Evaluating Multi-Asset Strategies

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Multi-asset strategies are successfully gaining ground within institutional portfolios, and their role is likely to grow. This is no mean accomplishment—institutional portfolios are typically well-tuned structures that require reshaping to accommodate additional strategies.

Despite the barriers, assets allocated to multi-asset strategies are expected to increase by an estimated 10% annually over the next several years, making it one of the most rapidly growing investment approaches in the United States (Baghai [2014]). A Greenwich Associates study of U.S. institutional investors commissioned by Standard Life Investments underlines the many benefits of multi-asset strategies (Greenwich [2015]), such as the potential for improved diversity, greater liquidity, and reduced volatility. Another advantage is their ability to fit readily alongside a variety of investment approaches and asset class categories.

That said, multi-asset strategies come with challenges, including even simply defining multi-asset. This article addresses a particularly problematic area—evaluating multi-asset strategy outcomes.

Evaluating the strategy outcome begins with the recognition that there are no short cuts. If investors rely on only one or two evaluation measures, they may end up misinterpreting the historical investment results achieved from multi-asset strategies. Instead, we recommend using a variety of evaluation techniques. One of these—correlation—we discuss in depth, as we believe it is misunderstood in many dimensions of multi-asset investing. We go on to examine some of the more useful performance and risk analytics that can help us understand what drives multi-asset investment outcomes.

LIMITATIONS OF CORRELATION IN EVALUATING STRATEGIES AND MARKETS

Correlation Complexities

Statisticians and social scientists have written volumes about the dangers of interpreting correlation. In fact, there is a Wikipedia webpage dedicated to the concept that correlation does not imply causation. Similarly, another routinely debunked myth is that highly correlated variables are destined for the same performance outcome.

Various capital market studies highlight how an instantaneous measure of co-movement may not provide the full story (see Damghani et al. [2012] as one example):

- Average correlation does not capture tail dependence.
• Correlations change when regime shifts happen, so there is a danger of averaging through the change.
• Correlation is very sensitive to individual outlier events, which can lead to unstable correlation results.

Investors unaware of these limitations may apply correlation results in an overly simplistic manner. We look at each of the above in turn.

**Correlation and Tail Dependence**

One tail-dependent relationship that correlation fails to capture is that between equities and investment-grade corporate fixed income (IG credit). In turbulent periods, these two asset classes tend to move in close alignment.

Despite this, the correlation of stocks (represented by the S&P 500 Index) and IG credit (represented by Barclays U.S. Corporate Fixed Income Index) has averaged just $-0.17$ in the United States over the last 10 years using one-year intervals and a weekly time window. Interestingly, only a negligible increase in correlation was seen even during the most turbulent months of the global financial crisis. Although stocks and IG credit had a similar pattern of performance, correlation showed little evidence of this connection.

This anomaly illustrates the risk of an asset class relationship going undetected when we rely on correlation. We sought to address this problem by developing our own robust methods to monitor markets, going beyond historical correlation. One of the measures we use is designed to highlight sudden discrete changes in asset class relationships by comparing the last observation of correlation to the recent trend. We also track gradual but significant changes in correlation by comparing its level at the beginning and end of a time period. In the next section, we show why this is important.

**Correlation and Regime Shifts**

Over the past 10 years, the weekly correlation of the U.S. dollar/euro exchange rate and European stocks has averaged $-0.1$. From this information, one might infer that this currency pair and European equities have no strong relationship. However, during this time, there were substantial swings in correlation (see Exhibit 1).

For instance, reviewing one-year rolling periods, correlation swung between a low of $-0.63$ in May 2010 and a peak of $0.59$ in February 2015. In our assessment, there had been unique, strong persistent market drivers influencing correlation over the time frame. Specifically, the episode of strongly negative correlation in May 2010 coincides with the worst of the Eurozone crisis. We believe that the period of positive correlation during 2015 and 2016 was associated with European Central Bank quantitative easing.

Seeking some early indication of this type of regime shift, we monitor unusual market behavior by combining correlation with volatility, rather than by looking at correlation alone. When both correlation and volatility move sharply, and to a degree that is statistically significant, our “unusualness” index spikes. Alerted by this information, we examine world and market events in order to understand the root of this exceptional correlation and volatility behavior. In particular, they question whether it might herald a regime shift that will take time to work into longer-term correlation statistics.

**Correlation and Sensitivity to “Outlier” Events**

Multi-asset investors seek consistent and practical methods to evaluate correlations between their portfolio exposures. When an investor uses historical data, the degree to which an individual event may destabilize correlation figures can be surprising. Exhibit 1 displays the impact of Switzerland’s abrupt and chaotic removal of its three-year-old currency linkage with the euro in January 2015. Financial markets were seized with panic; within minutes, the Swiss franc soared over 20% versus other currencies, while Swiss equities plummeted. This had a very dramatic effect on correlation calculations.

**DIFFERENT WAYS TO EVALUATE MULTI-ASSET STRATEGY OUTCOMES**

There is no one correct way to evaluate the performance of a multi-asset portfolio as a stand-alone investment. Basically, an investor needs to look at the outcomes promised by the strategy and ask whether the strategy has achieved these outcomes and whether it is capable of continuing to do so. A range of measures is needed to answer these questions. The selection and emphasis of the techniques used will vary according to the nature of the strategy under evaluation and the investor’s intentions for that strategy in the portfolio.
Here, we review methodologies that can help us evaluate multi-asset strategies beyond basic return and risk analysis. We use a case study approach, focusing on a multi-asset strategy that aims to provide downside protection, meaningful diversification to the broader portfolio, and an absolute return (without a “long” bias).

Our multi-asset strategy strives to earn risk premiums by investing in higher-risk asset classes at appropriate times over a medium-term investment outlook. To achieve this, it must hold risk assets or market-based exposures. Therefore, we expect it to show some correlation with risk assets.

Exhibit 2 shows correlation of the multi-asset strategy with U.S. and global equities over two three-year periods ending in 2012 and 2015. Correlation was higher at the end of 2015 than the prior period. How should we evaluate this change in correlation? As discussed earlier, treating this correlation information as proof of a growing connection with risk assets seems ill-advised. Indeed, we needed a variety of techniques to unravel what lies behind the rise in correlation and assess whether the current level is aligned with the strategy goal of meaningful diversification.

To determine this, we can use either historical or predictive techniques.
Historical
- historical tail behavior
- upside versus downside participation
- attribution by asset class

Predictive
- risk modeling
- modeling tail behavior

Historical evaluation techniques focus on past events. Predictive techniques extrapolate from the past to suggest how the current portfolio might perform under different circumstances in the future. Predictive techniques can be applied to assess historical stress scenarios, as well as those not previously encountered.

Historical Measure 1—Tail Behavior
Tail behavior provides critical information about the strategy’s investment results during periods of market stress. In other words, it assesses performance during the largest drawdowns for risk assets that have occurred historically. In our example, we look to see if our strategy’s behavior during market stresses is as tightly tied to the performance of risk assets as correlation statistics predict.

We first define our range of difficult past market conditions—the five highest equity market drawdowns since July 2006. During these periods, drawdowns ranged from 9% to 37%, yet the strategy’s participation in the market’s decline never exceeded 25% of the drawdown. Moreover, this limited drawdown was maintained from 2013 to 2015, during which time the strategy’s correlation with equities had increased. Therefore, a rise in correlation does not necessarily imply a reduction in the portfolio’s downside protection.

Historical Measure 2—Upside vs. Downside Participation
Tail behavior gives us an indication of how well a strategy might weather difficult markets. However, it does not demonstrate how the strategy will fare when markets are rising. Performance in both rising and falling markets is vital to a strategy’s long-term returns. Thus, it is useful to break down returns in different market environments to observe the degree of market capture.

We are particularly interested in asymmetric behavior; ideally, we want the strategy to rise when the market falls and to fall infrequently when the market rises.

We compare 132 months of consecutive data (up to June 30, 2017) for our sample multi-asset strategy versus U.S. equities (see Exhibit 3). Focusing on the upper-left and lower-right quadrants, we can assess the asymmetrical behavior. The dots falling in these quadrants represent months when equities posted a negative return while the strategy delivered a positive return, or vice versa.

We find that the strategy delivered positive results in two-thirds of the negative equity months. By contrast, the strategy was down in only 25% of the positive-equity months. Encouragingly, our strategy has captured more of the upside of risk assets than the downside.

To further our study of upside versus downside and visually capture the effect of asymmetric returns, we used weekly performance data of the multi-asset strategy and the S&P 500 Index. We sorted the weekly return histories based on the S&P 500 (low to high) and generated the cumulative detrended performance of the S&P 500 and our multi-asset strategy (see Exhibit 4; note the dark blue and green lines). In addition, the individual weekly returns are displayed based on the S&P 500 sorting. The chart shows that the multi-asset strategy delivered positive performance in a number of the worst weeks for the S&P 500 (far left-hand side). These positive-performing periods during falling markets made a significant contribution to the flatter shape of the detrended performance line.

The dark red line in Exhibit 4 provides an additional illustration of how correlation figures fail to provide the fully story of the degree of connection between asset classes. This line is the sorted, detrended performance of the J.P. Morgan EMBI Global Diversified Index (JPM-EMBI), which represents emerging market government bonds in hard currencies, over the same time window. Although the JPM-EMBI and the multi-asset strategy have a similar correlation to the S&P 500, the detrended performance line for the multi-asset strategy is flatter than the JPM-EMBI.

To examine this relationship more systematically, we charted the strategy’s upside and downside capture ratios (see Exhibit 5). For this analysis, we used three-year rolling periods instead of the shorter periods in the tail-risk analysis. This allowed us to ascertain whether the strategy consistently delivered asymmetry in its
EXHIBIT 3
Multi-Asset Strategy and S&P 500 Monthly Returns


EXHIBIT 4
Cumulative Detrended Performance and Monthly Returns, June 30, 2017

Source: Standard Life Investments' multi-asset representative portfolio and Bloomberg.
returns; investors care about all time periods, not just spells of high downward volatility. As before, we are looking for the strategy to participate more in the market upside than in the downside.

Exhibit 5 shows the upside and downside capture ratios (calculated as (Strategy return/Index return) x 100) for our multi-asset strategy versus the S&P 500 Index over rolling three-year periods. Clearly, upside capture (represented by the dark blue bars) exceeded downside capture (the light blue bars). Upside capture generally ranged from 25% to 35%. By contrast, downside capture typically ranged from −15% to 10% (a negative ratio for downside capture means that when the market is falling, the strategy is rising).

These ratios highlight the strategy’s asymmetry: It captured more of the upside than the downside. Also, this demonstrates that correlation between the strategy and equities is materially different in up markets than in down markets. This is an important distinction that would be missed by a long-term view of correlation.

Historical Measure 3—Attribution by Asset Class

Now that we understand the portfolio’s performance characteristics, we can establish how much of its return comes from equities. We start by calculating the cumulative returns generated by each long equity position.

It turns out that since the strategy’s inception during the period from July 2006 to June 2017, only about 13% of its cumulative total return was derived from long equity exposures. And yet, importantly for our investigation of the change in correlation, over the three years ending in December 2015, the return contribution from long equity was around one-third of the total return.2

Attribution analysis underscores the limitations of correlation in explaining the strategy’s returns. At the same time, it helps to shed light on the role played by equities in generating the portfolio’s historical returns, something that other statistics may not do with the same degree of precision.

Predictive Measure 1—Risk Modeling

To engage in risk modeling, we must understand the portfolio’s exposures. These historical data become the foundation of a risk-based view of the portfolio, providing insight as to how meaningfully it is exposed to different asset classes.

Exhibit 6 shows the equity exposure of the sample multi-asset portfolio, typically ranging from 25% to 35%. This leaves room for other portfolio sources to generate returns, in accordance with the objective that no one risk factor dominates the strategy’s return profile.
It is also important to note that the guidelines in the case of this particular strategy limit equity exposure to 40%.

In our example, we group equity and equity relative value strategies together. Their combined contribution to portfolio risk was roughly 38.3% of the total stand-alone group risk of the strategy, as of June 30, 2017. Certain equity relative value strategies have low or even negative correlation to the portfolio as a whole. Risk modeling has therefore revealed how the strategies work together in a blended, diversified portfolio.

In addition, the composition of the portfolio will change over time and therefore short-term correlation is unlikely to persist. Any alteration of the manager’s investment outlook will also result in a change of strategy positioning, which could materially alter the allocation of risk.

To deepen our understanding of the portfolio’s risk profile we use the arbitrage pricing theory (APT) risk model. It provides an estimate of portfolio and equity correlation, and the volatility of each. Using these two outputs, we can arrive at an implied equity beta for the portfolio, that is, an approximation of its sensitivity to market movements, adjusted for its volatility. According to the model, as of June 2017, correlation between our sample multi-asset portfolio and global equities was 0.73 and its volatility was 5.3%. This implies a forward-looking beta of 0.33 (portfolio volatility is estimated as 45% of equity, giving an implied forward-looking beta of $0.73 \times 0.49 = 0.33$). Accounting for expected portfolio volatility, this methodology suggests a connection to equities substantially below historical levels of correlation.

This type of analysis depends on the future being the same as the recent past. It also assumes the portfolio remains unaltered from the time of the snapshot. In reality, the dynamic nature and asymmetric behavior of risks within a strategy means that the interplay between them is subject to marked shifts in different regimes. And so, while these estimates provide useful information, other methods of analysis must be considered.

**Predictive Measure 2—Tail Behavior Modeling**

To overcome the shortcomings of the risk modeling analysis discussed above, we believe it is critical to examine the portfolio’s behavior under stress scenarios that by definition are likely to be different from what has happened “on average” in the past. The aim is to test the

![Exhibit 6](image-url)
portfolio in different risk and correlation regimes before such stresses occur and determine whether the strategy already has the necessary protective diversification. To do this, we conduct both historical and forward-looking stress analysis.

Tail behavior: historical scenarios. We use historical analysis to assess how our multi-asset strategy might behave should various scenarios from recent years recur (see Exhibit 7).

Historical tail behavior modeling is almost entirely objective. What happened to different assets during each stress period is a matter of record and, with the exception of new asset classes, not open to debate. Evaluating our strategy under these scenarios is therefore a demanding test—the portfolio is built around what we believe is likely to make money and diversify in tomorrow’s environment. If the portfolio also happens to work well in historical stresses, this is a strong endorsement of our objective to be diversified during extreme events. It tells us whether the portfolio’s behavior under extreme stresses is aligned with our expectations for such events.

Tail behavior: forward-looking scenarios. Although historical scenario testing is demanding and objective, there is a possibility that the stresses of the past do not fully represent possible future world shifts. While human nature inclines us to avoid thinking about crises or realizing that their probability can be relatively high, any statistical analysis of tail events demonstrates their relevance for all investors. We therefore need to go further and evaluate the portfolio under never-before-seen stresses.

A simplistic approach is to add or subtract 100 basis points to bond yields and determine what return outcomes might be expected for the whole portfolio. However, while this may be adequate for single-asset portfolios, for a multi-asset portfolio it fails to allow for the interconnectedness of asset classes or changes to those connections during times of stress.

One approach is to develop complex multiregime and “fat-tailed” distribution models. (Fat-tailed distributions occur when the distribution falls outside the normal bell-shaped curve. They arise when many events or values stray wide of the average, giving extreme high and low values. This makes the bell flatter and fat tailed.) This too has drawbacks: the models are computationally intense and generally lack analytical solutions.
To circumvent these problems and supplement our understanding, we developed a proprietary forward-looking scenario analysis methodology. Looking beyond the assumptions of traditional stress modeling, this advanced approach combines the opinions and judgment of experts with quantitatively determined relationships between market risk factors, creating richer, more coherent scenarios. In this way, we generate the expected impact on our portfolios of a “never-before-seen” event in a rational manner that does not simply assume a period of history recurs.

To model future risk events, we first consider possible extreme but plausible future stresses. These may be economic, geopolitical, environmental, societal, or technological (see Exhibit 8 for current stress scenarios being considered). We then refer to expert judgment to identify the key factors and how they might respond, focusing on markets with a direct causal link to the stress under consideration.

Next, we combine the key factor market moves with market simulations in a manner that weights the simulations to capture the fat-tailed nature of the outcome. This creates a distribution for individual assets and portfolios that represents the range of potential outcomes under a particular stress, rather than simply a point estimate. Critically, the evaluation tells us how well the strategy weathered the projected stress scenario in comparison with the relevant asset classes.

**THE BEST EVALUATION MEASURES WILL VARY**

In our experience, investors use multi-asset strategies in different ways. For this reason, the emphasis on different evaluation measures will vary. To identify the most appropriate metric, we first ascertain the placement and intended role of the multi-asset strategy.

To illustrate, U.S. investment consultant Callan (2015) determines the placement and role possibilities of multi-asset portfolios in the following way.

**Placement**

- identify distinct “core” allocation—that is, the middle ground between “risky” and “defensive” allocations
- identify allocations within an existing grouping, including long-only hedge fund or opportunistic

**Roles**

- complement strategies with different expected outcomes
- anchor a group of focused strategies
- strategically tilt the overall portfolio in a tactical manner in an asset allocation process that is not set up to be dynamic or responsive

For instance, if a multi-asset strategy is identified as an alternative allocation designed to serve as an anchor for the wider portfolio, the evaluation should focus on how the strategy is set up to behave when other investments fall. In this case, the emphasis will be on tail behavior in order to show whether the strategy is fulfilling the goal set for it. In Exhibit 9, we share a selection of what we believe are key evaluation measures for given placement and role combinations.

**EXHIBIT 8**

Current Stress Scenarios Being Considered

- China’s rebalancing fails (growth collapses and investment falls sharply).
- A currency war is set off by small devaluations that ultimately snowball, thus forcing central banks to cut rates or end plans to hike.
- ECB tightens monetary policy faster than expected.
- Tightening financial conditions set off a negative spiral of capital outflows and defaults in emerging markets.
- Protectionist policies lead to global trade slowdown, and fiscal stimulus pushes inflation higher.
- Personal and corporate tax cuts and business deregulation lead to a consumption boom and higher inflation; Fed forced to tighten harder and faster.
- Continued low inflation prompts Fed to reverse its outlook and cut rates.

CONCLUSION

Institutional investors will benefit from a more nuanced analysis of multi-asset portfolios. In particular, correlation can be misleading when viewed in isolation. Thus, investors analyzing historical information and variations in correlation between risk assets and the multi-asset portfolio should not use this information to drive decision making. Rather, correlation should be complemented by other measures.

For example, we can use tail behavior to understand performance during market stress. Similarly, analysis of market capture in both rising and falling markets will provide insight into long-term returns. Asset class attribution and market participation analysis will corroborate—or reject—our findings on correlation. Predictive measures such as risk modeling and tail behavior modeling will complement historical methods. Investors should also consider the placement and role of the strategy to determine which evaluation technique is most important.

ENDNOTES

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1See https://en.wikipedia.org/wiki/Correlation_does_not_imply_causation.

2In fact, examining the prevailing market behavior over these different periods (July 2006–June 2017 and January 2013–December 2015) helps explain the increase in the proportion of equity returns generated by our multi-asset strategy in past three-year periods. It suggests that our multi-asset strategy was well positioned to capture the higher returns available from equities, as they steadily regained favor from 2012 to 2013.

3For a discussion of multi-asset strategy roles, see Callan [2015].

REFERENCES


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