Know Your Risk

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The full article may be accessed here.

Central Issue of the Paper

As most media outlets and finance professionals take an introspective look 10 years after the global financial crisis, we thought it would be apropos to revisit a paper by Andrew Rozanov, CAIA titled "Volatility, Non-Randomness or Non-Linearity: What Drives Portfolio Returns in Times of Stress and Dislocation?" This paper considers what underlying exposures drive portfolio returns in periods of extreme market stress and dislocation. Those investors who were shocked in the recent financial crisis by a perceived failure of diversification are now keen to avoid a repeat of that painful experience, need to identify and correct unintended risk gaps and biases in their portfolios.

One view is to consider it from a risk contribution perspective: it can be shown that even very diverse multi-asset class portfolios are typically dominated by broad equity risk, which can account for more than 80% of total risk. The author takes a slightly different angle, drawing on academic research and relevant practitioner experience in the areas of hedge fund investing and options trading. Specifically, he considers three types of underlying return drivers: (1) exposure to volatility, (2) exposure to non-randomness in returns, and (3) exposure to non-linearity in returns.

Approach Employed by Paper

In this white paper they focus their analysis primarily on hedge funds. They do this for three reasons. First, they believe it is sufficient for purposes of exposition and discussion of the overlaps and differences between the three schools of thought (more detail below). Secondly, the main ideas and general principles identified in the context of a multi-strategy, multimanager hedge fund allocation should be applicable more broadly across the entire portfolio, with one possible caveat of capacity. Thirdly, it is their strong belief that their hedge fund expertise, with a focus on global macro, is where they can offer most value to institutional investors.

Exposure to Volatility

Most academic research suggests that most hedge funds are either linear in their risk relative to the equity market (e.g., long/short equity funds) or are effectively short a put option on the underlying equity market (e.g., relative-value or arbitrage funds), and as such would amplify rather than mitigate left tail risk. The all-important exceptions are global macro managers, both systematic and discretionary. Another niche strategy that does particularly well when equity markets collapse, unsurprisingly, is dedicated short selling; however, it is linear in its risk and as such is not considered to contain embedded optionality. Also, given its negative absolute performance when equity markets are strong, it probably has more in common with costly tail risk hedging solutions than with global macro strategies.

Exposure to non-Randomness

The authors propose to view different strategies as either divergent or convergent and to anchor all hedge fund allocation decisions in an optimal combination of the two. Convergent strategies perform best in normal times, when fundamentals prevail, and investors act rationally. Expecting mean reversion, traders act on mispricing and deviations from fair value, arbitraging away inefficiencies and profiting handsomely in the process. Divergent strategies, on the other hand, perform best in turbulent times, when uncertainty prevails and investor psychology tramples fundamentals. Instead of reverting back to intrinsic value, price deviations develop into full-fledged and well pronounced trends. Traders who successfully anticipate and ride these trends deliver outstanding performance, both in absolute terms and relative to convergent strategies.

Exposure to non-linearity

The third school of thought focuses on two different types of non-linear payoffs: convexity and concavity. The paper references that this goes back to Perold and Sharpe (1988), who demonstrated how different portfolio rebalancing rules resulted in two different shapes of returns. Compared to a static buy-and-hold strategy, which is linear, rebalancing back to the target asset mix is a concave strategy: as the underlying risk asset moves further and further away in either direction, the underperformance of the constant-mix strategy accelerates. Conversely, a dynamic CPPI-type strategy which increasingly buys on the way up and sells on the way down is convex: during strong and persistent market moves in either direction its outperformance accelerates.

In options markets, convexity comes from being long gamma, which typically corresponds to being long volatility. Conversely, a fragile or concave position typically results from being short gamma, which in turn corresponds to a short volatility position. To popularize and explain this concept to a broad non-specialist audience, Triana (2011) described what he called the "concavity-convexity duo" as follows: "What is a convex play? Simply put, it is one where you risk a penny to make a million. Your potential losses are limited and typically known beforehand while your potential gains are immense and unknowable. You gain disproportionately from turbulent developments in the asset market of your choice. The opposite of a convex punt is a concave one, where you risk a million to make a penny. Your potential gains are limited and typically known in advance, while your potential setbacks are huge and uncertain."

Findings of the Paper

Each school of thought provides a useful lens through which to analyze and interpret the behavior of individual investment strategies, in both normal and turbulent markets. Combining the three can help a hedge fund analyst identify and explain the unique risk-return "signature" of a particular hedge fund style. And interestingly, all three appear to have the same message for those investors who want to strengthen their fragile portfolios: increase allocation to systematic and discretionary global macro strategies.

However, one must be careful in applying these methodologies: what is meaningful for one strategy may turn out to be misleading for another. As discussed, contrary to a widely held belief, strategies like trend-following CTAs may have ambivalent exposure to volatility. Another example would be a strategy in the options market that maintains zero net exposure to volatility, while benefiting from the volatility of volatility. In both cases, it is not long vega exposure, but long gamma exposure – in other words, not volatility but convexity – that matters. Similarly, irrespective of whether a hedge fund deploys convergent or divergent strategies, it can still exhibit that all important asymmetry and convexity of returns that investors seek during times of crises and market dislocations. Therefore, going back to their original question of what drives portfolio returns in times of stress and how institutional investors can use that knowledge to strengthen their portfolios, they propose to start by looking at the degree and price of convexity available through various financial instruments and funds.

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