

Minimally Destructive Scenarios and Cognitive Bias

by Mary Pat Campbell

In choosing metrics and processes for conducting an Own Risk and Solvency Assessment (ORSA), one needs to be clear at what the purpose of an ORSA is. While it seems regulators are looking for specific measurements to be made for this exercise, ideally ORSA will go beyond compliance theater. For ORSA to be a serious part of running a business, it needs to improve risk decision making, and in a tangible way.

Over the past decade, a multitude of risk metrics have been thrown at people in the insurance industry. Value-at-risk (VaR) has been a popular metric for setting capital, as it can capture tail risks and is relatively easy to explain and understand. However, VaR has many shortcomings that make it easy to game for experienced practitioners, and decision making based on VaR meant that one was blind to the distribution beyond the percentile used. The magnitude of catastrophe, when it occurs, is of great importance to insurers.

Other risk measures fixed this “extremity blindness”; one of the most popular being conditional tail expectation, or Tail-VaR, which takes the expected value beyond the specific percentile. But while TailVaR fixes some of the major shortcomings of VaR, it retains one of the most important ones: How does one make decisions based on this metric?

The Framing Effect

Consider the state of mind one is in when considering traditional risk measures based on probability distributions. The frame is how likely certain events are, which plays into particular cognitive biases.

If the measure is VaR(99.5), for example, and surplus is well within this mark, the temptation is to figure things are OK—“Oh, the possibility it’s worse is a 1-in-200-year situation ... no problem.”

Probability-based metrics get people focused on the probabilities, and even very numerate people have problems making good decisions based on this sort of information. Even more to the point, a specific probability level gets chosen, or one looks at the VaR or TailVaR level of the capital, and gets fixated on that specific number. But people have very poor “gut feel” for these sorts of things, which is just another term for being able to connect the data to one’s experience and mental model of how the business works.

To help management make better decisions, the focus needs to move off of numbers that are disembodied from anything one can have actual feedback on. I propose changing the frame from the probabilities to the specific scenarios themselves.

Minimally Destructive Scenarios

So the question becomes not what the likelihood of various scenarios is, but what kind of scenarios the company can actually handle. Ideally, one would explore the least extreme scenarios in the variety of dimensions that would wipe out all free surplus for an insurer within a certain time horizon, which produces a set of what I’m terming “minimally destructive scenarios.”

The concept is not a new one—something similar was termed “reverse stress-testing” by the Financial Services Authority (FSA) in the United Kingdom in Policy Statement 09/20, released in 2009. The definition from the FSA:

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“Reverse stress-tests require firms to explicitly identify and assess scenarios most likely to render its business model unviable

... a firm’s business model is described as being unviable at the point when crystallising risks cause the market to lose confidence in the firm. A consequence of this would be that counterparties and other stakeholders would be unwilling to transact with or provide capital to the firm and, where relevant, existing counterparties may seek to terminate their contracts. Such a point could be reached well before a firm’s regulatory capital is exhausted.”

However, note the language refers to likelihood, and the definition of “unviable” is not necessarily well-defined (though you’d know it when you saw it occur in the marketplace). While there is value in attempting to do the exercise as described by the FSA, I believe having something well-defined in terms of boundaries will make the exercise less onerous for companies to complete.

To be sure, finding such minimally destructive scenarios is not trivial, and they are not at all unique. Inverse problems are often like this. Indeed, there is theoretically an infinite number of such sets, but the idea is to simplify the search initially. Pick some key driving variables in the models and find the contours of “destruction” in each of these dimensions singly and in combination. As one gains experience in this exercise, the level of sophistication in describing these “destructive surfaces” in the scenario space can increase. One’s understanding of what “minimal” is may also change in defining the scenarios.

The exercise of reverse stress-testing the models may elicit surprises, such as finding interactions or nonlinearities that one would not have thought through if one were simply

running the model forward in the usual way, in choosing a scenario and assumption set and then looking at the results. Here, one starts with the result and runs the model backwards. If nothing else, those involved in model development and evaluation should gain some insight in the models, and be better able to see the weaknesses and strengths of their particular models.

Changing the Frame

But, most importantly, these minimally destructive scenarios change the frame. Instead of asking, “What’s the probability we can survive?” the question has now changed to “This is what we won’t survive. Are we comfortable with that?”

Suppose one minimally destructive scenario was the euro collapsing. If this were for an international insurer, management would possibly find that sort of minimally destructive scenario unacceptable. If it were a small, localized European insurer, not surviving a complete collapse of the eurozone might be reasonable as a minimally destructive situation, depending on company strategy.

But let us suppose one seeks out such minimally destructive scenarios, and determines the minimum it would take something so extreme it would be akin to supervolcanoes, the Black Death and an alien invasion to wipe out free surplus. At this point, the likely reaction would not be “perhaps our strategy is too conservative,” but “our models aren’t believable.”

One can explore the impact of different options—e.g., changing pricing, adding or dropping product features, changing investment strategy—by seeing how these minimally destructive scenarios change. This metric isn’t intended to replace other decision-making metrics, such as hurdle rate, but simply change the frame of how one looks at the decision.

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One can determine how these scenarios change as the business moves forward in time, giving feedback to how well one's models are working.

concrete frame of reference for making decisions. The more tangible the metric, the more likely it will actually be used for decision making.

In none of the cases above is one slapping a probability on these minimally destructive scenarios. To be sure, people may have an opinion on the likelihood of various scenarios occurring, and that will be difficult to get away from in people working in a business ruled by probabilities. However, by making the scenarios themselves the focus, people have a

Reference

FSA on Reverse Stress-Testing: http://www.fsa.gov.uk/pages/About/What/International/stress_testing/firm_s/reverse_stress_testing/index.shtml

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