



The importance of Stress Testing and Scenario Analysis in multi asset portfolios

Introduction

How do your multi asset portfolios perform under different market conditions?

How do you test your portfolio construction, screen for risk concentrations and gauge factor sensitivity?

Portfolio managers often field such questions from senior management and clients. While there may not be definitive answers, stress testing and scenario analysis can help form part of a robust foundation for portfolio construction, risk, and more.

This paper aims to help you answer those questions. We introduce both methodologies, transitioning from basic single-factor stress tests to intricate scenario modelling. We will discuss the importance and challenges associated with these techniques, outline their creation and application, and provide practical insights from a portfolio manager's viewpoint. Lastly, we'll highlight how these methods can enhance communication both internally with colleagues and externally with clients and stakeholders.

Scenario analysis and stress testing: significance and challenges

Scenario analysis and stress testing are indispensable tools for evaluating the performance and potential risks to multi asset portfolios across diverse market conditions. They assist in numerous facets of portfolio management, encompassing portfolio construction, trade evaluation, risk identification, and client communication. However, these tools come with their own sets of challenges, such as the need for scenarios that are realistic while still intuitive, and ensuring they are applied to portfolios consistently and robustly.

Stress testing

Stress testing involves subjecting the portfolio to specific factors or combinations thereof, such as fluctuations in interest rates, equity prices, exchange rates, or volatility. The primary purpose is to gauge the portfolio's sensitivity or vulnerability to different factors or asset classes and to estimate potential gains or losses during extreme market events. Typically, stress tests are direct, concentrating on singular or multiple risk factors but without any correlation or covariance assumption.

Scenario analysis

On the other hand, scenario analysis entails the creation and application of hypothetical future situations based on historical events, ongoing trends, expert insights, or even speculative scenarios. This approach can help to explore and understand the possible outcomes and impacts of different events on the portfolio, and to prepare and protect it accordingly. Scenario analysis, whether it is rooted

in historical or future events, is by construction more complex. Historical events provide an implicit picture of correlation or covariance, whereas future scenario building requires one to estimate relationships directly or implicitly. While this makes the model setup more challenging it's more than offset by a far richer and more intuitive output.

Applications

One application lies in detecting hidden risk concentrations, where the portfolio might be disproportionately vulnerable to specific factors, regions, or sectors. For instance, when subjected to a recession, oil price drop, or a trade war scenario, a portfolio might display unexpected risks associated with emerging markets, the energy sector, or the US dollar, even without any overt investments in these areas. Such concealed risks could amplify portfolio volatility or suppress returns in specific scenarios. By varying the scenarios and stresses, these vulnerabilities can be pinpointed, potential gains or losses can be quantified, and strategies can be devised to mitigate or hedge these risks.

Scenario analysis and stress testing can also play an important role at the portfolio construction stage by evaluating the impact of different assets or strategies on portfolio performance and risk. A conventional approach is to simply examine the Value at Risk (VaR) impact of a new allocation. However, there are times when you want to understand the drivers of this singular metric, especially when VaR remains unchanged. Here, a combination of stress test and scenario analysis could shine a light on where risk is being added or offset.

The past decade and a half has seen its share of extreme market and 'black swan' events, leading to a near universal realisation among portfolio managers about the imperativeness of risk management and the very real threats of extreme market events. Contemporary risk models are equipped with a vast range of computations, from VaR and CVaR to Liquidation VaR and numerous co-movement estimates.

While these advancements undeniably mark progress, the outputs from such models can sometimes confuse even the most numerate portfolio manager. This can lead to communication issues between risk managers, quants, and portfolio managers. Scenario analysis offers a middle ground - complex but tractable with an intuitive input and output.

However, it's not all plain sailing. There are of course challenges and limitations to be aware of. One being the need to create forward-looking scenarios that are realistic but simple enough to be intuitive and to model. This involves balancing several trade-offs between complexity and clarity, realism and relevance, optimism, and pessimism, etc. Another challenge lies in integrating these methodologies within pre-existing risk frameworks and systems.

Creating Coherent and Intuitive Scenarios

Crafting coherent scenarios that are both realistic and easily comprehensible remains a central challenge. These scenarios depict potential future states that can influence portfolio returns. For a scenario to be effective, it must be consistent, logical, plausible, and grounded in the current global situation and potential market, economic, or political developments. Simultaneously, its simplicity should facilitate understanding, communication, and application.

Balancing these requirements is tricky. Overly complex scenarios may blur the clarity of analysis, while oversimplified ones might overlook vital implications. A scenario's tone—whether overly optimistic or pessimistic—can skew its impact analysis.

One important characteristic of a historical or hypothetical stress test is that they are effectively static. Conversely, many risk models are dynamic, calculating VaR on a rolling lookback basis; so large events such as the 2008 crisis, the 2011 US debt downgrade, the Greek crisis and the 2015 Chinese devaluation, not to mention the whole of 2018, have effectively dropped out of such models. I expect most would agree these events and their precursors remain relevant. Scenario analysis is one way to keep them on your radar.

Stress testing and Scenario analysis: An Art and a Science

Creating and applying scenarios for stress testing is both an art and a science, as it involves balancing intuition and creativity with logic and rigor. There are different approaches and techniques to create and apply scenarios, each with its own advantages and limitations. In this section, we will discuss some of these approaches and explore how they can help us to create and apply realistic, coherent, and intuitive scenarios. Remember input quality matters.

Methods for Forward-looking Scenarios:

1. **Top-down:** Starting from a macroeconomic or geopolitical perspective, this approach examines how global events, like a recession induced by rate hikes during high inflation, would trickle down to influence various countries, markets, sectors, or asset classes. The challenge here is to decide which factors to focus on and estimate their movement. Historic or current relationships can be used to propagate stresses across other factors.
2. **Bottom-up:** Originating from a market-specific viewpoint, this method assesses scenarios like an oil price shock and its cascading effects on sectors like energy, transportation, and consumer goods. They tend to be more specific focused scenarios, either completely forward looking or modifying some historic scenario for today.

3. **Narrative Driven:** This method crafts a plausible story detailing a sequence of events and their repercussions. For instance, assessing the potential outcomes of the ongoing conflict in Ukraine or the Fed hiking cycle. This is a mixture of methods 1 and 2, combining both top-down and bottom-up shocks that are all consistent with a broad market narrative with diverse drivers.
4. **Historical:** Utilizing historical data, this approach gauges asset prices or risk factor movements during past events, which can be narrow or extremely broad in nature. In theory this approach seems to solve most problems with little estimation required. However, determining a specific date range for these events can be challenging, the 1987 crash happened in a day, volatility peaked in October 2008, but equities bottomed in March 2009. In addition, absolute yield movements from the past may need to be adjusted given current levels to avoid significant negative yields.

These limitations and challenges have led to various solutions ranging from regression-based factor models, distributionally driven Monte Carlo all the way to techniques like entropy pooling. Though entropy pooling, which amalgamates diverse information sources into a coherent probability distribution, offers a promising approach, its complexity presents a real challenge for many investment managers.

Tools that strike a balance between complexity and simplicity arguably provide the greatest utility across stakeholders. The next section of this paper will provide a practitioner's perspective on stress and scenario analysis, emphasizing the benefit of a balanced approach.

Stress Testing in Practice: A Portfolio Manager's Perspective

It's more common these days to find risk managers and portfolio managers sitting on the same floor, they might even be on the same team, but they don't always speak the same language.

Communication between portfolio managers, risk analysts or quants is essential for maximizing performance and ensuring a pleasant office environment. Stress and scenario tests can help facilitate that dialogue; risk managers love a good stress test after all.

For portfolio managers, stress testing and scenario analysis serve dual purposes: risk management and portfolio construction. Their aim? To highlight the risk of and hopefully mitigate against significant losses from extreme events or scenarios, whether it's the 2008 financial crisis or the COVID-19 pandemic of 2020 or explore if the current asset allocation is robust to future threats that look different from the past.

While we cannot forecast the future, it would be irresponsible to suffer a catastrophic loss under circumstances similar to known historical events. We can use stress testing and scenario analysis to measure and manage our exposure and vulnerability to similar events.

Asset allocation, by construction, is a subjective combination of human intuition and quantitative data. Stress testing and scenario analysis offer a lens through which portfolio managers can integrate their projections about global future states.

Collaboration with other portfolio managers or strategists can also benefit from scenario analysis. The inherent subjectivity in market views implies varying outcomes from different individuals even if all agree on the event. For example, a portfolio manager may believe a US treasury or UK Gilt exposure reduces risk in a recession, others may feel a recession follows in a casual fashion from higher rates. In this instance a well-laid-out stress test or scenario can drive discussions beyond event sequencing and drivers, towards portfolio risks, and potential strategies to mitigate those under adverse market moves.

Effective scenario analysis not only aids in constructing robust portfolios but also enhances communication within teams and across peer groups. But the conversation shouldn't be limited to colleagues. Clients, too, need to be kept in the loop. A well-structured stress and scenario report can help foster understanding and trust. It can make a significant difference when engaging both prospective and existing clients, especially during those difficult performance conversations.

Engaging Stakeholders: Communication's Role

Engaging with stakeholders, be it senior management or clients, is a key part of any portfolio manager's role. Their trust and loyalty directly influence an asset manager's success. Direct and transparent communication about portfolio performance and risk builds this trust. Scenario analysis and stress testing, if intuitively designed, can simplify complex risk report outputs, making these outputs relatable. Such tools can illuminate how portfolios might behave under market conditions clients feel comfortable and familiar with, simplifying otherwise complex discussions to provide straightforward easy to understand answers.

Answers to questions like the two we started this paper with:

- How would your multi asset portfolio perform under different market conditions?
- How do you test your portfolio construction, screen for risk concentrations and gauge factor sensitivity?

Through this piece, we've aimed to shed light on how scenario and stress testing can guide asset allocation, improve portfolio robustness, and aid discussions both within teams and companies but also importantly with external stakeholders.

In Conclusion

In this paper, we have discussed both the importance and challenges of stress testing and scenario analysis. We have also discussed different approaches and techniques associated with the methodologies, providing a practitioner's insight along the way illustrating their use as both a risk and a communication tool.

Stress testing and scenario analysis are essential tools for portfolio managers and investors who want to assess the performance and risk of portfolios under different market conditions. These tools can help challenge portfolio construction, identify risk concentrations, evaluate trade ideas, and communicate with colleagues and clients. These tools, while invaluable, are not without limitations. The future of financial markets, by its very nature, is unpredictable and chaotic. While stress testing and scenario analysis offer a roadmap and semblance of preparedness, portfolio managers should remain vigilant and adaptive to unforeseen market dynamics.

The chaotic and ever-evolving nature of financial markets requires a proactive approach to risk management. It's crucial for practitioners to invest in continuous learning and training. As the complexity of markets grows, understanding and applying advanced stress testing and scenario analysis techniques will become even more valuable.

We hope that this paper has provided you with insights and guidance on how to use stress testing and scenario analysis for your portfolios. Embracing these insights and methodologies could be the key to not only refining portfolio construction and risk management strategies but also bolstering team communication, client engagement, and ultimately one hopes, portfolio performance.

About Jacobi

Jacobi was founded in 2014 with a vision to transform technology used for multi-asset portfolio design, analytics and client engagement. Jacobi provides its services to top-tier investors across the globe with a client base representing assets under management of over US\$7 trillion. Its award-winning technology has its roots in institutional investment management and uniquely incorporates a market leading software development kit. This allows firms to build their own models, tools and applications on the platform.

Contact

United States/Canada

Liz Gartsman
+1 (757) 510-1330
liz@jacobistrategies.com
www.jacobistrategies.com =

Australia/Asia

Rebecca Chong
+61 (0) 480 350 279
rebecca@jacobistrategies.com
www.jacobistrategies.com

Europe/Middle East/Africa

Curtis Evans
+44 79-2873-1094
curtis@jacobistrategies.com
www.jacobistrategies.com