



How to Quantify Downside Risk in Hedge Funds

Stockholm (HedgeNordic) - The purpose of hedge funds, essentially, is supposed to hedge and reduce downside risk for investors. Yet, especially in the public eye, hedge funds are often seen as complex, risky and opaque. This view is supported by prominent blow-ups such as LTCM, or cases where criminal energy abstracts the case, such as Madoff, all exploited by media and Hollywood. This raises the hard-to-answer question of how to measure risk in hedge funds. Maximum drawdown, downside deviation, and standard deviation are common measures for assessing downside risk. These measures, however, cannot estimate the tail risk - the chance of losing money in a sudden state of market turbulence.

Back to the basics, what is the risk in investing? Many would agree that risk in investing represents the chance of losing money in the future or the prospect of an undesirable outcome and yet, we have to rely on historical data to evaluate the risk of an investment, asset class or investment strategy. Risk measures should, ideally, represent forward-looking indicators, but we are terrible at predicting the future and no "prophet" indicator can foretell it. As Michael Halling, Professor at the Stockholm School of Economics, tells HedgeNordic, "If you believe strongly that history does not necessarily repeat itself, then obviously the practicality of commonly-used measures of risk is limited." Halling, nonetheless, puts forward an

approach to measure downside risk that does not rely on history repeating itself.

Stress Testing in Hedge Funds

If investors want to assess how bad things can get for a hedge fund when an extreme misfortune strikes, stress testing represents the most suitable forward-looking method for assessing downside risk, reckons Michael Halling. Stress testing seems uncommon to the hedge fund industry, but Halling believes the practice of modeling the impact of hypothetical adverse market scenarios on hedge fund portfolios represents a reasonable approach to move away from the backwards-looking nature of traditional risk measures.

A broad spectrum of stress tests can be used to shock hedge fund portfolios for almost anything depending on strategy, ranging from sharp moves in equity markets, spikes in volatility, to movements in credit spreads and other scenarios. Since correlations and price behaviours are very different in low-probability and extreme market scenarios, stress testing against different scenarios can answer many questions concerning the level of risk of a hedge fund's portfolio. Stress testing does not come without flaws, acknowledges Halling. One disadvantage relates to the question of how to identify relevant stress testing scenarios for hedge funds, especially considering the broad spectrum of strategies in the industry. "In banking, regulators define relevant stress testing scenarios," says Halling. The unregulated nature of the hedge fund industry, however, makes stress testing a more arbitrary and subjective approach to measuring downside risk.

Despite the flexibility of stress testing, one of the most commonly used measures of tail risk or downside risk in hedge funds is value-at-risk. Using historical correlations of risk factors, value-at-risk spills out the worst loss in value terms that can occur over a defined period for a given level of confidence. As Michael Halling explains, value-at-risk answers the following question: "Where do the lowest-return realisations for a given fund start?"

Value-at-Risk for Hedge Funds

Let's use a simple hypothetical example to illustrate value-at-risk. Consider a stock trading on a stock exchange. Now assume the standard deviation in the daily returns of the security over the past five years was 1.8 percent. In a normal distribution (of returns), 2.33 times the standard deviation represents the largest

possible move the security can experience in a given day 99 percent of the time. Therefore, one would expect to lose no more than 4.2 percent of the value of the security 99 percent of the time in any given day. Value-at-risk tells us with 99 percent confidence that the security's losses would not exceed the 4.2 percent level, but that does not mean daily losses cannot exceed that level.

Hedge funds, of course, do not hold only one single security in their portfolios, but there are advanced value-at-risk models (which account for the fact that hedge fund returns are non-normally distributed, for instance) that estimate the potential loss on a portfolio that contains various assets and securities. Past research outlines three main approaches of calculating value-at-risk: the variance-covariance approach, historical simulation and Monte Carlo simulation. Without going into much detail, all these three approaches provide a possible outcome depending on a certain confidence level over a period of time. By delivering just one number that is easy to interpret, value-at-risk represents an attractive measure of downside risk.

Value-at-risk can be used both to measure and control risk in hedge funds. A high number of Nordic hedge funds use value-at-risk for reporting purposes, but Michael Halling underlines that some managers use value-at-risk for allocation purposes as well. Brummer & Partners, Coeli Asset Management, Adrigo Asset Management, Rhenman & Partners Asset Management, and Catella Fondförvaltning are just a few hedge fund management companies that state value-at-risk, at least, for public reporting purposes.

Increased interest in hedge funds from institutional investors serves as one reason for the widespread usage of value-at-risk in the Nordic hedge fund industry, as this group of clients tends to have a very structured investment approach that requires managers to answer questions related to measurements of risk, risk systems and processes, among others. Despite the common usage of value-at-risk in the hedge fund industry and asset management industry in general, Michael Halling outlines several disadvantages of value-at-risk.

Disadvantages of Value-at-Risk and Benefits of Expected Shortfall

One shortcoming of value-at-risk is that it does not tell anything about losses beyond the value-at-risk level. "Value-at-risk has a bit of a disadvantage because

this measure serves as a threshold only - value-at-risk does not reveal how bad it can get in the tail area of less profitable outcomes,” says Halling.

Suppose a fund manager builds a portfolio that has a 99 percent chance of incurring a daily loss of less than SEK 10 million and a one percent chance to lose SEK 500 million. Although risk limits are seemingly low when using the value-at-risk approach, the manager is clearly taking high risks.

Whereas value-at-risk is reported as an easy-to-interpret number that shows the potential loss in monetary terms with a given confidence level, the main disadvantage of this risk measure is that the losses beyond the specified confidence level have no weight. Expected shortfall, also known as conditional value-at-risk, can be used as an improvement of value-at-risk to account for this issue, says Halling. In simple words, expected shortfall is the expected value of losses beyond the confidence level. When measuring a fund’s value-at-risk at the 95 percent confidence level, for example, the expected shortfall would equal the average loss in the 5 percent of scenarios where the value-at-risk level is exceeded.

As Michael Halling explains, expected shortfall answers the following question: “if things get really bad, how bad do we expect bad to be?” Yet another advantage of expected shortfall over value-at-risk is that the latter measure is not sub-additive, which means one can observe situations where the value-at-risk of a portfolio is larger than the sum of the value-at-risk values of the portfolio’s components. “This does not make sense. In contrast, you would expect the opposite result because of diversification effects,” says Halling. “Expected shortfall does not suffer from that problem.” Halling also observes a “shift in the asset management industry to focus more on expected shortfall instead of value-at-risk.” This shift, however, is not visible in the Nordic hedge fund industry from the outside just yet.

Conclusion

According to Halling, “Obviously, investors - especially institutional investors - are very worried about how a fund behaves in crisis situations,” therefore, risk measures such value-at-risk and expected shortfall (or ideally, measures stemming from stress tests) can help put hedge fund investors and managers alike at ease.