

FINANCIAL SERVICES

MANAGING EXTRAORDINARY RISK

The economic crisis and other recent events highlight the need to manage extraordinary risk associated with assets, liabilities and capital. A combination of valuation models, statistical risk measures and stress testing can help to better manage the unknown.

By Mike Lombardi, Michael Griffiths and Andrew F. Giffin

The current economic, financial and credit crisis is generally regarded as an unprecedented combination. An unanticipated decline in housing values led to outstanding mortgage balances that often exceeded collateral value, and led to rapidly increasing default and foreclosure rates. Securities, whose value depended on mortgage repayment, lost value, which triggered a general decline in security values and the failure or crippling of some large financial institutions. Loss of savings and confidence led to general economic decline, resulting in job losses and reduced buying power and buying inclination. Government bailouts blunted some of the damage but also contributed to widespread concern and further hesitance to buy, lend and invest.

WHY DID IT HAPPEN?

Financial institutions underestimated the potential for volatility in the valuation and liquidity of markets in unprecedented stressful conditions. There were no active markets for certain financial instruments. Because many hedging strategies were based on incorrect assumptions about expected price movements and robust market price availability, institutions were not effectively hedged.

Even before the downturn, the insurance industry, along with other financial services industries, began establishing more robust risk management systems, including enterprise risk management (ERM), hedging strategies and analysis of economic capital (EC). These efforts have significantly improved the rigor applied to particular types of risk that were not adequately addressed in the past, and they have influ-

enced companies' consideration of accumulations of risks related to counterparties and events.

Yet there is continuing criticism that current efforts do not go far enough. If current efforts are not adequate, what will it take to protect company solvency from unknown and unknowable future events that occur outside historic risk patterns? To what extent is this protection possible?

WHAT STANDARDS MUST RISK ANALYSIS MEET GOING FORWARD?

We can anticipate that financial institution regulators will impose higher capital requirements in anticipation of the greater risks of stressed markets and other extraordinary circumstances. This comes at a time when the world is moving to a system that relies more heavily on internal models that better identify the enterprise risks of particular institutions. In order to manage both expected and extraordinary risk, meet the coming regulatory requirements, and protect their own performance and capital positions, insurers and other financial institutions need to incorporate appropriate tools into their own risk management systems.

A combination of initiatives by regulators, rating agencies and institutions have contributed much to the risk assessment arsenal. ERM programs identify a broader array of risk, measure exposures and lead to better risk selection, transfer and mitigation. EC analysis draws on historic risk distributions to aggregate risk capital requirements for institutions with complex risk structures. EC is intended to identify a level of capital required to maintain

solvency over a certain period of time (e.g., one year) at a prespecified probability (e.g., 99.5% value at risk). EC is intended to cover worst-case losses in all but the most extreme risk scenarios. Growing reliance on market-consistent measures of assets and liabilities adds an element of reality to valuation, although markets don't always have the depth and volume of activity to provide a reliable value.

TOOLS FOR VALUING RISK OF LOSS

ERM provides a comprehensive framework for identifying, analyzing and managing risk. It is concerned with all risks faced by an organization, and its aim is to create value for owners/stakeholders and ensure that promises to customers are met. It involves all the systems, structures and processes within an organization. ERM requires a common language of risk across the organization that defines the risks inherent in each function of the organization as well as all of the tools required to evaluate and manage these risks. To be effective, ERM must become embedded in the fabric of business decision making (see *Exhibit 1*).

Now, financial institution managers and regulators need to assemble a reliable set of tools for understanding risk and related market behavior. They need to understand what each tool can and cannot measure effectively and make provisions for the hard-to-measure or unmeasurable risk potential. Their key analyses should include measures of risk in determining required risk capital and valuing assets and liabilities. Some prominent examples follow.

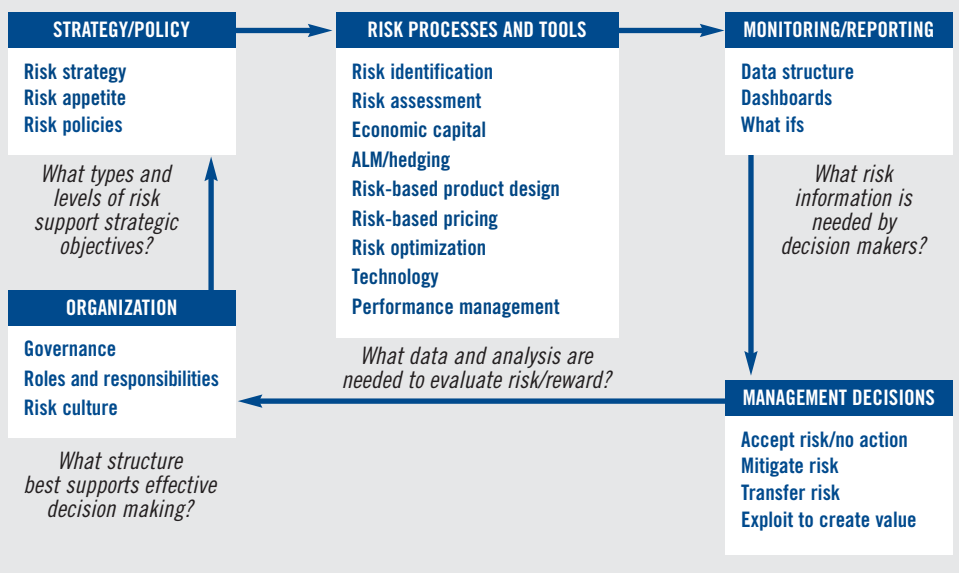


Mike Lombardi is a Managing Principal with Towers Perrin in Toronto. He specializes in mergers and acquisitions, insurance regulation and financial reporting for multinational insurance companies. Mr. Lombardi is a Fellow of the Canadian Institute of Actuaries, a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries.



Michael Griffiths was a Principal of Towers Perrin, responsible for the insurance consulting business in Italy, until he retired in 2003. He is a nonexecutive director of Mediolanum Assicurazioni and Mediolanum Previgest, Mediolanum's general insurance and pension fund units in Italy. He is active in the design of corporate governance for financial institutions and coauthor of *Ethical Economics*.

EXHIBIT 1
Embedding ERM for risk-based decision making



Insurance and Extreme Risk

Extreme risks of greatest concern are those that combine very low likelihoods of occurrence with outcomes of high loss if they occur (i.e., low frequency, high severity). Risks that may be extreme for individuals or businesses can be well within normal risk distributions for insurers. An individual homeowner usually considers the risk of losing a home to fire remote, but one that cannot be ignored, particularly because insurers are willing to assume the risk at a manageable premium charge. Insurers, in turn, often transfer their rare but catastrophic exposures to reinsurers. But what about the risks that are not properly anticipated? What types of risks and potential loss amounts should an individual insure and an insurer reinsure? In short, what is the value of the risk?

Value at Risk

Value at risk (VaR) is becoming a common method for measuring the probability of insolvency and is the key metric used for insurers (e.g., in Solvency II standards) and banks (Basel II). VaR measures the risk of loss for a particular portfolio of risks (e.g., assets, liabilities, enterprise) over a particular period of time at a particular probability. A one-year, 99.5% VaR of \$100 million means that there is a one-in-200 chance that the portfolio will experience a loss in excess of \$100 million during a one-year period (see *Exhibit 2* on page 25 for an example of a VaR distribution analysis in the context of EC). However, although VaR provides information on the probability of such an event, it does not indicate the actual size of an extreme loss, except that it will exceed \$100 million. The VaR analysis relies on a combination

of historic data, extrapolation and judgment as the basis for modeling risk. However, if the historic period used is too short, it may not capture the full range of adverse market outcomes.

VaR has been criticized by Nassim Taleb, author of *The Black Swan*, and others for ignoring extreme events, creating false confidence and encouraging risk takers to accept rare extreme risks without making adequate capital provision for them. In effect, VaR tells us about the probability but not the severity of the extreme outcome. However, the full range of possible adverse market outcomes is unknown and could include unprecedented events such as the extension of mortgages to poor risks combined with a drop in housing values or the counterparty risks not anticipated in the credit default swap markets.

Statistical Measures of Extreme Risk

Just as the VaR method addresses risk of loss assuming all but the most extreme and unknown conditions, tail VaR (TVaR, or conditional tail expectation [CTE]), measures the conditional expectation of values in the tail of a risk distribution. If 99.5% VaR indicates the probability of an outcome not more than the specified value, the TVaR is based on the remaining severity of the scenarios in the remaining tail of the distribution.

From an empirical perspective, a TVaR analysis is limited by the data available to determine the risk distribution under consideration. The data requirements are an order of magnitude higher because sufficient data are needed both to quantify the probability of a loss and reliably quantify



Andrew F. Giffin is a senior consultant with Towers Perrin in New York and the publisher of *Emphasis*. He specializes in strategic planning for insurers, enterprise risk management, distribution strategies, M&A transactions and implementation, competitive market analysis, and organization and regulatory issues. Mr. Giffin has J.D. and M.B.A. degrees.

the average amount of loss should the event occur. This is a particular problem in “fat tail” distributions, where there are a limited number of historical extreme events. And, just as a TVaR analysis is hindered by this lack of data, the same is true for theoretical distributions (e.g., Pareto) for which the parameters are based on this scarcity of data. How can these be dealt with?

Scenario Analysis and Stress Testing

Beyond VaR and TVaR, capital requirements can be evaluated by applying certain stress tests. Typically, a baseline is established for expected institution performance under a best estimate of relevant conditions and expected company responses. Then a particular risk factor (e.g., loss costs), an external risk influencer (e.g., interest rates) or a combination of internal and external factors (e.g., economic crisis) can be assumed and alternative scenarios developed to retest expected company performance.

Certain insurance regulators require stress testing, including prescribed scenarios and company-selected scenarios that test their particular sensitivities. Some regulators try to limit company exposure by specifying allowable criteria for constructing products. For example, ISVAP, the Italian insurance authority, forbids the use of structured products or bonds with a low rating for index-linked products. Cash-flow projections demonstrate how companies are expected to perform in terms of income statement and balance sheet changes over a period of future years under the stress scenarios.

Scenario analysis can provide a broader picture of risk, but its ability to anticipate extreme outcomes depends on the definition of the scenarios to be tested. Hypothetical extremes can be tested, but are they extreme enough, on the right dimensions, to anticipate what may come in the future?

VALUING ASSETS AND LIABILITIES

Accurately valuing assets and liabilities and understanding their interdependencies are key elements in understanding and measuring risk in insurance companies. Understanding interdependency is particularly important in life, annuity and pension products, where product guarantees are dependent on maintaining asset values. Accounting and regulatory standards (e.g., IFRS, Solvency II, IAIS) are moving toward greater reliance on market valuation for assets and liabilities in financial institutions, in part to reflect current risks. Market valuation works best when markets are deep and liquid.

Problems arise when markets experience extremes (e.g., when the few buyers available offer only “fire sale” prices). In such circumstances, available market values don’t reflect underlying intrinsic values and may reflect an overcorrection for short-term negative perceptions.

When there is no reliable market to mark to, it is possible to mark to a model of a market with expected risk characteristics and more rational economic behavior. However, because the model requires subjective input, the challenge becomes defining or selecting meaningful characteristics and behavior. The consensus seems to favor a consistent treatment of assets and liabilities

under a mark-to-market approach, with the option to use mark-to-model where mark-to-market is not appropriate because of overly stressed market conditions that do not provide an active (i.e., non-fire sale) market price.

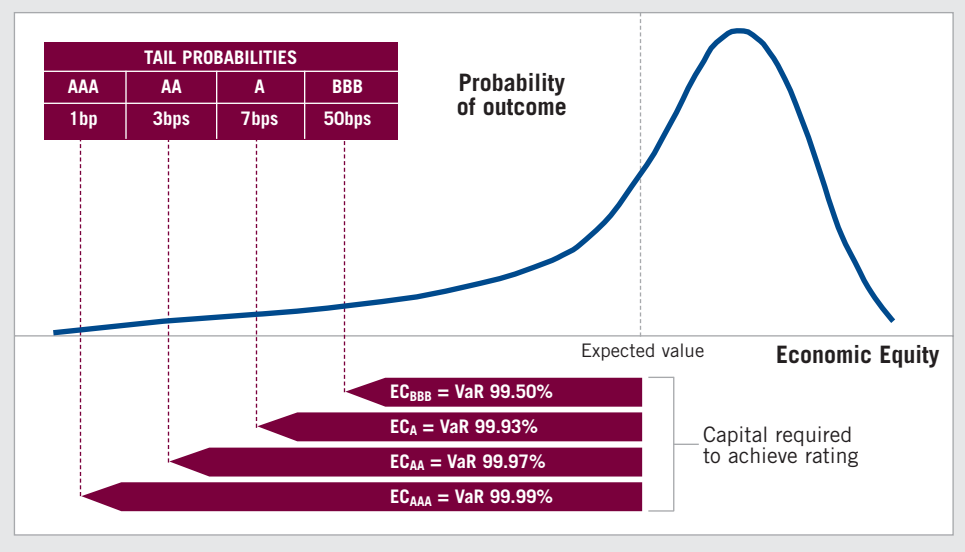
In complex life products (e.g., variable annuities with investment guarantees), companies establish hedging positions by purchasing financial instruments that can be managed to offset liability risk sensitivities determined by stochastic simulations. An extremely complex and time-consuming process, the analysis can be made more manageable by using replicating portfolios (see “Replicating Portfolios for Variable Annuity Hedging,” *Emphasis* 2008/4).

The challenge for the pension industry, with the move from defined benefit to defined contribution plans, is how to provide security for contributors when offering plans that have a high equity content in the investment portfolio. As they face the issue of how to advise clients in choosing between low-, medium- or high-risk portfolios, plan managers must better communicate what the final pension is going to look like against the predicted contributions for the alternative low-, medium- or high-risk portfolios. They must also avoid incentives that encourage salespeople to drive buyers to the higher-risk option.

The liability of state pension provision has now become a major component of the gross national product in some countries such as Italy, where it now exceeds 14%. Funding of these proportions has now become a major systemic risk of indebtedness for the countries concerned.

We need to understand what available risk management tools measure and make provisions for hard-to-measure risks.

EXHIBIT 2
Economic capital translates risk appetite into a monetary amount



Property & casualty liabilities also have a wide range of uncertainty as to their ultimate value. While the range is typically narrow for automobile physical damage coverage, it's much broader for medical malpractice or product liability. Stochastic reserving provides useful information about the shape of risk distributions around liability estimates (see "Justifying Loss Liability Estimates," *Emphasis* 2009/1).

ACCOUNTING FOR PROCYCLICALITY

One of the practical problems of solvency regulation is that regulators are inclined to mandate capital strengthening in times of crisis. But, in crisis, financial institutions are typically suffering reductions in capital as asset values drop and extraordinary liabilities arise. In addition, as they all liquidate available assets to improve capital positions, they collectively drive asset

values down even further, making it difficult to cover existing, much less enhanced, capital requirements.

Many have suggested an approach in which capital resources are built up (capital shock absorbers) in boom times and then drawn down to buffer losses in economic crises (see "How Do You Deflate a Bubble Gently?" *Emphasis* 2009/1). This would require that institutions and regulators have in place a credible process for anticipating extreme events and appropriate capital resources to account for them when a crisis hits.

MANAGING EXTRAORDINARY RISK

The methods described here can account for most of the likely expected risks, and their use within a comprehensive ERM and EC environment can vastly improve

understanding of risk dependencies. However, appropriate treatment of unprecedented extreme circumstances requires more attention. Scenario analysis can help complete an assessment of potential extreme events by extending analysis of highly sensitive risks (i.e., potential for high loss) with hypothetical extremes, provided these are calibrated sufficiently. While the precise cause is less important, the analysis must recognize the possibility of a loss so severe that it exceeds recorded experience.

External standards (e.g., regulator, rating agency) can be expected to require such risk margins (e.g., to address procyclicality). Sound corporate risk management policy requires the same to protect the capital base, performance and value creation in the long term. Because we are dealing with the unknown, we can't be sure that our risk margins will be adequate or that they won't be excessive. But we should consider the implications of all the tools available and of scenarios that can be anticipated. As always, this requires a balancing of concerns about risk with the cost to stakeholders of committing additional capital risk margins.

For comments or questions, call or e-mail Mike Lombardi at 1-416-960-7426, mike.lombardi@towersperrin.com, Michael Griffiths at 0039-335-6320-847, michael.griffiths@aliceposta.it or Andrew F. Giffin at 1-631-757-7186, andy.giffin@towersperrin.com.