



RISK MANAGEMENT SECTION

"A KNOWLEDGE COMMUNITY FOR THE SOCIETY OF ACTUARIES"

Risk *Management*

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Table of Contents

| | | | |
|---|----|--|----|
| What's in a (Nick) Name? by David N. Ingram _____ | 2 | Highlights from the 2006 Stochastic Modeling Symposium by Gilbert Lacoste _____ | 27 |
| From Pension Risk Management to ERM by André Choquet _____ | 4 | Highlights from the 4th Annual ERM Symposium by Valentina A. Isakina and Max J. Rudolph _____ | 30 |
| Measuring Returns after Reflecting the Rental Cost of Rating Agency Capital by Robert A. Bear _____ | 8 | Scientific Paper Track Keeps ERM Symposium on the Cutting Edge by Steven C. Siegel _____ | 31 |
| Risk Is Our Business, Say U.K. Actuaries by Paul Stanworth _____ | 12 | The Actuarial Practice Forum: Call for Papers _____ | 33 |
| AAA Enterprise Risk Management Task Force by James Rech _____ | 14 | Risk Management—ERM for Insurers—From Compliance to Value by Prakash A. Shimpi and Stephen P. Lowe _____ | 34 |
| 2007 Astin Colloquium Call for Papers _____ | 16 | Announcing the Arrival of the Risk Management Section's Regional Meetings! by Ron Harasym _____ | 39 |
| Defining Risk Appetite by Sim Segal _____ | 17 | Articles Needed for Risk Management _____ | 40 |
| Actuary in the News... The SunGard/IAFE Financial Engineer of 2005: Dr. Phelim P. Boyle by Ken Seng Tan _____ | 20 | | |
| You Are in the Risk Management Business! by John Kollar _____ | 22 | | |
| GMWB and the Four Actuaries by Voltaire _____ | 24 | | |

Actuaries

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What's in a (Nick) Name?

by David N. Ingram

The name just isn't working. Originally we were called the Risk Management Section of the Society of Actuaries. Quite a mouthful, but you could say it with only one breath. Then we expanded and became the Risk Management Section jointly sponsored by the Casualty Actuarial Society and the Society of Actuaries. Picture yourself talking to someone who is from outside of the insurance industry and they ask you the name of your organization. And what is a section anyway—are we a part of a fruit or what?

So the section council tried on several shorter labels and came up with ERMAP—which stands for the Enterprise Risk Management Actuarial Professionals. Nothing official, just a nickname. So we are trying on the ERMAP nickname. Let us know what you think.

What a rush. Just two days before I write this I was attending the 2006 ERM Symposium. With over 500 attendees, three workshops, 27 concurrent sessions and five general sessions. This year seemed different to me. In prior years there was an excitement in the air because many of the attendees were feeling so relieved to be amongst others who were fighting to establish ERM in their companies. It was a shared struggle. This year, there was more of a feeling of self-assured confidence in the air. Risk management is more of an established discipline in many companies now. The sessions were different as well. In past years, many of the presentations were about the reasons why companies *should* be doing risk management. This year, they were more about the different ways that companies were actually doing their risk management. Valentina, the program committee and John Riley did a great job with this. I'd also like to wish John a fond farewell. John, best of luck in your new endeavors. Don't forget that I promised you free lifetime ERM training!

At our annual face-to-face section council meeting, we started by re-affirming our core objectives:

1. Integration with new CAS members
2. Member services
3. Continuing education
4. Basic education

5. Research
6. Support of CAS and SOA initiatives

Last issue, I wrote about our committees for Continuing Education, Newsletter, Research and the ERM Symposium. We affirmed the roles of each of those committees in supporting those objectives.

In addition, we looked at a number of other projects underway in which our section was the lead sponsor or a major participant. In the research area, there are seven projects:

1. ERM practice across industries
2. Linking of capital management, financial management & risk management
3. Theoretical foundation for property casualty company ERM
4. Pandemic risk
5. Policyholder behavior in the tail
6. Extreme value modeling
7. RBC covariance

Of those projects, two were brought to us by people who wanted to do research; three are continuing efforts from the Risk Management Task Force committees, and one was directly initiated by the Research Committee based on discussion at a prior Section Council meeting. As you can see, some of these projects relate to P&C companies, some to life insurance companies and some to general risk management. We are looking for volunteers to be members of the project oversight group for two of the research projects. Also, we are looking for ideas for next year's research projects. If you would like to do some research or if you can think of a risk management research project that you would like to see started, please let any council member know. We will be starting to talk about next year's projects soon.

In addition, there are 11 special risk management projects that the section is either leading or is a significant participant in:

1. Macro risk
2. Operational risk
3. Risk terms



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4. Risk preference (completed)
5. ERM practice guide (completed)
6. Extreme value modeling
7. Policyholder behavior
8. Actuarial value proposition
9. ERM online guide
10. Best practices
11. Local networking

The CAS research committee initiated some of these projects, some are continuing from the Risk Management Task Force, and several were initiated by the section. People have been really great in volunteering to help. A recent call for volunteers for the operational risk project drew over 30 responses. There will be more such calls. Two of these projects are just getting started and still need volunteers. The risk terms project will work to identify a set of risk management terms that can become the common language of actuarial risk managers. It is an important step to allow us to talk to each other and could become a part of forming a new language for all risk managers. The ERM online guide is a project to organize the rich material that the section and the SOA and the CAS have collected over the years, with a topical index that could be the basis for an online ERM education platform. That material includes papers and PowerPoint shows and audio files of ERM Symposium sessions. This project may become a worldwide effort with participation from the United Kingdom and Australia. I have talked to leaders of actuarial risk management efforts in those two countries and they were both interested in joining with us in some effort to build up the risk management practice support. A web-based project seems like the perfect way to overcome the time differences that might otherwise make a joint effort unmanageable.

Many people are helping with these efforts and more help is needed. We all need to do our part. Imagine that the actuarial profession is a giant highway. You entered that highway when you completed your certification as an actuary. You have been traveling down that highway all of your career, making excellent progress most of the way. But this is not an interstate highway. There is no massive federal funding coming. It is not a private highway funded by a Rockefeller or a Gates. The travelers do all the maintenance on this highway. And it is voluntary. You decide if you want to do maintenance. The highway is probably in good enough shape to take you to the end of your journey, so you may not feel that you

have to do the maintenance, but, you didn't build the highway. The last generation of actuaries built it. If you want the next generation of actuaries to have a smooth ride, then you will have to pitch in. Risk management is going to be one part of the future of the actuarial profession. The Section is planning some maintenance. We are building a new entrance ramp and we are extending the road for many miles. Work crews are forming and individuals are staking their own personal sections of new road to build. Join in as soon as you can. Finally, I end the chairperson's corner by reporting our budget for year 2006:

The SOA is in the process of developing a new ERM credential at the ASA level with a supporting syllabus and qualifying exams. For people who already have an actuarial credential and who want to learn the new ERM material, we need a process to facilitate that learning. The section is forming a committee to develop a proposal for this ERM education process. The committee proposal might include steps for the development of segments to teach the information at stand-alone events or as part of other events such as the ERM Symposium or actuarial meetings and a process for the recruitment of instructors for segments.

The actual implementation of those steps may be a second stage of that committee work or may be done by a different group.

If you are interested in volunteering for this ERM Continuing Education Committee, please contact Hubert Mueller (hubert.mueller@towersperrin.com) or David Ingram (david_ingram@standardandpoors.com).

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If you want the next generation of actuaries to have a smooth ride, then you will have to pitch in. Risk management is going to be one part of the future of the actuarial profession.

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Risk Management Section Budget 2006

| Sources of Funds | | Uses of Funds | |
|------------------------|----------------|--------------------|----------------|
| Dues | 44,000 | Research | 115,000 |
| Seminars | 63,000 | Newsletter | 15,000 |
| SOA Research (2 years) | 75,000 | Continuing Ed | 42,000 |
| Prior Year Surplus | 66,000 | Operating Expenses | 30,000 |
| Other | 4,000 | Regional Meetings | 20,000 |
| | | Other | 30,000 |
| Total | 252,000 | Total | 252,000 |

From Pension Risk Management to ERM

by André Choquet

If the field of Enterprise Risk Management (ERM) is to grow outside the insurance sector, and there is every indication that it will, pension actuaries are well positioned to become active participants. This was my conclusion after attending the SOA-sponsored ERM and pension finance symposium in New York City in November 2005. The two and a half day seminar presented views from actuaries, financial economists and representatives from investment firms, credit rating agencies, the PBGC and the ac-

counting profession on how to measure and manage risk in pension plans within an ERM framework. The seminar presented the CAS definition of ERM, which is:

“The discipline by which an organization in any industry assesses, controls, exploits, finances, and monitors risk from all sources for the purpose of increasing the organization’s short- and long-term value to its stakeholders”

To date, ERM has been applied by banks and insurance companies. This symposium was about extending its reach to any organization, starting with its pension plan.

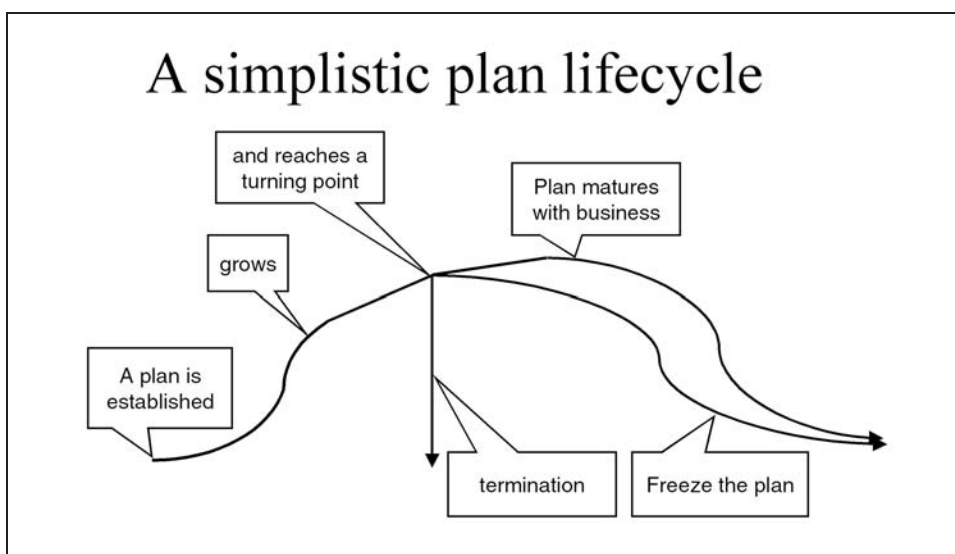
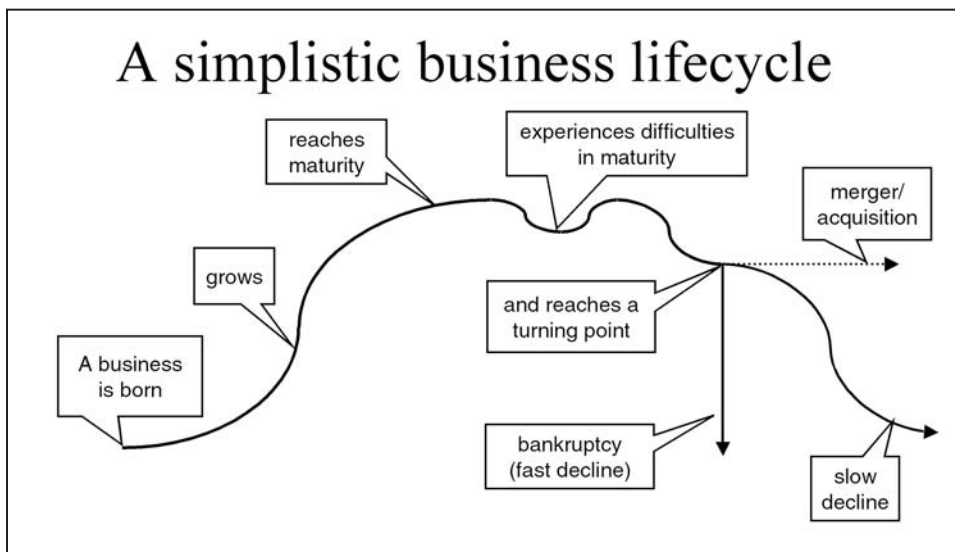
There were many interesting presentations but in the interest of space I will summarize only one of them. I will then offer my personal views on ERM opportunities for pension actuaries.

The lifecycle principle

Emily Kessler, SOA staff fellow, presented a very thought-provoking session. Armed with her own ideas and discussions with ERM experts, she came up with an interesting life cycle theory to explain risk management policies at a sponsor of a defined benefit pension plan.

In a visually convincing way, she superimposed the life cycles of a pension plan and of its sponsor. She affirmed that in the early stage of both life cycles, the company can more easily withstand the fluctuations in the plan contributions and may willingly choose to take on more investment risk in the hope of benefiting from the potential extra return. There is a lag between the two life cycles so that the company’s growth precedes that of its pension plan.

When the company’s growth reaches a plateau, it may experience some difficulties and will eventually face a critical point: bankruptcy,



Pension Plan 1

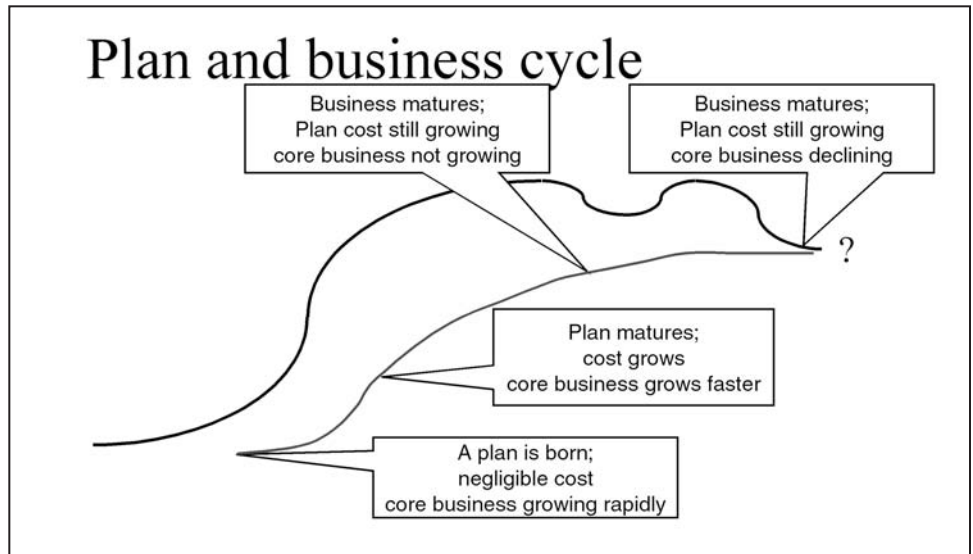
merger or acquisition, or slow decline. At that critical point, the pension plan liabilities would still have a lot of momentum and become significantly larger as the ratio of retirees to active lives increases. That is the stage when the company is most vulnerable to negative experience fluctuations, when it must find ways to reduce risks and/or costs associated with the plan.

What I found to be groundbreaking about this big picture view is that it steps above the recent debate between the proponents of financial economics and the traditional actuarial approach in valuing plan liabilities. In the early stages of a pension plan life cycle, funding follows the traditional actuarial approach and the equity risk premium is reflected in the assumptions, as a company is willing to take on risk with the hope of extra return. In the later stages of the life cycle, where we currently are with many North American plan sponsors, their appetite for risk is reduced and the financial economics view of the liabilities becomes the order of the day.

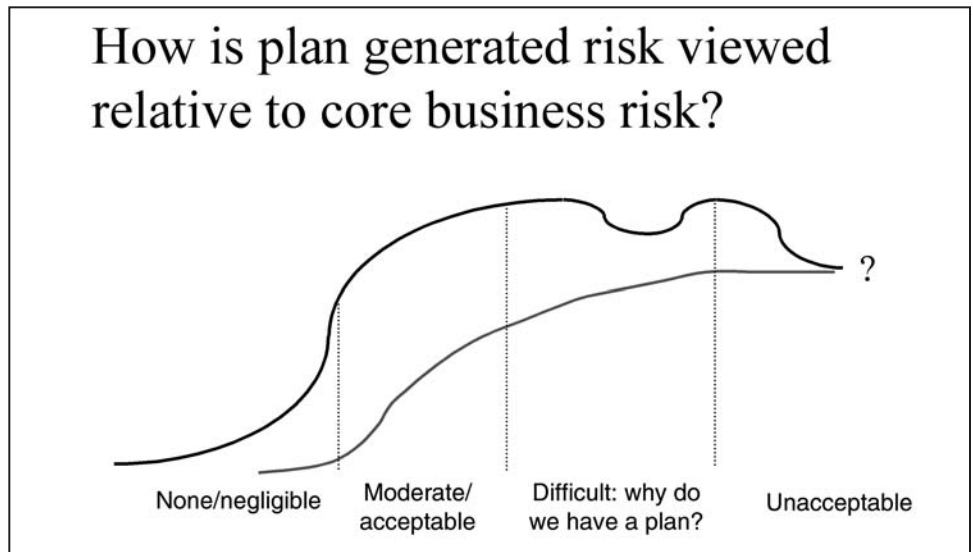
More empirical research is needed to test the risk appetite of sponsors as they and their pension plan go through various stages of the life cycle, but intuitively this makes sense. An individual may be more or less willing to take certain risks, depending on the size of the risk, their circumstances and time horizon. Similarly, a corporation may be more or less willing to take risks with the pension plan, depending on the size of the plan, the corporate structure and the time horizon.

Potential opportunities for pension actuaries in ERM

I am not suggesting that only pension actuaries can answer the ERM challenge for corporations outside the insurance sector. Any actuary who decides to take on the ERM challenge can offer great value to an organization by bringing tools



Pension Plan 2



The above four life cycle slides were designed by Emily Kessler, SOA staff fellow in the Schaumburg, Ill. office. She can be reached at: ekessler@soa.org for more information.

and skills unique to our profession. However, the pension actuary is particularly well positioned to participate. Here's why:

1. Using our technical skills, we could improve or build actuarial models to identify and quantify the **measurable risks** inherent in pension plans. In that regard we have

continued on page 6 ▶

From Pension Risk Management to ERM

▸ continued from page 5

everything to gain by communicating with our actuarial colleagues in the life insurance and casualty fields and by studying their methods used in the banking and insurance sector. We would need to improve our communication with CFOs to understand their existing risk control process so that our actuarial models can be designed to provide answers in a format and language useful to management.

2. We need to devise ways to illustrate the **intangible risks** inherent in pension plans using, say, futurism or other risk-management techniques. For example, just as the risks associated with DB plans have recently been brought to light with the evolution of time, the market downfall and drop in interest rates, there are risks within the whole pension arena that have yet to be exposed. An obvious one would be the investment risk DC plan members are assuming after a DB plan conversion. Others are not so obvious, like the long-term risks to a corporation of having its workforce not adequately transitioned off into retirement, the risk of not being able to attract a skilled workforce or the micro and macro impact of pension plans investing exclusively in bonds. We can either be proactive and devise techniques to bring these risks to light now, or we can let the passage of time reveal them later and miss our chance to make an impact on society. In that regard, studying the techniques used by other credible risk management associations like GARP or PRIMA could provide some answers.
3. After developing or improving risk models for pension plans in 1 & 2, we could discuss with management the benefits of applying these techniques to model **non-pension risks** that corporations are facing. A *raison d'être* of a corporation is to produce needed goods or services for society at an adequate return to its shareholders. As these goods or services are produced and sold, revenues flow in, expenses must be paid out, profit must be distributed or reinvested, salaries must be earned and paid, workers must be retained and transitioned off, and succession must be planned. All of the above involve cash flows governed by the decision-making process of human beings, (or of systems built by humans) which are shaped by outside forces and random events. Pension actuaries are experts at managing risks linked to the future cash flows within a pension plan. Why not apply our techniques to other forms of cash flows within an organization?
 4. We could design methods to hedge risk selectively. It would be a shame if “enterprise risk management” were confused with “enterprise risk elimination.” ERM involves conscious decision-making about which risks to assume and which ones to hedge against. Some decisions made today can protect against a downside risk of insolvency or lawsuits, but there are also decisions made today that can lead to high returns for shareholders like investing R&D in an up-and-coming technology. For a given level of enterprise risk allocation, what would be the optimal mix of long and short positions on various risks? Once a “risk portfolio” is adopted, a control process would be necessary to review the strategy over time.
 5. We have an important role to play in creating innovative plan designs that respond to the needs of today’s and tomorrow’s employees and their employers by:
 - Allowing the sharing of risks between sponsors and employees;
 - Recognizing the fact that most workers change employers several times in

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ERM involves conscious decision-making about which risks to assume and which ones to hedge against. Some decisions made today can protect against a downside risk of insolvency or lawsuits ...

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their career. They may not all have a defined-benefit plan but they will likely have defined-benefit retirement needs. If retirement can be likened to a second career, what level and form of “compensation” will workers of today expect or need in their next “career?”

- Incorporating flexible and cost-effective retirement provisions, like phased retirement, to respond to society’s needs as the baby-boom generation ages.

Plan design needs to be accompanied with a good communication strategy so as not to be perceived as another way for corporations to shirk from their responsibilities.

6. The North American actuarial profession should lobby the regulators to modify legislation that hampers the development of innovative plan design in order to:

- allow the party(ies) that bears risk to benefit from the potential rewards and

- protect the pension promises that have been earned.

One of the biggest challenges current pension actuaries may face in trying to adopt ERM is our own thinking. The outdated and narrow view of the pension plan as being independent from the corporation is no longer valid. Shareholders are affected by risks in the pension plan. In turn, the plan and its members are affected by risks from outside the corporation (*e.g.* financial and industry risks). The ERM pension actuary will have to identify the company stakeholders and their various, sometimes conflicting, interests. We will need to illustrate risk in a language and format that business leaders will understand and find valuable for decision-making purposes. Finally, acquiring a good dose of business knowledge would help us in communicating more effectively with management, equity analysts and credit rating agencies.

Are you an ERM pension actuary? ♦



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Measuring Returns after Reflecting the Rental Cost of Rating Agency Capital

by Robert A. Bear

Background

Donald Mango presented a paper on “Insurance Capital as a Shared Asset” at the CAS 2004 Annual Meeting and published a revised version in the 2005 ASTIN Bulletin [1]. Rodney Kreps presented a paper on “Riskiness Leverage Models” at the CAS Spring 2005 Meeting [2]. To clarify and integrate these approaches to profitability measurement, the author has written discussions of both of these papers [3], [4]. This article will first summarize material from these papers and then present a proposed integration of these approaches.

Insurance Capital as a Shared Asset

Donald Mango treats insurance capital as a shared asset, with the insurance contracts having simultaneous rights to access potentially all of that shared capital.

The aggregation risk is a common characteristic of shared asset usage, since shared assets typically have more members who could potentially use the asset than the asset can safely bear.

A consumptive use involves the transfer of a portion or share of the asset from the communal asset to an individual. Non-consumptive use involves temporary, non-depletive, limited transfer of control.

While the intended use of a hotel room is benign occupancy (non-consumptive), there is a risk that a guest may fall asleep with a lit cigarette and burn down a wing of the hotel (clearly consumptive).

Mr. Mango notes that the generation of required capital, whether by premiums or reserves, temporarily reduces the amount of capacity

available for other underwriting. Being temporary, it is similar to capacity occupancy, a non-consumptive use of the shared asset. Capacity consumption occurs when reserves must be increased beyond planned levels: funds are transferred from the capital account to the reserve account, and eventually out of the firm.

Mr. Mango summarizes by stating that the two distinct impacts of underwriting an insurance portfolio are as follows: (1) Certain occupation of underwriting capacity for a period of time, and (2) Possible consumption of capital. He notes that this “bipolar” capital usage is structurally similar to a bank issuing a letter of credit (LOC).

Every insurance contract receives a parental guarantee: Should it be unable to pay for its own claims, the contract can draw upon the company’s available funds. The cost of this guarantee has two pieces: (1) a capacity occupation cost, similar to the LOC access fee according to Mr. Mango, and (2) a capital call cost, similar to the payback costs of accessing an LOC, but adjusted for the facts that the call is not for a loan but for a permanent transfer and that the call destroys future underwriting capacity.

Mr. Mango defines his key decision metric, economic value added, to be the NPV return net of expected capital usage cost:

$$\text{EVA} = \text{NPV return} - \text{capacity occupation cost} - \text{capital call cost}$$

The capacity occupation cost is computed as the product of an opportunity cost rate (minimum risk adjusted hurdle rate) and the amount of required rating agency capital generated over the active life of the contract.

Capital call costs are risk loads calculated using the following algorithm:

(1) For each iteration (loss scenario) in the simulation, calculate the deviation of the loss for



each segment from the expected loss. If the deviation from the mean is positive, there is no capital call and no capital call cost. If the deviation from the mean is negative, the capital call cost equals the product of the magnitude of the deviation and the capital call cost factor.

(2) Calculate each segment's share of the portfolio capital call cost as the ratio of the segment cost to the total of all segment costs.

(3) Use the procedure in (1) to calculate the portfolio capital call cost. Multiply the portfolio capital call cost by the segment shares from (2) to calculate each segment's share of the capital call cost for that scenario.

(4) Each segment's expected capital call cost is average of (3) over all scenarios.

This conditional risk allocation method has become known as the RMK algorithm. Mr. Mango points out that this method extends risk valuation from the aggregate portfolio level down to segments that comprise the portfolio. Each segment's contribution to the portfolio risk is reflected, yielding an internally consistent allocation of diversification benefits for which risk charges (costs of capital) are additive in any combination.

We have an asymmetric dynamic, where additional capacity from upside scenarios rarely compensates for the lost capacity of downside scenarios. This is particularly true after occurrence of extreme events, when pricing can become excessive for a limited period of time. Capital call costs are intended to compensate for these missed opportunities [4].

For examples tested in the discussions ([3], [4]), when a reinsurance program is in place for a line of business and is invoked by a loss scenario, the average capital call cost factor for the line of business is applied to the deviation of the simulated reinsurance loss from the mean reinsured loss. This generates a credit capital call cost in the reinsurance line, which reduces the average capital call cost for the line of business when combined with the reinsurance line.

Tail Penalty

Notes from the 2005 CAS Seminar on Reinsurance session on "Risk Load,

Profitability Measures, and Enterprise Risk Management" illustrate the flexibility which this approach permits management in quantifying risk preferences. In Mr. Mango's notes entitled "Insurance Capital as a Shared Asset—Theory and Practice," he points out that rating agency required capital can provide a convenient means to introduce a tail penalty.

An additional charge can be assessed for exceeding allocated rating agency capital (this would be analogous to burning down a wing of a hotel in our illustrative example). In computing the capital call cost, Mr. Mango assesses a moderate charge for damage within a segment's allocation (drawdown on allocated capital), and a much more severe charge for damage beyond a segment's allocation (drawdown of other segments' capital).

Assuming that correlations between segments are estimated with reasonable accuracy, this reviewer believes that this two-step approach has the advantage of discouraging company threatening accumulations of risk, which is the central goal for an enterprise risk management system. For those willing to allocate capital as an intermediate step in allocating the cost of capital, the tail value at risk and semi-variance metrics would also serve this function [4].

Riskiness Leverage Models

Rodney Kreps has written an important paper on the central topics of risk load and capital allocation for profitability measurement [2]. Riskiness leverage models are a class of mathematical models that satisfy two highly desirable properties of a risk load or surplus allocation method (additivity and allocable down to any desired level of definition). Tail value at risk and excess tail value at risk reasonably satisfy the properties that management would likely want of such a model, while still satisfying the properties of a riskiness leverage model and the properties of coherent measures of risk [3].

Integration of RORAC and EVA

The traditional return on risk-adjusted capital (RORAC) approach presented by Mr. Kreps [2] does not reflect rating agency capital

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Capital call costs are intended to compensate for these missed opportunities.

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continued on page 10 ■

Measuring Returns after Reflecting the Rental Cost...

▸ continued from page 9

requirements, particularly the requirement to hold capital to support reserves until all claims are settled. This is very important for long tailed casualty lines.

RORAC is computed as the ratio of expected total underwriting return to allocated risk capital, and represents the expected return for both benign and potentially consumptive usage of capital. This author developed a modified RORAC approach, called a risk return on capital (RROC) model. A mean rating agency capital is

computed by averaging rating agency required capital from the simulation. The mean rental cost of rating agency capital is calculated by multiplying the mean rating agency capital by the selected rental fee (an opportunity cost of capacity).

Expected underwriting return is computed by adding the mean NPV of interest on reserves and interest on mean rating agency capital to expected underwriting return (profit

& overhead). The expected underwriting return after rental cost of capital is computed by subtracting the mean rental cost of rating agency capital. RROC is computed as the ratio of the expected underwriting return after the rental cost of capital to allocated risk capital.

Risk capital is a selected multiple of Excess Tail Value at Risk (XTVAR). Capital is allocated to line of business based upon co-excess tail values at risk (co-XTVAR) [3]. RROC represents the expected return for exposing capital to risk of loss, as the cost of benign rental of capital has already been reflected. It is analogous to the capital call cost in the EVA approach, here expressed as a return on capital rather than applied as a cost.

Mr. Venter has noted that co-XTVAR may not allocate capital to a line of business that didn't

contribute significantly to adverse outcomes [5]. In such a situation, the traditional RORAC calculation may show the line to be highly profitable, whereas both EVA and RROC may show that the line is unprofitable because it did not cover the mean rental cost of rating agency capital. The author believes this to be a key advantage of the RROC approach.

Comparison of Three Approaches

In the EVA approach, risk preferences are reflected in the function selected and parameterized in computing the capital call cost. In the RORAC and RROC approaches, risk preferences are specified in the selection of the statistic used to measure risk and allocate capital. All three approaches utilize the RMK algorithm for allocating risk (measured as a capital call cost in EVA and as risk capital in RORAC and RROC) to line of business.

In practice, the RORAC and RROC approaches would be parameterized to allocate the total capital of the company. Total capital would be maintained to at least cover rating agency capital required for its desired rating [4].

Simulation Comparison

The discussion papers use simulation to illustrate differences between approaches [3], [4]. The examples in the discussion of Mr. Mango's paper measure the impact on profitability, rating agency capital, and risk capital due to rate changes, changes in the distributions of premium written by line, inaccurate pricing due to parameter and model risk, correlation between lines, alternative reinsurance programs, and alternative capital call cost functions.

One example tested the impact of a court decision declaring recent tort reforms to be unconstitutional. As it happened for a long tailed line, EVA deteriorated dramatically and RROC declined much more significantly than RORAC. This was caused by the mean rental cost of rating agency capital increasing materially due to increased reserves held for a long period of time.

In another variation on the base example, it was recognized that a profitable line was correlated with an unprofitable line. EVA deteriorated for



both lines and the portfolio. For the ROE measures (RROC and RORAC), profitability decreased dramatically for the profitable line because its losses now contribute more significantly to adverse scenarios created by the unprofitable line. Capital required to support the portfolio under the ROE approaches increased significantly.

The reinsurance examples demonstrate that reinsurance programs can reduce risk capital much more significantly than they reduce required rating agency capital. The portfolio returns with reinsurance improved because a smaller share of capital is allocated to a marginally profitable line and greater shares of capital are now allocated to highly profitable lines.

Alternative capital call cost function parameters were tested (e.g., the consumption fee for capital less than required rating agency capital is x percent of the consumption fee for common capital). Test results illustrate the critical importance of this EVA assumption.

Future Work

As rating agency required capital evolves to measure company specific risks such as catastrophe risk, then the selected rental fee used in computing RROC should be adjusted upward. It would no longer represent an opportunity cost of capacity, but should now reflect charges for the company specific risk elements reflected in rating agency capital. The risk model used to compute RROC should now be parameterized with these company specific risk elements excluded from the loss data. RROC would now measure returns attributable to risks assumed that are not measured by rating agency capital.

Conclusions

Mr. Mango's innovative work developing concepts of insurance capital as a shared asset and EVA contribute significantly to understanding the ways capital supports an insurance enterprise and must be financed. The EVA approach permits one to charge for risk (capital usage) and measure profitability at any desired level of definition while satisfying the key additivity property for risk charges without needing to al-

locate capital. EVA allows stakeholders flexibility in reflecting risk preferences.

Mr. Kreps has written an important paper on risk load and capital allocation. He has given us a class of mathematical models satisfying the desirable properties of a risk load or surplus allocation method (additivity and allocable down to any desired level of definition). TVAR and XTVAR also satisfy properties likely desired by management and are coherent measures of risk.

A risk return on capital (RROC) model is suggested as a way to integrate desirable properties of the EVA approach and the RORAC approach based upon riskiness leverage models. RROC measures returns after reflecting the mean rental cost of rating agency capital. Returns that are a reward for exposing capital to risk of loss are measured after reflecting the cost of carrying capital to support premium written and loss reserves.

Supplementary Material

Seminar notes from 2005 seminar on reinsurance on "Risk Load, Profitability Measures, and Enterprise Risk Management," which may be downloaded from the CAS Web site. ♦

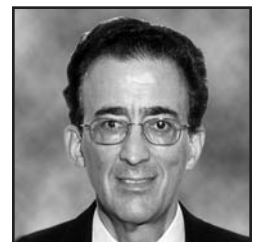
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RROC measures returns after reflecting the mean rental cost of rating agency capital.

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Risk Is Our Business, Say U.K. Actuaries

by Paul Stanworth

This year, the U.K. actuarial profession made significant steps to establish a more focused role in risk management by actuaries. Several factors have highlighted the need for these skills and in the United Kingdom, actuaries are demanding greater support from the profession in this area.

The driving factors have been brought about by the changes in the management of risk introduced by the U.K. regulatory regimes, the FSA in life and general insurance and the pensions regulator.

These changes pre-empt the risk based capital regimes to be introduced across Europe under Solvency 2 (which will make extensive use of cutting-edge risk modeling and market-consistent valuation techniques). The interpretation in the U.K. continues to be a principles-based regime, which imposes requirements upon actuaries to use techniques more commonly applied to banking risk management, but evolved to incorporate both a longer time horizon than used in banks and the measurement and judgment required of many risks not established in the banking sector, *e.g.* mortality risk.

In response, life and general insurers are spending heavily to upgrade risk management capability to meet investor and regulator expectations. Management of pension plan risk is at or near the top of the agenda for boards throughout U.K. industry. It is estimated that each large bank will spend an average of £115 million on Basel 2 implementation—providing a benchmark for the possible costs of implementing Solvency 2. The area of risk management is a field to which U.K. actuaries bring competitive quantitative skills, allied with a

history and standards of professionalism, which we believe should make us important players on the risk management team all across the U.K. financial sector.

A number of years ago, changes were introduced to the education syllabus to bring U.K. actuaries up to date with banking techniques with the establishment of a finance and investment paper and a much greater emphasis on financial economics in the examination syllabus. However the profession, in common with its counterparts in North America, Australia, and elsewhere, wishes to extend further into the risk management community.

In terms of actions, the actuarial profession has several representative boards, which provide the impetus for different areas of interest for the profession. These include life, general insurance and pensions. In addition, there is a Finance & Investment Board, which took the initiative to become the Finance, Investment & Risk Management Board to establish a driving force for creating the support for U.K. actuaries. Within this board, a task force was set up, chaired by myself and closely supported by Seamus Creedon. The task force agreed to set about raising awareness that the initiative is up and running by establishing a manifesto and emailing all members. This communication outlined our views on which direction we believed actuaries should move towards to be recognised in the area of risk management. It stated:

- *All actuaries are risk managers now* – the world understands risk and management of it, which is what actuaries have been doing all along.
- *Risk management is much more than risk measurement* – value is created by taking some risks and avoiding others – it is active.



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Risk in the United Kingdom

- *Follow the money: focus on firms* – banks, insurers, other financial firms and other sectors spend vast sums on managing risk – we actuaries should clearly understand how and why.
- *Choose our niche, but not our tomb* – we find ourselves working alongside professionals from a wide range of backgrounds – we all have distinct skills to offer.

We asked actuaries about risk management and the actuarial profession's role within it. We also planned a number of initiatives including networking evenings, regular news and knowledge portals (to be communicated via the internet) and linkage to other actuarial professions and relevant professions —of which this article is an example.

Over 200 actuaries from 22 countries responded with interest to the e-mail and agreed to be associated with this initiative, a significant number offering to support the initiative across communications, education and other initiatives. Furthermore, many also attended the inaugural networking evening, which was addressed by actuary and chief risk officer at ING, John Hele, in February 2006. In this talk, John highlighted the challenges facing the European insurance companies in managing their risk and the scale of input required as European companies prepare for Solvency 2. This was a particularly appropriate talk to kick off the series of networking evenings, since John chairs the European Chief Risk Officers Forum, which is providing the guidance for the development of the risk based capital regime schedules to be introduced across Europe.

We also interviewed leading risk management figures (both actuarial and non-actuarial) across the largest U.K. financial institutions and the U.K. regulator, and the message is becoming clear:

- Risk managers must have very strong and clear communications skills to bridge the gap between very technically demanding analysis and commercial decision makers.

- Actuaries' strong quantitative background is a clear advantage; however, techniques must be up to date.
- A background of practical experience can make all the difference between a strong technician and a leading risk manager.

As a consequence of all this feedback, further events and developments are planned throughout 2006, all with a view to encouraging actuaries and users of our work to see it in the context of risk management. A regular risk management column "Risk is our Business" appears in the U.K. profession's magazine *The Actuary* and, given the international interest, we are working to establish a risk management Web site as a resource for members.

Furthermore, as well as serving as an active interface for actuaries within the international risk management community, the Finance, Investment & Risk Management Board is working with others to bring the risk management perspective to education and continuing professional development. Employers have told us that communication of risk issues to general management is a particular challenge for actuaries and that for many actuaries a wider exposure to the business might help.

There is clearly both a great opportunity and a significant challenge for actuaries in the United Kingdom to be recognised as a leading profession in the area of risk management. However, it is a challenge which many wish to rise to and we hope to be reporting a speedy development over the coming months and years. ♦

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Risk managers must have very strong and clear communications skills to bridge the gap between very technically demanding analysis and commercial decision makers.

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AAA Enterprise Risk Management Task Force

by James Rech

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One should not assume that ERM is solely a U.S. thought process. It is global in its impact to the business community.

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The defining element of Enterprise Risk Management (ERM) is its holistic view of risks facing an organization. The complex nature of such a “broader” view of an enterprise results in competing, parallel frameworks. While management has often attempted to qualify organizational risks, quantification was limited due to complexity or simply not a priority. With several significant financial failures, such as Barings Bank, Long-Term Capital Management, Reliance and Enron, financial regulators have begun to demand more transparency regarding enterprise risks. To fill this void, various organizations are stepping up to provide enterprise risk management definitions, structural design and operational precepts. For example, in the United States we are most aware of the Committee of Sponsoring Organizations (COSO) of the Treadway Commission’s 2004 ERM—Integrated Framework. The Casualty Actuarial Society (CAS) has also provided a definition for ERM. ERM Institute International, Ltd. (ERMII) is currently developing a more quantitative approach within its definition of ERM. These frameworks are designed for all business activities, not just financial organizations.

One should not assume that ERM is solely a U.S. thought process. It is global in its impact to the business community. While the benefits of ERM may be thought of as being driven by corporate governance, management controls, financial transparency and governmental regulations (Sarbanes Oxley), by far the strongest impetus for financial institutions has been from the international regulatory authorities (Basel II, Solvency II, IAIS) and rating agencies (e.g., S&P’s new ERM initiatives).

In North America, each actuarial organization has been working on its own response to ERM relative to the needs of its constituency. In January 2005, the American Academy of Actuaries created the ERM Task Force in recog-

inition of the emerging importance of ERM. The purpose of the task force is to improve communications regarding ERM initiatives among the North American actuarial organizations; this task force includes members from Canada, Mexico and the United States. The task force is organized under the AAA’s Financial Reporting Committee and was created by the North American Actuarial Council.

The Enterprise Risk Management Task Force serves as the North American actuarial profession’s hub for discussing research, educational and public policy initiatives relating to enterprise risk management, and seeks to develop work on ERM-related public policy issues that affect multiple areas of actuarial practice. The task force adheres to the following guidelines:

- The ERM Task Force serves as the entity where the North American actuarial profession can freely discuss and, if appropriate, coordinate the various ERM-focused projects underway within the Academy and the other North American actuarial organizations.
- The ERM Task Force, with the consent of any involved group, capitalizes on the research and findings of these ERM-focused projects and tailors this information to address or respond to public policy issues.
- With respect to the other North American actuarial organizations or Academy groups dealing with ERM, the ERM Task Force serves solely as a forum for communication and holds no authority over any aspect of a project or work product developed outside of the ERM Task Force.

The members of the ERM Task Force hold monthly conference calls. Recent forum discussion items included, for example, ERM



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requirements for Mexico's Insurers, development of the ERMII paper on ERM for insurers, currently being written by Shaun Wang and Robert Faber, interest and potential for development of a series of ERM case studies for life, health and P/C carriers, and ERM topics at annual and regional actuarial meetings.

The concepts involving ERM are rapidly developing along a number of parallel paths. There are a variety of projects underway at the various

actuarial organizations and within the Risk Management Section, each examining ERM from different perspectives. These projects reflect a need for the risk measurement and management skills inherent to actuaries. The ERM Task Force represents one hub of communication to discuss these projects, share information, and reduce the possibility of redundant or contradictory work. ♦

Do you know...

Do you know the SOA Library has recently expanded its book collection of ERM?

Some of the excellent titles include:

Quantitative Risk Management: Concepts, Techniques and Tools by A. McNeil, F. Rudiger, and P. Embrechts. NJ: Princeton University Press, 2005.

Catastrophe Modeling: A New Approach to Managing Risk Edited by P. Grossi and H. Kunreuther. Springer 2005.

Operational Risk Modelling and Analysis: Theory and Practice. Edited by M. Cruz. London: Risk Books, 2004.

Managing Hedge Fund Risk: Strategies and Insights from Investors Counterparties, Hedge Funds and Regulators. Edited by V.R. Parker (editor), London: Risk Books, 2nd edition, 2004.

Economic Capital: A Practitioner Guide. Edited by A. Dev. London: Risk Books, 2004.

These books can be borrowed by the SOA members free of charge (four weeks within U.S. and Canada and six weeks outside United States and Canada); another membership value!

For more information on addition titles, please contact the librarian, Ellen Bull, at 847-706-3538 or via e-mail at ebull@soa.org. ♦

2007 ASTIN Colloquium Call for Papers

The Scientific Committee invites authors to submit papers for the 37th ASTIN Colloquium, scheduled for June 20-23, 2007 at Disney's Contemporary Resort in Orlando, Fla., United States. Created in New York City in 1957, ASTIN will be celebrating its 50th anniversary in 2007, and the Casualty Actuarial Society is hosting the event. Additional details can be found online at www.IAA-ASTIN.org.

Topics

The Scientific Committee welcomes papers on the following topics:

Topic 1: Risk Management of an Insurance Enterprise

- Risk models
- Risk categorization and identification
- Risk measures
- Stochastic control
- Risk transfer
- Quantifying inter-dependencies among risks
- Risk adjustment of business unit profitability
- Asset risk including asset/liability dependencies
- Credit risk, including reinsurance recoverables
- Accounting for risk
- Risk in accounting

Topic 2: Pricing Risk

- Risk margins
- Pricing highly variable business
- Pricing when probabilities are not known
- Quantifying possible pricing error
- Effects of pricing changes on business retention
- Effects of company financial strength on pricing achievable

Topic 3: Liability Risk

- Reserve models
- Testing reserve models
- Runoff risk
- Estimation risk
- Impact of reinsurance
- Risk issues in discounting

Papers on topics other than those identified above will be considered by the ASTIN Scientific Committee and may be accepted at the committee's discretion.

Intention to Submit a Paper

In order to assist the Scientific Committee in planning the program, authors who intend to submit a paper should notify the committee of their intentions. Please send your intentions to submit a paper to Mike Boa, CAS Director of Communications and Research, at mboa@casact.org, and include the topic of the paper and a brief abstract. Authors are not required to provide this notification in order to submit a paper, but your assistance would be appreciated.

Submission Deadline

Papers should be submitted in their final form by Jan. 31, 2007. All decisions taken by the ASTIN Scientific Committee regarding acceptance or rejection of papers will be final. Authors will not have the opportunity to revise their papers.

Additional details on paper submissions can be found in the instructions for authors available through www.IAA-ASTIN.org. ♦

Defining Risk Appetite

by Sim Segal

Most insurance companies implementing Enterprise Risk Management (ERM) programs have established an ERM committee. Perhaps the most important role of the ERM committee is to define risk appetite. Many of these ERM committees are defining risk appetite in terms of their Economic Capital (EC) definition. For example, they define risk appetite as:

“The level of risk that results in no more than a 0.5 percent chance of failure over a one-year time horizon, where failure is defined as losing 100 percent of GAAP capital.”

It is fairly natural to define risk appetite in terms of EC, since EC is usually a key element of an ERM program. However, this capital-centric approach to defining risk appetite:

- May not fully capture all risks of the enterprise, and
- Does not necessarily result in the optimal level of risk.

Not Capturing All Risks

A primary goal of ERM is to determine the integrated and aggregated impact of all risks in the enterprise. Therefore, it is important to select a risk appetite metric that addresses all enterprise risks. Unfortunately, the EC metric usually excludes operational risk (e.g., litigation) and strategic risk (e.g., poor forecasting). EC modeling typically works well for market, credit, liquidity and insurance risks, which are risks that primarily relate to values of assets and liabilities on the balance sheet. However, EC is less effective for measuring operational and strategic risks, which are risks that impact future revenues or expenses. EC models usually address these risks separately by allocating an addition-

al static percentage of EC or simply omitting them.

Not Necessarily Optimal

The optimal level of risk can be defined as the level that best serves the primary stakeholders (shareholders) while satisfying the constraints of other stakeholders (rating agencies, regulators, customers, the public, etc.). Using this definition, the optimal level of risk is one that maximizes shareholder value. Maximizing shareholder value is clearly the way to best serve the shareholders. In addition, the shareholder value will only be maximized by satisfying the constraints of the other stakeholders, to the appropriate degree. For example, holding large amounts of excess capital may result in a favorable rating, but too much fallow capital may lower shareholder value. Similarly, holding too little capital may result in higher costs of capital, which again may lower shareholder value.

However, the capital-centric approach to defining risk appetite does not necessarily result in a level of risk that maximizes value. The focus is on solvency, which is fundamentally different from maximizing value. The capital-centric process begins with the assumption that a specific rating (e.g., AA) is optimal. Another assumption is then made about the level of risk that will produce/maintain that rating. EC is then calculated and risk appetite is defined at the level of risk consistent with the EC formula. There is no consideration of the possibility that a lower or higher level of risk may enhance shareholder value.

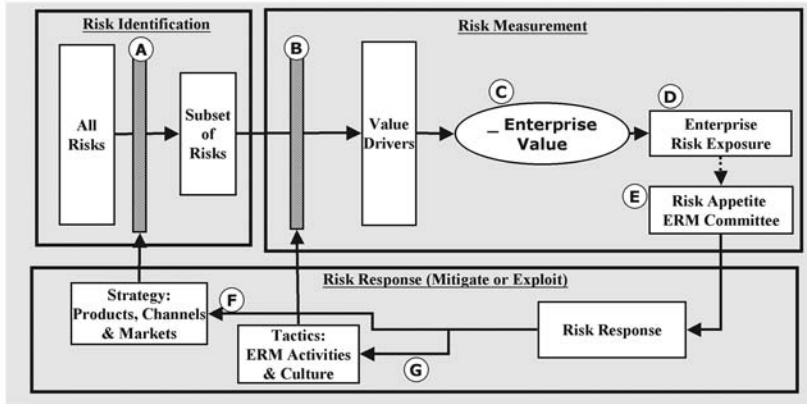
However, there is an approach that resolves these issues. It is called value-based ERM.

continued on page 18 ►

Defining Risk Appetite

► continued from page 17

Chart 1: The Value-Based ERM Framework



What is Value-Based ERM?

Value-based ERM is an approach that makes the quantification of enterprise value¹ central to all aspects of the ERM process. It is a combination of two techniques—enterprise risk management and value-based management.² (For an in-depth discussion of Value-Based ERM, see my article in the June 2005 issue of *The Actuary* magazine.)

The Framework

A portion of the value-based ERM framework is represented in Chart 1. On the far upper left is the entire universe of risks. Moving to the right on the chart, the company's chosen strategy (product mix, distribution channels and target markets) acts as the first filter (labeled "A" in Chart 1), screening out risks not relevant to the company. For example, the risk of changes in the costs of auto repair is not likely to be a rele-

vant risk to an insurer that is not selling auto insurance. For each relevant risk, a distribution is constructed, including probabilities and correlations.

Moving further to the right on the chart, these relevant risks operate on the company's value drivers, such as revenues, expenses, costs of capital, etc. The company's tactics, including ERM activities (e.g., reinsurance, hedging, etc.) and ERM culture, act as the second filter (labeled "B" in Chart 1), dampening the impact of the risks on the company's value drivers. For example, in a culture where problems are openly discussed and quickly acted upon, a risk incident is likely to have less of an impact than in cultures where this type of communication is not encouraged. The impact of the risks on the value drivers is quantified as a change in enterprise value (labeled "C" in Chart 1). Stochastic risk simulations are run to produce a range of enterprise value impacts called "enterprise risk exposure" (labeled "D" in Chart 1).

The enterprise risk exposure is a key input into defining risk appetite (labeled "E" in Chart 1). The upper graph in Chart 2 on page 19 illustrates enterprise risk exposure in terms of "value volatility" or enterprise shock resistance (ESR). This information (along with key supporting statistics) is presented to the ERM Committee along with the question, "Are you comfortable with this level of ESR and if not, with what level of ESR are you comfortable?" Risk appetite is then defined as the level of ESR with which the ERM committee is comfortable. For example, the committee may feel that a higher level of shock resistance would increase enterprise value (e.g., if stock analysts had indicated that the financial results of the company were more volatile than its peer group).

¹ Enterprise value may be defined as the present value of distributable earnings, discounted at the weighted average cost of capital. Distributable earnings include changes in required capital (which may be defined by the company as Economic Capital). This is an internal management valuation rather than market value.

² Value-based management involves decision-making that is driven by its potential impact on value.

To manage the risk exposure to a level consistent with risk appetite, management takes actions (labeled “F” and “G” in Chart 1), such as changing business/product mix, engaging in various ERM activities, making risk-informed business decisions and possibly changing the risk culture. Each such action changes the risk-value profile, resulting in a new calculation of expected ranges of enterprise value and enterprise risk exposure. This re-calculation is performed *prior* to management action, to inform management of the risk-value trade-offs and assist in identifying strategic alternatives.

With the framework above, the value-based approach to defining risk appetite captures all enterprise risks and also results in the optimal level of risk.

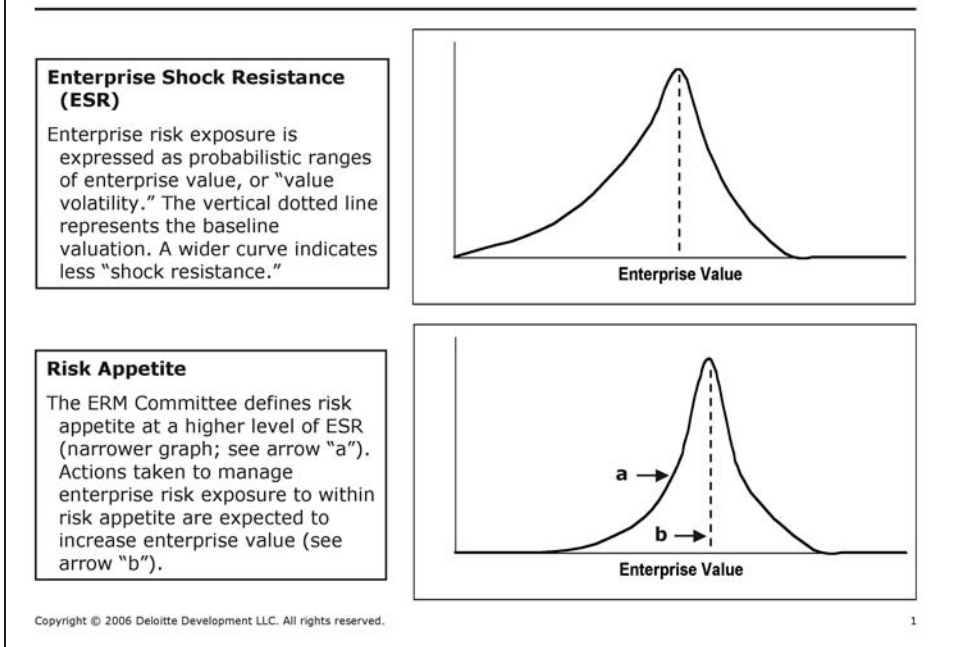
Captures All Risks

The capital-centric approach may not fully capture operational and strategic risks. The EC metric it employs is usually limited to addressing risks that primarily impact the balance sheet. However, the value-based approach captures all risks using a single metric. The value metric can accommodate all financial impacts—those impacting the balance sheet³, the income statement and the weighted average cost of capital.

Optimal Level of Risk

The capital-centric approach to defining risk appetite does not necessarily lead to the level of risk that maximizes value. However, the value-based approach is designed to do just that. The process of defining risk appetite begins with a focus on value by considering the distribution of enterprise value (ESR). The committee arrives at a consensus for the desired level of shock resistance, which is the level that will maximize shareholder value. As

Chart 2: Enterprise Shock Resistance (ESR) & Risk Appetite



an example, the lower graph in Chart 2 above illustrates how risk appetite might be defined by the ERM Committee. In this example, the committee decided on a higher level of ESR. The ESR graph becomes narrower (more shock resistant) and the enterprise value is expected to increase.

Defining risk appetite is one of the fundamental elements of an ERM program. Using an EC metric in a capital-centric approach to defining risk appetite is a natural outgrowth of an evolving ERM program. However, the capital-centric approach may not incorporate all risks and does not always result in an optimal level of risk. To further advance their ERM programs, companies can adopt a value-based approach to defining risk appetite. The value-based approach can enable a truly enterprise-wide definition of risk appetite, and can help define risk appetite at an optimal level, increasing enterprise value. ♦



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³ This reference to “balance sheet” here is intended to cover items actually on the balance (assets, liabilities, capital) as well as required capital, which may take the form of economic capital (EC). Value is a function of distributable earnings, which includes changes in required capital.

Actuary in the News...

The SunGard/IAFE Financial Engineer of 2005: Dr. Phelim P. Boyle

by Ken Seng Tan

And the award goes to Dr. Phelim Boyle... It was announced on Dec. 5, 2005 that Dr. Boyle was named as the “2005 SunGard/IAFE Financial Engineer of the Year”—an award which is so prestigious that it may be regarded as the Nobel Prize in Finance. In fact, two of the past recipients were also Nobel Laureates (see shaded box on page 21). This award acknowledges Dr. Boyle’s lifetime contributions and accomplishments in the field of financial engineering. Not only is Dr. Boyle a financial engineer and a professor at the University of Waterloo, he is also an actuary—FIA, FCIA, Hon. FSAI. While Dr. Boyle is best known for pioneering the Monte Carlo methods in quantitative finance, he has

also made significant contributions in other areas including actuarial science and insurance.

His research is creative, groundbreaking and always ahead of his time. For example, he was one of the first actuaries to advocate the use of the stochastic interest rate models in insurance modeling, and the use of financing engineering tools in actuarial science in pricing and risk management of complex long-term embedded options in insurance contracts. In 1977, his paper on “Rate of Return as Random Variables” received the Best Paper Award for the papers published in the *Journal of Risk and Insurance*. His research paper entitled “Immunization under Stochastic Models of the Term Structure” won the inaugural Halmsted Prize (1978). A partial list of Dr. Boyle’s actuarial-related awards and achievements includes:

- 1989: INA (Istituto Nazionale delle Assicurazioni) Award, awarded by the Italian Academy of Science for distinguished research in the insurance field.
- 1995: Centennial Gold Medal for Outstanding Scientific Achievements within the Actuarial Profession, awarded by the International Actuarial Association.
- 1996-97 F.M. Redington Prize: for the paper on “Quasi-Monte Carlo Methods in Numerical Finance,” co-authored with Corwin Joy and Ken Seng Tan. This paper was also selected as one of the seven most important contributions in investment research in the last 50 years, as judged by the SOA Investment Council.



The photograph above was taken on Feb. 2, 2006 (United Nations, New York City) at the award ceremony dinner hosted by the SunGard and International Association of Financial Engineers (IAFE).

Left to right: Dr. David Li, Dr. Phelim Boyle, Dr. Dawei Li, Dr. Robert Merton

Past Winners of the Financial Engineer of the Year Award (and Affiliation)

| | |
|------|--|
| 1993 | Dr. Robert Merton - Harvard University |
| 1994 | Dr. Fischer Black (deceased) |
| 1995 | Dr. Mark Rubenstein – University of California |
| 1996 | Dr. Stephen Ross – MIT |
| 1997 | Dr. Robert Jarrow – Cornell University |
| 1998 | Dr. John Cox – MIT |
| 1999 | Dr. John Hull – University of Toronto |
| 2000 | Dr. Emanuel Derman – Columbia University |
| 2001 | Dr. Andrew Lo – MIT |
| 2002 | Dr. Jonathan Ingersoll – Yale University |
| 2003 | Dr. Darrell Duffie – Stanford University |
| 2004 | Dr. Oldrich Alfons Vasicek – Moody's KMV |

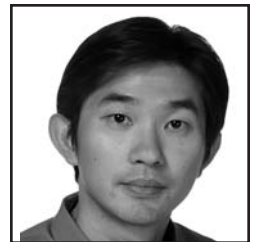
Lifetime Achievement

– Dr. Myron Scholes – Oak Hill Platinum Partners

- The Annual Prize for the best paper published in *NAAJ*:
 - 1997 on “Optimal Portfolio Selection with Transaction Costs,” co-authored with Sheldon Lin.
 - 2001 on “Valuation of the Reset Options Embedded in Some Equity-Linked Insurance Products,” co-authored with Adam Kolkiewicz and Ken Seng Tan.
 - 2004: Bob Alting von Geusau Prize for the best paper in *ASTIN Bulletin* “Guaranteed Annuity Options,” co-authored with Mary Hardy.

For more information on Dr. Boyle’s Financial Engineer of the Year award see the *Financial Engineering News* March/April 2006, issue 48 (http://www.fenews.com/fen48/one_time_articles/sungard-iafe/sungard-feoy.html and http://www.fenews.com/fen48/one_on_one/on_e_on_one.html), *The Actuary* April/May 2006, volume 3, issue 2 (<http://www.soa.org/ccm/content/about-soa-member-directory/the-actuary-newsletter/april-2006/pioneers-an-interview-with-dr-phelim-boyle/>) or his acceptance speech from <http://www.iqfi.uwaterloo.ca/news.shtml>. ♦

In a speech in Dublin on March 22, 2006 when he was made the 7th Honorary Fellow of the Society of Actuaries in Ireland, Dr. Boyle stated, “Financial engineers are very strong on mathematical techniques but actuaries – the oldest risk management profession in the world - have some advantages in terms of quality control in technical competencies, professionalism and discipline. The question is how can we combine the best of both worlds?”



Ken Seng Tan, ASA, is Canada Research Chair professor of University of Waterloo, Canada, and Cheung Kong Scholar of China Institute for Actuarial Science, Central University of Finance and Economics, Beijing, China. He can be reached at kstan@uwaterloo.ca.

You Are in the Risk Management Business!

by John Kollar

Editor's Note: The following article is reprinted with permission. It last ran in the Actuarial Review, Volume 33, No. 2, 2006.

As a pricing actuary, you attempt to come up with the best estimate of the losses and expenses that your company will have to pay on its portfolio of insurance policies. The more precisely you can measure those future costs, the less risk is involved in writing those policies, the less capital that is needed, and the greater opportunity for profit. From your own experience you know that all of the parameters underlying the losses and possibly even the premiums and policy provisions are not known to you. Consequently, there can be a

substantial amount of uncertainty in achieving your profit objectives. This may be particularly true for some lines. Everyone is painfully aware of hurricane losses over the last few years. While some day scientists may be able to forecast hurricanes, you are probably using a long-term average catastrophe provision from a catastrophe model in your pricing. Thus the insurance policies that

you are pricing have a substantial amount of uncertainty in them because some years the winds don't blow and results are favorable. And in the years when the winds do blow, results are poor. But you do the best you can.

As a catastrophe modeling actuary, you estimate the catastrophe risk for individual policies, and you evaluate the overall risk of an insurer's portfolio of policies. You well know the difficulty of predicting cat losses. Recent years

have demonstrated that multiple occurrences increase the volatility of losses even more.

As a (ceding) reinsurance actuary, you may have no choice but to purchase reinsurance to mitigate the risk of substantial catastrophe losses (or large liability losses). You may be faced with the challenge of balancing the cost of reinsurance and the cost of capital. Supplementary contingent capital comes at a cost, and sometimes that cost may be high. On the other hand, reinsurance coverage may be extremely expensive or unavailable at any price. However you look at it, you are dealing with a lot of uncertainty.

As a corporate actuary, you may build the cost of reinsurance and the cost of capital into the profit provisions that underlie your company's rates. But you are not only building the expected costs into your rates. You are also building the uncertainty in expected costs into your rates.

As a loss reserving actuary, you must estimate your company's ultimate losses. Some claims may not yet have occurred. For some lines claims may be outstanding for many years before they are paid. Nevertheless you are expected to come up with expected reserves that reflect all of these uncertainties. Recognizing that the expected reserves will virtually always be wrong, you have to recognize the uncertainty in reserves and communicate that to management. Your communication may include margins for adverse development or confidence intervals.

As a predictive modeling actuary, you try to improve the accuracy of your company's rating structure by incorporating additional information that more accurately measures the expected cost of individual policies. You also are aware of the risk of adverse selection if you do not keep up with the competition. The more accurate the



measurement of the expected costs, the lower the rating uncertainty associated with the policy and the lower the amount of capital needed to support the policies written.

As a marketing actuary, you may focus on identifying new, potentially profitable groups of policyholders. Again the idea is to reduce the uncertainty in expected costs.

As an underwriting actuary, you want to select policyholders that match up to your company's rates as closely as possible. Once more, the idea is to reduce the uncertainty around the expected costs.

As an investment actuary, you are trying to maximize the return on assets while assuming an acceptable amount of risk.

Uncertainty is common to *all* actuarial functions, not just the ones I have mentioned here. Ideally, all these functions are well coordinated so that risk is treated consistently and in an integrated fashion across your company. That is the objective of ERM. The integrated holistic treatment of risk in the ERM process can help you and your company reduce expenses, increase profits, and increase the value of the company. As an actuary, you will find that ERM is an excellent process by which to understand and be a part of the "big picture" of your company. Actuarial career paths will change in the coming years, and ERM will pave the way.

Jim Rech reminded me of the experience of the railroads in the last century. The railroads clung stubbornly to the idea that they were in the *railroad* business. Despite what was happening all around them, they failed to comprehend that they were in the *transportation* business. They did not—indeed, *could not*—compete

effectively against the trucking industry, and the railroads lost their dominant market position.

Are you in the risk management business? ♦

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As an underwriting actuary, you want to select policyholders that match up to your company's rates as closely as possible.

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GMWB and the Four Actuaries

by Voltaire

Once upon a time there were four actuaries—the Cash-aware actuary, the Surplus-aware actuary, the Volatility-aware actuary and the Market-aware actuary. One morning at dawn, they all set out to take a walk through the wild forest of insurance products. As they shuffled along and looked around at the many variations of financial services products and riders that were wandering by, they stopped paying attention to where they were walking and became separated, randomly diffused in the forest.

After a while, the Cash-aware actuary came upon a guaranteed minimum withdrawal benefit

(GMWB) rider that was lost in the forest looking for its proper premium. The Cash-aware actuary said, “Don’t worry young rider. Being the new kid on the block, I will find your proper premium.” The Cash-aware actuary priced the snappy GMWB rider reflecting expected benefits and expenses, discounted at the universal discount rate of 15 percent, and told the GMWB rider

that his proper premium is \$12.

Later that morning, in another part of the wild forest of insurance products, the Surplus-aware actuary was looking for the best-estimate way to get back to the corporate office when she also came upon the GMWB rider. “How do you like my premium?” asked the GMWB rider. The Surplus-aware actuary took a careful look at the GMWB rider and said, “Hmm. This benefit needs to be stochastically tested. Will that hurt?” queried the GMWB rider. “Only if you don’t hold still,” responded the Surplus-aware actuary. The Surplus-aware

actuary then simulated expected benefits and expenses along 10,000 paths, examined various levels of conditional-tail expectation, and said to the GMWB rider: “My, my, you need to hold capital that is four times the premium that you showed me. Given that there is no such thing as a free lunch, there is going to have to be an increase here to pay for that.” “Oh, no. I won’t be marketable,” said the GMWB rider. “It’s not that bad,” responded the Surplus-aware actuary. “Your premium only needs to increase by about a third to pay for the carrying cost of your capital.” So the premium was increased to \$16, and the GMWB rider scurried away off in search of his market.

All through the morning, the Volatility-aware actuary tried to build a model of the wild forest that should show him the way back. However, that rascal heteroskedasticity along with her side-kick multicollinearity in a multiple regression context were starting to extract their toll. The Volatility-aware actuary, having wrestled enough with the muscle bound polynomials, finally decided to take a break for lunch and started to conduct a non-linear search for the subsidized cafeteria when he came across the GMWB rider. The GMWB rider was afraid to show his premium to this stranger who kept talking about some mythical person named Vega. However, the rider’s outgoing marketing personality got the better of him.

“Look at the shiny new premium that two nice actuaries gave me,” said the GMWB rider. The Volatility-aware actuary, upon a quick look, said, “that looks like the right premium for an average-type insurance product—mind if you open your kimono and let me take a look at your volatility?” “My mother told me never to let a stranger look at my volatility,” said the GMWB rider. “Do I look strange to you?” replied the Volatility-aware actuary. “Why I



Fictional Interlude: GMWB and the Four Actuaries

look at volatility all of the time. There is nothing that you are going to show me that I haven't seen before."

The GMWB rider did think that the Volatility-aware actuary looked a little strange, but he seemed to need to look at his volatility very badly. So, the GMWB rider agreed to put his volatility on the table. The Volatility-aware actuary, upon inspection, quickly found there was no charge for volatility in determining the premium and that the projected ROE indeed averaged 15 percent.

However, the standard deviation of the quarterly ROE was 5 percent. "How does my volatility look to you?" asked the GMWB rider. "A material deficiency" answered the Volatility-aware actuary. "The average benefit for other insurance products have half as much volatility as you do." "Is that good?" asked the GMWB rider defensively. "Not very," replied the Volatility-aware actuary. "I will have to risk-adjust your discount rate to about 25 percent. That means your premium will have to double to about \$32." The GMWB rider was floored. "But how will I ever face the other benefits and riders? They are all priced at the universal one-size-fits-all discount rate of 15 percent" cried the GMWB rider. "Well, there is another way," replied the Volatility-aware actuary. "I could calculate your premium using the 75th percentile cost instead of the mean cost. It will get us to the same place." The GMWB rider was dazed, confused and very upset with both answers. He was now most certain that he would not look attractive to the market.

The GMWB rider turned and ran away without even stopping to thank the Volatility-aware actuary for correcting his premium. As he made a left turn to avoid running smack into a term rider, he instead tripped over the Market-aware actuary who was looking for signs of where everyone else had gone. Why? So that she could follow them! The Market-aware actuary had found that if she followed the path that most everyone else had taken before, she would always get ... where

everyone else was going! Anyhow, the GMWB rider, being so flustered and upset, blurted out rudely: "Look at what those actuaries did to my premium! I will never sell." The Market-aware actuary took a long and careful look at the GMWB rider and finally said: "You are very different from anything that I have seen traded in the financial markets. To replicate you, I would have to devise a complicated dynamic hedge embedded within a well defined hedging strategy." The GMWB rider just stared at the Market-aware actuary. No one had ever said anything like that in his presence before. "What would you do with the dynamic hedge and why would you want to replicate me?" asked the GMWB rider.

"Why everything needs to be replicated," said the Market-aware actuary. "How else would you know what it you are worth!" The GMWB benefit didn't take that for an answer and asked "then would you have to hedge me?" The Market-aware actuary grinned and said: "No, silly benefit. You do not have to execute the hedge. But knowing how much the hedge costs, tells you how much your benefit should cost. You can test your premium for market consistency against thousands of trades that make up the financial markets."

The GMWB rider thought that was a good idea, so he asked the Market-aware actuary to build the replicating hedge. The Market-aware actuary pulled out her portable Bloomberg terminal, tapped into the forest's enterprise computing grid and got to work. After a while, she woke the GMWB rider and told him: "I've got it. I couldn't find any single set of hedges that will do, but if you maintain this set of delta, gamma, vega and primrose hedges, then you will cost \$30 if the market stays just like it is today." The GMWB rider started to cry. "Why that is almost the same as what the Volatility-aware actuary said." "Come back tomorrow" said the Market-aware actuary "and I will tell you what your replicating hedge cost is on that day." So off ran the GMWB rider even more perplexed than ever.

continued on page 26 ■

“

You do not have to execute the hedge. But knowing how much the hedge costs, tells you how much your benefit should cost.

”

GMWB and the Four Actuaries

▸ continued from page 25

Just before dinner-time, the four actuaries encountered an extreme-tail event and all haphazardly and coincidentally managed to wander into the same small glen at the same time. They all cordially greeted each other and began to all talk at once about their adventures. It soon became apparent that they had all met the GMWB rider and given him a price.

They started to argue about who had given the best price. “But you cannot sell the GMWB rider at a price higher than mine” said the Cash-aware actuary. “But your company will notice that things are amiss as soon as the new C-3 Phase II RBC requirements come into effect and your ROE will stink to high heaven” said the Surplus-aware actuary. “Before too long, you will have other problems” said the Volatility-aware actuary. “Your company’s earnings will have so much volatility that the stock price will take a big hit.” “And worst of all, if your company wants to lay-off the risk, they will find that there is not enough premium there to pay for a hedge” says the Market-aware actuary. Their discussion went on and on in a recursive loop format until the argument almost turned into an open brawl.

Suddenly, the four actuaries were surrounded by the GMWB rider and many other bells and whistles that were all looking for their premiums. “Please, please, give us premiums,” cried the benefits in high shrill voices. “Okay, come with me,” said the Cash-aware actuary. Most of the benefits followed along eagerly, knowing that they would quickly sell with the premiums that the Cash-aware actuary would give them. “Who is coming with me?” asked the Surplus-aware actuary. Almost all of the rest of the benefits followed him home.

There was only one benefit left—the GMWB rider. He said: “I cannot decide with whom to go

with. You are both so close together.” “Well” said the Volatility-aware actuary to the Market-aware actuary. “Maybe we should we should work together. Our GMWB rider will probably sell after the others burn out. We can both calculate the premiums.” “Agreed” said the Market-aware actuary. “And whenever we disagree, we can put our heads together. We might find that it is a market opportunity or maybe it is a time when your model needs recalibrating.” The GMWB followed along unnoticed as the two actuaries went on and on about the benefits of market consistent pricing and the calibration of stochastic scenario generators.

And at the end of the day, they all got what they deserved! ♦

Highlights from the 2006 Stochastic Modeling Symposium

by Gilbert Lacoste

If you weren't in Toronto this past April 3 and 4, you missed out on the 2006 Stochastic Modeling Symposium. But missing out on the symposium doesn't mean you have to miss out on all of the excellent papers that were presented.

It was a great event, organized by the Canadian Institute of Actuaries' (CIA) Committee on Investment Practice. Furthermore, the symposium received the full support and sponsorship of The Actuarial Foundation of Canada and a number of SOA sections, namely the Financial Reporting Section, the Investment Section and the Risk Management Section (also co-sponsored by the Casualty Actuarial Society).

Various events throughout the symposium were made possible in part by generous financial contributions from various corporate sponsors, which included Barclays Global Investors, Mercer Oliver Wyman, Tillinghast and Valani Consulting.

The symposium kicked off with a welcoming reception on the evening of April 2. The symposium got down to business the next morning and started on a great footing with the special announcement that one of its members, Phelim Boyle, was named financial engineer of the year by the International Association of Financial Engineers (IAFE). The symposium covered a lot of ground over the next two days. One hundred sixty-one attendees gathered in Toronto for the opportunity to see, hear, learn and question the authors of 22 excellent papers, all addressing some aspect of stochastic modeling.

Like the previous 1999 and 2003 Stochastic Modeling Symposia that were also held in Toronto, this symposium brought together aca-

demics and practitioners. In fact, of the 22 papers presented, nine were authored by academics, five were authored by practitioners and eight were authored by both academics and practitioners. There is a lot that each can learn from the other, and these symposia are great forums for these exchanges. And let me tell you, the refreshment breaks were breaks from sitting down, but there were still a lot of ideas being shared. Lots of contacts were rekindled and many new ones were formed.

Clearly, interest in stochastic modeling is high. We all know that, when built and used carefully, stochastic models can be extremely powerful tools in shedding light on the potential financial implications of today's increasingly complex pension, insurance and wealth accumulation products. Without stochastic models, one is often left speculating on the possible outcomes.

The CIA and the Office of the Superintendent of Financial Institutions (OSFI) have both realized the power of stochastic modeling. OSFI based the capital requirements (MCCSR) for segregated fund guarantees on the results of stochastic modeling, and, subject to some conditions, permits companies to use their own internal models to set liabilities and capital for these products. OSFI sees stochastic modeling as a critical part of a company's risk management infrastructure. The CIA, for its part, encourages the use of stochastic models for the valuation of a wider range of products by including stochastic models as an alternative to the



continued on page 28 ■

Highlights...

▸ continued from page 27

general Canadian Asset Liability Method (CALM) valuation process.

The papers presented covered a variety of practical topics ranging from choosing appropriate equity, interest rate and credit models and calibration parameters to optimal and efficient techniques and methodologies in valuing and managing associated risks. These practical applications were demonstrated in many areas of practices and products.

All papers presented had been first subject to the scrutiny of a scientific review committee, also consisting of both academics and practitioners. It would be fair to say that all 22 papers were high-quality papers. The review committee initially identified a number of papers deserving of special mention. With the help of the prize committee, six papers were honored with “Outstanding Paper Awards” and rewarded with \$3,000 cash prizes. The cash prizes were made possible due to the generous contributions of our non-corporate sponsorships. The winning authors (in alphabetical order) and the paper titles are as follows:

- **Thomas S.Y. Ho** (Thomas Ho Company Ltd.), **Sang Bin Lee & Yoon Seok Choi** (Hanyang University)
Practical Considerations in Managing Variable Annuities
- **Joonghee Huh** (Merrill Lynch Commodities Inc.), **Adam Kolkiewicz** (University of Waterloo)
Efficient Computation of Multivariable Barrier Crossing Probability and its Applications in Credit Risk Models
- **Martin le Roux** (ING Institutional Markets)
A Long-Term Model of the Dynamics of the S&P 500 Implied Volatility Surface
- **Jun Cai** (University of Waterloo) & **Ken Seng Tan** (University of Waterloo and Central University of Finance and Economics)
Optimal Retention for Stop Loss Reinsurance under the VaR and CTE Risk Measures
- **Hon-Kwok Fung & Leong Kwan Li** (Hong Kong Polytechnic University)
Valuation of Equity Indexed Annuities when Interest Rates are Stochastic
- **Mary R. Hardy, R. Keith Freeland & Matthew C Till** (University of Waterloo)
Validation of Long-Term Equity Return Models for Equity-Link Guarantees

Now, if you weren't at the symposium and don't know someone who was, you might wonder how you could get your hands on these excellent papers. Well, you're in luck—it's not too late. In fact, all 22 papers that were presented at the symposium are now available on the CIA Web site at http://www.actuaries.ca/meetings/stochastic-investment/2006/material_e.cfm. And next time, come out and join the crowd, meet people with similar interests and learn more than you could from just reading the papers. Also, it's a great break from the office!

Stochastic modeling has changed our lives, is here to stay and actuaries will find a growing number of necessary and useful applications in the future. In that vein, the Committee on Investment Practice plans to hold another stochastic modeling symposium in two to three years. That's good to know if you want to attend or even submit a paper. I encourage everyone working on a regular basis with stochastic models to start thinking about what you would like to write a paper on. If enough of us do that, the next symposium could be even better than the one we just had. ♦



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The recipients of the Outstanding Paper Awards and the representatives from the non-corporate sponsorships (who were present at the symposium).

Back row (L to R) : Hon-Kwok Fung, Martin le Roux, Joonghee Huh, Thomas S.Y. Ho, Ken Seng Tan, Michel Rochette

Front row (L to R): Ron Harasym, Mary R. Hardy, Christian-Marc Panneton

Highlights from the 4th Annual ERM Symposium

by Valentina A. Isakina and Max J. Rudolph

With sessions ranging from *Exploiting Risk to Identification and Measurement of Extreme Events*, the 4th annual Enterprise Risk Management Symposium provided something for everyone who attended. Chicago was the place to be April 23-25 for risk managers—almost 600 attendees from financial services, energy, mining and manufacturing came to attend the event co-sponsored by the Society of Actuaries, Casualty Actuarial Society, and Professional Risk Managers' International Association. They came to Chicago from across the world, traveling from as far as Japan and Russia. This was the broadest representation to date, indicating that the buzz about the event is spreading well beyond the insurance industry.



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Max J. Rudolph, FSA, MAAA, is a consulting actuary with Mutual of Omaha Insurance Company in Omaha, Neb. He can be reached at rudolph@tcn.com.

The first day featured three workshops, covering distinct topics:

- ERM Essentials for Decision Makers,
- Banks and Insurers: Separate Paths But a Common Destination, and
- Applying a Principles-Based Approach to Valuation Requirements (co-sponsored with the American Academy of Actuaries).

These day-long seminars allowed participants to dive deeper into specific issues than a single session allows.

The goal of the symposium was to show that ERM principles are the same across different industries and practices, and risk managers need to talk to each other to learn and disseminate the best practices faster. Four general sessions set the tone for the meeting:

- Leading off on the first day was a session featuring a variety of energy and financial services leaders discussing the convergence of tools used by each.
- The first day finished with perhaps the most out-of-the-box session offered—with

actual board members discussing how ERM integrates management and the board. This session brought the *View from the Top* closer to home.

- The third general session kicked off the second day with practitioners sharing their experiences adding value through ERM.
- Andrew Smith provided a keynote address during Tuesday's lunch, continuing on the topic addressed during the opening session and showing how the market provides clues to assessing extreme events.
- The meeting concluded with the ever-popular grand finale, where attendees could *Ask the Experts* from several disciplines.

In addition, 30 concurrent sessions were organized around five different tracks. All the sessions were taped to MP3 format and are available, along with the presentation slides, on www.ermssymposium.org.

To meet the challenge of last year's attendees to take the symposium to the next level, this year featured, for the first time, a call for scientific papers. Three sessions on the second day of the symposium were reserved for the authors of the best papers to present their findings. The selection committee had a very difficult task of choosing the final winner, but after several rounds of discussion, Bill Panning of Willis RE won the ERM Research Excellence Award, offered by The Actuarial Foundation, for his paper *Managing the Invisible: Measuring Risk, Managing Capital, Maximizing Value*. All of the papers are excellent and can be downloaded from the Web site.

The next symposium will be held in Chicago March 28-30, 2007. It will surely be an event not to be missed. ♦

Scientific PaperTrack Keeps ERM Symposium on the Cutting Edge

by Steven C. Siegel

One glance at the ever-expanding list of attendees to this year's fourth annual ERM Symposium will tell you that this event is no doubt the leading forum for professionals to gather, network and learn about the latest on this topic. Although this has become a well-established event, how do you keep it on the cutting edge to push the boundaries of ERM? Last year, this very question occurred to Max Rudolph, one of the members of the event's organizing committee. His solution: establish an annual call for ERM-related research papers that would present the very latest in ERM thinking and move forward principles-based approaches.

To move the effort forward, Rudolph enlisted the help of SOA staff, including Jeanne Nallon and myself. With the additional support of CAS, PRMIA and ERMII, a call for papers was drafted and readied for distribution. Of particular importance for the success of the call for papers, The Actuarial Foundation agreed to sponsor an annual monetary prize for the top paper submitted. This prize, dubbed the ERM Research Excellence Award, not only serves as further proof of The Actuarial Foundation's commitment to quality in education and research, but also gave the event added prestige to attract authors.

The official call for papers was issued in October 2005 and was widely publicized to potential authors. As the abstract deadline approached, we were astonished by the response we received. In all, close to 30 abstracts were submitted for review. This level of response far and away exceeded our expectation and proves just how hot this topic is.



Tricia Guinn presents Bill Panning with the first annual Actuarial Foundation ERM Research Excellence Award

With the abstracts in hand, a committee was recruited to review them and decide which papers would be presented at the ERM Symposium. The committee, chaired by Rudolph, included Mark Abbott, Sam Cox, Emily Gilde, Krzysztof Jajuga, Don Mango, Michel Rochette, Nawal Roy, Fred Tavan, Al Weller and myself. With only nine slots available for presentation of papers at the symposium, it was no small task to choose from the abstracts submitted. Given the quality and number of abstracts received, the committee regretted that there were not additional presentation slots available.

continued on page 32 ►

Scientific Paper Track...

▸ continued from page 31

After meeting regularly between December 2005 and April 2006, the committee settled on nine papers for the three dedicated sessions at the symposium. A list of those papers is shown below. The final responsibility of the committee was to choose the first annual Actuarial Foundation ERM Research Excellence Award. After several rounds of scoring and deliberation, the committee judged as best paper William Panning's "*Managing the Invisible: Measuring Risk, Managing Capital, Maximizing Value.*" Tricia Guinn, a trustee on the Board of The Actuarial Foundation, presented the award to Panning during the General Session luncheon on Monday, April 24.

The objective of Panning's paper is to demonstrate the linkage between ERM on the one hand and maximizing a firm's value on the other. In the paper, Panning presents a valuation model for a property-casualty company and shows how the model can assist managers in making value-maximizing strategic decisions. The paper concludes with observations on the importance of value-focused ERM, as it makes a firm's value more visible and manageable.

List of Papers Selected for Presentation (in alphabetical order)

Adapting Banking Models to Insurer ERM by Gary Venter

Applying Actuarial Techniques in Operational Risk Modeling by Don Mango

Bye Bye Beta, Bye Bye by Jeremy Gold

Economic Impact of Capital Level in Insurance Company by Yingjie Zhang

Enterprise Risk Management Quantification—An Opportunity by Christopher Bohn and Brian Kemp

Extending ERM to Multi-Employer Pension Plans by Doug Andrews

Managing the Invisible: Measuring Risk, Managing Capital, Maximizing Value by William Panning

A Multi-Stakeholder Approach to Capital Adequacy by Robert Painter and Dan Isaac

As of this writing, an online monograph is being created to house the papers. A link to the monograph, when completed, can be found on the ERM Symposium Web site at www.ermssymposium.org. Papers that were not presented at the symposium will also be included in the monograph.

We encourage you to review the monograph and read papers of particular interest to you. You may not agree with everything you read in the monograph; it was our intent to procure papers that would not only inform, but also provoke discussion and spark debate. After all, this is what keeps us on the cutting edge of ERM.

We wish to thank all the organizations and committee members for their support and for making this a success. Planning for the 2007 ERM Symposium call for papers will begin shortly. I invite you to contact me if you have ideas or feedback for next year. Until then, watch the ERM Symposium site for the latest developments! ♦

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The objective of Panning's paper is to demonstrate the linkage between ERM on the one hand and maximizing a firm's value on the other.

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Steven C. Siegel, ASA, MAAA, is a staff research actuary with the Society of Actuaries in Schaumburg, Ill. He can be reached at ssiegel@soa.org.

The Actuarial Practice Forum: Call for Papers

You are encouraged to submit a paper to *The Actuarial Practice Forum*, a new online journal designed to deliver practical and applicable information to SOA members in the form of useful papers that are of educative value to the general actuarial readership.

The papers in this journal will convey important information on actuarial methodology, regulatory requirement analysis, product design, analysis techniques and other practical areas of actuarial work. They will convey, at length and in considerable detail, information about the intended topic. The purpose for publishing these papers is to help practitioners in their day-to-day work. Such papers will provide members with opportunities for basic and continuing education, both inside and outside of their areas of practice. By sharing their knowledge, expertise, and experiences in this way, authors can provide members with education and continuing education opportunities as well as increase their stature in the actuarial profession.

Manuscript Submission

Electronic submissions in Microsoft Word or pdf format are preferred. Accompanying graphics should be sent in a format suitable for publishing (high-resolution TIFF or JPEG files or pdf files).

Length

The suggested length for APF papers is approximately 6,500 to 19,500 words (or approximately 20 to 50 double-spaced, typewritten pages long). This includes a brief abstract (100-300 words) and references/bibliography. However, articles of fewer or more words will also be considered. Accompanying charts, graphs, tables and exhibits are also welcome, and are subject to review according to the same guidelines as a submitted manuscript. References should be included and must be complete.

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Content of Papers

The editorial board and SOA staff has the right to accept, reject or request changes to papers after reviewing the material. Marketing pieces, or those manuscripts that advocate an opinion, person, product or company association will not be accepted. Any specific proprietary company-related material should have company approval or be removed before the paper is submitted. Staff editors reserve the right to edit articles for length, basic syntax, grammar, spelling and punctuation.

For more information, or to submit a paper to *The Actuarial Practice Forum*, contact Phyllis Crittenden at pcrittenden@soa.org. ♦

Risk Management

ERM For Insurers — From Compliance to Value

by Prakash A. Shimpi and Stephen P. Lowe

Adding a corporate finance dimension to actuarial analysis of risk creates a unifying framework that shows how enterprise risk management (ERM) can create value.

*Editor's Note: The following article is reprinted in its entirety from the 20th Anniversary Issue of Towers Perrin's *Emphasis* magazine, with permission from Towers Perrin.*

Risk and capital management are important, fundamental concerns of the insurance industry. To address these concerns, insurers have always assessed risks, allocated capital to them and developed

increasingly sophisticated methods for risk management at a level of granularity not always available to other businesses. Many insurance companies now recognize the critical importance of integrating risk management with capital management. Doing this is easier said than done—and requires careful thought to make sure both tasks are handled in a manner consistent with value creation.

Now there is a growing demand from shareholders and others for senior management to take enterprise risk management (ERM) more seriously. This means formalizing the essential connection between a company's business operations and its overall risk management program. This is ending the practice of operating these functions as silos within many organizations.

The initial stage of ERM is mostly about compliance and corporate governance. New rules and responsibilities have been imposed on senior management and boards of directors, resulting in higher costs, resource constraints and even questions about whether these new regulations are really cost effective.

However, leading companies are beginning to use ERM as a strategic tool that will help them increase shareholder value. To do so requires a synthesis of the actuarial techniques of insurance and the capital markets perspectives of corporate finance.

Strategic ERM requires a unifying framework that articulates risks consistently across an organization and evaluates alternative capital

Prior articles in *Emphasis* magazine have described leading-edge approaches to managing risk and capital at both the tactical and strategic levels.

In 1990/4 "Extending the Efficient Frontier," Joseph Buff and John Sweeney project a standard investment analysis technique to the joint management of an insurer's assets and liabilities.

In 1995/1 "The Once and Future Discipline," Jerry Miccolis predicts the use of strategic risk management within 10 years.

In 1998/3 "Risk Financing the DFA Way," Imelda Powers and Joseph Lebens present a decision-making technique to evaluate alternative capital management solutions.

In 1998/4 "Two Sides of the Same Coin," Stephen Lowe describes how managing risk and deploying capital are interrelated activities, ultimately leading to creation of shareholder value.

In 1999/3 "Risk Managing Shareholder Value," Jane Rastallis and Jerry Miccolis show how good corporate governance and the coordinated management of a full range of risks can increase an insurer's performance.

In 2000/1 "Getting a Handle on Operational Risks," Jerry Miccolis and Samir Shah develop rigorous techniques to model operational risk.

In 2002/3 "It's a Stochastic World After All," Alastair Longley-Cook and Michael O'Connor describe how simplistic methods to determine capital or assess risk are being replaced by more sophisticated stochastic modeling.

In 2000/3, 2002/4 and 2004/4, articles present the findings of periodic ERM surveys of the insurance industry.

structures—comprising equity, debt, insurance and hedging—to bear those risks.

The Evolution of ERM

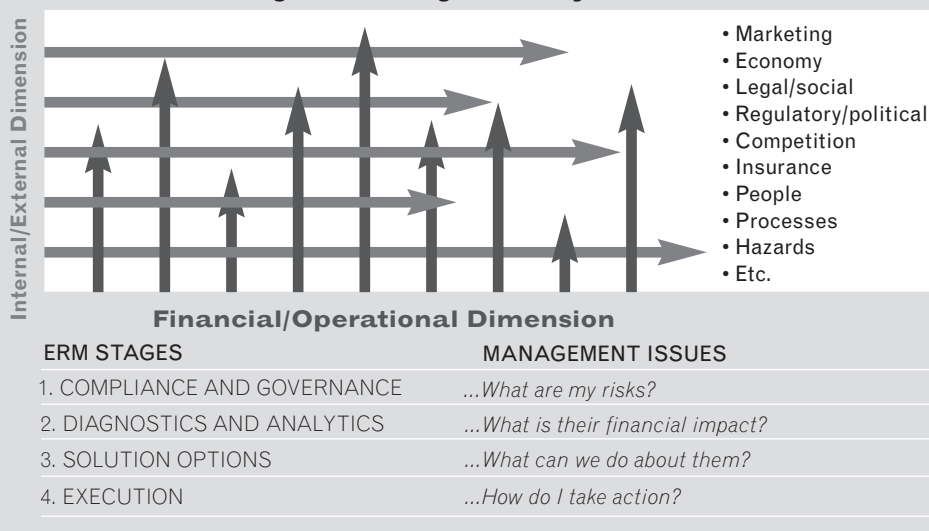
Both life and non-life insurers have contributed to the evolution of ERM techniques, reflecting the event risks that they face. For life insurers, the mortality event is a question of “when” and not “if,” so they have focused intently on whether the firm has sufficient assets to meet the obligations of each policyholder at the right time. Given the long-term nature of life contracts and a focus on asset-intensive products such as annuities, life insurers have been early developers of managing financial and investment risks.

In the 1950s, the actuaries developed a formal asset/liability management (ALM) method for assessing and managing interest-rate risk. This method, known as immunization, has since become the foundation of several risk management techniques in life insurance, pensions, banking and derivatives.

The volatile interest-rate environment of the late 1980s, combined with regulatory action requiring life insurers to demonstrate capital adequacy relative to their liabilities, led to cash flow testing (CFT). This expanded ALM to include simulation of a wider set of risks of the business line and their financial impact over a variety of scenarios and time horizons. As a result, the life insurer’s tool kit is now able to address risks arising from options and guarantees embedded in both the products and the assets used to fund them.

The techniques for managing event risks have come primarily from the P/C insurers where the questions about an event are both “if” and “how big.” Formally, the analytical tools address the combination of frequency and severity of events, often with the challenge of sparse data. Immunization principles are not much help here, so P/C insurers have developed increasingly sophisticated tools to manage their portfolio of risks and assess the capital they need to

EXHIBIT 1 Insurers Need to Manage Risk Arising From Many Interrelated Areas



run their businesses. The most notable tool is dynamic financial analysis (DFA), developed in the 1990s, which has the same underlying principles of ALM and CFT but addresses a wider range of business risks. In effect, DFA assesses the total capital required to cover the entire mix of event risks in the insurance portfolio.

Insurers have also benefited from risk management techniques developed by banks to assess whether they have sufficient capital to run their business—spurred in part in recent years by the growth in the derivatives markets. For the most part, these financial risks are actively traded with a wealth of data available to validate and calibrate pricing and hedging models. As a consequence, there is greater recognition of the need to evaluate risks on a market-consistent basis and impose arbitrage-free conditions that formalize the basic rule that two identical cash flow streams must have the same price.

Although some of the leading insurers have both life and P/C operations, traditionally risk and capital management were managed separately. This has changed dramatically in the last decade. For both single line and composite insurers, detailed analysis of risk dynamics for each business line can be aggregated to develop a firm-wide view of risk and the consequent

continued on page 36 ■

ERM for Insurers...

► continued from page 35

capital requirements, enabling the entire organization to benefit from the diversification of the portfolio of risks underwritten.

A major work in progress for insurers, as well as for other corporations, is a robust way to qualify, quantify and manage operational risk. This, along with new regulations intended to increase transparency, account-ability and good corporate governance, has had the effect of formalizing risk management with a more comprehensive scope. Today, leading firms are doing more than complying with new corporate governance regulations. They are using ERM to create value.

Compliance and Governance

The compliance and governance phase of ERM begins by asking a vital but elementary question of management and the company’s board: Do you know your risks? Clearly that must only be the first in a series of questions that lead ultimately to management action (see Exhibit 1).

The value of ERM is the ability to optimize the value created from the joint management of risk and capital. As Exhibit 1 shows, a firm is exposed to a variety of risks. The taxonomy of risks is merely a device to capture the descriptions of a firm’s risk exposures. Perhaps more important is

the diagnosis of the financial impact of those risks as they act in concert upon the firm. This forms the basis for developing and assessing a range of solutions and the criteria required to take action to mitigate or capitalize on those risks.

Ultimately, once compliance processes and procedures have been put into place, the firm needs to consider how to finance its risks. However, this is not easy. While the relationship between risk and capital management seems clear enough in principle, how does a firm put the right measures in place that fully capture this linkage?

Compliance to Value Creation

To move from a compliance focus to a value focus, management needs a unifying framework that is valid for the financial management of the full range of risks that it faces and that can be used at the tactical (product line) or strategic (senior executive) levels. This can be achieved if the framework combines actuarial techniques with the capital market perspectives of corporate finance and explicitly recognizes that risk financing instruments act as equity substitutes.

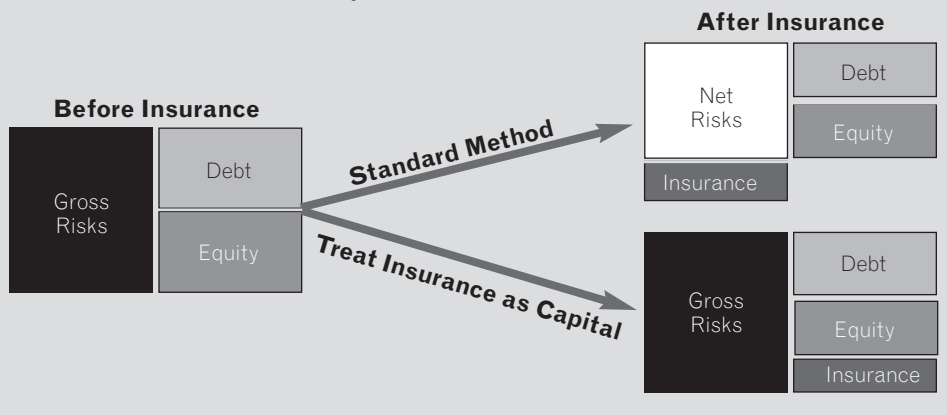
The actuarial perspective begins with a bottom-up evaluation of each individual risk and then aggregates that information into an overall assessment of the portfolio of risks. The analysis of the portfolio of risks leads to a determination of the amount of capital needed to support those risks.

The corporate finance perspective focuses on the firm’s capital structure. Its purpose is to increase shareholder value by delivering the optimal balance sheet—composed of equity and debt—that minimizes the cost of capital not just in absolute terms but relative to the price of risks it bears.

Joint Perspective — Risk AND Capital

Both actuaries and corporate finance managers know intuitively that risk and capital are related.

EXHIBIT 2
Treat Insurance as Part of Capital Structure



Their joint perspective leads naturally to the question of how insurance and hedging instruments should be treated in the analysis of risk financing alternatives. There are essentially two possible choices: Treat them as offsets to risk or treat them as capital (see Exhibit 2).

Conventionally, capital is defined as only those instruments that provide immediate cash to the firm (e.g., equity and debt) and exclude contingent capital (e.g., insurance and derivatives) that may bring cash to the firm at some later date. The total paid-up capital (debt plus equity) must be sufficient to bear the net risk of the firm after insurance and hedging. The capital structure decision is about financial leverage, which selects the mix of equity and debt.

Alternatively, the definition of capital can be broadened to include all instruments that reduce the need for equity. With this definition, the sum of the paid-up and contingent capital must be sufficient to bear the gross risk of the firm. The capital structure decision combines financial leverage (equity versus debt) and risk leverage (risk retention versus risk transfer) to find the best mix of equity, debt and insurance. It is consistent with the way insurers evaluate their reinsurance programs and make decisions on risk transfer based on the capital relief they can achieve.

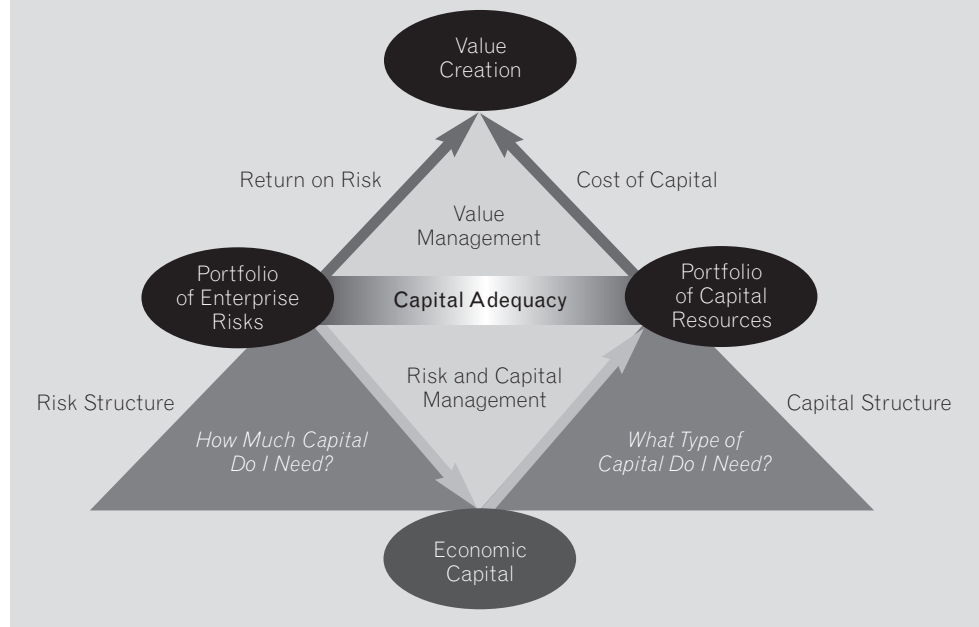
Strategic RCV Framework

A strategic risk capital value (RCV) framework (see Exhibit 3) connects value creation to the fundamental choices that managers make on a daily basis. Essentially, the portfolio of enterprise risks and the portfolio of capital resources are the two major items that management can change to advance the interests of the firm.

Conventionally, risk management and capital management have operated as two different disciplines and, indeed, as two (or more) separate operations within a firm. Nevertheless, the two have always had a close economic relationship.

EXHIBIT 3 A Strategic RCV Framework

Maximize value by relating the firm's decisions on the risks it takes to the decisions on capital it uses to finance its business.



In a corporate setting, this relationship acts like gravity, keeping the two portfolios of enterprise risk and capital resources tightly connected. The amount of risk dictates the capital needed and, vice versa, the amount of capital determines the risk capacity.

The relationship between risk and capital is not easy to articulate. In this framework, this relationship is developed by referring to an intermediate measure, economic capital (EC) which is the amount of capital needed to remain solvent with a high probability. In its purest sense, EC is the true measure of the weight of a firm's risks. (This term distinguishes EC from other measures that are also relevant to the firm, such as regulatory capital, rating agency capital and GAAP capital.)

The risk structure of the firm (i.e., the financial impact of the company's risk exposures as they unfold over time and scenarios) is measured by EC. In practice, this is done by running a dynamic EC model that simulates the financials of

continued on page 38 ■

ERM for Insurers...

▸ continued from page 37

the firm over a range of possible futures and produces the minimum amount of capital that the firm needs to bear its risks.

With EC setting the minimum amount of capital needed, the key corporate finance question is: What is the best capital structure for the firm? The same dynamic EC model can help managers evaluate different combinations of capital resources (e.g., equity, preferred stock, debt, insurance, hedging).

The ultimate aim is to create value. The firm is expected to generate returns on the risks inherent in its activities. (Strictly speaking, the shareholders would expect the firm to generate excess returns over the price of those risks in the markets.) Holding capital—both in cash form as well as in contingent form—results in a cost reflecting the price of accessing that capital. Through their selection of risks and capital, management has the opportunity to maximize value creation (shown in the top half of Exhibit 3) bearing in mind the constraints imposed by risk and capital management (shown in the bottom half of Exhibit 3). In short, value is created when the return on risk exceeds the cost of capital.

While the RCV framework may be conceptually elegant, care must be taken in its implementation to be sure that all assumptions are explicit, particularly those regarding market consistency.

Broader Analysis, Better Results

Risk management at the enterprise level, or ERM, is intended to assess, control, exploit, finance and monitor risks from all sources in order to increase shareholder value. It encompasses the actuarial approach to risk. But it also addresses governance questions such as who is responsible for those risks, does the firm have enough capital to sustain itself and how much volatility can the firm tolerate.

Risk and capital management is the foundation of how insurance companies function. Today, with the latest developments in ERM, the insurance industry is taking another evolutionary step that is both beyond, and inclusive of, ALM, CFT and DFA. Using these tools within a unifying framework, managers can include more risks in their planning and arrive at a more comprehensive analysis of their business. While regulatory actions may have provided the initial impetus, the insights gained from this analysis can profoundly affect management's ability to create value.

Comments or questions may be e-mailed to prakash.shimpi@towersperrin.com or stephen.lowe@towersperrin.com. ♦



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Announcing the Arrival of the Risk Management Section's Regional Meetings!

by Ron Harasym

Would you like to know more about what's hot in the Enterprise Risk Management (ERM) arena? Are you interested in networking with other risk management professionals? Then get ready as the Risk Management Section rolls out its program of regional meetings!

The first event of this exciting endeavor was held in Toronto on June 1. Other regional meetings are soon to follow. The event was organized by Ron Harasym, Ken Seng Tan, and Fred Tavan and featured a presentation by Mike Stramaglia, Executive Vice President and Chief Risk Officer of Sun Life Financial.

The meeting was kicked off by Ron Harasym as he provided an update on an exciting plan that will bring the Canadian Institute of Actuaries to be joint sponsors with the Society of Actuaries and the Casualty Actuarial Society of our Risk Management Section. Fred Tavan provided an overview of several exciting research initiatives underway that are being funded by the Risk Management Section. Ken Seng Tan described the vision of the Institute for Quantitative Finance and Insurance (IQFI), University of Waterloo, to be a world-class centre in financial risk management and to promote excellence in the science and practice of risk management through teaching, research and outreach activities.

Mike Stramaglia, the featured speaker, then provided a compelling presentation titled "Insurance/Capital Markets Developments: Convergence or Collision? Some Risk Management Perspectives".

Mike talked about how insurance and capital markets continue to converge on a number of key fronts. The extension of catastrophe bond issuance to extreme mortality events and other forms of life insurance securitization represent some of the more recent trends in this area. Mike focused on convergence at the product level. In particular, key drivers of product-related convergence include supply / demand imbalances,

regulatory / accounting / tax developments, advances in structured finance, increased rating agency participation, along with advances in ERM.

Insurance / capital market product convergence have evolved via practices involving securitization, insurance derivatives, contingent capital structures, credit derivatives as well as retail products such as variable annuities with riders linked to investment performance guarantees. The development of the life settlements industry is an excellent example of where risk managers need to "stay awake at the wheel" as markets will evolve to take opportunistic advantage of financial services providers wherever possible.

All in all, the convergence of insurance and capital markets is leading to new risks and opportunities to insurance company risk managers! Looking forward, further unbundling of the insurance value chain is inevitable leading to the emergence of new specialized competitors as well as the likelihood of increased disintermediation risk. All this leads to and increasing demand, expectations, and opportunities for innovative risk management professionals!

So now, would you like to know more about what's hot in the span of Enterprise Risk Management (ERM)? Are you very interested in networking with other risk management professionals? Then stay tuned for further announcements as the Risk Management Section rolls out its program of regional meetings in a number of cities across North America! ♦



Photo taken at the regional meeting (Toronto)

Left to Right: Gaurav Upadhyaya, Julia Wirch, Mike Stramaglia (speaker), Ron Harasym, Ken Seng Tan.



Ron Harasym, FSA, FCIA, is chief risk officer with AEGON Canada, Inc. in Toronto, Ontario. He can be reached at ron.harasym@aegoncanada.ca.

Articles Needed for *Risk Management*

Your help and participation is needed and welcomed. All articles will include a byline to give you full credit for your effort. If you would like to submit an article, please contact Ken Seng Tan, editor, at kstan@uwaterloo.ca or Ron Harasym, co-editor, at ron.harasym@aegoncanada.com.

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Preferred Format

In order to efficiently handle articles, please use the following format when submitting articles:

Please e-mail your articles as attachments in either MS Word (.doc) or Simple Text (.txt) files. We are able to convert most PC-compatible software packages. Headlines are typed upper and lower case. Please use a 10-point Times New Roman font for the body text. Carriage returns are put in only at the end of paragraphs. The right-hand margin is not justified.

If you must submit articles in another manner, please call Joe Adduci, (847) 706-3548, at the Society of Actuaries for help.

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Thank you for your help.

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