More than 7,500 hedge funds and 2,300 funds of hedge funds managed just under $2 trillion in assets as of the end of the first quarter of 2008 according to Hedge Fund Research Inc. (2008). Any way you look at it, the hedge fund industry is big—so big that many investors now question whether hedge funds deliver on their promise of superior risk-adjusted returns. Combined with illiquidity, lack of transparency, and time commitments, concerns over hedge fund performance have helped spawn a new industry built around hedge fund replication. Replication proponents argue that such strategies are low-cost, liquid, transparent, and often outperform broad hedge fund benchmarks.

Commercial hedge fund replication techniques have gained support from the following three key industry trends:

Separation of alpha and beta. On-going developments for disaggregating the alpha (manager skill) and beta (systematic risk exposures) have made the separation of active and passive elements of hedge fund returns a plausible practice.

The burden of fees. The high fees charged by individual hedge fund and fund-of-funds managers increasingly are hard to justify in a world of declining average returns.

The long-only example. The success of low-cost indexes in the long-only world provides a powerful model for how the replication industry can develop.

While still in its formative stage, the replication space is dominated by the following three schools of thought:

1. Factor models, which suggest that hedge fund returns primarily come from a set of tradable factors that can be captured using a regression framework.

2. Mechanical trading rules, which attempt to deliver an absolute return by following a set of defined trading rules.

3. Distribution models, which attempt to replicate the desired distribution of a given hedge fund through model-driven trading.

To date, hedge fund replication has had moderate success. Many replication models have outperformed the broader hedge fund universe, particularly aggregate measures of hedge fund performance. However, questions remain around how these models will perform during periods of significant market dislocation. Further, asset raising has been modest at best, as firms struggle with cannibalizing more-traditional, higher-fee alternative products.

We see the replication industry evolving into a cross between the three dominant models. Replication will target the aggregate hedge fund space (e.g., funds of funds, pooled hedge funds, or multi-strategy funds). Quality replication products ultimately will be delivered through mutual funds, separate accounts, and even exchange-traded funds (ETFs). This will broaden the potential investor base in the product while simultaneously pressuring both traditional alternative and mainstream solutions.

Separation of Alpha and Beta

William Sharpe (1992) brought the concepts of alpha and beta to the mainstream consulting community when he pioneered returns-based analysis for actively managed mutual funds in the early 1990s. Sharpe’s method describes an active style as a linear combination of a set of asset class indexes (beta) plus an error term (alpha). Alpha often is referred to as manager skill. The trouble with alpha is twofold: identifying it in advance and distinguishing it from luck after the fact are both imperfect exercises.

Alpha is idiosyncratic and not widely available, and therefore it should be worthy of premium pricing. Beta is readily available at low cost through index funds, ETFs, or the futures markets. It makes sense to pay different prices for the two functions. The premise behind hedge funds is that they deliver more alpha than beta, hence the high fee structure.

Measurement of alpha and beta in hedge funds historically has been a tricky business because hedge fund strategies profess to be dynamic, they resist benchmarking, and data on returns have been scant and imperfect. With improved understanding of the drivers of hedge fund returns and more available data, the disaggregation exercise has begun to yield some useful results. A growing body of literature and empirical evidence validates what many have long suspected: The hedge fund industry does not make its living by extracting inefficiencies alone (Fung and Hsieh 2002; Jaeger and Wagner 2005; Kat 2007).

Figure 1 shows the relationship of two investable hedge fund indexes to the S&P 500. Both hedge fund indexes show moderately high correlation and lower returns with lower volatility relative to the market. Given our view, based on anecdotal evidence, that the majority of hedge funds run a net long 35-percent position, we constructed a simple replication strategy of a 35-percent S&P 500 and 65-percent one-month London interbank offered rate (LIBOR) portfolio (S&P blend) for a more insightful comparison (i.e., a simple replication strategy).

Figure 2 shows that a simple replication strategy of the S&P and LIBOR
outperforms the broader hedge indexes over the time period selected. One might interpret this to mean that some individual hedge funds produce meaningful alpha, but when they are pooled with many funds the alpha is diversified away. What one is left with is beta, and after fees something even less than that. The premise behind hedge fund replication is that this beta is identifiable and can be delivered in a cheaper, more-liquid way.

The Burden of Fees

The fees charged by individual hedge fund managers generally include a 1–2-percent management fee and a 20-percent incentive fee. Up to 50 percent of hedge fund assets flow through funds of hedge funds that charge another layer of fees, usually a 1-percent management fee and a 10-percent incentive fee.

While it is plausible and even likely that a higher percentage of the world’s investment skill resides in the hedge fund industry than elsewhere (and that skill is most highly compensated in hedge funds), the high fees are a steep hurdle to the production of high absolute returns.

Table 1 shows the net returns to an investor in a fund of hedge funds, where that fund of funds has a single hedge fund investment returning 12 percent. Nearly half the returns are lost to fees. By comparison, a replication strategy would need to return only 7.05 percent to deliver the same net returns. That implies a breakeven manager alpha of 495 basis points—a significant hurdle for even the most-stellar hedge fund. By stripping one layer of management fees and two layers of incentive fees, hedge fund replication strategies face a relatively lower bar for comparable returns.

Funds of funds also suffer from an additional potential fee drag due to the asymmetric nature of paying incentive fees to the individual underlying managers. At the extreme, a fund of funds could lose money in aggregate but still be paying incentive fees to those underlying managers who made money. This additional drag has been estimated at 40–80 basis points annually (Jaeger 2007).

Lackluster average returns and persistent high fees have provided much of the impetus for the hedge fund replication movement. When double-digit net returns prevail, investors tend to ignore high fee structures. Not surprisingly, interest in low-cost hedge fund replication strategies has grown as aggregate hedge fund returns have come down. Returns may or may not materialize, but fees are certain.
The Long-only Example

Returns to active management tend to decline as more people pursue similar strategies. In the long-only world, this has resulted in an estimated 75–80 percent of active money managers underperforming their passive benchmarks (see Bogle 2005).

Not surprisingly, a large amount of long-only business has migrated to cost-efficient index funds over the years (see figure 3). More recently, the proliferation of ETFs has increased the number of tools available to investors for making passive investments. Global assets in ETFs recently were estimated to be $800 billion, a 40-percent increase over the previous year (Investment Company Institute 2008).

In the past decade huge sums of capital have flooded into the hedge fund industry and the number of funds has multiplied several times. The increased competition among these active fund managers is cited as one reason for the decline in average hedge fund returns. With less return differentiation and lower average returns it may become harder to justify the high fee structures.

The evolution of the mutual fund industry and the recent explosive growth in exchange-traded funds are driving a push toward a passive, cost-efficient alternative to funds of hedge funds. The analogy is arguably imperfect, but it’s plausible enough to draw the attention and creativity of an increasing number of market participants.

Factor Models

Fung and Hsieh (1997) pioneered factor-based analysis of hedge fund returns. Hedge fund factor models extend Sharpe’s returns-based style analysis to include hedge fund techniques such as leverage and short selling, and across a wider set of inputs. The objective is to replicate the returns of hedge funds. The model is of the form:

\[ HF_t = \sum_{i=1}^{N} \beta_i F_i + \epsilon_t \]

where \( HF_t \) is the return of the hedge fund index at time \( t \), \( \beta_i \) is the weight of the \( i \)th of \( N \) factors, \( F_i \), and \( \epsilon_t \) is the residual. The practitioner has flexibility in setting the limits on the weights, \( \beta_i \). For example, the practitioner can allow leverage (\( \sum \beta_i > 1 \)) or short selling (\( \beta_i < 0 \)) across one or more factors.

The practitioner also has flexibility in identifying the factors, \( F_i \). Factors might include a tradable commodity index, the spread between growth and value stocks, a long-put chain or a short-volatility premium.

The biggest shortcoming of factor models is that they use a simple step-wise linear regression to measure past hedge fund returns. These returns generally are thought of as both dynamic and nonlinear. Empirical evidence suggests factor models perform poorly in out-of-sample testing (Amenc et al. 2007). However, performance improves significantly when replicating large groups of managers pursuing homogeneous strategies or very large samples of managers pursuing heterogeneous strategies (Kat 2007, 14–15). Our interpretation of this is that the larger the manager pool, the more idiosyncratic risk is diversified away and aggregate returns become normally distributed, leaving well-behaved systemic factors.

Assuming the inputs are correctly specified, a factor-based model can be described as an asset allocation model where decisions are outsourced to the collective wisdom of hedge fund managers who constitute the index being replicated.

Mechanical Trading Rules

While factor models can be thought of as a top-down approach, mechanical
trading rules seek to replicate certain risk premia or “alternative beta” from the bottom up through mechanical trading rules. Asness (2004) described alternative beta as returns that can be specified in a systematic way but require hedge fund techniques such as short selling, leverage, and derivatives.

A widely implemented example of alternative beta is volatility arbitrage, or spreading implied and realized volatility. While returns are tied to systemic risk factors, implementing such a strategy requires a sophisticated understanding of options and delta hedging.

Replication of alternative beta requires in-depth knowledge of the workings of various hedge fund strategies. Once specified, implementation requires capital markets expertise including mastery of various hedge fund techniques. As such, replication strategies that emphasize alternative beta tend to resemble traditional hedge funds in areas such as pricing and transparency.

Distribution Models
Building on earlier work by Dybvig (1988), Kat and Palaro (2005) have been leading the distribution model camp. This method of replication attempts to match the unconditional distribution properties of a hedge fund rather than its time series properties. We can define the following:

\[ P(HF \leq j) = P(CF \leq j) \]

for all \( j \) where \( 0 \leq j \leq 1 \) where \( P \) is the probability operator, \( HF_t \) is the return of the target hedge fund at time \( t \), and \( CF_t \) is the return of the replicating fund at time \( t \). Applying this criterion against a defined reserve portfolio, the practitioner can build a payoff distribution function. The cost of replicating this distribution function through dynamic hedging yields the expected return on the strategy. The premise is that with the right assets, the practitioner can dynamically replicate a given distribution of returns.

The earlier work by Kat and Palaro (2005) utilized the above framework to capture the moments of a distribution—though not the first moment (the mean). Later work (Kat and Palaro 2006) expands the application to replicate both the first moment and the co-moments (second or higher moments) of the distribution relative to the investor’s portfolio.

There are several drawbacks to the distribution model approach, starting with the fact that many hedge fund strategies cannot be effectively modeled (Amenc et al. 2007). Even when strategies can be modeled, it can take years before the replication strategy exhibits the same characteristics as the target; Amenc et al. (2007) suggest that it takes up to six years. These drawbacks, combined with the analytical and operational complexity of the strategy, have limited the commercial adoption of the approach.

The State of Hedge Fund Replication
To date, there are at least nine commercially available hedge fund replication products. Roughly half of these are factor models, and the rest are based on mechanical trading rules. Kat also offers his solution directly and through a set of dealers. But despite the fanfare, assets raised have been modest at best. The Financial Times (February 25, 2008) sized the market at $2 billion in a $2 trillion industry.

Figure 4 shows the performance of various replication strategies and HFR benchmark indexes from April 2003 to May 2008. Figure 5 shows performance of the same set of funds (HFRX Global and ML Factor) have data from only April 2003 so they are omitted) over a longer time period (March 1999 to May 2008) that includes different market conditions.

Performance is mixed in the recent period though the strategies presented outperform the investable benchmark (HFRX Global). In the longer period shown in figure 5, the factor models underperform the index during the bear market. Note, however, that the HFRX global hedge is not available during this earlier time period, and that the sub-stitute HFRI FOF index is noninvestable. Further, no replication strategies existed during the entire time period, so returns for the majority of the period all are back-tested results.

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Given the relatively encouraging historical performance, the obvious question is this: Why haven’t replication products raised more assets to date? We believe there are multiple reasons. Most products are quite young, and many investors have adopted a wait-and-see attitude. Also, access to replication products is limited. To date, no viable ETFs or mutual funds position themselves this way.

The biggest barrier to replication adoption is simple economics. Unfortunately, charging 75 basis points for a solution that cannibalizes a 2-percent management fee/20-percent incentive fee product does not make economic sense for a broker, even if it is in the best interest of the client. We do not think it coincidence that some of the larger replication products by assets, such as Partners Group’s absolute return product, charge both a management fee and a performance fee.

The Future of Replication
We anticipate two trends in replication over the next 12 months. First, the models will get better. Practitioners already have started blending the best elements of factor, distribution, and mechanical trading models to build a better solution. Our firm’s product is one such example, though others are coming to market quickly. Rather than focusing on individual hedge fund styles, replication products will focus on the aggregate performance of hedge funds, benchmarking to a broad hedge fund universe, funds of hedge funds, or multistrategy hedge funds.

Second, the model for distributing replication products to investors will change. Replication products will make their way to an underserved retail market, be it through ETFs, separate accounts, or mutual funds. Given the broad targeting, replication products should become integral in asset allocation, potentially taking a sizable portion of the public equity allocation for institutional investors, and becoming a core allocation for retail investors.

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