

Hedge Fund Replication

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Key Points

- Hedge Fund factor replication products attempt to create 'hedge fund-like' returns using liquid, investable factors such as equity indexes, bond indexes and commodity indexes
- These products tend to have a high correlation to equities and have delivered lower returns than widely used hedge fund indexes
- We believe that when investing in hedge funds the focus should be on alpha, with manager selection rather than capturing factor exposures being of critical importance
- We do not recommend the use of factor replication products as strategic investments

Introduction

The ideas behind hedge fund replication methodologies were borne out of the strong historic performance of hedge funds. From 1990 - 2007, the average hedge fund, as measured by the HFRI Fund Weighted Index, only had one down year in 17, and returned a cumulative 924%. This compared to equity returns of 508%¹ and bond returns of 366%². During this time, the number of hedge funds grew from an estimated 610 to over 10,000.

These compelling returns, along with the growth in the industry, began to attract academic interest. Initially academic research focused on analyzing the drivers of hedge fund returns. Notable work in this area was performed by William Fung and David Hsieh in the late 1990s. Their work focused on explaining hedge fund returns on a qualitative and quantitative basis, and extending William F. Sharpe's 'style analysis' to the world of alternative funds. A flurry of academic activity continued in this area, but it was in the mid-2000s that real breakthroughs were made, with perhaps the seminal paper of the time being 'Can Hedge Fund Returns Be Replicated?: The Linear Case' by Jasmina Hasanhodzic and Andrew Lo (2006). They proposed a linear six factor model for cloning hedge fund returns, using liquid exchange traded instruments. The factors were pre-specified as being liquid, investable and providing a broad cross section of risk exposures for the typical hedge fund³. Time series regression was performed on each individual hedge fund (the sample size was 1,610), regressing the fund's monthly returns on each of the six factors, thereby estimating a beta for each factor.

About 12-18 months after this, we witnessed investment banks marketing replication products. Research in this area continued, extending to non-linear replication strategies (Amenc et al, 2010) and distributional replication (Alternative Routes to Hedge Fund Replication Extended Version, Kat, 2007). Furthermore, some practitioners proposed a completely different approach; utilizing rules based trading strategies to

¹ S&P 500

² Barclays Global Aggregate Bond Index

³ For posterity, the factors were DXY, SPX, GSCI, a credit spread, a Lehman Bond Index and DVIX (the first difference of the end of month value of the VIX index). The DVIX was omitted from section 4 of the paper (Linear Clones) as its returns were not easily realized, at that time, with liquid instruments.

replicate hedge funds from the bottom up. However, most products are grounded mainly in the theories espoused in the work by Lo and Hasanhodzic and this paper will focus on these products.

What Is Being Replicated?

When examining a replication product, we first need to identify what it is one is attempting to replicate. There are three categories of hedge returns that one could attempt to replicate:

One possible approach is to attempt to replicate the returns of a single hedge fund. However, in practice this is almost impossible, at least for factor model methodologies. A single hedge fund can turn over its portfolio relatively quickly, and may have a number of idiosyncratic risks that cannot be easily replicated. Hence this approach is impractical.

Another, more popular, methodology is to attempt to replicate the returns of a large group of hedge funds. This is the approach that the majority of replicators follow. Most replication products will aim to track the returns of 'a broad universe of hedge funds', or the 'returns of the hedge fund industry', although others will name a specific index that they are attempting to track.

One of the advantages to the index replication technique is that although single hedge funds can be extremely nimble, an index or group of funds, containing thousands of funds, is less so, as it contains multiple decision makers. Positioning across a large group of hedge funds will move at a much slower pace than in the individual funds which comprise the index and there will often be some commonality of views. This means that a slow-moving replication approach, even one that is rebalanced monthly, may have greater success in capturing some of the returns of the index.

A final approach is to attempt to replicate the returns of a sector specific index such as equity long/short. The advantages and disadvantages are similar to replicating a broader index, although there may be other problems, such as lack of data points and difficulty in modeling certain strategies.

Methodology

There are a number of products available, mainly created by investment banks that utilize a factor replication approach. Most of these models have originated from the academic research noted above. This method attempts to decompose the returns of a group of hedge funds into a relatively small number of different predictive factors, using regression analysis. An example of a factor could be the S&P 500 Index, or the Dow Jones UBS Commodity Index. If the returns of a group of hedge funds can be broken down into such factors, and these have reasonable explanatory power, it may be possible to replicate the group using these factors. If these factors are liquid and investable it should be possible to create an investment strategy that attempts to replicate the group's performance⁴.

⁴ Typically products will use 6-12 different factors and rebalance monthly. The algorithm will take the form Monthly Return = $x_1F_1+x_2F_2+\dots+x_nF_n$ where x_1,\dots,x_n is the percentage weighting to each factor and F_1,\dots,F_n represents the factor set. There is no requirement for $x_1,\dots,x_n = 100\%$ hence some products do employ leverage

Recently, advances have been made in this field to include more dynamic factors. The original replication models used simple, easily investable factors such as those mentioned above. Some of the new generation models use less traditional factors. Examples of these could be the slope of the yield curve (2 year – 10 year), volatility, and options strategies. Some participants have also introduced adjustments to compensate for autocorrelation in certain strategies, along with other tweaks.

That is the theory. However, there have been some challenges to this approach:

- Some hedge fund strategies cannot be reasonably broken down into liquid, investable factors. The technique works quite well for certain strategies, but struggles when faced with those that have higher frequency of turnover, high convexity, or esoteric exposures not easily captured by conventional factors.
- The replication strategy is always playing catch up, as it is based on historical data. It can also be relatively sluggish, as most products are only rebalanced monthly. Hence strategies with a high turnover, and mid-month inflection points in markets will be very difficult to replicate.
- Performance for most replicators has been poor. It has mostly failed to keep pace with hedge fund indexes, themselves a questionable investment proposition.

The main potential advantages to this approach are as follows

- *Fees*: lower than traditional hedge fund investments and much lower than fund of hedge fund investments. This can be attractive to some participants who are deterred by the high fees associated with the industry.
- *Liquidity*: many factor replication products will offer daily or weekly liquidity, with no lock ups. This can be compared to monthly or quarterly liquidity for most hedge funds, sometimes with lock up periods and notice periods. Transaction sizes are also not an issue.
- *Transparency*: some replicators will show the exposures they have each month, which will typically be to 6-12 factors. This is in direct contrast to some hedge funds which may not wish to share their positions with investors, and whose portfolio may consist of thousands of line items.

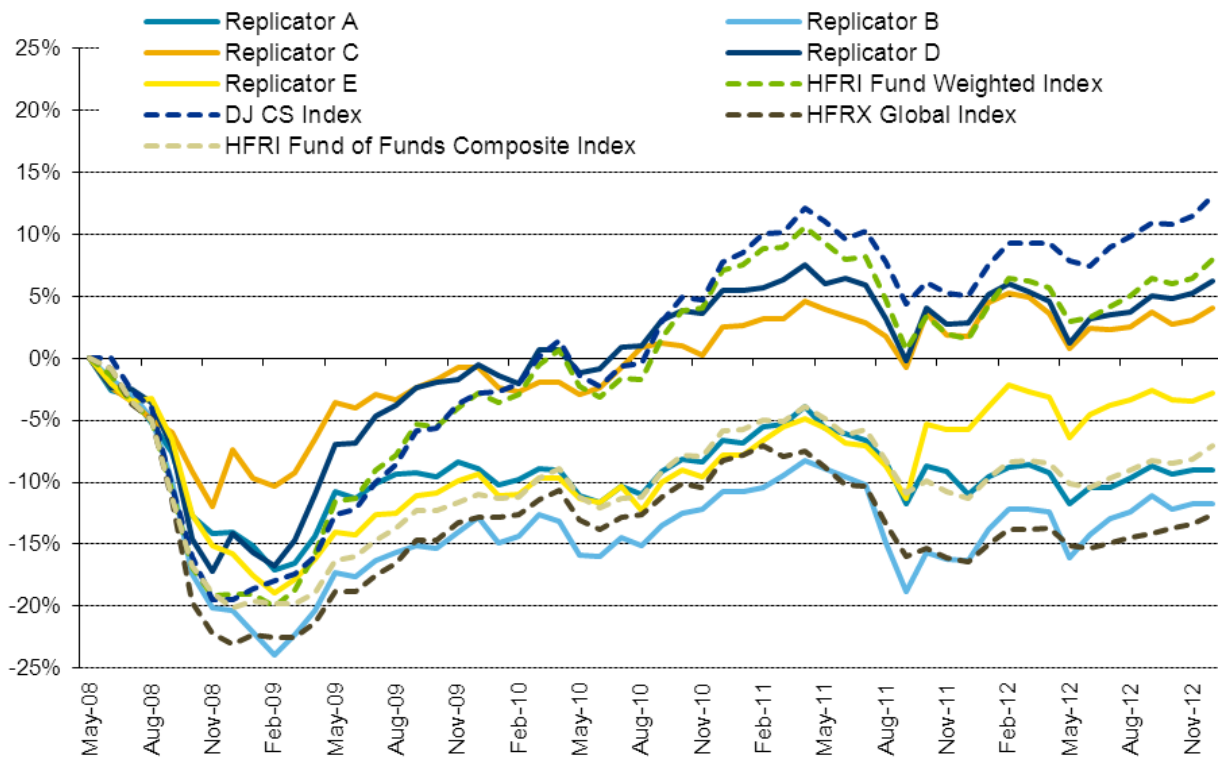
It may be useful to compare the two approaches alongside an investment in a hedge fund:

	Hedge Fund Replication	Direct Hedge Fund Investment
Availability	Few providers, although the universe is growing. Predominantly investment banks	Approximately 10,000 of widely differing size and quality
Fees	Typically management fee only	Management fee and performance fee
Correlation to equities	High	Variable
Liquidity	High - daily	Variable – monthly/quarterly
Performance	Lower than widely used hedge fund indexes	Variable
Provide Alpha	No	Variable
Capacity	High	Limited
Investment process	Mainly passive with monthly reweighting	Active

Performance Comparison

The performance section will only focus on 'live' track records; back-tests will be excluded. We have selected five hedge fund replicators, mainly from investment banks which will have a number of investable products based on the replicators. All products use a factor replication methodology and have a live track record from June 2008 through December 2012. Returns are shown net of fees.

Figure 1: Performance of replicators and various benchmarks



The Figure above illustrates a number of interesting points. Firstly, no replicator has managed to match the net of fees performance of arguably the two most common benchmarks used for hedge fund performance, the HFRI Fund Weighted Index ("HFR") or the Dow Jones Credit Suisse Index ("DJ CS").

The replicators have performed better than the HFRX Global Index ("HFRX"), which is an investable index with daily liquidity, including a subset of managers from the HFR database (approximately 6,800 funds) that are open for investment and will accept managed account investments from HFR, along with other restrictions. However in our opinion, the restrictions placed on inclusion in this index, notably ac-

ceptance of a managed account from HFRI, mean that this index is by no means representative of the performance of the 'average' hedge fund.

The actual benchmarks to which replication products compare themselves vary significantly. Some managers will state that the product will attempt to track a certain index and show performance against this benchmark. Others will adopt a more general statement, such as the fact that the fund will attempt to track the broad hedge fund universe. There are also those that may illustrate performance against a number of different benchmarks, representing various hedge fund indexes. Finally some may claim high correlation to a certain benchmark, and then show performance against a different benchmark that has performed relatively poorly. This can create confusion over what the replication product is attempting to replicate.

As can be seen from the above, a successful attempt to replicate a certain index could offer a much more desirable return stream than another. However, this requires a decision in advance regarding which index will perform well in the future, which can be difficult for similarly constructed indexes, and a belief in the ability of the chosen replicator to closely track the target index, which as seen in the Appendix most products have failed to do. Even if all of these challenges were met, we are of the opinion that the return of the average hedge fund, as represented by hedge fund indexes, is not a compelling investment.

Figure 2: Monthly Dispersion June 2008 – December 2012

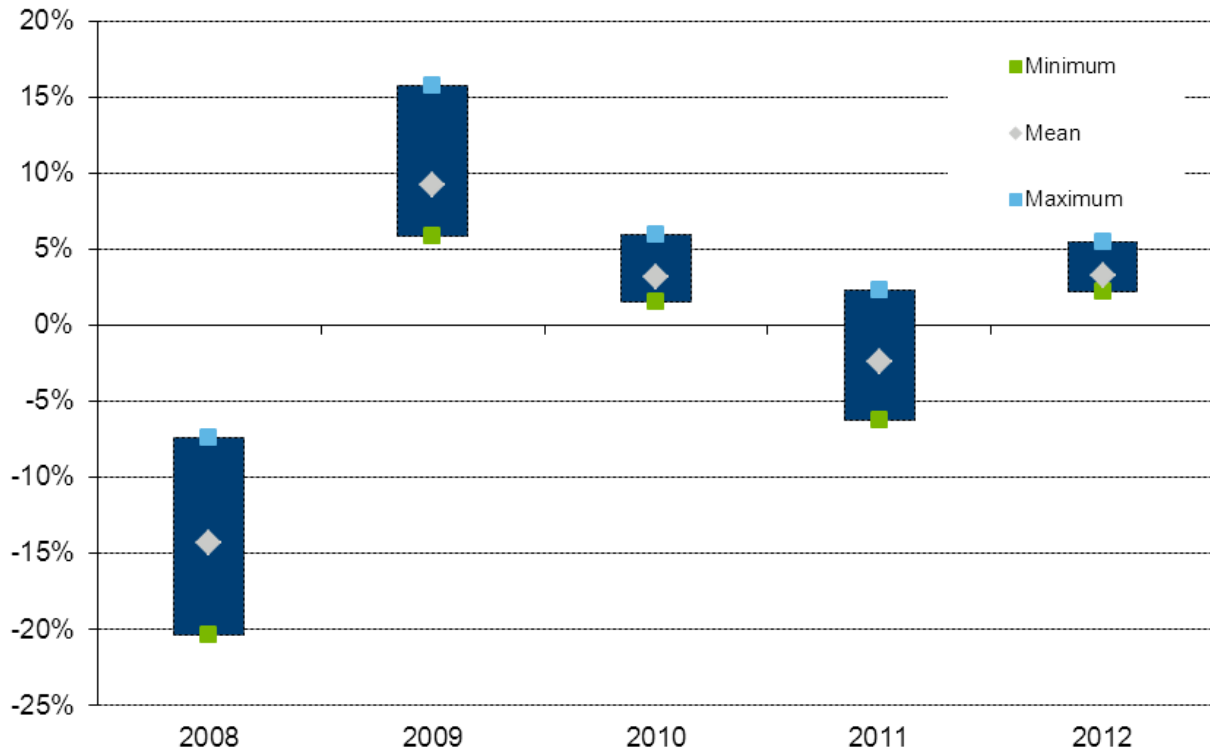


Figure 2 shows the dispersion of annual returns from June 2008-2012. What is striking is the range of returns available from just 5 products that are attempting to replicate hedge fund returns. This is caused to some extent by the large dispersion in hedge fund indexes, but is exacerbated by the tracking error contained in the replicators compared to their reference index. This illustrates how a number of products which have a similar aim, which is to replicate hedge fund returns, can result in very different outcomes for the investor.

Figure 3: Correlation to market Indexes: June 2008 – December 2012

Correlation	Fund A	Fund B	Fund C	Fund D	Fund E
S&P 500 Returns	0.9	0.9	0.7	0.9	0.9
DJ US Total Stock Market	0.9	0.9	0.7	0.9	0.9
MSCI World Ex US	0.9	0.9	0.8	0.9	0.9
BC Agg Bond Index	0.1	0.1	0.2	0.2	0.1
BC High Yield Bond Index	0.7	0.8	0.7	0.9	0.7
DJ UBS Commodity Index	0.8	0.8	0.6	0.7	0.8

Many commentators cite the fact that pension funds can obtain cheap diversification by investing in hedge fund replicators, but we are of the opinion that this is not the case. General hedge fund indexes, and as such replicators, are heavily correlated to equities; therefore the diversification benefits of investing in these products are minimal. The hedge fund universe contains a large number of managers who have a heavy long bias, and tends to be dominated by strategies with a high equity beta. As such, it is no surprise that this is the case.

A further point to highlight is the fact that we would argue that the returns of the average hedge fund are not a particularly attractive investment. Even if a product existed that could replicate the returns of a widely used index, such as the HFR, in a consistent manner, the hedge fund universe contains many funds in which an institutional investor would not realistically entertain investing. We believe it is possible to select hedge funds that are above average, by adopting a rigorous investment and operational due diligence approach.

Due to the poor out of sample performance of most hedge fund replicators, and the fact that they are attempting to replicate something that is not an attractive investment (the average hedge fund), we believe they have limited uses for institutional clients. One possible use, however, could be as part of a transition management program; cash could be invested in the replication product while suitable hedge funds are identified, with the investment being easily unwound when the cash is deployed with hedge fund managers. However, the caveat to this approach is the performance dispersion that can occur, as demonstrated in the preceding performance analysis. The expectation of a similar return to an identified hedge fund index over a short time frame may not be forthcoming.

Due to the preponderance of investment banks offering these products, there are a large amount of OTC and structured products based on the replicators. As well as fund vehicles it is possible to structure capi-

tal protected notes, leveraged vehicles and total return swaps around the products. However, there will normally be additional fees to pay for this type of structuring.

Conclusion

We do not recommend the use of hedge fund replication products as strategic investments, at least in their current form. There are two main reasons for this

- Out of sample, net of fees performance has generally been disappointing. Despite offering flat fees generally lower than those of traditional hedge fund investments, and no performance fee, the returns generated by these products have lagged those of hedge fund indexes.
- We are of the opinion that the typical hedge fund index is not an enticing investment. It has high correlation to equities and little or no specific risk or alpha. Hence the starting point of these products is flawed.

Proponents of hedge fund replication will cite various factors that supposedly make this approach a sensible alternative to direct hedge fund investing, but the arguments don't really stand up to scrutiny:

- *Fees:* fees can be low, but vary considerably between products. They range from 0.5% - 1.6%, although for larger allocations the terms could be more attractive. However, net of fee returns have not matched the most widely used hedge fund indexes.
- *Liquidity:* these products do offer daily liquidity, but most institutions do not need such frequent access to capital. The investment horizon of most institutional investors can be measured in years rather than days.
- *Transparency:* the monthly exposures for each product are easily available, and are often displayed in the monthly fund literature. However, the hedge fund industry has become increasingly transparent, and investors should demand a level of transparency with which they are comfortable, up to and including position level transparency.

One area where replication could be useful is as part of a transition management program, as a placeholder prior to investment in a hedge fund for example. However, due to the dispersion of returns, great care and research would be needed prior to any investment.

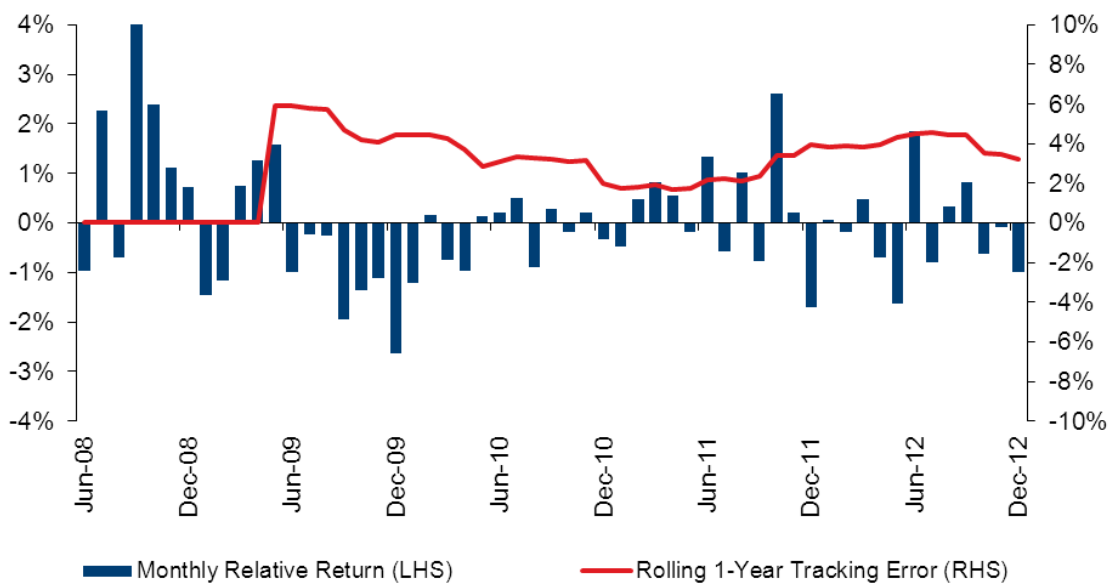
We would not recommend hedge fund replication as a replacement for hedge fund exposure. The approach does not offer alpha – those returns which can be ascribed to manager skill. In fact, to date it has offered a return stream inferior to those of widely used hedge fund indexes with a notable tracking error.

Hedge funds, more than any traditional asset category, offer outsized rewards for investing in talented managers as returns are measured on an absolute rather than relative basis. In their present form, factor replication methodologies have largely failed to offer returns comparable to the broad hedge fund industry, which we believe in itself is not an enticing investment proposition.

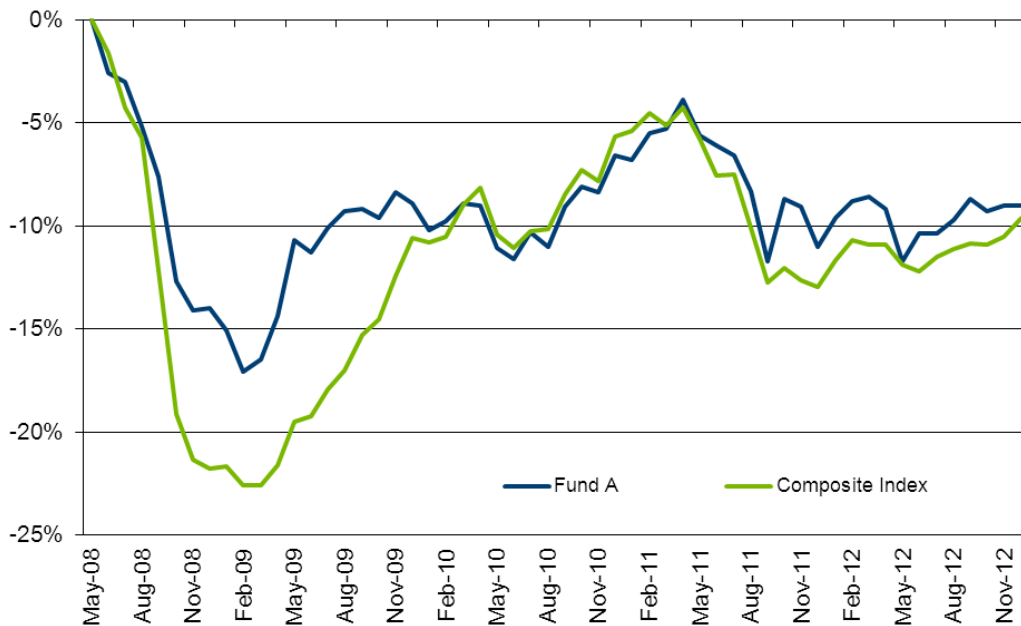
Appendix – Individual Replicating Fund Performance and Tracking Error

This section compares individual replicators to benchmarks which they attempt to replicate. In some cases this benchmark is unclear, in these cases the replicator will be compared to all suggested benchmarks.

FUND A – Benchmark – composite of investable Hedge Fund indexes

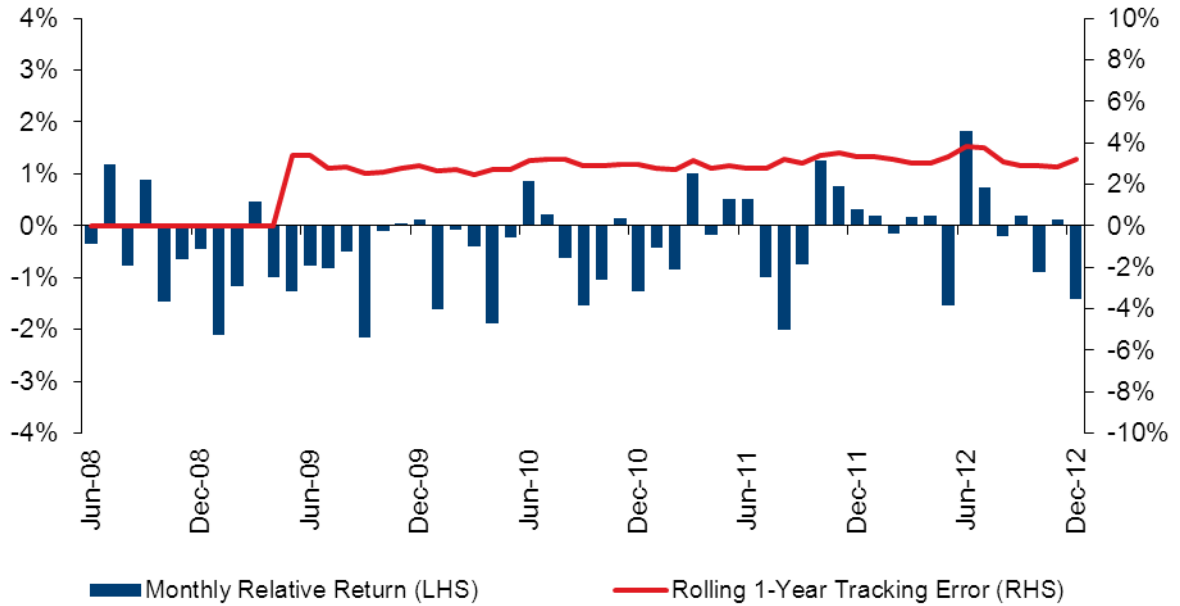


Performance Compared to Target Index

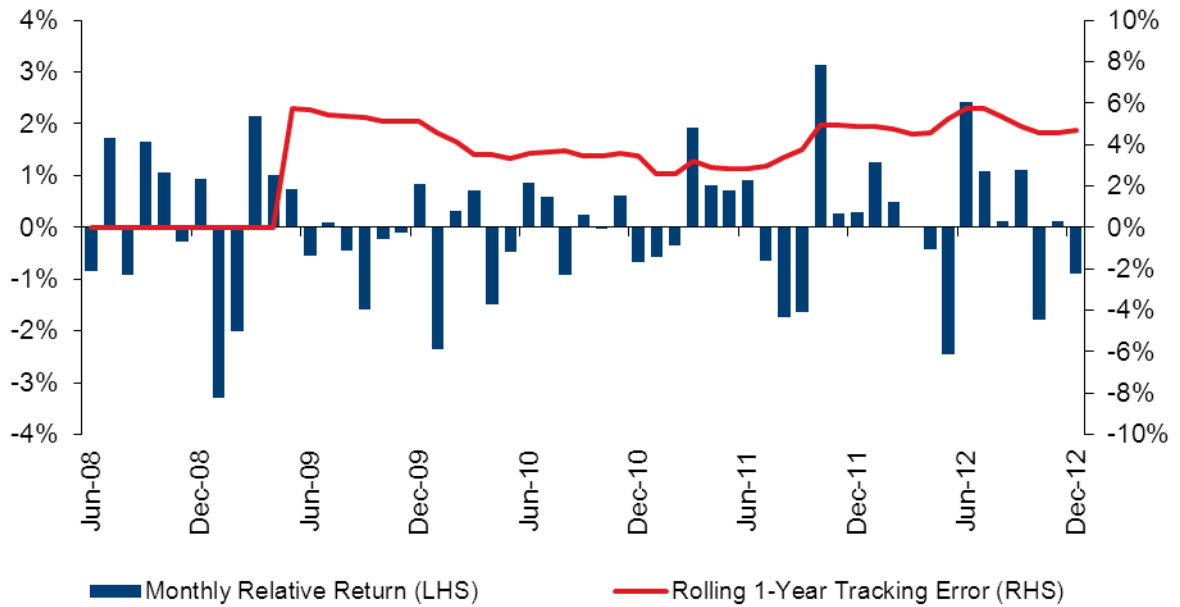


Fund B – Benchmark – HFRI Fund Weighted Index, HFRX Global Hedge Fund Index

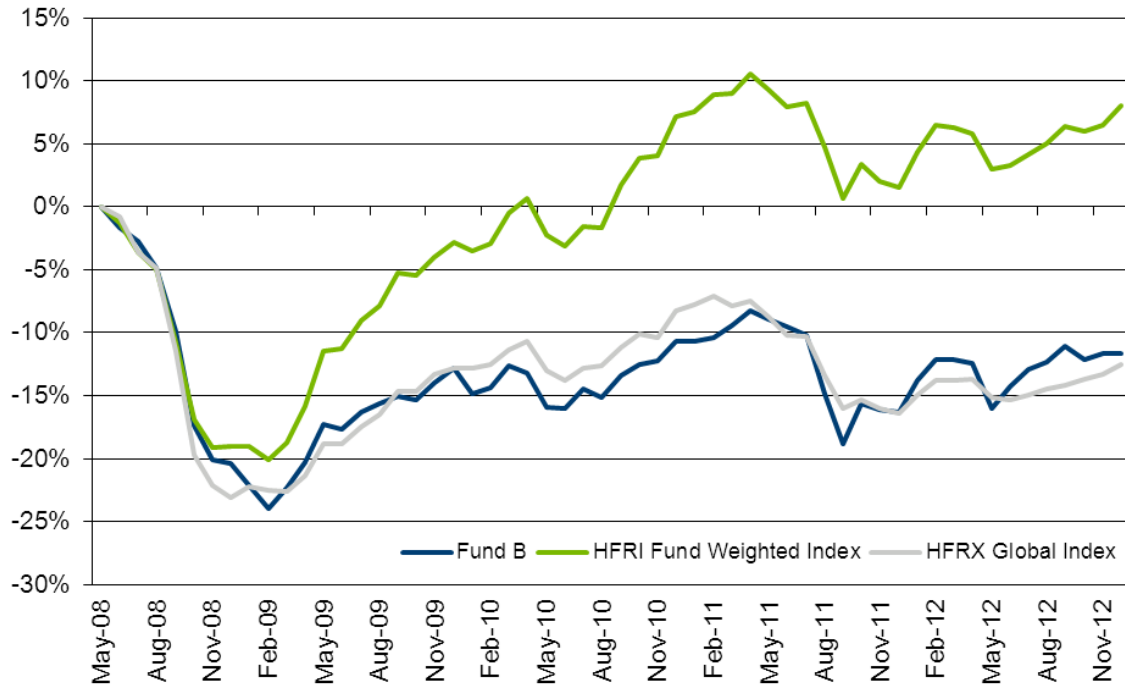
Tracking error – HFRI Fund Weighted Index



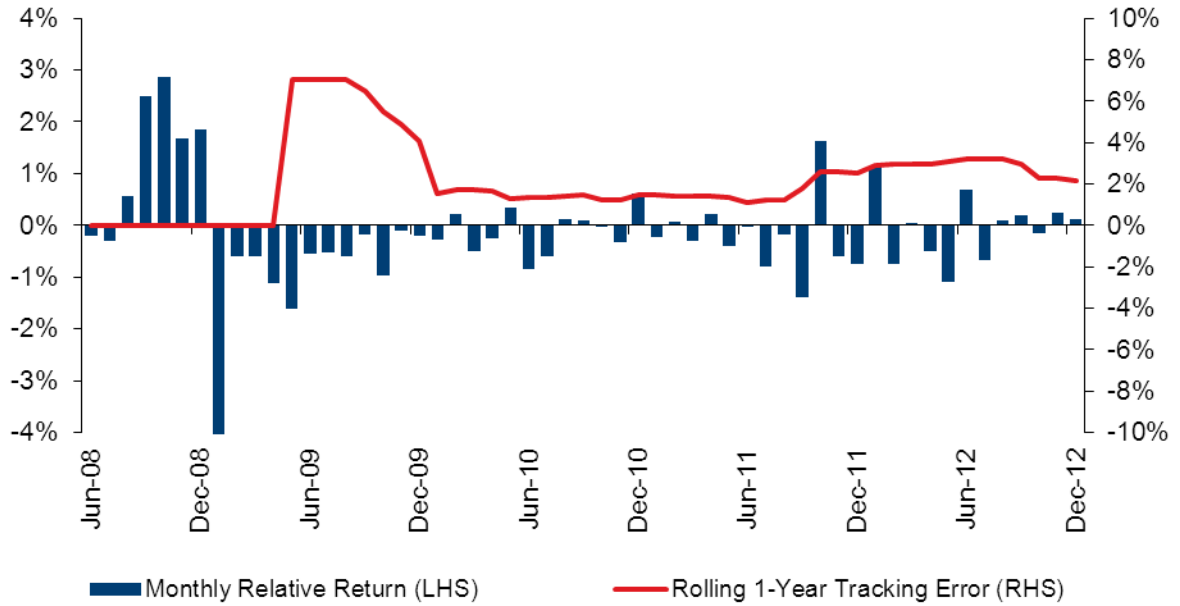
Tracking error – HFRX Global Hedge Fund Index



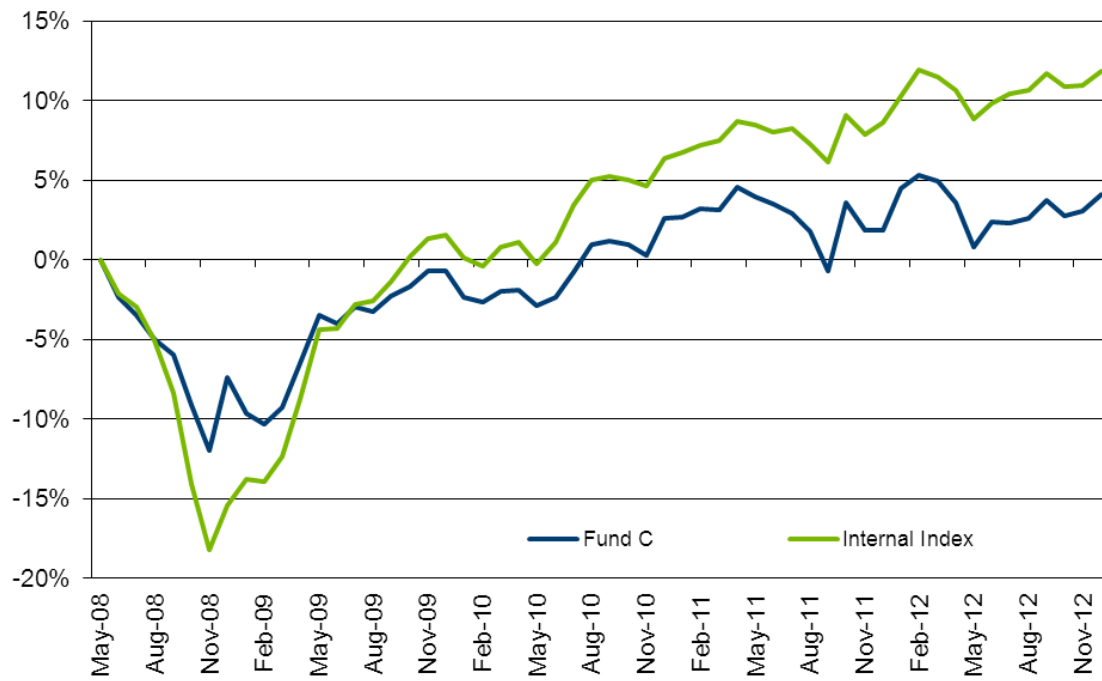
Performance Compared to Target Index



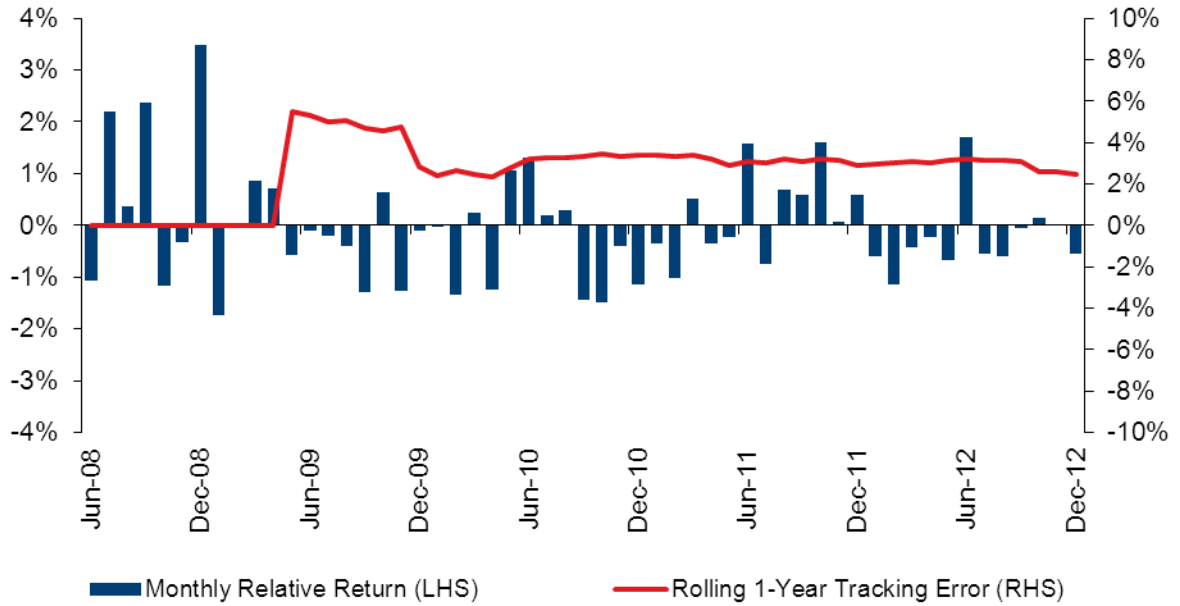
Fund C – Benchmark – Internally calculated



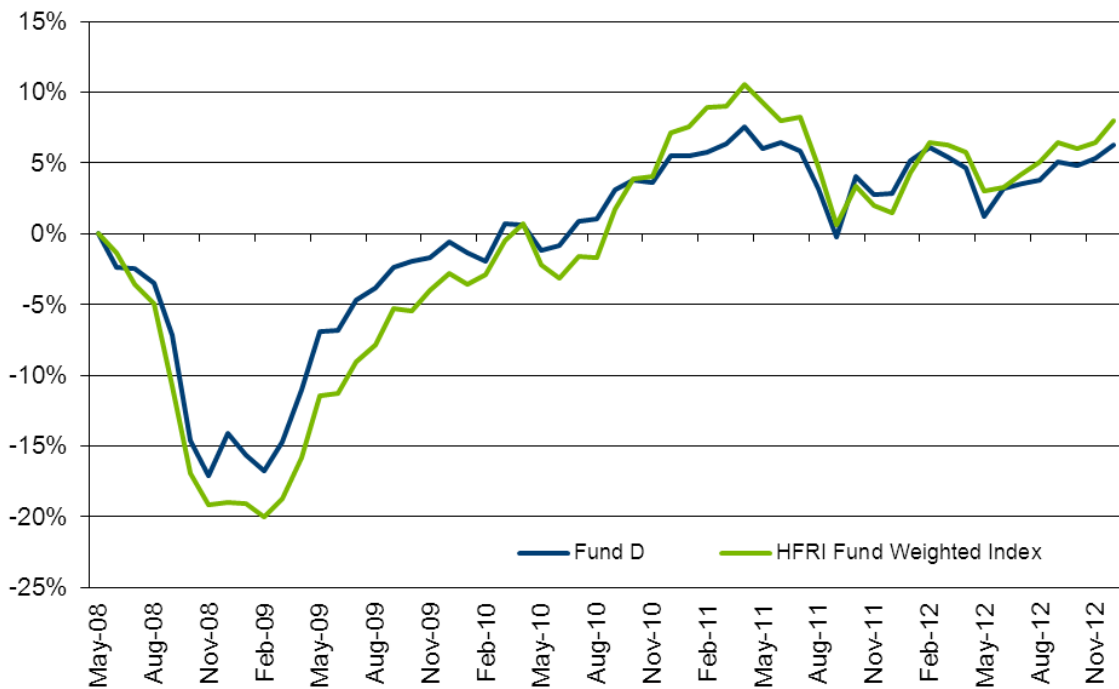
Performance Compared to Target Index



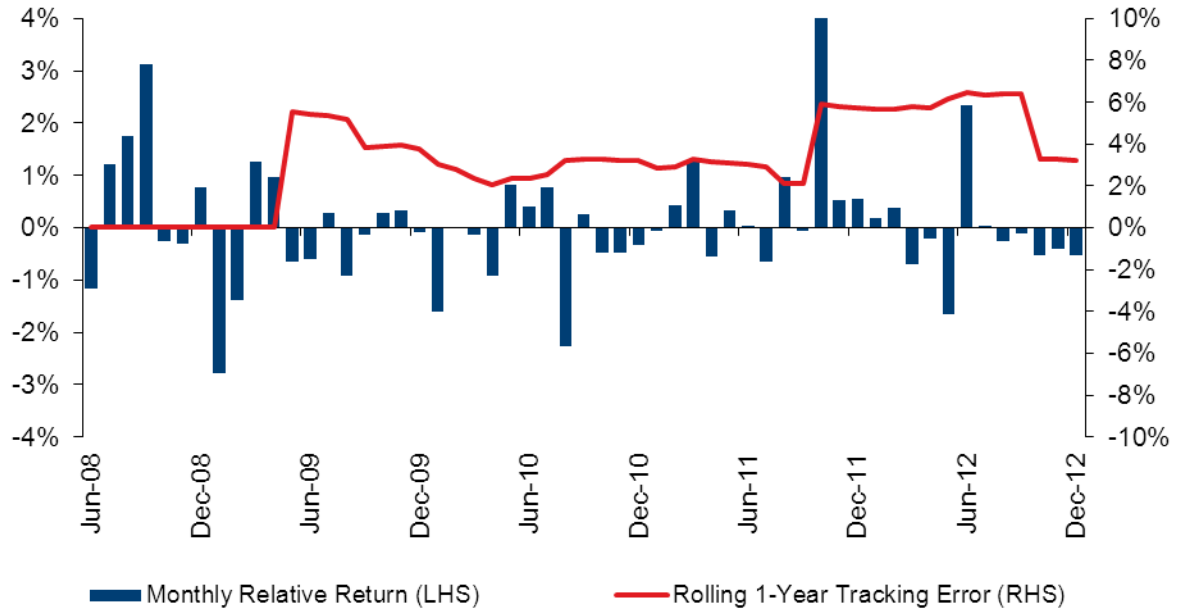
Fund D – Benchmark – HFRI Fund Weighted Index



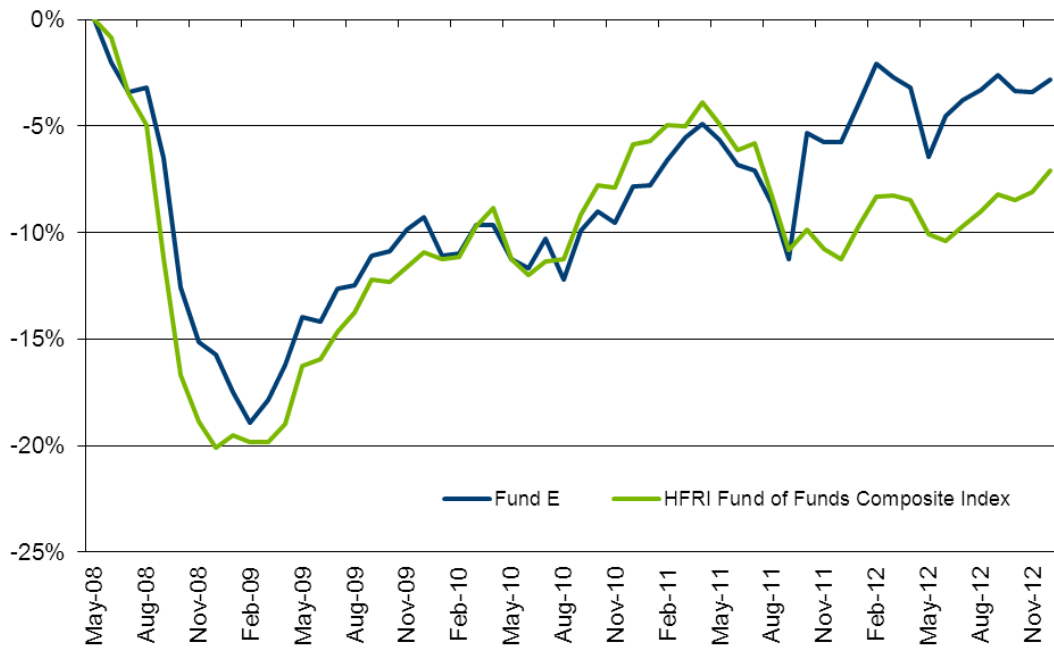
Performance Compared to Target Index



Fund E – Benchmark – HFR FOF Composite Index



Performance Compared to Target Index



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