Risk Metrics for Decision Making and ORSA

by Stephen J. Strommen

Events surrounding the 2008 financial crisis have revealed glaring weaknesses in the way financial risk and solvency are measured and assessed. While there has been a great deal of progress over the last few decades in theoretical approaches to valuation of risk, these advances have been sometimes misunderstood and often misapplied in the financial world, not just by business but also by regulators and accounting standard-setters. The multiplicity of technical approaches leads to confusion. With that in mind, I present ideas in two areas in an attempt to clarify thinking about these issues. The first area is accounting measurement, and the second is solvency assessment.

In the world of insurance accounting, there is much debate over the way risk should be reflected in the financial statements. Discussion focuses on the way risk should be reflected in liabilities (reserves) and in capital requirements. Quite often a probability-of-adequacy concept is used, with the idea that reserves should be set to be adequate at one probability level, with reserves plus capital being adequate at a higher probability level. This approach ignores the fact that reserves and capital serve different purposes, and the risk metric used for each needs to be tailored to its purpose.

In an accounting context, the function of liabilities (reserves) is to defer income in situations when revenue is collected before, sometimes long before, the related service is rendered or obligation is paid. In the case of long-term contracts that involve risk, such as insurance contracts, liabilities represent the present value of the future service or obligation, including some kind of provision for its inherent risk. The question is how to determine the provision for risk.

I propose using the accounting paradigm of matching revenue and expense. In situations where revenue is collected long before the related expense is incurred, a liability is set up for the expense. In the case of long-term contracts that involve risk, if we could measure the expense of carrying the risk, we could apply the paradigm of matching revenue and expense very directly.

Fortunately, there is a simple concept that can be applied to measure the expense of carrying risk. Businesses that write long-term contracts involving risk must hold capital sufficient to ensure their ongoing solvency. There is a cost to acquiring and holding capital, because providers of risk capital require an elevated return as compensation for bearing risk. The cost of capital is therefore a cost of bearing the risk. The present value of the cost of capital is, I suggest, the appropriate risk metric that should be used for valuation of liabilities because it is consistent with the paradigm of matching revenue with expense for long-term contracts.

The cost-of-capital approach is one of three approaches enumerated by the International Accounting Standards Board (IASB) for valuation of insurance contracts. The other two approaches are variations on a probability-level concept. However there seems to be little recognition that the cost-of-capital approach and the probability-level approach produce fundamentally different results. The cost-of-capital approach leads to a larger provision for risk on longer-term contracts than on short-term contracts with the same degree of risk (that is, the same size of potential gain or loss). The probability-level approach leads to a provision for risk that does not depend on the length of the contract, but only on the range of possible results. In order to equate the results of the probability-level metric with those on the cost-of-capital metric, one would need to use a lower probability level for short-term contracts than longer-term contracts. If one fails

to do so, the size of the risk adjustments produced by these two different metrics can differ by as much as a factor of five.

Let us accept the cost of capital as the risk metric for use in reserves, and turn to the question of the risk metric for capital.

Companies should hold sufficient total assets (reserves plus capital) so that there is a very high probability that they will be able to fulfill all their obligations, even those of uncertain timing or amount such as insurance. Therefore, a probability-level metric is fully consistent with the purpose behind capital requirements (given that reserves have already been defined). The matching of revenue and expense does not enter into discussion of required capital; the question is directly one of the likelihood that all obligations can be met.

It therefore makes sense to use a probability-level approach as the risk metric when determining minimum capital requirements, and to use the cost-of-capital approach as the risk metric when calculating reserves. The need for these two different risk metrics for these two different purposes is fundamental to clarifying the discussion in the area of accounting measurement.

Solvency assessment depends, of course, on how solvency is to be measured. We assume here that solvency is defined by the financial statement. A company is solvent if it has assets that exceed liabilities, or, in many regulated industries, if it has capital that exceeds regulatory minimums. With that in mind, a solvency assessment is an assessment as to whether a business can remain solvent over some period of time even if adverse events take place.

This is where a fascination with modern mathematical and computer models has led many astray. A calculation of "economic capital" using a computerized stochastic simulation model is often confused with a solvency assessment. It is sometimes thought that if currently reported capital is greater than "economic capital" determined in this fashion, that solvency must be assured, perhaps with 99.9 percent probability. This kind of measurement has its place as a tool, but is decidedly lacking as a means of solvency assessment for several reasons.

- A stochastic model uses probability distributions that are based on historical experience, but quite often the historical experience is far too small to derive the tails of the distribution with any confidence. The tails of the distribution of future results arising from use of that historical distribution should not be given more confidence than the size of the historical sample suggests. It is hard to see how one can get 99.9 percent confidence for a one-year model when one doesn't have 1,000 years of experience to draw from.
- Because of the complexity of many economic capital models, their results are sometimes viewed as sacrosanct by board members who do not have the technical background to question them in detail. After all, many of the techniques being applied are based on concepts that earned Nobel prizes. They must be scientifically accurate, right?
- No stochastic model can accurately predict the changes in behavior that might occur in the future if one or two extreme events occur at the same time. Future behavior has a way of changing in unpredictable ways, and that can significantly affect the financial future of any human enterprise.

- "Economic capital" is often defined as the size of loss that could be experienced if an adverse event occurred. But if a business actually held that amount of capital and then experienced that size loss, it would be left without any capital, thereby essentially being insolvent.
- The figure calculated for "economic capital" is often very sensitive to starting conditions, and can often increase significantly as conditions get more adverse. So "economic capital" is a moving target that can be very difficult to manage to.

To be thorough, a solvency assessment should include plans for any action that would be needed to maintain solvency in specific foreseeable scenarios. With that in mind, and with an understanding of the shortcomings of stochastic models, it seems reasonable to suggest that solvency assessment be based on a careful review of not only the current business plan but also several very specific stressful scenarios. The actions that would be taken in each scenario to maintain solvency and company vitality should be carefully planned. Only then should a simulation model be used to help illustrate the outcome.

This stress-testing approach to solvency assessment has the advantage of being grounded in reality rather than in stochastic models. Every board member can understand and provide input regarding the scenarios and the management actions that would be taken if they occurred. This kind of engagement of board members is vital to the effectiveness of any solvency assessment.

In summary, before one can undertake an ORSA, one must have a financial reporting framework in place using appropriate risk metrics for reserves and capital. The cost of capital is the appropriate risk metric for use in reserves, while the probability level is an appropriate concept regarding capital. However, when one actually undertakes an ORSA, one can better engage management by getting away from the probability-level concept and focusing rather on specific stress tests. In that way, management can be engaged using what they know, rather than being snowed by elaborate and intimidating stochastic financial models.

Stephen J. Strommen, FSA, CERA, is a senior actuary at Northwestern Mutual in Milwaukee, Wis. He can be contacted at *sjstrommen@wi.rr.com.*