

Hedge Fund Performance Measurement and Attribution

Dan diBartolomeo
Steve Gaudette, CFA

Northfield Hedge Fund Seminar
March 8, 2007

Context: Justification for Hedge Funds

- Enhance total return
 - Allowing engagement of superior active managers that require incentive fees
 - Removal of “long-only” constraints
 - Participation in illiquid securities that are undervalued by investors who need liquidity
- Weak correlation with other asset classes implies a reduction in overall portfolio volatility

Basics for Measuring Hedge Fund Returns

- Requirements
 - Good valuations of securities in the portfolio in a timely fashion
 - Consistent calculation methods
 - Appropriate benchmarks
 - Fund comparison universes that correctly define peer groups

Valuation Judgments

- The “price” of non-liquid securities can change radically in the fire sale of a big position
 - David Askin, LTCM, Amaranth
- OTC securities (bid, asked, midpoint?)
- Private equities (side pocket funds)
- Model prices such as matrix pricing of bonds
- Broker quotes (for what size lot?)
- High incentive fees provide motivation for gaming
- Are valuations done internally or by third-party administrator? Is there real independence?

Calculating Returns is Straightforward, But there is a Big BUT!

- Valuation biases lead to highly serially correlated returns
- Extreme case is “appraisal smoothing” in real estate returns where there is a huge literature
- In hedge funds, Amin and Kat (2003) find higher kurtosis and reduced skew in returns
- MIT students Fadeev and Kuzucu (2005) propose an analytical correction for serial correlation in the returns of illiquid assets in Northfield related project

Skewness, Kurtosis and Correlation

Average Skewness and Kurtosis Individual Hedge Fund Returns

	Skewness	Kurtosis	Correlation to S&P 500
Merger Arbitrage	-0.50	7.60	0.47
Distressed Securities	-0.77	8.92	0.37
Equity Market Neutral	-0.40	5.58	0.07
Convertible Arbitrage	-1.12	8.51	0.19
Global Macro	1.04	10.12	0.14
Long/Short Equity	0.00	6.08	0.35
Emerging Markets	-0.36	7.83	0.44

Source: Kat (2005)

Mitigating Skewness and Kurtosis

- Purchase out of the money puts
- Managed Futures and Macro Funds
 - Trend following behaviors tend to give a portfolio insurance effect
- Equity market-neutral funds
 - Bondarenko (2005) finds lesser evidence of “short vol” strategies subject to “blow up”

Standard Benchmarks Not Suitable

- Benchmarks Competing Objectives
 - Completeness
 - Accuracy
 - Transparency
 - Investability
 - Low Turnover
- For index pricing purposes benchmarks have to be made up of securities that are liquid enough to be continuously priced
 - Clearly not the case with a lot of hedge fund investments

Peer Comparisons: Database Biases

- Reporting Bias:
 - Not everyone chooses to report at all
- Initiation Bias
 - 24 months before fund shows up
- Survivorship Bias
 - Average life of fund is 3.5 years
 - Fund of funds have less
 - Attrition rates vary
 - 8-10% per year on average
 - 4% (1994) to 13% (1998)
 - Estimate 2-3% performance per year

Source: Fung & Heist (2000), Rouah (2005)

Performance persistence

- Losers do not report until they become winners
- Most persistence on downside
 - Looked at winners/losers in first 6 months relative to average in group
 - Losers continue to lose

Source: Brown, Goetzmann and Park (2001)

Comparison Issues for Performance

- Style purity
- Consistency
- Fund size
- Use of leverage
- Liquidity
- Asset concentration

Factors for survival

- Performance
- Asset under management
- Incentive fees (high is good)
- Leverage (high is bad)
- Age (old is good)
- Manager stake

Source: Liang (2000)

Two Views of Performance Attribution

- Internal: Holdings based
 - Requires transparency of holdings generally available only to the fund itself
- External: Style Analysis
 - Requires only fund returns
 - Severe limitation: factor loadings are presumed nearly constant across time
- Both require
 - Factor Alignment (Explicit)
 - Factor Relevance (Implicit)
 - Process Alignment

Holdings Based Analysis

- Even if you have the holdings, the high turnover of most hedge funds makes doing traditional holdings based attribution difficult
 - Non IID return distributions require special statistical techniques
 - diBartolomeo, “Just Because We Can Doesn’t Mean We Should”, Journal of Performance Measurement, Spring 2003
 - Suggestion: Do full blown attribution on a monthly basis, then attribute the difference between daily and monthly “buy and hold” returns to specific daily trading events
- Short positions and leverage obfuscate interpretation of portfolio characteristics
 - What is the influence of having a portfolio P/E of -2?
 - Our system has three modes to deal with this problem

External Analysis

- Choose indices that represent factors that are relevant
- Choose indices that represent factors that are representative of the investments
- Nearly 50% of hedge fund index performance volatility can be explained by conventional indices
- Use non-conventional indices – e.g. Zurich Trend-Follower
- Capture the non-linear properties of hedge funds by including spanning indices that are explicitly driven by volatility
 - For example, the return spread between coupon bonds and mortgage backed securities is a highly non-linear function of interest rate volatility
- Use custom benchmarks – Look back option straddle

Source: Fung & Hsieh (2002)

Our Refinements of Style Analysis

- Allow short positions in the portfolio of spanning indices while controlling gearing within rational limits
- Computations of the confidence intervals so that we can tell if the style analysis is telling us anything meaningful.
 - Lobosco, Angelo and Dan DiBartolomeo. "Approximately The Confidence Intervals For Sharpe Style Weights," Financial Analyst Journal, 1997, v53(4,Jul/Aug), 80-85.
- Hedge funds may change character more rapidly than traditional funds. We need to employ methods to make the analysis more responsive to behavior changes in the fund analysis. One approach is to use Kalman filtering as put forward in:
 - Swinkels, Laurens and Peter Van Der Sluis, "Returns based Style Analysis with Time Varying Exposures", ABP Working Paper, 2001
 - For long only portfolios the only propose approach is the Markov Chain Monte Carlo Simulation

Another Key Refinement

- Use CUSUM based methods to determine the optimal "look-back" period for the style analysis (i.e. do we want to look at fund style over the last 3 years, 5 years, 32 months, etc.)
- CUSUM is a statistical process control technique widely used to monitor the quality of industrial processes
- Was adapted for the purposes of monitoring external asset managers by the IBM pension fund
- A detailed description of the methodology was presented in the Northfield client newsletter in February 2005
 - <http://www.northinfo.com/documents/72.pdf>

Style Analysis Output

- By running the style analysis, we get three pieces of information
 - observed volatility of the subject hedge fund during chosen sample period
 - the "style" exposures of the subject fund (growth, value, etc.) expressed as percentages of the different indices that best mimic the fund's return behavior over time
 - the relative proportion of risk coming from style factors and from asset specific risk

Higher Moments Again

- As previously noted, return distributions for hedge fund often have high degrees of skew and kurtosis. This makes typical estimation methods for metrics such as beta and alpha unreliable
- Asymmetrical performance fees give hedge fund managers incentives to create skew in their portfolio returns
- Further complicating the problem is that hedge funds often do not disclose their holdings, making the validation of performance statistics difficult.
- Anybody remember Chebyshev?

Traditional Approaches to Performance Evaluation

- Hedge fund often market on their IR
 - Calculating the confidence interval on an IR is tricky
 - Jobson, J. D. and Bob M. Korkie. "Performance Hypothesis Testing With The Sharpe And Treynor Measures," Journal of Finance, 1981, v36(4), 889-908.
- The usual approach to hedge fund performance measurement is to estimate metrics such as beta and alpha from an "ordinary least squares" time series regression
 - OLS regressions do not produce accurate parameter estimates in the presence of higher moments
 - Some firms have tried to measure all moments of the return distribution (mean, variance, skew, kurtosis). However, the higher moments typically arise from outliers in the historic returns, so historic skew and kurtosis are very weak estimators of future values

Improving Estimation

- Use a more robust form of regression
 - Windsorize the data (trim outliers)
 - Generalized Least Squares. GLS regression puts less weight on outlier data points
 - Mean Absolute Deviation Regression. This approach uses absolute values, rather than squaring so less emphasis is put on outliers compared to OLS
- A caveat: If investors price higher moments in the return distribution, measuring alpha may be inappropriate from the start
 - Seminars now exist that refer to the risk of a “blow up” as “alternative beta”
 - Harvey, Campbell R. and Akhtar Siddique. "Conditional Skewness In Asset Pricing Tests," *Journal of Finance*, 2000, v55(3,Jun), 1263-1295.

Bootstrap Estimation

- Use “bootstrap” simulations. Resample the return history with replacement
- Create a series of simulated return history for the fund and estimate the parameters for each simulated history. Average the results
- To create a simulated history:
 - Take N time periods of fund return history
 - Draw a random integer X from 1 to N. Make the Xth return observation the first observation in the simulated history
 - Repeat the random draw process N times so you now have a full simulated times series of returns
- The parameter estimates will change because in the simulated histories some observations will be omitted and some will be repeated more than once in the same series.

Bootstrap on Steroids

- Markov Chain Monte Carlo Simulation
 - Rather than resample the observed return distribution, we mathematically simulate all moments of the distribution and take random samples of that full distribution
 - Use Bayesian statistical procedures to establish acceptance/rejection regions for the parameters
 - Very numerically intensive
 - Sfridis, James. “Incorporating Higher Moments into Financial Data Analysis”, University of Connecticut Working Paper, 2005

Conclusions

- Performance attribution of hedge funds is very difficult
- Procedures taken directly from long-only traditional asset management don't work well
- Advanced statistical methods exist for validating performance on hedge funds