Building pessimised scenarios

Isolating events that could produce significant losses has long been a part of risk assessment. However, pressure is building to make such insights a standard component of regular risk analysis and reporting, writes David Rowe

One of my first risk projects was building a basic value-at-risk system for the foreign exchange trading activities of Security Pacific Bank. Using simple correlated aggregation based on parameters estimated from a short moving history, it was a distinctly first-generation effort. Even so, the standard daily report showed VAR estimates broken down by trading room and by currency, in addition to the total. This was an early, albeit crude, attempt to identify comparative sources of risk.

In the mid-1990s at Bank of America, we built a risk source sensitivity table into the simulation-based counterparty credit exposure system. For each exposure profile, we evaluated the impact of shifting each market driver up and down by two standard deviations over the life of the portfolio. This allowed easy identification of those counterparties where exposure could rise significantly from a large shift in any selected risk source. It proved to be a valuable capability as the Asian currency crisis unfolded in late 1997 and early 1998.[1]

Both the above efforts are examples of risk diagnosis rather than just risk measurement. Their purpose was to identify specific causes of risk to supplement estimates of its aggregate magnitude. They illustrate that risk diagnosis, far from being a new concept, has been a part of risk analysis since the early days of VAR. Nevertheless, there is growing pressure to increase the role of risk diagnosis and to make the resulting insights a more prominent aspect of daily risk reports.

As I pointed out in my October column, VAR was an important advance when it was first deployed in the early 1990s, but further advances have been slow in coming. Now, the Basel Committee appears ready to push for enhanced market risk functionality. Specifically, the committee has indicated a determination to demand explicit treatment of specific credit risk and greater focus on the magnitude and causes of potentially extreme losses. Of these two areas, I believe the second will prove more significant than the first.

Explicit treatment of specific risk certainly can give a more accurate estimate of VAR. In particular, it can reveal increased risk from an unusually concentrated exposure to the credit standing of a single entity or a small group of correlated names. In the end, however, it is hard to visualise a large global financial institution becoming so concentrated as to cause potentially lethal losses without such concentration being detected by other means. In contrast, we continue to see surprisingly large market risk losses from unauthorised trades and even from positions that are fully recorded and reflected in market risk systems.

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Unauthorised trading is fundamentally an operational risk issue that can be addressed most effectively by strict procedural controls. Enhanced supervisory attention to such controls and the surrounding cultural environment is certainly in order. On the other hand, all positions are exposed to potentially extreme events of the type that seem to arise every few years. Particularly vulnerable are out-of-the-money written options.

Self-analysis is key

The world is such a varied and complex place that attempting to evaluate all possible scenarios, especially extremely unlikely ones, is effectively impossible. Fortunately, such a highly inefficient approach to stress testing is unnecessary. A more sensible approach is to analyse the vulnerabilities of existing positions and then apply stress scenarios that exploit these specific exposures, a process that can be called 'pessimisation'. An important question is how to implement this in a way that makes it commercially practical as part of the daily market risk assessment process. Fortunately, existing Monte Carlo-based VAR systems offer a promising way forward.

Assume a firm produces a daily 99% VAR estimate based on a 10,000-draw Monte Carlo simulation. This implies that 100 scenarios produce losses in excess of the final VAR figure. The question is how to define the main drivers of these large simulated losses. One approach is to begin with the loss contribution of individual risk factors in each scenario. For each risk source R_i, its contribution is the loss with R_i at its value in the extreme loss scenario with all other risk factors unchanged.[2]

For each of the 100 worst scenarios, the largest loss contributions would be tabulated in decreasing order of size until the sum of these contributions exceeds 90% of the total loss for the scenario. Then, the loss contributions from any given risk factor would be summed across the 100 scenarios and divided by 100 to give an average extreme scenario contribution for this factor. The risk factors would then be ranked in decreasing order of their average extreme scenario loss contribution. This ranking would be a useful guide to constructing one or more appropriately pessimised stress tests.

A purely mechanical procedure to simulate shocks of an agreed magnitude to the most important risk factors would yield useful information. It would be better, however, to have an experienced risk professional review the average extreme loss contributions and configure one or more scenarios with structurally consistent shocks. Even without an actual pessimised stress scenario, having a senior risk professional review the average extreme loss contribution table would provide useful insights into which potential market events present the worst threat. ■

[1] *This functionality was the subject of my first regular Risk Analysis column. See* Risk *October 1999, page 49*

[2] *This approach has been suggested, in a somewhat different context, by Thomas Breuer of the Fachochschule Vorarlberg in Dornbirn, Austria*