Risk considerations unique to hedge funds

Hilary Till continues in the spirit of her August 2002 Quantitative Finance feature on measuring risk-adjusted returns in alternative investments.

The August article noted that a number of hedge fund strategies appear to be earning risk premia. In other words, they earn returns because they are performing an economic function which involves some form of risk transfer. One consequence is that they have short-option-like return profiles. The previous article also discussed the new risk assessment techniques that are being used to evaluate hedge fund strategies, which may have highly asymmetric outcomes. Traditional risk measures that were designed for diversified baskets of equities, which have symmetric outcomes, are frequently inappropriate for the evaluation of hedge funds.

A further distinguishing feature in evaluating the risk of hedge fund strategies is the relative paucity of data, as noted by Feldman et al (2002). This creates great discomfort in attempting to apply statistical techniques to sparse datasets.

This article will discuss five further approaches that academics and practitioners have proposed since the summer for addressing the risk considerations that are unique to hedge funds.

Non-standard performance characteristics

The following section will briefly discuss three risk measures that researchers have recently proposed for evaluating hedge fund strategies.

- Conditional value-at-risk. Agarwal and Naik (2002) recommend applying the conditional value-at-risk (CVaR) framework to hedge funds. They advocate replacing value-at-risk (VaR), which has been popular among traditional asset managers. The authors explain that;

  ‘[Whereas] VaR measures the maximum loss for a given confidence interval, … CVaR corresponds to the expected loss conditional on the loss being greater than or equal to the VaR’. By using CVaR, the authors are able to capture the left-tail risk of those hedge fund strategies that have short put option-like exposures.

  They additionally show that the application of the mean-variance framework in the case of some hedge fund strategies can result in underestimation of tail risk by as much as 50%.

  The authors conclude that if an investor’s goal is to create portfolios for which the magnitude of extreme losses is kept under control, then that investor should consider using CVaR as their risk constraint.

- Modified value-at-risk. When one cannot assume that an investment’s returns are distributed normally (or at least symmetrically distributed), Signer and Favre (2002) propose a risk measure that takes into consideration the third and fourth moments of an investment’s distribution. They describe a statistical method for adjusting VaR to incorporate skewness and kurtosis; they refer to this new measure as ‘modified VaR’.

  The authors advocate using modified VaR as the risk constraint for portfolios that include hedge funds because;

  ‘nearly all hedge fund strategies show negatively skewed return distributions with positive excess kurtosis’.

  The authors provide an example that shows how the efficient frontier is changed when using modified VaR rather than VaR as the risk constraint. Exhibit 1:

  ‘shows the degree to which [a] … sample portfolio with a hedge fund portion of maximum 10% is represented too positively (in the sense of returns being too favorably risk-adjusted) by not taking account of the skewness and kurtosis of the return distributions’.

  The authors conclude that an evaluation of the benefits of hedge funds needs to incorporate the higher moments of an investment strategy’s return distribution.

  Excess downside deviation as an adjustment to the Sharpe ratio. Johnson et al (2002) note that many hedge fund strategies appear to be in effect ‘short option’ strategies that bear overpriced risks associated with rare events.

  The authors advocate examining the downside deviation of an investment strategy’s return distribution. The downside deviation measures the degree to which the overall return distribution is due to returns below a threshold level.

  Given that the Sharpe ratio is so prevalent as a performance measure, the authors propose making an adjustment to this ratio to incorporate the extra information from the downside deviation calculation. (The Sharpe ratio is the expected excess return divided by its standard deviation.)

  Their ‘adjusted Sharpe ratio’ is defined as: ‘the Sharpe ratio that would be implied by the fund’s observed downside deviation if returns were distributed normally’.

  The authors show one example hedge fund strategy where this adjustment can be quite dramatic:

  ‘a Sharpe ratio of over 2.50 is reduced to 0.79 [for one particular fund]’.

  The researchers conclude that their framework has the benefit of being sensitive to rare events, which might otherwise go undetected when using standard measures.
**Paucity of historical data**

Historical hedge fund data only date back to the 1990s. This is probably not sufficient to give a good understanding of the risks of hedge-fund strategies. Also, hedge-fund returns from historical databases are likely to be upwardly biased since unsuccessful funds either do not report liquidation values or the funds are deleted altogether from historical databases.

The following section will briefly discuss two approaches that researchers have recently proposed for addressing the historical data problems associated with hedge funds.

- **Asset-based explanation of risks.** The current academic thinking on how to evaluate the brief track records of alternative investment strategies is to use ‘asset-based style factors’, which explain a strategy’s returns.

  Sharpe (1992) originally advocated this approach to model mutual fund risk. A current effort by academics is to extend this approach to hedge funds.

  The idea is that if an investor can link a hedge fund’s returns to the fund’s underlying ‘style factors’, then one can use the longer history of the factors’ returns to evaluate the specific hedge fund. Presumably the longer history of the style factor(s) would be sufficient that the magnitude of losses that have occurred (and therefore could occur again) would be apparent from the long-term data.

- **Equity example.** Agarwal and Naik (2002) take into consideration the option-like features inherent in a number of hedge fund strategies. Specifically, they apply stepwise regressions on a number of equity hedge fund strategies. They regress the strategies against a number of style factors and include options on market indices, too.

  For example, the authors find that the following risk factors are significant in explaining the returns of the hedge fund research event arbitrage index: a short out-of-the-money put on the S&P 500 along with an equity market capitalization factor and a equity value versus growth factor.

- **Fixed-income example.** Fung and Hsieh (2002) conclude that the returns for bearing the added sources of risk identified in their study need to be balanced against the additional tools needed to manage the attendant tail risk of the strategies.

  - **Disaster function.** One simple method of correcting for the survivorship bias that is likely to exist in databases of hedge funds returns is to apply a ‘haircut’ to returns. Commonly used downward adjustments of return data are in the range of 2% to 3% per year.

  The problem with this adjustment is that it does not adequately capture the risk reflected by attrition, as noted by Feldman et al (2002).

  Feldman et al (2002) propose using default-like models of attrition risk. They consider using a simple Poisson process for their ‘disaster model’. Specifically: ‘in every period, with fixed probability, a fund loses half of its assets (computed after its normal periodic return). We set the probability of failure at 0.25% per month’.

  The researchers find that when they include the disaster model in their time series structure, the negative skewness and excess kurtosis of modelled hedge fund returns increase considerably. Both of these adverse statistical properties negatively impact recommended allocations to hedge funds under optimizations that take into consideration commonly expected risk and loss aversion levels of investors.

The specific parameters to use in models...
of hedge fund attrition will be a matter of considerable research. But the basic idea of a disaster model is very appealing to experienced hedge fund practitioners who have witnessed the dynamics of the business through financial crises during the past decade.

**Conclusion**

As the hedge fund business expands relative to traditional asset management, researchers are developing risk measures to take into consideration the non-standard performance characteristics of hedge funds. This article gives three examples of proposals that have been published since this summer. Each proposal notes that conventional risk measures might understate the risk of hedge fund strategies.

Researchers are also grappling with how to extract useful risk information from brief and flawed historical data. This article discusses two proposals to address this difficulty. Although the proposals noted in the article are highly statistical in nature, they each require considerable professional judgment in application.

**References**

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Hilary Till is a co-founder and portfolio manager of Premia Capital Management, LLC in Chicago. Premia Capital specializes in detecting pockets of predictability in derivatives markets using statistical techniques. Prior to Premia Capital, Ms Till was Chief of Derivatives Strategies at Boston-based Putnam Investments. She has a BA in Statistics with general honors from the University of Chicago and an MSc in Statistics from the London School of Economics (LSE.) She studied at LSE under a private fellowship administered by the Fulbright Commission.