An Economist's View of Risk Management of Hedge Funds

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Risk Management of Hedge Funds
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THE UNIVERSITY OF WARWICK

WARWICK BUSINESS SCHOOL

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Task:

Sum up the day,
Provide further ideas of my own.

Overview:

Why me? - Not an economist. F&C link.
What is a hedge fund?
The talks.
Perspectives, issues and problems.

Hedge Funds - What Are They?

A private investment pool, with a similar structure to a mutual fund (unit trust) and some or all of:

- closed to general public,
- high minimum investment,
- amount of capital restricted,
- money committed for a minimum period,
- long/short/leveraged positions o.k.,
- performance fee as well as annual management fee (typically 1-2% + 20% of performance above a monthly benchmark).

Dramatic Growth:

- 1990: 600 funds
- 2004: 7,000 funds, $1,000 billion under management.

Specialist types of strategies:

- Long/short equity,
- Market Neutral,
- Merger arbitrage,
- Convertible arbitrage,
- Emerging Markets,
- Distressed Securities,
- Global Macro,
- Fixed Income Arbitrage,
- Derivatives overlays.

The SEC's Definition of a Hedge Fund

"Hedge fund" is a general, non-legal term that was originally used to describe a type of private and unregistered investment pool that employed sophisticated hedging and arbitrage techniques to trade in the corporate equity markets. Hedge funds have traditionally been limited to sophisticated, wealthy investors. Over time, the activities of hedge funds broadened into other financial instruments and activities. Today, the term "hedge fund" refers not so much to hedging techniques, which hedge funds may or may not employ, as it does to their status as private and unregistered investment pools.

Hedge funds are similar to mutual funds in that they both are pooled investment vehicles that accept investors' money and generally invest it on a collective basis. Hedge funds differ significantly from mutual funds, however, because hedge funds are not required to register under the federal securities laws. They are not required to register because they generally only accept financially sophisticated investors and do not publicly offer their securities. In addition, some, but not all, types of hedge funds are limited to no more than 100 investors.

Advertising

Hedge Funds are prohibited from advertising, that's why there is little information about particular hedge funds. Hedge funds will raise money through the use of consultants or word of mouth, the consultants will have accredited or qualified purchaser clients that they solicit various hedge funds to. The consultants in some cases will conduct background checks as well as due diligence for their clients on the hedge fund managers. this means that on behalf of the potential investors, the consultant will visit the hedge funds, gather background information, gather references, collect performance data, conduct statistical and analytical reviews of the funds. They will then have a database of reviewed funds that they can present to their clients.

The First Hedge Fund

The first hedge fund was set up by Alfred W. Jones in 1949. Jones wanted to eliminate a part of the market risk involved in holding long stock positions by short-selling other stocks. He thereby shifted most of his exposure from market timing to stock picking. Jones was the first to use short sales, leverage and incentive fees in combination.

In 1952, he converted his general partnership fund into a limited partnership investing with several independent portfolio managers and created the first multi-manager hedge fund. In the mid 1950's other funds started using the short-selling of shares, although for the majority of these funds the hedging of market risk was not central to their investment strategy.

The Talks:

Raman Uppal

What To Do About Excessive Volatility

Anthony Ledford

Risk Modelling and Monitoring Within a Systematic CTA

Stan Beckers

A Multi-Factor Approach to Hedge Fund Risk Modelling

Bill Fung

Pricing Extreme Market Event Risk: Theory and Evidence From Traded Options and Trend-Following Hedge Funds

What To Do About Excessive Volatility

Bernard DUMAS (*INSEAD*), Alexander KURSHEV (*London Business School*), Raman UPPAL (*London Business School*)

Volatility arbitrage?

- If the reason for excess volatility is irrationality of one or several categories of traders,
- Can the rational traders take advantage of their behavior?
  - Optimal strategy probably varies depending on cause of excess volatility

The Paper

What trading strategy that would allow an investor (or hedge fund) to take advantage of excessive stock price volatility?

1. Construct a general equilibrium model where stock prices are excessively volatile. There are two classes of agents: one is overconfident about the value of the signal.
2. The trading strategy of a rational investor consists of three components:
   A. a static (i.e., Markowitz) component based only on current expected stock returns and risk,
   B. a component that hedges the investor against future revisions in the market's expected dividend growth, and
   C. a component that hedges against future disagreement in revisions of expected dividend growth.

Features

1. While rational risk-arbitrageurs find it beneficial to trade on their belief that the market is being foolish, when doing so they must also hedge future fluctuations in the market's foolishness. Thus, the analysis illustrates that risk arbitrage cannot be based on just a current price divergence; the risk arbitrage must include also a protection in case there is a deviation from that prediction.
2. The presence of a few rational traders is not sufficient to eliminate the effect of overconfident investors on excess volatility. Overconfident investors may survive for a long time before being driven out of the market by rational investors.

Issues

1. Is there really excess volatility, or can we account for mean reversion in terms of diminishing relative risk aversion?
2. Does this model provide close enough to the right mechanism?
3. How profitable is it? How would you implement it?

N.B. An empirical study by Chen (2004) suggests hedge funds do have some ability to time the market.

Risk Modelling and Monitoring Within A Systematic CTA

Anthony Ledford (*Man Investments*)

This talk gave an overview of the key features of a systematic trading model that aims to capitalize on a particular type of pricing inefficiency in order to generate returns whilst at the same time controlling for risk.

The treatment deals with:

- modelling temporal dependence in both mean and variance (volatility),
- trading rule selection,
- the effect of trading costs,
- risk assessment and the benefits of diversification through trading more than one market.

Features

- Real time computer based: trends $\rightarrow$ orders.
- Risk hierarchy: target risk at portfolio level
  $\rightarrow$ sectors $\rightarrow$ instruments.
- Small edge on 150 instruments $\rightarrow$ SR = 0.83
  (vs. 0.39 world stocks) each $R^2 < 0.01$
- Sectors: FX 25%, Energy 17%, Stocks 15% etc
- Risk management uses real time updates
- Calculates VaR and stress testing.
- Measurement of slippage

Issues

Trend following:

- How strong does a trend have to be to detect it?
- Does this strategy increase market inefficiency?
  If so how would you exploit them?
- Dealing with transactions costs:
  - Measurement
  - Threshold for trading
  - Order splitting
- Risk Measurement
  - VaR o.k.: No need for a coherent measure.
  - Q-Q plot of forecasts would be interesting.

A Multi-Factor Approach to Hedge Fund Risk Modelling

Stan Beckers (*Barclays Global Investors*)

Multi-factor risk modelling is well established within the equity world.

With its theoretical foundations in Arbitrage Pricing Theory, the practical implementation has either relied upon investment practice (fundamental factor models) or statistical data analysis (factor analysis).

Academic research so far has amply proven that systematic risk factors are also present in hedge funds. However the identification of these factors has been hampered by

- lack of reliable and high frequency return data

- a lack of transparency of the underlying investment strategy

- the widespread presence of derivative based (sub)-strategies that are harder to capture

Features

Looking at hedge funds from the outside.

The talk reviewed which 'factors' have so far been identified within the various hedge fund strategies.

It reviewed their (in and out of sample) explanatory power.

- Data and data biases
- Communality (5 groups or 20?)
    - Does same style have to mean high correlation?
- Dissection of hedge fund returns
    - PCA, literature, stepwise and out-of-sample tests.

Conclusion:

Hedge funds do not hedge out systematic exposures

– but do provide alpha.

Issues

- Skewness of monthly returns provides no guide at all to the skewness over longer time periods.
- Should we adjust for serial correlation?

  (if so, adjust what, and how?)
- What are hedge funds really selling?

Alternative Methods of Estimating Covariances/Portfolio Risk

Factor models have a number of advantages over the usual time series estimates of the covariance matrix.

We may:

1. Use factor analysis/principle components analysis to refine a raw historical estimate of the covariance matrix.
2. Measure the factor returns, and estimate the loadings,
3. Measure the loadings and estimate the factor returns.

Alternatively we may use:

4. Bootstrap, or Filtered Historical Simulation (FHS), or
5. Some hybrid of these.

2. Macroeconomic Factor Models (Roll and Ross)

Run S time series regressions to estimate the factor structure:

$$r_{st} = \sum b_{sk} f_{kt} + u_{st}, \text{ or}$$

$$\mathbf{r}'_s = \mathbf{b}'_s \mathbf{F} + \mathbf{u}'_\mathbf{s}, \text{ where } \mathbf{F} \text{ is } K \times T. \text{ We get:}$$

$$\hat{\mathbf{b}}_s = (\mathbf{F}\mathbf{F}')^{-1}\mathbf{F}\mathbf{r}_s.$$

Note that the f_{kt} are observed macro economic time series, such as market index return, change in interest rate, or currency rate etc.

3. Fundamental Factor Models (BARRA)

Run T cross-sectional regressions to estimate the factor structure:

$$r_{st} = \sum b_{sk} f_{kt} + u_{st}, \text{ or}$$

$$\mathbf{r}_t = \mathbf{B}\mathbf{f}_t + \mathbf{u}_t, \text{ where } B \text{ is } S \times K. \text{ We get:}$$

$$\hat{\mathbf{f}}_t = (\mathbf{B}'\mathbf{B})^{-1}\mathbf{B}\mathbf{r}_t.$$

Note that the b_{sk} are observed company descriptors, such as leverage, sector, time series estimate of beta etc, and may also depend on time.

Covariance Estimates for the Factor Models

For either model:

$$\hat{\mathbf{C}} = \mathbf{B}\mathbf{F}\mathbf{B}' + \mathbf{U}, \text{ where } \mathbf{F} = \mathrm{E}[\mathbf{f}_t\mathbf{f}_t'], \ \mathbf{U} = \mathrm{E}[\mathbf{u}_t\mathbf{u}_t'].$$

Pricing Extreme Market Event Risk: Theory and Evidence From Traded Options and Trend-Following Hedge Funds

Bill Fung (*London Business School*)

Dynamic Trading Strategy (DTS) contingent claim.

Trend following is precisely like holding a lookback straddle.

The model gives good out-of-sample predictions, but does badly in sustained bull markets.

Decomposition of implied volatility:

- expected volatility + premium.

Option risk premium is high in bad S&P periods:

- this has biased the comparison between the options strategy and the trend following one. +timing the CTA's!

Issues

- What further insights can we obtain into trend following strategies? and into what their realised alpha means?
- What if we are not in a Black-Scholes world?
- Can we use options directly to create better strategies?
- What about FX, energy, metals markets etc?

Perspectives

- Hedge fund practice
- Statistical issues
- Historical perspective
- Further issues
- What is different about hedge funds?

Hedge Fund Survey Overview

By Richard Horwitz

Risk Management

Approximately 75% of respondents have a risk manager, though those that do not are not planning on adding a risk manager.

An overwhelming majority of respondents have implemented a set of risk limits.

Richard Horwitz is a Vice President at Capital Market Risk Advisors, Inc., a consulting firm headquartered in New York that specializes in risk management, valuation, strategy, and independent risk oversight.

From the August 2000 issue of Financial Engineering News

Risk management is necessary to maintain investor confidence. It is a normal part of the investment management process.

My Two Cents Worth

Measuring and controlling risk is part of the routine of much investment management.

Sharpe Ratios relative to a yardstick is a common focus.

Conventional risk measures are often used (depending on the type of fund):

- prospective total standard deviation,
- prospective tracking error,
- ‘greek exposures’: delta, gamma, vega,
- measures of country/sector concentrations etc.

You need enough risk as well as not too much.

Puzzles: How do you:

- set objectives (design a mandate)?
- give investors sufficient information to choose?

Statistical Properties of Hedge Fund Returns

- Different types of hedge funds have different return characteristics,
- Many hedge funds display positive serial auto-correlation (particularly Merger, Distressed, Convertibles and Emerging)
- Methods have been developed to adjust Sharpe Ratios for this (e.g Getmansky, Lo et al, 2003).
- Correlations with main market indices is usually fairly low (and may hence justify inclusion in diversified portfolios).

References: Fung et al(2000), Kat et al (2002).

Further Issues

- Why are the fees so high?
- Why are hedge funds so popular?
- How did we get here?

A Historical View

1952 – Markowitz portfolio selection

1964 – CAPM

– Portfolio separation: even with 1000's of securities 2 (or 3) funds are sufficient to cater for all investors.

1970's – Tests of market efficiency,

– Index tracking funds: low management fees,

1973 – Black-Scholes, and CBOE

1980's – Expansion of derivatives markets, and front office quants.

last 10yrs – Former derivatives quant traders move to hedge funds.

Now – 20% of investment banking revenues from prime broking for hedge funds.

Performance Fees

- What conflicts of interest are generated by the performance fee structure?

- How are these conflicts managed?

Measurement of Performance

- In a nice constant Gaussian world

$$s.e.(\text{Sharpe Ratio}) = 1/\sqrt{T}$$

where T is the length of the fund's track record in years.

What is Different about Hedge Funds?

Many of the issues are the same for hedge funds as for all forms of portfolio investment, e.g. mutual funds, pension funds.

Key differences are:

- Illiquidity and serial correlation,
- Flexibility of instruments, and
- Type of performance fees.

Final Issue

- Is the market becoming more efficient?
- Will alpha's decline?? On average??

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Kowinski, R , N Naik and M Teo, (2004), “Is Stellar Hedge Fund PerformanceFor Real?”, INSEAD/LBS.

Useful/Interesting Web Sites:

www.hedgefundcenter.com

http://faculty.fuqua.duke.edu/~dah7/HedgeFund/HedgeFund.htm

www.iamgroup.ca/resources_articles.asp

www.library.hbs.edu/guides/hedgefunds/index_print.html

www.cass.city.ac.uk/airc/

www.intelligenthedgefundinvesting.com/aut.html

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http://cisdm.som.umass.edu/index.html