July 28, 2002

Returns-Based Analyses Of Hedge Funds

When hedge funds were primarily of interest to high-net-worth individuals the need to understand the types of exposures taken on by these investment vehicles was practically non-existent. A hedge fund manager who now has over a USD1 billion under management told me four years ago that his prospective investors were only interested in receiving a one-page summary of his performance numbers. The ensuring discussions would then focus on the nuances of how the performance numbers were calculated. There was no interest in discussing the underpinnings of the firm's investment process.

It was as if hedge fund investors were applying **Baron Otto von Bismarck**'s advice on sausages and legislation to their investments, "Anyone who likes legislation or sausage should watch neither one being made."

In addition, until recently few academics had examined hedge fund data, probably because clean hedge fund data had been notoriously difficult to obtain. But now that U.S. and European pension plans are actively considering investing in hedge funds, there is tremendous academic and practitioner interest in accurately characterizing the unique exposures of hedge funds.

Ideally one would approach this problem starting with some form of holdings-based analysis, such as **Morningstar** has been able to do with mutual funds. But in most cases, hedge fund investors are not allowed to see what a hedge fund is investing in because this is considered proprietary information.

As a result of this lack of transparency, one is left with using returns-based analyses to figure out the following about hedge funds:

* Their underlying exposures;

* The appropriate risk-adjusted-return metrics;

* Their optimal weightings in a diversified portfolio.

This column will discuss the state of the art methodology in applying returns-based analyses to hedge funds. It will pay particular attention to those hedge fund strategies where the use of derivatives and dynamic trading strategies can lead to highly asymmetric outcomes.

Underlying Exposures

To reverse engineer hedge fund exposures, a good starting point is to use classic linear multi-factor models. These models were originally created to understand the fundamental drivers of mutual fund returns. **Franklin Edwards** of **Columbia University** and **Mustafa Caglayan** of **JPMorgan** have used the following multi-factor model to characterize the fundamental risk exposures of hedge funds:

R(i) Rf = alpha + b*(S&P500 Rf) + h*HML + s*SMB + w*WML + g*TERM + k*DEF + e(i), where

* R(i) is the monthly return of hedge fund i;

* R(f) is the 30-day T-bill rate;

* HML is the monthly return on a portfolio of high book-to-market stocks minus the monthly return on a portfolio of low book-to-value stocks;

* SMB is the monthly return on a portfolio of small stocks

minus the monthly return on a portfolio of large stocks;

* WML is the monthly return on a portfolio of past year's winners minus the monthly return on a stock portfolio of previous losers;

* TERM is the monthly return on a long-term government bond portfolio minus the one-month-lagged 30-day Treasury bill return;

* DEF is the monthly return on a portfolio of long-term corporate bonds minus the monthly return on a portfolio of long-term government bonds;

* e(i) is the remaining residual return.

The advantage of using such a model is that one can decide whether the underlying exposures of a hedge fund or a hedge fund style are appropriate additions to one's overall stock-and-bond portfolio, assuming the model's explanatory power is high enough.

The disadvantage of a linear factor model is that a number of hedge fund styles have returns that have nonlinear relationships to fundamental risk factors. This can be because these investments explicitly use derivatives or because their return profile involves taking on some implicit short options risk.

Laurent Favre at **UBS** and **Jose-Antonio Galeano** at **Banque Cantonale Vandoise** have illustrated the non-linear relationship of a number of hedge fund styles to an equity-and-bond benchmark of interest to Swiss institutions, the LPP Pictet index. They have used non-linear regression techniques to estimate the relationship between a hedge fund style and a portfolio of traditional assets.

For example, as shown in Figure 1, Favre and Galeano have found that the equity non-hedge strategy is equivalent to a long position in a traditional portfolio combined with some long out-of-the-money calls and some short out-of-the-money puts.

In addition, some hedge fund styles appear to take advantage of the persistence of equity volatility to time equity-market exposure. In other words, they go into cash during periods of high equity market volatility. Such dynamic trading strategies will be poorly modeled by a static and linear modeling framework.

William Fung at the **Center for Hedge Research and Education** and **London Business School**, and **David Hsieh** of **Duke University** have proposed a way of dealing with the dynamic aspect of some hedge fund strategies in modeling fundamental exposures. They have proposed searching for rule-based strategies that can be implemented systematically and passively, which mirror a dynamic trading strategy's returns.

Fung and Hsieh used this approach in modeling the returns of trend-following commodity trading advisors (CTAs). They found high explanatory power in modeling the return profile of CTAs as equivalent to a combination of look-back straddles on currencies, commodities and fixed income. In this way, they were able to capture the non-linear, option-like return profile of CTAs better than buy-and-hold benchmarks.

Appropriate Risk-Adjusted-Return Metrics

A good starting point for evaluating an investment is to examine its Sharpe ratio. In the realm of alternative investments, the trouble with this metric results from the identification of risk as the standard deviation of returns around the investment's mean. This is appropriate only if the investment's return distribution is symmetrical. But if an investment's returns are highly skewed as with option strategies, the use of the Sharpe ratio is inappropriate. One can increase the Sharpe ratio of an investment by selling fairly valued options: in this case, an investor is accepting the possibility of negatively skewed outcomes in exchange for improving the investment's average return.

The fact that investors have a preference for positively skewed outcomes and an aversion to negatively skewed outcomes is not captured by a risk measure that equally weights the two types of outcomes.

One would like a measure that accounts for an investor's preference for positively skewed outcomes and their avoidance of negatively skewed outcomes.

The Bernardo-Ledoit gain-loss ratio is one such measure. This measure is the ratio of the expectation of the positive part of the returns of an investment divided by the expectation of the negative part.

Optimal Weightings

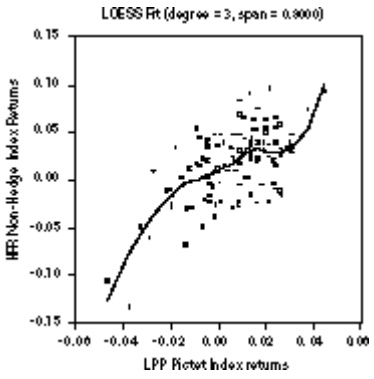
A first step in determining how much an investor should allocate to hedge funds is to use standard mean-variance tools.

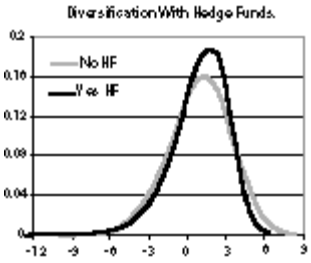
The problem with this technique is that as recommended allocations to hedge funds become high, one can expect lower skewness in the overall portfolio's return distribution, as pointed out by **Harry Kat** and **Gaurav Amin** at the **University of Reading**. In other words, there is a trade-off between improving a portfolio's mean-variance characteristics and taking on more risk of rare, but large losses.

As shown in the return distribution graph of Figure 2, Kat and Amin have illustrated that a diversified portfolio with a large allocation to hedge funds compared to one without hedge funds has a higher probability of a very large loss and a lower probability of a high positive return.

The next wave of hedge fund research will focus on taking into consideration the third and fourth moments of a portfolio's return distribution. The mean and variance are the first and second moments of a distribution; skewness is the third moment, which describes how asymmetric a distribution is; and kurtosis is the fourth moment, which describes how fat the tails of the distribution are.

Because of the interest in hedge funds as potential portfolio diversifiers, researchers will be focusing on co-skewness and co-kurtosis; that is, how a hedge fund's performance relates to traditional assets during times of market stress. Stay tuned.





*This week's Learning Curve was written by **Hilary Till**, co-founder and portfolio manager at **Premia Capital Management** in Chicago.*

Printer Friendly Version
• **Feedback to the Editor**
• **Back To The Top**
• **Back To DW Home**

Derivatives Week
http://www.derivativesweek.com
Learning Curves

July 28, 2002

Returns-Based Analyses Of Hedge Funds

E-mail: till@premiacap.com