Measuring the Performance of Hedge Funds using a Modified Sharpe Ratio

Research Proposal

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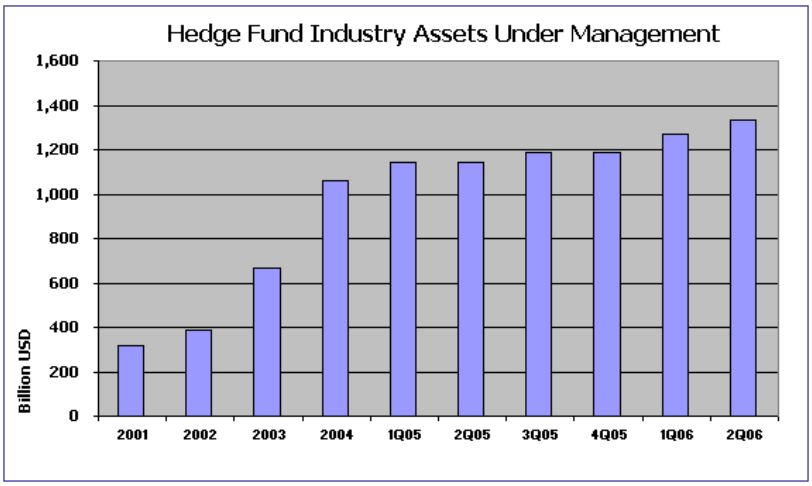
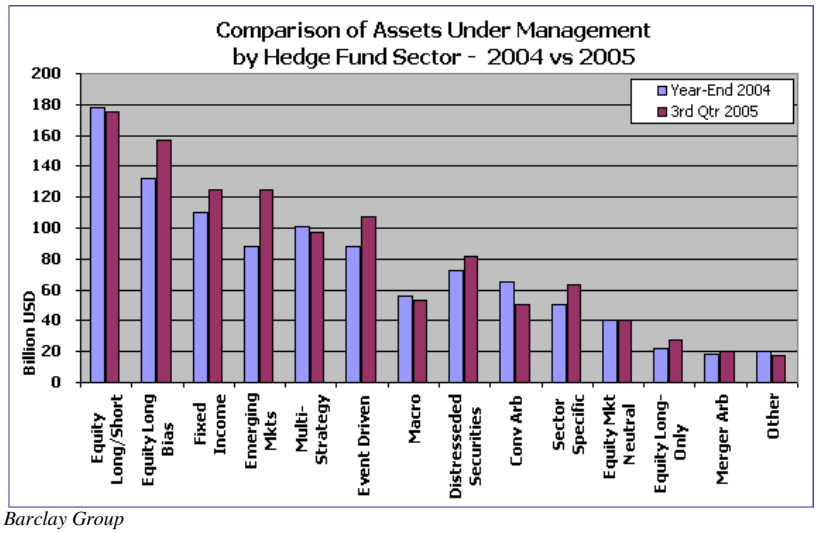
Introduction

Alfred Winslow Jones developed the first prototype of the hedge fund, in the 1940's. Jones's strategy was market neutral, i.e. eliminating market risk by taking offsetting positions. Jones also pioneered the first incentive fee. (Caldwell, 1995) Since then the growth in the hedge funds industry has been phenomenal, especially over the last decade. According to Barclays[1], hedge fund assets-under-management (AUM) has grown to approximately $1,335 billion (industry wide estimated in USD billions) by the second quarter of 2006. One of the largest growing categories of hedge funds is the emerging markets sector with their AUM estimated at $177.4 billion up from $130.6 billion in late 2005. This indicates that emerging markets investments have become an important fixture in the portfolio of all investment houses. Indeed as highlighted by Charlie Fell (Irish Times, Business this week, 17/11/06); the market capitalisation of the MSCI Emerging Markets Index has exceeded $2,000 billion (€1,561 billion) already this year, up from just $500 billion four years ago. While almost 40% of emerging market debt is now investment grade as opposed to 3% ten years ago. The most popular category of hedge fund is the equity long / short, which involves an equity orientated investment strategy on both the long and short sides of the market.

[1] Online at http://www.barclaygrp.com/indices/ghs/mum/HF_Money_Under_Management.html



Source: Barclay group



Source: Barclay Group

Hedge funds are defined as actively managed investment portfolios that hold positions in both publicly traded securities and over the counter (OTC) products. They are subject to less regulation and investment restrictions than the more common mutual funds. Hedge funds present flexibility to the hedge fund manager, as they can invest in financial products that are generally beyond the reach of a mutual fund manager, due to the UCITS (Undertakings for the Collective Investment of Transferable Securities) regulations in Europe and SEC (Securities and Exchange Commission) regulations in the US, which both govern mutual funds. Hedge funds can go long or

short stock, enter into an array of over-the-counter (OTC) derivative contracts and take undiversified positions. Hedge funds also differ from mutual funds with respect to the incentive fee introduced by Jones. These fees typically comprise of a small annual fee (1-2%) and, more importantly, an incentive fee of anything between 5 and 25% of profits. Brown, Goetzmann and Ibbotson (1999: 92) point out that this type of 'compensation is effectively an at-the-money call option on up to a quarter of the portfolio every year, plus a fixed fee to cover operating expenses.' It is clear therefore, that managers are paid to take risks that will provide a superior return. Hence, the accurate measurement of the risk-adjusted return of these portfolios is essential.

Hypothesis

The key to this research is does a modified Sharpe ratio combined with a modified VaR overcome the limitations of the more traditional performance measures when applied to hedge funds?

Literature Review

Performance measurement of funds began back in the 1960's with Markowitz's mean-variance analysis. This analyses stock or portfolio return in terms of mean and standard deviation and therefore assumes a normal distribution of returns. Many simple performance measures were then developed using mean variance analysis. These include the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Model (APT), which have been the foundation of most empirical research on asset pricing. They both assume a linear relationship between risk factors and returns and

use variance as a proxy for risk exposure. However Kat (2003) notes that modern portfolio theory, using mean variance analysis, is too simplistic to deal with hedge funds, as it fails to consider skewness and excess kurtosis. This leads to a systematic overstatement of hedge fund performance.

One of the more traditional measures of fund performance is Jensen's Alpha (1968); it represents abnormal performance over the market, or in other words, the average return of the fund over and above the market return, as predicted by the CAPM. Jensen's Alpha is a risk adjusted performance measure.

It is defined as:

$$\alpha_p = \bar{r}_P - [r_f + \beta_p(\bar{r}_m - r_f)]$$

where:

r_p = expected portfolio return

r_f = risk free rate

β_p = Beta of the portfolio

r_m = expected market return

If the value of alpha is positive, it indicates that the portfolio is earning excess returns, for this reason, Jensen's Alpha is often used as a measure of managerial skill.

The Treynor ratio can also be considered as a measure of managerial skill. It measures returns earned, in excess of that which could have been earned on a riskless investment, per each unit of market risk.

It can be defined as:

$$T = \frac{r_p - r_f}{\beta}$$

where:

r_p = return on the portfolio;

r_f = risk-free rate and

β = portfolio Beta

The Treynor ratio is essentially a risk-adjusted measure of return, based on systematic risk; it relates excess return over the risk-free rate, to the additional risk taken. The higher the Treynor ratio, the better the performance being analysed is.

Carhart (1997) expands the Fama and French's (1992, 1993) 3 factor model to take Jegadeesh and Titman's (1993) one-year momentum anomaly into account. He uses a four-factor model;

$$R_{it} - r_t = \alpha_i + \beta_{1i}(R_{mt} - r_t) + \beta_{2i} SMB_t + \beta_{3i} HML_t + \beta_{4i} PR1YR_t + \varepsilon_{it}$$

Where, SMB_t, HML_t and $PR1YR_t$ are factors representing size, book-to-market value and one-year momentum effects respectively. These risk factors represent a risk weighting for size, a higher required return and the fund's sensitivity to following a zero-investment strategy of investing in past strong-performance stocks and short-selling stocks with low past returns. Carhart's alpha is the intercept and again is a measure of returns above that of the market.

Sharpe's ratio is also a traditional fund performance measure. The key assumption behind the use of the Sharpe ratio is that an investor needs only consider expected

return and standard deviation for evaluating the prospects of a portfolio of assets. This allows the investor to rank assets or funds in order of preference.

The Sharpe Ratio was first introduced by William Sharpe in the 1960's. It ranks funds by the excess return to variability.

For stock A, it can be defined as;

$$\frac{r_A - r_f}{\sigma_A} \qquad \textbf{[1]}$$

where:

r_A = return from stock A;

r_f = risk-free rate, and

σ_A = standard deviation of stock A.

The higher the Sharpe ratio of an asset or portfolio of assets, the more attractive such an asset or portfolio is to the investor. The Sharpe ratio, however, also suffers from shortcomings because it uses variance as a proxy for risk. For example, Amin and Kat (2002) show that 'one can easily create the illusion of superior performance by sacrificing the distribution's higher moments in exchange for a higher mean and/or lower standard deviation.' Kat (2003) observes that there tends to be a clear relationship between a fund's Sharpe ratio and the skewness and excess kurtosis of the fund's distribution. He finds that high Sharpe ratios tend to go together with negative skewness and high kurtosis. This indicates that the relatively high mean and low standard deviation offered by hedge funds is not a free lunch. Investors simply pay for a more attractive Sharpe ratio in the form of more negative skewness and higher kurtosis.

Value at Risk (VaR) has become a popular risk measure in the last decade. The risk of a portfolio of stocks can be measured by VaR; its popularity has grown throughout the industry for many reasons. VaR is a measure of market risk of an asset portfolio, it measures risk in one readily understandable number. The VaR number makes the following statement: we are X% certain that we will not lose more than V dollars in the next N business days. VaR also measures downside risk which is advantageous, when used by investors, who are generally risk averse. Value-at-Risk can also be adjusted for non-normal distributions, which is especially relevant for the hedge fund universe. Favre and Galleano (2002:24) demonstrate that a modified VaR allows investors to calculate a VaR for non-normal distributions that exhibit positive or negative skewness (asymmetry) and positive excess kurtosis (fat tails). VaR is also often used by fund managers as a limit setting device. It should however be treated with caution, as highlighted in the Long Term Capital Management case, when the fund lost $2.1 billion in August 1998 after Russia defaulted on its debt. Part of the failure can be attributed to the VaR measurement which essentially became useless when the market became highly correlated during the so called 'flight to quality'.

> *'According to LTCM managers their stress tests had involved looking at the 12 biggest deals with each of their top 20 counterparties. That produced a worst-case loss of around $3 billion. But on that Sunday evening it seemed the mark-to-market loss, just on those 240-or-so deals, might reach $5 billion.' (David Shirreff, Lessons from the collapse of hedge fund, Long Term Capital Management)*[2]

[2] Available online at http://riskinstitute.ch

A modified Sharpe ratio has been developed by Gregoriou and Gueyie which uses the Modified VaR (mVaR) as the denominator instead of variance. Gregoriou and Gueyie (2003:79) argue that two portfolios with the same mean and standard deviation could essentially be completely different due to their extreme losses. They argue the modified Sharpe ratio corrects for this, since risk measured only with volatility will be lower than the risk measured with volatility, skewness and kurtosis. The modified Sharpe Ratio as defined by Gregoriou and Gueyie is:

$$\frac{R_p - R_f}{MVaR} \qquad \textbf{[2]}$$

where MVaR =

$$W[\mu - \{z_c + \frac{1}{6}(z_c^2 - 1)S + \frac{1}{24}(z_c^3 - 3z_c)K - \frac{1}{36}(2z_c^3 - 5z_c S^2\}\sigma] \qquad \textbf{[3]}$$

where:

R_p = return of the portfolio;

R_f = risk-free rate;

σ = standard deviation;

W= amount at risk/portfolio value

μ= drift rate of asset value for longer maturities;

Z_c = critical value for probability (1-α) -1.96 for a 95% probability;

S = skewness and

K = excess kurtosis.

Hedge Fund Data

The raw data required for the research can be found through the Credit Suisse First Boston/ Tremont Index.[3] This is a comprehensive source of hedge fund indices. To construct the index, CSFB/Tremont includes funds from the TASS+ database that have at least $10 million assets under management (AUM), that provide audited financial reports and meet their reporting requirements. CSFB/Tremont creates subcategories, such as emerging markets, convertible arbitrage and equity-market neutral. Each sub-index represents at least 85% of the AUM in that category and provides monthly data from late 1993-present. As of October 2006, the index comprised of over 1,000 hedge funds. The data includes the Net Asset Value (NAV) and the return. The site also provides performance related data of the funds versus the Dow Jones World Index and the S&P 500.

Hedge fund indices generally experience a level of bias in their figures; namely, survivorship bias, backfill bias and self selection bias. Survivorship bias occurs when an index exclude funds from their database that die during the sample period. Since funds that liquidate are generally poor performers, the index can be artificially higher than it otherwise would be. Backfill bias arises when the database is backfilled with historical return data of a new fund instead of on a going forward basis. Self-selection bias occurs when funds stop reporting data. Unlike mutual funds there are very few reporting regulations surrounding hedge funds, therefore if a fund is performing badly, a decision may be taken to stop reporting entirely. The CSFB/Tremont index aims to be representative of the funds universe, it controls for survivorship bias by not removing 'funds in the process of liquidation, and therefore captures all of the

[3]Available online at http://www.hedgeindex.com

potential negative performance before a fund ceases to operate.' The index also negates backfill bias by only including funds on a going-forward basis. While CSFB/Tremont control, as much as possible for these biases, the data is in all likelihood biased upwards due to the existence of the biases, therefore all data should be analysed in the context of these biases. Performance data is recorded net of all fees charged such as the incentive fee described earlier.

Methodology

The modified Sharpe ratio [2] as developed by Gregoriou and Gueyie will be used to analyse each of the sub-indexes of the CSFB/Tremont Hedge Fund Index. This will then be compared to the traditional Sharpe Ratio [1] for each index.

The parameters of equations [2] and [3] will be estimated from the data supplied in the CSFB/Tremont Index. Skewness, excess kurtosis, standard deviation and the return on the portfolio can all be estimated through Excel with the data provided. The assumptions underlying these estimations and whether they impact on the results will be discussed. A possibility for estimating μ is to use a GARCH methodology, which allows μ to be time-varying.

Within the data set, there are some extreme events such as the Asian crisis in 1997, in 1998, Russia defaulted on its debt, and the terrorist attacks of September 2001. I will compare the modified and traditional Sharpe ratio over periods that include these events.

Research Plan

Mar-Apr 07: Identify the leading articles and papers on the performance measurement of hedge funds.

Apr 07: Write literature review from the beginnings of fund performance measurement through to Value-at-Risk measurement and modifications of existing measures.

June 07: Download most current data from CSFB/Tremont, the implementation of the model and review of output.

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