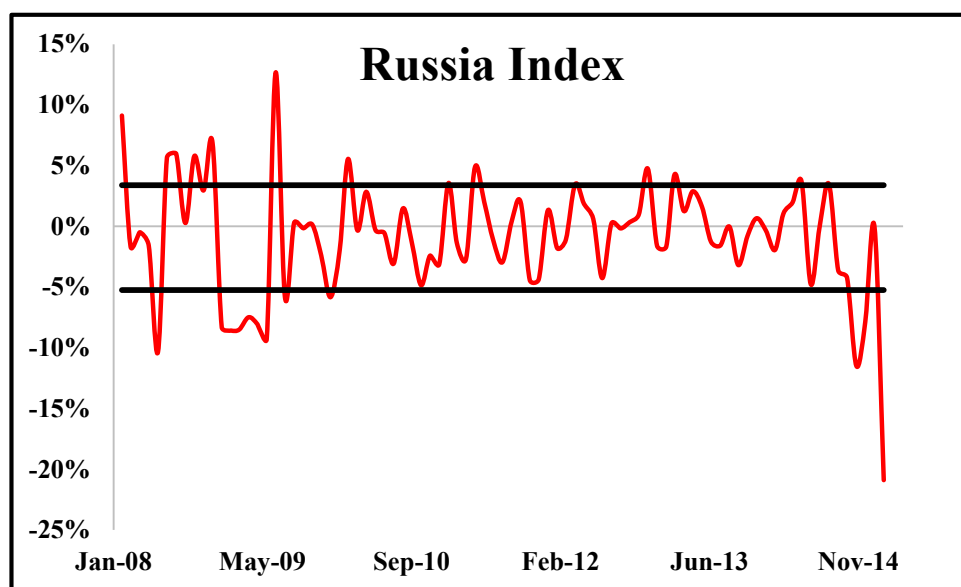
After gathering the performance data for the Russian Index, I benchmarked it against the MICEX which tracks the performance of the Russian broad market. I tracked a \$100 investment in both those indices from January 2008 until December 2014.



From the chart above, we see that the MICEX outperformed the Russian hedge fund index.

This chart, however, measures only the return on an investment. It does not take into account the risk taken by both these indices to provide this return. In order to measure the risk, I looked at the Sharpe Ratio and the Beta. The Sharpe ratio for the MICEX was -0.002 and the Sharpe ratio for the Russian hedge fund index was -0.159. So on a risk adjusted basis, the MICEX outperformed the Russian hedge fund index. The beta of the

Russian hedge fund index when benchmarked against the MICEX was 0.43, which showed that the Russian hedge fund index was fairly exposed to the macroeconomic risk within Russia. Thus, the Russian Index did not meet the purpose of a hedge fund to fully mitigate the macroeconomic risk of Russia.



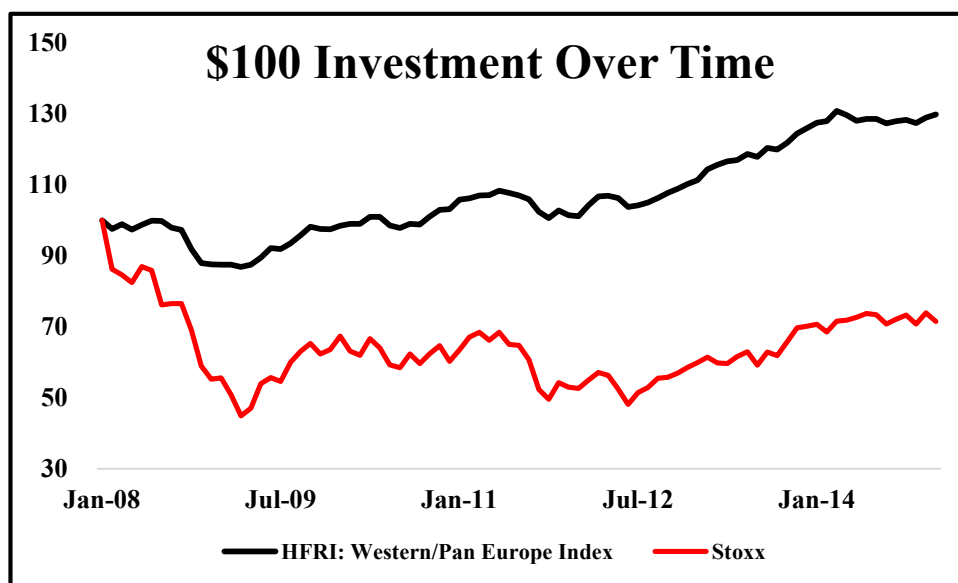
This chart shows the excess return of the hedge fund index over the broad market. Any value above 0% indicates that the hedge fund beat the broad market. The bars are one standard deviation marks which show that about 65% of the returns are between the bars assuming a normal curve. These values is not the hedge fund index's alpha because these returns have not been adjusted for risk. However, the MICEX's and the Russian Index's Sharpe ratio shows us that the MICEX has outperformed the Russian hedge fund index on a risk adjusted basis.

Another thing to consider, is the exchange rate risk that neither the beta or Sharpe ratio take into consideration. The returns of the MICEX is stated in Russian Ruble whereas the returns of the Russian hedge fund index is stated in United States Dollars. I will address the issue of exchange rate risk in another section.

### *The Western European Index*

The Western Index was created to closely track the performance of the hedge fund universe in Western Europe. Hedge funds in this index are based on different criteria set by Hedge Fund Research Inc. According to Hedge Fund Research Inc., the Western European Index replicates risk and return profile of the hedge fund industry in Western Europe.

After gathering the performance data for the Western European Index, I benchmarked it against the Stoxx which tracks the performance of the European broad market. I tracked a \$100 investment in both those indices from January 2008 until December 2014.

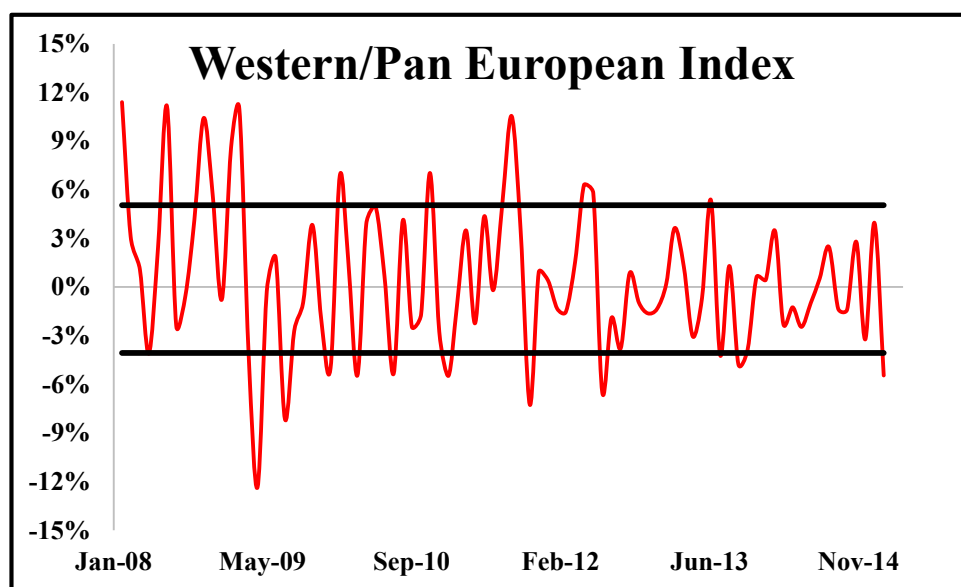


From the chart above, we see that the Western European Index outperformed the Stoxx.

This chart, however, measures only the return on an investment. It does not take into account the risk taken by both these indices to provide this return. In order to measure the risk, I looked at the Sharpe Ratio and the Beta. The Sharpe ratio for the Western European Index was 0.06 and the Sharpe ratio for the Stoxx was -0.07. So on a risk adjusted basis, the Western European Index outperformed the Stoxx. The beta of the Western European



hedge fund index when benchmarked against the Stoxx was 0.21, which showed that the Western European hedge fund index was fairly exposed to the macroeconomic risk within Europe. Thus, the Western European Index did not meet the purpose of a hedge fund to fully mitigate the macroeconomic risk of Europe.

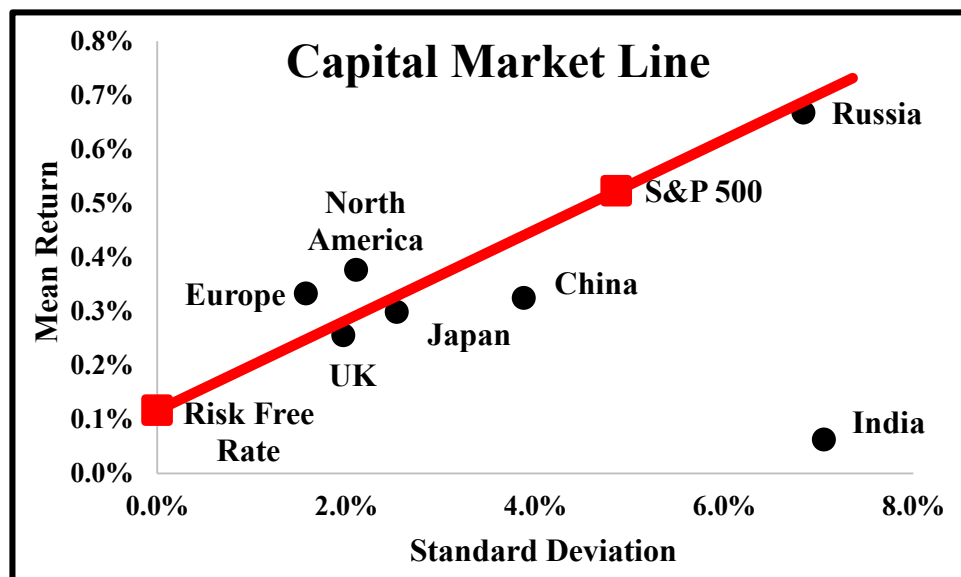


This chart shows the excess return of the hedge fund index over the broad market. Any value above 0% indicates that the hedge fund beat the broad market. The bars are one standard deviation marks which show that about 65% of the returns are between the bars assuming a normal curve. These values is not the hedge fund index's alpha because these returns have not been adjusted for risk. However, the Stoxx's and the Western European Index's Sharpe ratio shows us that the Western European Index has outperformed the Stoxx on a risk adjusted basis.

Another thing to consider, is the exchange rate risk that neither the beta or Sharpe ratio take into consideration. The returns of the Stoxx is stated in Euros whereas the returns of the Western European hedge fund index is stated in United States Dollars. I will address the issue of exchange rate risk in another section.

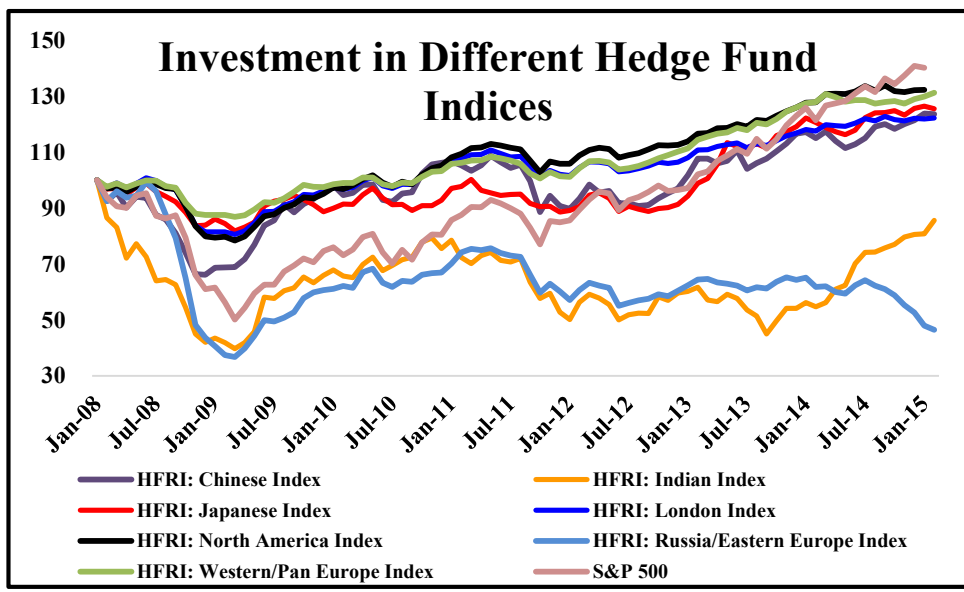
### ADJUSTMENTS FOR CURRENCY RISK

Returns for the hedge fund indices are reported in United States Dollars. Therefore, comparing absolute returns for between a hedge fund index and the broad market index might be misleading. In order to have a more holistic view of the returns of various hedge fund indices, I benchmarked all the indices against the S&P 500. I plotted the Capital Market Line to see how every hedge fund index performed on a risk adjusted basis. The chart below is a Capital Market Line. The Capital Market Line is a line that plots the returns against the volatility of the returns. It then runs a line from the risk free asset risk and return to the market risk and return. Everything above the line is a risk and return profile better than the market risk and return profile and everything below the line is a risk and return profile worse than the market risk and return profile. This showed me that on a risk adjusted basis, only the European Index and the North American Index beat the S&P 500 on a risk adjusted basis.



	S&P500	North American Index	India Index	Russia Index	Japan Index	Western Europe Index	China Index	London Index
Sharpe Ratio	0.06	0.05	(0.02)	(0.16)	0.02	0.06	0.02	0.01
Mean	0.52%	0.38%	0.06%	0.67%	0.30%	0.33%	0.32%	0.26%
Standard Error	0.53%	0.23%	0.77%	0.47%	0.27%	0.17%	0.42%	0.21%
Median	1.24%	0.68%	1.05%	1.43%	0.28%	0.41%	0.74%	0.42%
Standard Deviation	4.86%	2.11%	7.06%	6.84%	2.53%	1.58%	3.88%	1.97%
Range	27.71%	12.53%	44.52%	68.71%	12.70%	8.56%	19.96%	12.36%

If we do not consider risk and just measure the return, in the long run, we get the same results. The market index provides a higher return as compared to the every other hedge fund index in the long-run. My findings are consistent with Warren Buffett's bet against hedge funds. In 2006, Buffett placed a million dollar bet that the S&P 500, in the next ten years, will outperform any portfolio of ten hedge funds. Buffett is seven years into this bet and he is winning.



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