



Far Horizon Investments

Far Horizon Investments (FHI) is a hedge fund that has achieved incredible returns for its investors during its short existence. In its first three years of operation, FHI's investors saw after fees returns of 20%, 40%, and 40%, easily beating the US market by a comfortable margin. During its fourth year, FHI was having difficulty finding enough investment opportunities and, though returning almost 20% after fees, underperformed the US market. As a consequence, FHI management decided to return over \$2 billion of capital to investors (though the partners decided to contribute more of their own) to increase returns relative to their capital base, which now stands at \$4.7 billion.

Hedge Funds

The term hedge fund is somewhat of a misnomer. Since the type of investors allowed to contribute to a hedge fund are restricted (presumably to protect the small investor), they are only loosely regulated by the SEC, and are allowed to take short positions as well as long positions in equities. Some hedge funds live up to their names, offsetting long positions with corresponding short positions to obtain a "market neutral" portfolio. Other funds try to time market swings, find arbitrage opportunities, or perform complex market manipulations. Many funds also effectively borrow money from large bank by pledging their owned securities as collateral, leveraging their equity by many times. This leverage amplifies gains and losses, potentially on a grand scale, which runs counter to the meaning of the term "hedge".

Risk

A large expected return, by itself, does not necessarily a good investment make. For instance, stocks, on average, have a higher expected return than bonds. Does that mean everybody should buy stocks and no one should hold bonds? The difference is that bonds are less risky than stocks. All other things equal, investors should require a greater expected return for a riskier asset. Far Horizon asserts that its portfolio is managed such that its target risk was no larger than an unleveraged position in the S&P 500. But how does one test the validity of this assertion?

One strategy is to look at the volatility in returns; volatility is the standard deviation of the returns, in percentage terms, over a given period of time. Though this strategy is somewhat limited by the short history of the fund, it is worth a comparison. The average annual volatility of the S&P over the past 20 years has been about 15%. Applying this to Far Horizon's capital

This note was prepared as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

base of \$4.7 billion, this would amount to a daily dollar volatility of \$44 million, which roughly agrees with FHI's self reported daily volatility of \$45 million. On this basis alone, it seems that FHI has far outperformed the market with the same amount of risk.

VaR

Another potential measure of risk is called Value at Risk (VaR). This number is meant to represent the largest possible loss of the portfolio on a given day under normal market conditions. In other words, VaR is the equivalent of saying, "99 out of 100 days, my portfolio will lose no more than x ." FHI used the following equation for calculating VaR:

$$\text{Volatility} * \text{Factor} = \text{VaR}$$

Which value to use as the "factor" is dependent upon your assumptions. For instance, if returns are normally distributed and expected returns are zero, the factor for the 99% confidence level is 2.326. So, daily VaR for FHI would be about \$105 million, meaning only one out of every hundred days should losses be greater than \$105 million. This number can be converted into a monthly or yearly number by multiplying by the square root of the number of trading days (about 21 trading days in a month, 252 in a year).

VaR can also proxy for the amount of capital needed to provide a "cushion" for routine losses. Since VaR is supposed to represent the largest conceivable losses, by holding more than the VaR in reserve a company should be protected from routine fluctuations in the portfolio.

Far Horizon's Strategy

FHI's strategy was highly dependent upon credit events. In essence, FHI would make a bet that a country wouldn't default on payment of its debt.¹ If the country didn't default (the usual case), FHI would make a small sum of money, but if the country did default (a very small chance), FHI could stand to lose a large sum. Since FHI would make this bet many times on many different countries, as long as the occurrence of defaults is not very positively correlated, the distribution of returns should be approximately normal.

The nature of FHI's investments is also, for the most part, fairly illiquid, due to its extreme use of leverage (i.e. borrowing, using already purchased securities as collateral. This increases the potential gains, but also the potential loss). Should the fund lose over \$1 billion of its \$4.7 billion base without raising new capital, the fund is unlikely to survive (since those loaning the money will force sale of the assets to cover the loan, as the collateral is worth less). Far Horizon's managing partners were fairly confident that, since they had just returned over \$2 billion to investors eager to invest more, they could raise additional funds given just two months' time, avoiding any forced sale of their assets. The partners would like to bring in as little outside

¹ This is typically done by buying government bonds of the country with the worse credit rating and selling bonds of a country with a similar but slightly better rating (e.g. Germany and England). Over time, these prices should tend to converge (netting a profit equal to the original difference of the two bonds) and only if the former country defaults does the strategy lose money. Since the two countries will have similar movements in the underlying interest risk, the strategy effectively isolates the credit risk.

funding as possible, however, since they each had invested in the fund a significant amount of their own money, and any outside capital would dilute their gains. Since they believe their VaR in a two month time frame is well below their \$1 billion cushion, they are quite confident that they will have plenty of time to raise new capital, should the need arise.

Analysis

Attached is a mock portfolio for Far Horizon containing only three assets (in reality, Far Horizon has many more). A typical four years of daily returns are normally distributed around the mean given the volatility. The S&P at this time has a mean return of 17%, and over the past 20 years a volatility of 15% (a historically low number). Each asset has an expected return and volatility equal to the S&P, although FHI believes their investments to have close to zero correlation with each other.

Q1. What is FHI's 2 month VaR? Do they appear to be in danger of losing \$1 billion before they can raise new capital? Given the returns, what is their largest 2 month loss?

Q2. Why is portfolio volatility so much lower than the volatility of the individual assets?

Q3. Volatility is at a historical low... what happens to the VaR when volatility kicks up to a not historically uncommon 30%? What is the largest 2 month loss now?

Q4. Credit positions have a nasty habit of having higher correlations when something bad happens. As the correlation approaches one, what happens to the VaR and actual losses (with volatility at 30%)? Is FHI in danger of losing \$1 billion now?

Simulation.

Unhide columns A-C. These columns are only random draws from a uniform distribution [0,1]. By putting in new draws, you can simulate new returns.

Q5. Do 100 simulated iterations at zero correlation and 15% volatility. What is the 99th percentile greatest 2 month loss (that is, 99 of the simulations have 2 month losses less than what number)?

Q6. Repeat with a correlation of .8 and a volatility of 20%. What is the 99th percentile 2 month loss now? How often is the \$1 billion cushion enough to cover the worst 2 month loss?