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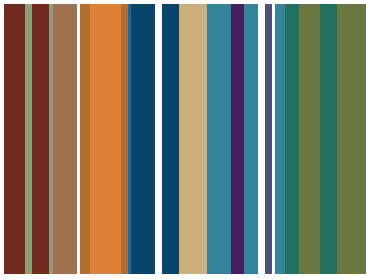

MARKET PERSPECTIVE

Anticipating and Mitigating Catastrophic Risk

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Anticipating and Mitigating Catastrophic Risk

We have recently experienced an unprecedented time in the global financial markets. Not surprisingly, risk managers and the techniques they employ are under fire from market participants, regulators, financial reporters, and shareholders alike.

Ironically, over the last fifteen years we have witnessed significant advances in the risk management profession, from both the institutional and regulatory viewpoint. This market perspective looks at limitations of the standard methodologies and introduces a new analysis to anticipate and mitigate the effects of cataclysmic events.

Recent market turmoil has put risk management firmly in the spotlight, with regulators, lawmakers, industry practitioners, senior management, and the press all scrutinizing current risk management practices. Standard measures such as value at risk (VaR), sensitivity analysis, and historically based stress tests have formed the backbone of risk management for a number of years, but have fallen short in terms of rigorously analyzing the extreme events that have swept through the global marketplace.

This market perspective introduces a new risk calculation that complements existing methodologies. Specifically, we address the potentially devastating effects on the overall value of a firm's positions following unforeseeable and extreme movements in key risk factors.

The measures mentioned above – VaR, sensitivity analysis, historical scenario analysis and stress testing* – are useful but have limitations:

VaR* measures the minimum loss expected from a portfolio under evaluation, assuming relatively normal market conditions. Even the back testing around VaR is based upon testing that this minimum loss would indeed occur one day in a hundred (assuming 99th percentile). The problem is that the actual loss could be far deeper than the minimum, but these losses are buried deep within the 'tail' of the profile and go largely unobserved.

A second problem with VaR is that it embeds correlations between risk factors that have shown themselves over the previous x years (typically 2 years worth of data is used). These correlations tend to break down in times of stress.

The third issue is the use of normal distributions to create the scenarios. This is a huge topic in and of itself, but there is considerable evidence against the use of normal distributions for this analysis. Still, the jury is very much split on this point across the market. VaR has uses but its limitations must be taken into account. Unfortunately, many practitioners, senior managers, and regulators viewed the measurement of VaR as the cornerstone of prudent risk management practice. Risk reports offered a false sense of security with respect to knowledge of financial risks at the organization and system levels.

The replay of **Historical Scenarios*** runs into a similar issue. The analysis allows for the assessment of extreme events on the current portfolio composition. Unfortunately, factor correlations are consistent with the period in which the event occurred and are unlikely to have relevance to the current environment. The danger with such analysis is that it may give the risk managers and senior management undue comfort regarding the impact of extreme events and disturbances.

Sensitivity Analysis* is the final plank of standard analysis, but is inadequate as far as institutional risk management is concerned. The small movements modeled, typically one or ten basis points, are excellent measures to aid traders and portfolio managers with day to day decisions. However, they offer very little to the risk team in terms of understanding the broader risk profile when bad things happen. Why? Many instruments have built in break clauses, optionality, step ups/downs, variable FX rates and other features that remove the concept of linearity and limit the predictive power of sensitivity measures to assess portfolio behavior under crisis.

The aforementioned observations are not intended to dismiss the commonly used risk measures. They are meant to illustrate limitations that must be understood by all users of such analysis and to set the stage for the introduction of a new shock analysis to complement

standard risk assessment. Incorporating this new approach, which we call catastrophic risk analysis, will enable practitioners, managers, and regulators to understand the firm's risks under normal and extreme market conditions.

Catastrophic Risk Analysis is designed to determine the movements required in individual and combined risk factors to generate unacceptable portfolio losses. Ideally, one would supplement this result with the pricing of deep out-of-the-money put (or call) options that would protect the firm in the event of such movements.

The approach is summarized as follows:

1. Deterministically create and run risk factor ladders, where each risk factor is stressed incrementally to extreme levels (rises and falls of between 20% and 80%).

2. Rank the result of the stresses on the overall portfolio to determine the individual risk factor fall at which the loss is considered catastrophic to the overall portfolio.

3. Select the top five risk factors and create multiple effect matrices to determine the levels at which these multi-factor losses become catastrophic.

4. Price deep out of the money options at strike levels just above the catastrophic loss level, in order that the price of insurance against such loss forms part of the standard risk reporting.

The analysis outlined above would deliver a crucial addition to basic risk reporting, which tends to provide succor that expected losses, under normal conditions, are tolerable. This result looks at risk from a reverse angle. Instead of starting with the portfolio, it starts with the risk factors and iterates towards the point of intolerable losses, without making assumptions around market correlations or past experience. Such a measure puts the risk manager in a position to ignore misleading albeit comforting data, and instead hone in on the potential for extreme loss.

In summary, when a market turns violently downwards, recently observed correlations disappear, with new unexpected correlations taking effect spontaneously.

It is at these times of extreme stress that the focus is on the risk managers, but conversely, it is also at such times that the standard risk measures, and the assumptions on which they are based, are at their least effective.

The problem of 'not knowing what is not known' is at its most prominent. The lessons learned from such turbulence should be that risk management takes on a far more creative, investigative and experimental aspect, in addition to the standard risk measures that are designed to work under normal conditions.

With Catastrophic Risk Analysis in place, the regular risk report would include:

- VaR
- Sensitivities
- Historical Extreme Stresses
- Single risk factors which could cause catastrophic losses, along with the fall/rise required for such losses
- Matrixed risk factors which could cause catastrophic losses, along with the fall/rise required for such losses
- Insurance orientated option pricing designed to protect the portfolio from such losses

Such a report would add extra dimensions and depth to the standard risk reporting. However, it requires systems that are able to extend beyond standard risk measures and calculate the laddered scenarios and OTC options discussed above.

Assuming access to these capabilities, the risk team would be able to add value and take a leadership role in times of extreme market turbulence.

***VaR Analysis:** Typically calculated at 99%, 97.5% or 95% confidence levels, with scenarios generated using historical simulation, Monte Carlo Simulation, or the generalized covariance approaches. These scenarios are generally created from historical archives from which they are either taken directly (Historical VaR) or calculated as a function of observed volatilities, drifts and correlations between risk factors.

***Historical Scenario Analysis:** This measurement is meant to ensure that extreme events of the past are constantly re-evaluated against the current portfolios to evaluate whether the potential impacts are controllable or acceptable.

***Sensitivity Analysis:** Sensitivity analysis involves small bumps to risk factor values to evaluate such movements on the value of instruments and portfolios. It is usually performed analytically (first and second order functions of the underlying valuation model) or numerically (manually bumping the risk factors, and fully revaluing of the underlying trades). The results are typically expressed as first order sensitivities (deltas) and second order sensitivities (gammas).

About Adaptiv

SunGard's Adaptiv provides enterprise-wide credit and market risk management and operations solutions for financial services institutions. Adaptiv assists institutions of varying size and complexity to deploy technology to meet both internal and regulatory requirements for risk management and operational control. Adaptiv helps financial services institutions from the banking, hedge fund, asset management, insurance and corporate sectors with our deep understanding of risk management and operational processes.

To talk to an expert to learn how SunGard Adaptiv can help your business please call: +44 (0)208 081 2779 or email adaptiv.marketing@sungard.com

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