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Tail Risk Hedging Is Never Free

Abstract

In response to recent market turbulence, institutional investors have been offered a variety of strategies and products aimed at hedging tail risk. While assessing the merit of these hedges, investors must remember three essentials: first, a disciplined investment process demands that every strategy be evaluated relative to a benchmark; second, the skew places a surreptitious drag on performance, and it deserves to be considered with more dramatic forms of wealth decimation; finally, like anything of value, tail risk hedging is never free.

Introduction

During the market turmoil of 2008 and 2009, institutional investors with substantial equity and equity-like allocations suffered significant declines. Because the negative equity returns were so unexpectedly large, investors were exposed to tail risk (see Exhibit 1). Since financial markets abhor a vacuum, investors have been offered a variety of strategies aimed at hedging tail risk. These range from strategies that reshape the distribution of portfolio returns, to advice suggesting significant changes in how to approach asset allocation. These strategies always come at a cost.

Our empirical investigation shows that buying tail risk hedging strategies may interest investors who have:

- a short investment horizon
- a clearly identified benchmark for these strategies
- an interest in using active strategies
- a resolution of governance issues associated with these strategies

An important consideration is the effect of skew, which has been a surreptitious drag on historical performance. Truly long-horizon investors may be better served by selling tail risk hedges. This strategy has provided a long-term premium, and has also mitigated the effects of skew.

The Impact of Extreme Events Declines with Horizon – Merely Mediocre Returns Abide

It is well known that when the investment horizon (or holding period) increases, the impact of extreme events declines. To cite two examples: during the market crash of October 1987, the US equity market returned -31%. Yet, the return for the US equity market in 1987 was 2%. More recently, global equity markets lost 55% of their value between November 2007 and March 2009. Equally impressive was the restoration that occurred during 2009, when global equities returned 36%. The top panel of Exhibit 2 plots the kurtosis of US large cap equity markets over lengthening investment horizons alongside an
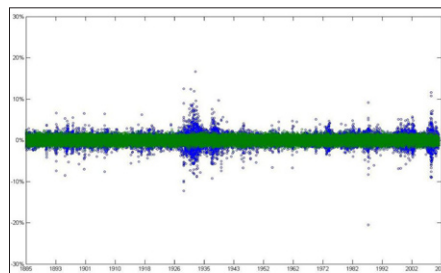

Exhibit 1: Daily Returns to the US Market, 1885-present. Source: Nomura.

Exhibit 2: Kurtosis and Skewness of returns to the US market as a function of horizon: 1950 – 2011.

independent, standard benchmark. Historically, the impact of extreme events moderated at longer investment horizons. Investors must ask themselves whether the length of their investment horizon warrants the purchase of a tail-risk hedging strategy.

In addition to extreme events, investors might be concerned about the impact of negative skew, i.e., the tendency of a large magnitude event to be negative. The bottom panel of Exhibit 2 plots the skew over lengthening investment horizons alongside an independent, standard benchmark. Regardless of the investment horizon, all investors are exposed to negative skew. In addition to considering whether to hedge the effect of extreme events, investors must also consider the implications of their strategies for skew.

Every Strategy Needs A Definition; Every Strategy Needs A Benchmark

Tail-risk hedges fall into three categories: 1) strategies that are purely based on financial variables (e.g., predictors of returns and volatility); 2) strategies that hedge the effects of macroeconomic events; and 3) strategies that broaden the investment scope by including alternative asset classes.

Macroeconomic tail risk hedging assumes that the effects of a specific macroeconomic event can be hedged with specific financial variables. For example, during a burst of inflation, an investor might allocate to commodities based on the correlation between commodity prices and inflation.

Similarly, strategies that shift away from equity and equity-like investments require that the substitutes produce equivalent returns, and that they diversify and decrease portfolio risk. While many new asset classes may offer the potential to do this, their relatively short histories introduce an additional source of uncertainty into the analysis.

Tail-risk hedging strategies based on purely financial variables are the most straightforward, since there are sufficient data available for investors to draw inferences about the portfolio implications of alternative strategies.

A significant issue for investors is the identification of a benchmark for a tail-risk hedging strategy. Benchmarks are ubiquitous in investing. They give a means for evaluating whether ex post results from a specific investment strategy are consistent with stated ex ante objectives. Benchmarks serve as proxy low-cost alternative portfolios against which active choices are judged. Good benchmarks are easily observable and relatively inexpensive. In most cases, the benchmark decision is derived from the asset allocation decision, and this can apply to tail-risk hedging strategies.

Consider a strategic asset allocation that has 65% allocated to US large cap equities and 35% allocated to long-duration fixed income
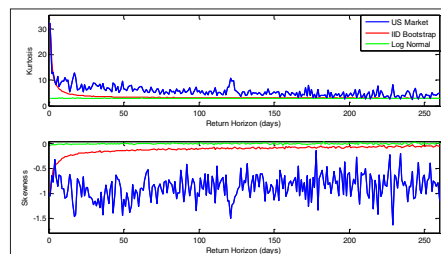
with monthly rebalancing. During the period from January 1970 to December 2010, as shown in Exhibit 3, this portfolio had an average annual excess return of 3.7%, an annualized volatility of returns of 10.3 %, skewness of -.42, and excess kurtosis of 1.18.

A simple strategy to reduce the kurtosis is to buy out-of-the-money puts and finance the put premium by selling out-of-the-money calls on a monthly basis. The position in puts mitigates the effect of bad events in the equity market. The cost is the loss in positive equity returns during market rallies and recoveries. Exhibit 3 shows that historically the impact was a reduction in portfolio volatility, a reduction in kurtosis, and a 120 basis point reduction in annualized performance. Notably, the negative skew was exacerbated.

Why is the collar a benchmark for tail-risk hedging strategies? Consider how a strategic asset allocation is developed – returns and risks associated with passive investments are used to determine allocations to various asset classes and active strategies. The collar strategy is a passive alternative whose price (in terms of foregone returns) and risk characteristics (relative to the same strategy absent the collar) are established. In this way, an allocation to a regularly rebalanced collar strategy mimics any other asset allocation decision.

Of course, investors can simply take less risk. Rather than sacrifice upside to an option premium, they can reduce their equity allocations. The historical performance for this type of strategy is also shown in Exhibit 3. The equity allocation has been reduced to 50%. Some kurtosis and skew remain in the portfolio.

Can Active Strategies Recoup Some of the Option Premium?

Institutional investors who have chosen to hedge tail risk might use an active rather than a passive strategy. In other words, rather than rebalancing the collar position regularly, the investor could hire a manager who deviates from the neutral collar positions based market variables. At its core, the active strategy is a volatility forecasting model (since the ratio of puts to calls is largely determined by volatility).

Exhibit 4 illustrates a simple active strategy. The exhibit shows the cumulative return to the 65/35 portfolio, the simulated return to the collared 65/35 portfolio and the simulated return to two active strategies. Both strategies are based on a simple regime-switching
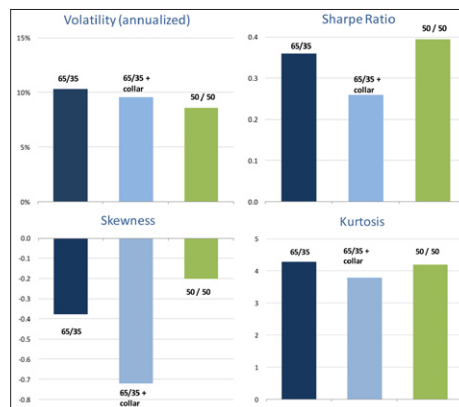

Exhibit 3: Performance statistics on 65/35 and 50/50 Equity-Fixed Income portfolios, and equities with a Collar capped at -10% and 5%. Equities are represented by the MSCI ACWI Index and Fixed Income is represented by CRSP 60-120M Bonds. Portfolios are rebalanced monthly and transaction costs are neglected.
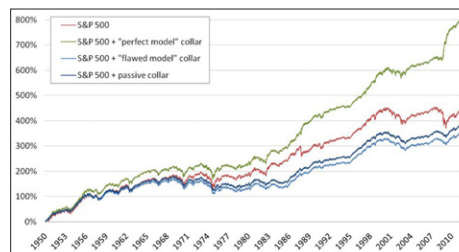

Exhibit 4: Active strategies benchmarked against an index with a zero cost collar. Hypothetical collar caps returns at the 95% loss threshold (VaR) and the 95% gain threshold. Transaction costs are incorporated by subtracting a constant, estimated from real market collars.

model of equity volatility. The first simulation assumes the model is "perfectly correct," meaning that insurance is purchased when the probability of a volatile state is at least 50%. The second simulation assumes the model is "perfectly wrong;" meaning that insurance is purchased when the probability a volatile state is less than 50%.

As the exhibit suggests, the impact of any active strategy depends on the validity of the model. And, as with other quantitative strategies, different managers will exercise different levels of skill in development and implementation. Issues such as performance in out-of-sample tests, sensitivity of strategy performance to estimation error, and transaction cost management are all as appropriate for active tail-risk hedging strategies as they are for any other quantitative active strategy.

All Roads Lead To Asset Allocation

For a short-term institutional investor, purchasing a tail-risk hedge may be suitable, even accounting for the foregone equity premium. However, the muted impact of extreme events at longer horizons suggests that a long-horizon investor might consider selling a tail-risk hedging strategy. Historically, selling the collar provided a premium and mitigated the negative skew. The addition of a short collar to the S&P500 raised the level of skewness from -1.1 to -0.4 for monthly returns over the period 1950 to 2011. Hence, the real question for investors posed by tail-risk hedging may be "what is my investment horizon?".

Asset allocation focuses on achieving targeted portfolio level risk and return characteristics by balancing the risk and return of specific asset classes or risk factors. In standard portfolio theory, this problem can be simplified into two steps: 1) determine an optimal portfolio of risky assets, and 2) tailor the mix between risky and risk-free assets to the investor's risk tolerance. An optimal asset allocation strategy should take account of investment horizon. A short-horizon investor may take a long position in an insurance strategy to mitigate kurtosis. A long-horizon investor may take a short position in an insurance strategy to mitigate skew. Either way, it is important for investors to take account of horizon in choosing a strategy, since tail risk hedging is never free.

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