



RISK MANAGEMENT SECTION

"A KNOWLEDGE COMMUNITY FOR THE SOCIETY OF ACTUARIES"

Risk *Management*

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Actuaries

The Best-Kept Secret in Business™

Volunteerism and the Risk Management Section

by Frank Sabatini

It's hard to believe that when this article is published it will have been almost a year since I assumed the role of Risk Management Section chair. My how time flies when you're having fun!

Fun is exactly what I had. It takes courage (maybe the word courage is a bit strong) and a passion for the cause to volunteer to take on another job when you have a least two others already.

I raised my hand when I was asked to join the Risk Management Section Council and again when asked to become the chair. It has been a great experience. As I look back on my two years on the council, I feel like the section has accomplished a great deal and we're now poised to take off on Starship ERM.

So what have I learned during the two fun-filled years as a member of the Risk Management Section Council?

Well, first and foremost, I've learned that volunteering can be extremely rewarding and gratifying. This isn't new for me because I've raised my hand to help before, both as an SOA member and in my personal life. But every time I look back, the sense of accomplishment and gratification is the one thing I focus on.

I've also had the opportunity to spend time with others who feel just as passionately as I do about the subject of risk management. I've learned from these exchanges and developed and strengthened relationships I would not have otherwise done.

At the same time I've learned that you can find time to make your contribution even though you don't think you have the time in the first place. And more importantly, none of my other commitments suffered as a result. I can't say it was

easy, but I found the time. The contributions I made tend to leverage my skills and knowledge on the more important things I was interested in doing, making it somewhat easier for me to do. Plus, I was never alone in my efforts having help from other section council members and a very special person at the SOA, Cheryl Krueger.

One of the things that I learned during my two years on the council is that the number of initiatives that the Risk Management Section did undertake is almost unlimited. Our business plan (located on the SOA Web site at www.soa.org) only begins to enumerate the activities. Our council discussions constantly uncovered new ideas that needed to be prioritized. (The realization is that we can never have enough volunteers.) I guess that's the consequence of having an interest in a *hot* and reinvigorated topic. I mention the reinvigorated comment on purpose because we know that we've been doing risk management for years. I'll admit the universe of risk topics has changed and expanded and the environment is pro-risk management.

We could keep hundreds of people busy helping Fred Tavan and Bev Margolian, who lead our research team, conduct a variety of research projects. During the past year, we've adopted a research model designed by Tavan and we're in the process of implementing it. The number of individuals assisting us is impressive. Yet, we have a list of priorities but only because of limited resources, even when our reliance on academic resources is factored in.

Doug Brooks and Dave Ingram, who lead our Marketplace Relevance and Professional Community Teams, are spending time trying to reach out to our external constituents. As you know, we've co-sponsored industry seminars and have continued to develop relationships with other risk management organizations: GARP and PRMIA. We've even recently agreed to co-sponsor an international risk conference to be held in Europe in December 2005. The notion of a risk index is even being tossed around



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in conjunction with others at the SOA and Brooks is leading our effort there. As actuaries, what is one of the unique qualities that we bring to the discipline of risk management? We have a working *value proposition*—an answer that has been championed by Ingram.

Hubert Mueller has led our continuing education team. The results of his efforts are most visible to the membership in the sheer number of sessions at each of the SOA's recent meetings. These sessions have been topical and focused on our development as risk management professionals. I know Mueller would love to have more help in designing and implementing our continuing education initiatives. Here's a case where literally more team members means more education programs.

The section also has plans for Webcasts and specialized seminars. One seminar idea currently in the planning phase focuses on helping risk management actuaries develop the softer skills of presenting risk information to non-technical audiences, effectively communicating across the organization and gaining support for risk initiatives within the organization.

Our newsletter has been a tremendous success. Thanks go to Ken Seng Tan and Dorothy Andrews, who has assisted Ken, for helping us

find topics, authors and for putting together an outstanding newsletter three times a year. They can use help in the publication process and we will always welcome article ideas.

We've also surveyed our membership (as I write this the results are not in yet) and we're hoping that the survey will help shape the section's activities over the coming year. Hopefully, many of you have already volunteered to help reach our objectives.

During the past year we have welcomed the Casualty Actuarial Society as section co-sponsors. During the coming year we hope to leverage their knowledge and membership.

So, what's my message as I pass the baton to David Ingram? It's pretty simple. We can use your help. Each of you is a member of the section for many reasons but almost universally because of your interest in the subject of enterprise risk management. The commitment we ask is not overwhelming. Plus, you too can have fun and realize that you've contributed to the advancement of your chosen profession.

So join us for our Starship ERM ride. It'll be fun. ♦

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U.S. Tax Reserves for Life Insurers Book Signing at Annual Meeting

Never before has there been such a comprehensive, updated document on life and health insurance tax reserves ...until now! *U.S. Tax Reserves for Life Insurers* is authored by SOA President-Elect Edward L. Robbins and Richard N. Bush, both experts in their fields. This new, innovative textbook provides authoritative guidance and mathematical approaches to calculating both statutory and tax reserves for all major product lines written by life insurance companies.

The text provides an introduction to statutory and tax reserve planning and includes a detailed discussion of the pertinent parts of the authoritative guidance, including extensive references to specific cases and rulings.

An added bonus! Also included, at no extra charge, is an interactive, Web-based feature that provides book buyers with access to the original Excel files used for most of the tables within the text ... an excellent way for readers to comprehend the more complex mathematical calculations and concepts discussed in the book.

Authors will be on site at the SOA Annual Meeting in NYC. Don't miss this opportunity! ♦

The Risk Management Starship

by David N. Ingram

Editor's Note: In Spring 2005, the boards of the SOA and CAS approved the rededication of the Risk Management Section as a jointly sponsored body. Since that time, CAS members have been encouraged to join the section. In the recent section election, three CAS members ran for Section Council and one (Kevin Dickson) was elected.

Welcome to the new CAS members of the Risk Management Section. Please quickly take your seats so that we can take off.



It is very exciting that we have chosen to fly together. But where are we going, you ask? This starship is headed directly into the future—nonstop to the future of risk and risk management.

But, you say that we actuaries have always dealt with risk and risk management; it is our past. Well, right you are, but while we have been

doing that, the world has been changing around us. The field of risk management has morphed into enterprise risk management (ERM) and expectations of investors, managers, regulators and customers for ERM practices have gone through the roof.

Both those sky-high expectations and the talented competition have caused us to pause and look around for friends before embarking. And somehow we found that our fellow actuaries were also starting on the same trip. But now we have to immediately get to work. There is no time to lose. There are a number of other starships going in the same direction. Some took off quite a while ago. When we land, we need to hit the ground running—knowing where we are going and how we are going to get there.

So during this flight, there will be no movies—we need to get to work. My suggestion is that we need to be ready with two things when we land: a

comprehensive model of risk (CMR) and an understanding of the unique skills, experience and training that each of our branches of actuarial science bring to the risk management table.

The CMR will be our map of where we are going. It's a single framework for looking at any risk including: high frequency, low severity risks; low frequency, high severity risks; market tradable and market hedgeable risks; totally illiquid risks; long-tailed risks and short-tailed risks; risks with inefficiently exercised optionality and completely efficiently exercised options; insurable and uninsurable risks; diversifiable and systematic risk. Notice that I did not say market, credit, hazard (insurance) or operational risks. I did not say workers' compensation, variable annuity, long-term care, property, Florida hurricane, pandemic or any other specific risk label. The specific risks need to fit into the CMR. If there are risks that do not fit into the model, then we need to move to make the model more comprehensive. Because this model, if it is built right, can carry the risk management field into the next century. A good CMR will provide the framework for approaching all existing risks consistently and will help to identify future risks and lead to efficient discovery of the best risk management techniques to fit each combination of risks, opportunities and risk appetites. That model will acknowledge that all types of risk are badly behaved and that they often look different when viewed at different points in time and at different confidence intervals.

Each of our actuarial professions has pursued somewhat different paths to looking at risk and dealing with risk focusing on our own areas of concentration and not the bigger evolving picture. Each of the points of view and the tool sets that we have developed are powerful and they are allowing us to be significant and unique players in the risk management space. But as remarkable as it may seem, few of us know about the strengths and paradigms and tools of the "other half" of our profession. So during this flight, we need to pool our knowledge and our talents. As an actuary trained in life insurance work, I can see that



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the tools that casualty actuaries use to work with incomplete data, to apply credibility theory techniques, to understand and apply numerous different loss distributions and to analyze tail risks would be very useful things to know in any risk management situation. And the direct experience that casualty actuaries can bring to the problem, that is vexing those who are struggling to comply with Basel II requirements to quantifying and managing operational risks, is enviable. Perhaps life actuaries can share our experiences with asset liability management—our hard lessons with financial market risks and our approach to modeling the situations that are described by behavioral economists. Together we can develop a Combined Actuarial Risk Management Toolkit (CARMT) that would become the Swiss Army Knife of risk management.

The actuarial risk manager who disembarks from our risk management starship ride will be powerfully equipped with the CMR map and the CARMT tools. When we land in the future, we will be ready for the risks we encounter there.

As we set out on the flight, I want to pause for a moment to thank those who have helped to arrange the flight. Don Mango, John Kollar, Kevin Dickson, David Ruhm, Shaun Wang, Valentina Isakina, Mike McLaughlin and Harry Panjer, as well as others, were instrumental in this collaboration. They dared to suggest to each of our organizations that we actually need each other to succeed on this journey.

So as we start the flight, the new leaders of this newly combined Risk Management Section are challenged to make this collaboration work. We will be struggling to form the CMR, starting with undoing the “Tower of Babel” like impact across the financial services industry of our separate terminology of risk and risk management by developing a common language. As the next year progresses, you should see the evidence of our collaboration in this newsletter, in the sessions that we sponsor at the SOA and CAS meetings, especially in the ERM Symposium where 2006 will reflect our fourth year of collaboration. We will be looking to bring together the best of the work done by the CAS ERM Committee and the

SOA Risk Management Task Force and will find ways to develop joint research projects.

To help to accomplish this we have expanded our section council from nine to 12 members, but each of the section members needs to take part in this effort. If each of us makes it our personal goal to expand our risk management horizons by learning something from the “other” actuaries, we will automatically start to see the rewards of this collaboration as we find new and better ways to accomplish the risk-related tasks that are our daily jobs. But do not stop there. Bring your experiences back to the group and share your learnings. The unique combinations of techniques and approaches to problems will certainly be used to build this future CARMT and to develop the CMR.

Think about it. I am excited to be traveling with you. We will talk about it more as the trip progresses. See you in the future. ♦

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The actuarial risk manager who disembarks from our risk management starship ride will be powerfully equipped with the CRM map and the CARMT tools.

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The CAS Working Party on Elicitation and Elucidation of Risk Preferences

by David L. Ruhm



Risk preferences is a topic that is pertinent to enterprise risk management (ERM). In managing risks across an enterprise, risk managers have to make many risk evaluation decisions that are necessarily based on some degree of judgment. Often this involves evaluating tradeoffs between various risks and associated mitigation costs. In order to quantify the seriousness of various potential adverse events, judgments have to be made as to

what constitutes an actionable event, what metrics to use, etc. Risk preferences—decisions about which risks and costs are more or less preferable—drive such judgments, whether they are explicitly expressed as part of the system or implicit in the decisions.

Recently, the Casualty Actuarial Society's Working Party on Elicitation and

Elucidation of Risk Preferences submitted its final report to the CAS, which was published in the Fall 2005 edition of the *CAS Forum*. The report explains the relevance of risk preference elicitation in the context of ERM and provides the actuarial community with an introduction to some pertinent concepts and techniques. A summary of the report's main ideas follows.

Interest in risk management has grown dramatically in recent years for several reasons, some being: Sarbanes-Oxley, high-profile insolvencies, better understanding of the risks that businesses face and better technology to help us model these risks. For example, an asset-liability manager might do extensive simulations that would not have been feasible 10 years ago.

Eliciting management's risk preferences and making them explicit can serve several worthwhile purposes. First, the company can be operated from a coherent risk management policy instead of having isolated, unorganized and

potentially conflicting individual judgments about which risks to avoid and at what costs. Furthermore, risk management strategy is an important element of long-term strategic planning. Documentation of risk management strategy might become more formalized as a requirement in the future. Finally, making acceptable tradeoffs explicit is the first step to ensuring they are consistent, transparent and ultimately implemented in daily decision-making at all levels.

While risk management has meant different things in different environments, a first step for the risk manager is to determine senior management's risk preferences. Although this is a first step, it is not a trivial task. A great deal of work may be required for senior management to reach consensus on the company's risk tolerance.

The working party left aside any direct treatment of where management's risk preferences come from or what should drive them, as well as all aspects of the management-investors relationship. Instead the focus was on the process of developing a rational framework that can be used by managers to link corporate risk preferences and decision-making.

The main steps in developing this rational framework involve:

- Defining "risk" unambiguously
- Determining the risk measures to be used
- Assessing the context of the company and managers
- Ascertaining risk preferences

Risk is one of those concepts that everyone has an idea about and no two ideas agree, which causes considerable confusion in conversations. As a general starting point, corporate risk can be defined as what makes the executive committee uncomfortable.

One potential stumbling block in risk analysis is to begin with risk evaluation without first establishing specific definitions and measures for the various types of risk. The failure to first



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define “risk” and how to measure it can lead to confusion and circular debate about the risk objective. Although it may sound overly simplified, a good initial question for a management team to consider is, “What is risk?”

Identifying corporate goals and considering what can endanger these goals makes it possible to identify specific risks that pertain to these goals. Some common examples are: impairment of surplus, excessive variability of earnings, loss of underwriting discipline or fraud.

The nature of the business will play a large role in answering the question, “What is risk?” For example, it is common among property-casualty (P&C) insurance actuaries to think of risk in terms of the potential *ultimate* loss from a block of business. The metric is often net income in some form (such as GAAP net income or return on equity) and the timeframe is usually ultimate which can range from a year to several decades, depending on the line of business. While most P&C actuaries are probably aware of other risks (such as balance sheet risk) and the significance of annual timeframes, discussions about risk often implicitly assume that risk is defined entirely in terms of ultimate income.

By contrast, many non-P&C actuaries recognize balance sheet exposure as a main risk and over a shorter timeframe, such as one year. Ultimate profitability remains a central goal, but there is also recognition of the need to remain solvent and to maintain strong writing capacity over the long lifetimes of the products. This perspective arises from the nature of non-P&C businesses, specifically: longer product timeframes, high renewal rates which require capacity to be available in the future for renewals and statutory reserve requirements above expected value that utilize capital.

Desirable measures of risk should be objective, transparent and appropriate. An objective measure allows agreement on planning. A transparent risk measure means that it is a measure that is tractable and can be allocated to the components that are driving the risk. An appropriate risk measure is one that matches both the business realities and the culture of the firm. It is important for the risk measures to fit well

with the corporate culture so that they will gain the necessary acceptance. The good news is that this fit can reduce the number and kind of considerations of risk. The bad news is the same: culture can create blindness toward real business risks or over-concern with risks that do not have significant impact on goals. In general, it is more important to have a risk measure that is approximately correct and fully accepted, than a perfect risk measure that is not trusted by the key decision-makers.

Risk preferences describe which tradeoffs management is willing to make. In other words, which combinations of risks are more acceptable than others. For example, in the case of ceded reinsurance, management may be willing to accept lower net profitability or even a higher probability of a losing year in exchange for limiting the very worst cases. Risk measures can be used to quantify risk preferences, so that management’s risk preferences can be stated in risk management policies and implemented more objectively.

Interviewing is the prime method. This should be done with individuals separately and then reconciled in a group. The interviewer needs to keep in mind the pitfalls of interview methods and of the particular corporate culture. Nigel Taylor’s excellent paper, (“Making Actuaries Less Human: Lessons from Behavioural Finance,” (Staple Inn Actuarial Society, 2000) mentions a number of sources of bias in interviews, especially around the framing of questions. These biases come up in all phases of risk analysis. Some of the important effects are:

- Decisions are often made by adjusting from an existing position (anchoring).
- People are risk-averse when facing gain but become risk-seeking when facing losses (prospect theory).
- The frequency with which something is monitored can impact the decision (myopic loss aversion).
- People have a tendency to ignore underlying probability distributions.
- Almost everybody is overconfident.

There are a number of established techniques for surveying and interpreting the results. Several are discussed in the report, including

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the Delphi technique, quality functional deployment and conjoint analysis.

Some of the main behavioral finance results that are pertinent to eliciting and elucidating risk preferences are discussed. Kahneman and Tversky have published many papers that chronicle the surprising results consistently obtained from relatively simple behavioral experiments involving risk and judgment. For example, in one experiment subjects were given a description of a man and told that he was drawn from a group of 70 percent engineers and 30 percent lawyers. The description used generic phrases such as “high ability” and “well liked.” This description was specifically designed to give no information regarding the man’s occupation.

Subjects generally estimated the probability of “engineer” to be 50 percent, even though the correct probability with no additional information is the a priori probability: 70 percent. Subjects also estimated the probability at 50 percent when told that the man was drawn from a group of 30 percent engineers and 70 percent lawyers. The a priori probabilities, which were the most important information, were disregarded in the presence of rich, descriptive details even when those details were statistically neutral.

In the risk management context, this is a human reasoning flaw in the perception of risk. People have trouble incorporating a priori probabilities, which can be the most important factor with qualitative information in estimating probabilities. This could affect management surveys in which the a priori probability of an adverse event is an important aspect of risk exposure.

In conclusion, the report’s intent is to raise awareness of the benefits of formally eliciting risk preferences for a company. This effort can lead to a mutually agreed upon framework for evaluating potential strategies. Introductions to techniques and references are provided to aid interested readers in pursuing the subject further. ♦

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The Chief Risk Officer Forum:

A Framework for Incorporating Diversifications in the Solvency Assessment of Insurers

by John C.R. Hele and Henk van Broekhoven

Preface

The Chief Risk Officer (CRO) Forum comprising of risk officers of the major European insurance companies and financial conglomerates, was formed to address key relevant risk issues. It is a technical group focused on developing and promoting industry best practices in risk management. The membership comprises of the following companies: AEGON NV, Allianz AG, Aviva PLC, AXA Group, Converium, Fortis, Generali, ING Group, Munich RE, Prudential PLC, Swiss RE, Winterthur, Zurich Financial Services. As a technical group representing the leading European insurers, the Chief Risk Officer Forum established a subgroup, under the leadership of John C.R. Hele, ING, and Sue Kean, Aviva, to coordinate the CRO forum responses and input to the new European Union insurance regulatory framework (Solvency II) project on the topics of diversification and group solvency. As a result the paper, "A Framework for Incorporation Diversification in the Solvency Assessment of Insurers," was presented on June 10, 2005. Another study, "Principles for Regulatory Admissibility of Internal Models" was also presented to assist in the development of the Solvency II framework. These projects were supported by Mercer Oliver Wyman and Professor Damir Filipovic of the University of Munich.

This article gives an overview of the CRO Forum diversification paper. Another major study will be highlighted in the next issue.

Introduction

The discussions at the European level for Solvency II have gathered pace in recent months. The European Commission sent out the first request for advice in July 2004, to which the Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS) provided a progress update and plan for subsequent work in October 2004. Since then, the response of CEIOPS to the first wave for advice was published at the end of June 2005, and CEIOPS' Working Groups have started work on

the second and third wave calls for advice and have requested insurance industry input. For the second wave, a draft answer from CEIOPS was also published at the end of June, with comments from external stakeholders to CEIOPS expected to be accepted until the end of September. CEIOPS' final report is due at the end of October 2005. The formal input from CEIOPS to the third wave will be published at the end of February 2006.

The purpose of the paper was to start an informed debate on the issues surrounding the treatment of diversification in the solvency assessment of insurers. Although diversification is the underlying reason for insurance, there is an imbalance in the recognition (or lack thereof) of diversification effects within the solvency regulation. The aim of the paper was to correct the imbalance and to make some initial suggestions regarding how diversification should be treated within a prudential regulatory framework.

Overview of the Paper

The CRO Forum believes that Solvency Capital Requirement (Pillar 1) needs to take account of risk concentrations, risk dependencies and risk diversification, both within and across entities of a group. Although such effects can be difficult to measure, diversification lies at the heart of the principles of insurance, and is a key rationale for the existence of the industry—to bear risks that individual policyholders would be unable or unwilling to bear themselves. The paper makes three key points:

1. Concentration of risk is one of the primary causes of insurer insolvency, and conversely risk diversification plays a critical role in the economics of insurance. There is



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widespread and accepted evidence of diversification benefits, even under stressed scenarios.

2. Although many insurance companies have dramatically improved their risk management capabilities and are now actively managing their risk profile to improve risk diversification, current regulatory approaches for dealing with diversification are inadequate and need to be updated.
3. A set of core principles and policies can form the basis of a framework for the treatment of diversification and group effects within European insurance regulations. This framework is defined to strike a balance between the needs of local regulators and the manner in which multinational groups are managed. It maintains the basis of local regulation—namely that local regulators will analyze local entities in the same way as the subsidiaries of groups. This framework also enables smaller insurers to benefit by giving them full credit for risk transfer arrangements where these are in place, which allows them to benefit from the diversification within others' balance sheets.

The principles and policies cover four main areas:

1. Recognition of diversification within both standardized and internal models.
2. Mandatory lead supervisor for groups with single authorization of internal models.
3. Replacement of current insurance groups directive with separate explicit risk-based group solvency test.
4. Admissibility of risk transfer, whether intra-group or outside the group, and formalized capital support.

Within each of these areas, the roles and responsibilities of groups, solo entities and regulators, appropriate disclosure standards and additional risk modeling requirements are described in more detail in the paper.

Six Guiding Principles

For the purposes of distinguishing between the approaches adopted by different regulators and rating agencies, the CRO Forum has classified diversification benefits into four distinct categories:

- Level 1 – Within risk types
- Level 2 – Across risk types
- Level 3 – Across entities, within a given geography
- Level 4 – Across geographies or jurisdictions

With these categories in mind, the CRO Forum proposed the first principle:

Principle 1

Risk diversification is a critical component of successful risk management for insurance companies; conversely, risk concentration is one of the major drivers of insurance company default. Furthermore, diversification effects (at the proposed levels 1-4) are uniquely determined by a company's portfolio mix and legal entity structure. Consequently, incorporation of the effects of risk diversification into solvency frameworks is critical for the purpose of rewarding strong risk management and discouraging risk concentration.

In the paper a set of four key areas were presented for the development of a new capital adequacy framework:

- The need for a robust measurement framework.
- The need for demonstrable links between measurement and management.
- The need of recognition of capital mobility and risk transfer.
- The need for a balance between local and group capital requirements and a revised group solvency test.

In recognition of these important conditions that define the extent to which insurers are able to understand and demonstrate the impact of diversifying strategies and to use them to manage their portfolio of risk, the CRO Forum put forth the second principle:

Principle 2

Diversification effects must be recognized when risk factors, their dependencies and the company's exposure to them are:

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Risk diversification is a critical component of successful risk management for insurance companies; conversely, risk concentration is one of the major drivers of insurance company default.

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- *Identifiable*
- *Supported by empirical, technical, scientific or expert opinion of causal linkages*
- *An active consideration in business decision-making*
- *And, where capital / risk mobility does not impose barriers to diversification being realizable*

The next chapter of the paper discusses the capital mobility and risk transfer, particularly in a group. An important position with respect to diversification effects within a group is the following:

“In case diversification benefits arise across multiple entities within the same group, consideration also needs to be given to the extent to which capital can move between the different entities. Consideration of the extent to which capital is truly mobile within a group is critically important to understanding group solvency.”

In the view of CRO Forum, the criteria used to assess internal risk transfer should be no different from the criteria used to assess external risk transfer, and identical credit in terms of capital relief should be given for identical quantum of risk transferred. This leads to the third principle:

Principle 3

For the purpose of recognizing diversification effects, capital mobility and risk transfer should be recognized if financial resources are available to back policyholder and other creditors' claims:

- *With sufficient economic value.*
- *As they fall due.*

The next part of the paper is about the balance between local and group capital requirements. At a solo level, in theory any individual legal entity can benefit from the wider diversification benefits that come from belonging to a group.

Achieving a consistency between the solo and group test requires a practical consideration of where and how the benefits arise. The CRO Forum believes that each of these levels should be incorporated in any solo test.

For the group test it is a combination of portfolios of risk across the constituent parts of the group that defines the overall risk profile. Those effects are arising within risk types (Level 1), across risk types (Level 2), across entities (Level 3) and across regulatory jurisdictions (Level 4) and impacts the group risk profile. Each of these should be recognized in the group test.

CRO Forum's perspective proposal is based on this the following principles:

Principle 4

Capital requirements at the solo entity level should reflect:

- *The diversification within that local entity, recognizing formalized risk transfer and capital support.*
- *The formalized support, where present, provided by transferability of capital between a group and the local entity, taking into account the credit risk of the group.*

Principle 5

Capital requirements for an insurance group must be assessed separately from those of the individual entities within the group, using models to explicitly reflect:

- *The diversification effects specific to that group, taking any constraints to capital mobility into account.*
- *The capital implications of both group legal structure and any intra-group agreements.*

It is seen as very important that the necessary balance involves coordination between solo and group supervision. In Europe, the concept of co-operation between member states is already well established in the Insurance Groups Directive and further supported by CEIOPS in the Helsinki protocol.

The CRO Forum believed that a strengthening of the existing approach is needed and thus requires the appointment of a lead supervisor. It is imperative for Solvency II that the role of the lead supervisor becomes a mandatory feature of the supervision of groups, rather than elective.

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Risk management is not seen as a separate and distinct process, but a natural part of all our business and operational processes.

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The Chief Risk Officer Forum...

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This leads to the next principle:

Principle 6

Coordination between supervisors of local entities and groups is essential to ensure an efficient, competitive European insurance market.

It is essential that for each group, there is a mandatory lead supervisor who understands the aggregate risk profile for the group, facilitates coordination across individual supervisors, ensures that it runs smoothly and has the ability to take decisions when a consensus among supervisors is not forthcoming.

In the following part of the paper, the CRO Forum recommended policies for incorporating diversification effects in solvency regulation. These policies included:

- Policy 1a – Recognition of diversification in required capital calculations.
- Policy 1b – Recognition of risk transfer in required capital calculations.
- Policy 1c – Recognition of capital support in available financial resources assessment.
- Policy 2a – Recognition of diversification in required capital calculations.
- Policy 2b – Recognition of risk transfer in required capital calculations.
- Policy 2c – Recognition of capital support in available financial resources assessment.
- Policy 3 – Risk modeling requirements
- Policy 4 – Supervision

The Way Forward

In the paper the CRO Forum has highlighted the importance of diversifying strategies for risk management in the insurance industry. They have also presented a set of core principles to form the basis of European insurance regulation that incorporates diversification in a consistent manner and a policy framework that promotes sound risk measurement and management practices, in a way that can be implemented and supervised with confidence.

The CRO Forum recognizes that the evolution of the Solvency II project is still at a relatively early stage and there is a wide range of issues that could affect its future evolution. However, the

CRO Forum strongly believes that the Solvency II project represents an important opportunity to build a forward-thinking insurance regulatory system, fostering the most sophisticated risk management practices leading to the strongest and most efficient insurance companies worldwide. Such a system would align regulatory capital requirements with the risk profile of the insurer. Recognition of diversification in a consistent, transparent way, is an important step in this process. The CRO Forum welcomes and encourages an open dialogue on this important topic.

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“

...the CRO Forum strongly believes that the Solvency II project represents an important opportunity to build a forward-thinking insurance regulatory system...

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Concurrent Simulation to Explain Reinsurance Market Price Dynamics

by Jens Alkemper and Donald F. Mango

Introduction

The property-casualty (P&C) reinsurance market, with fewer than 10 major players, is characterized by almost no product differentiation: production decisions are based on estimated product costs and prices, both of which are observed after significant time lags; there are low barriers to entry and established competitors are volume-constrained due to prior business. An agent-based model (ABM) is employed to provide insights into the dynamics of this market. The agent will be a reinsurer competing in a simplified market with other reinsurers. The simplifications allow tractability while preserving enough fundamental aspects of the market to make conclusions meaningful.

Each reinsurer will have the following key components: a book of business (with premiums and claims), a portfolio or collection of books of business, the aging of books (requiring establishment of reserves), required capital being generated by the books acting as a constraint on capacity for new business and a strategy for deciding how much capacity to offer each year. The interaction effect is introduced through a market demand curve that translates aggregate capacity offered into price.

Even with these simplifications, the market shows instability leading to price cycles. This suggests: (1) instability is at least in part a function of strategic interaction effects, and (2) the relaxation of the simplified assumptions is not likely to reduce or eliminate the cyclical nature.

Market Structure

Marketplace behavior has been extensively studied in monopolies, oligopolies and commodity markets. However, markets with three to 10 competitors are difficult to study from a theoretical sense. There are several reasons for this:

1. *Each participant influences the market significantly but none controls it.* Thus, we have a number of two-way interactions to consider. In a monopoly situation the single market participant controls the market and in a commodity market the participant has

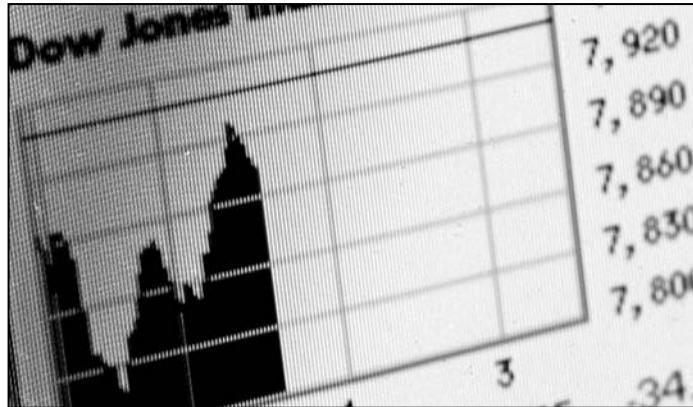
no influence on the market and dependencies are unidirectional.

2. *The feedback loop is not as strong as for two-player markets.* Any action a single participant takes affects a number of other participants. Retaliation for unwanted behavior is thus diluted and stable situations based on the fear of retaliation are fragile.
3. *Price wars are more likely.* This is due to the weak feedback loop and the number of actors. The more parties are involved, the higher is the chance that one tries to get away with a price cut. The other possibility to start a price war is the pure chance of a misinterpretation of some action.
4. A Nash equilibrium might exist, but is hard to obtain in reality. Besides the different issues listed above, there are always egos involved and varying goals.

The P&C reinsurance market, with fewer than 10 major players, falls into this category. In order to study this market we use a simulation based on only three market participants that replicates the key features of this marketplace. Some of these features are:

- Almost no product differentiation;
- “Production” (i.e., capacity) decisions made based on estimated product costs and prices, both of which are observed later;
- Low barriers to entry;
- Established competitors being volume-constrained due to prior business.

The reinsurance market has a well-known price cycle (See Figure 1 on page 14, Meier and Outreville 2003). The first question we wanted to answer using simulation was: “Can we



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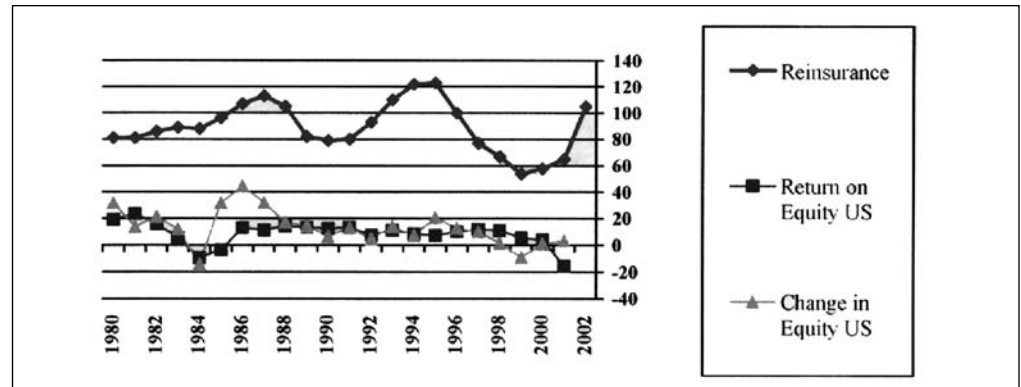
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Concurrent
Simulation...

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Figure 1: Reinsurance Price Index and Equity

(Source: Swiss Re, 2002)



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Each reinsurer agent is modeled following a fairly simple strategy of always trying to maximize its market share given its financial constraints.

”

replicate this price cycle using just basic assumptions?” We decided to construct a simplified reinsurance market, with core dynamics sufficiently realistic to ensure meaningful learning. The characteristics we chose to model are listed below:

- Single product type with known expected cost;
- Single, known claims payment timing pattern;
- Underwriting capacity measured, and pricing determined, as a function of underlying exposure units.

In many respects, one could consider this to be an idealized reinsurance market. Actual markets deviate most acutely with respect to the expected costs and the exposure units. Costs are extremely difficult to accurately forecast. Moreover, these costs emerge over time, many years after the reinsurance sale is completed. Underwriting capacity is typically estimated using proxies for exposures—either premiums (the product of exposure units and rate per exposure unit) or reserves (the product of exposure units and estimated ultimate claim cost per exposure unit).

Agent-Based Modeling of A
Reinsurer

An ABM is employed to provide insights into the dynamics of this market. Each reinsurer agent is modeled following a fairly simple strategy of always trying to maximize its market

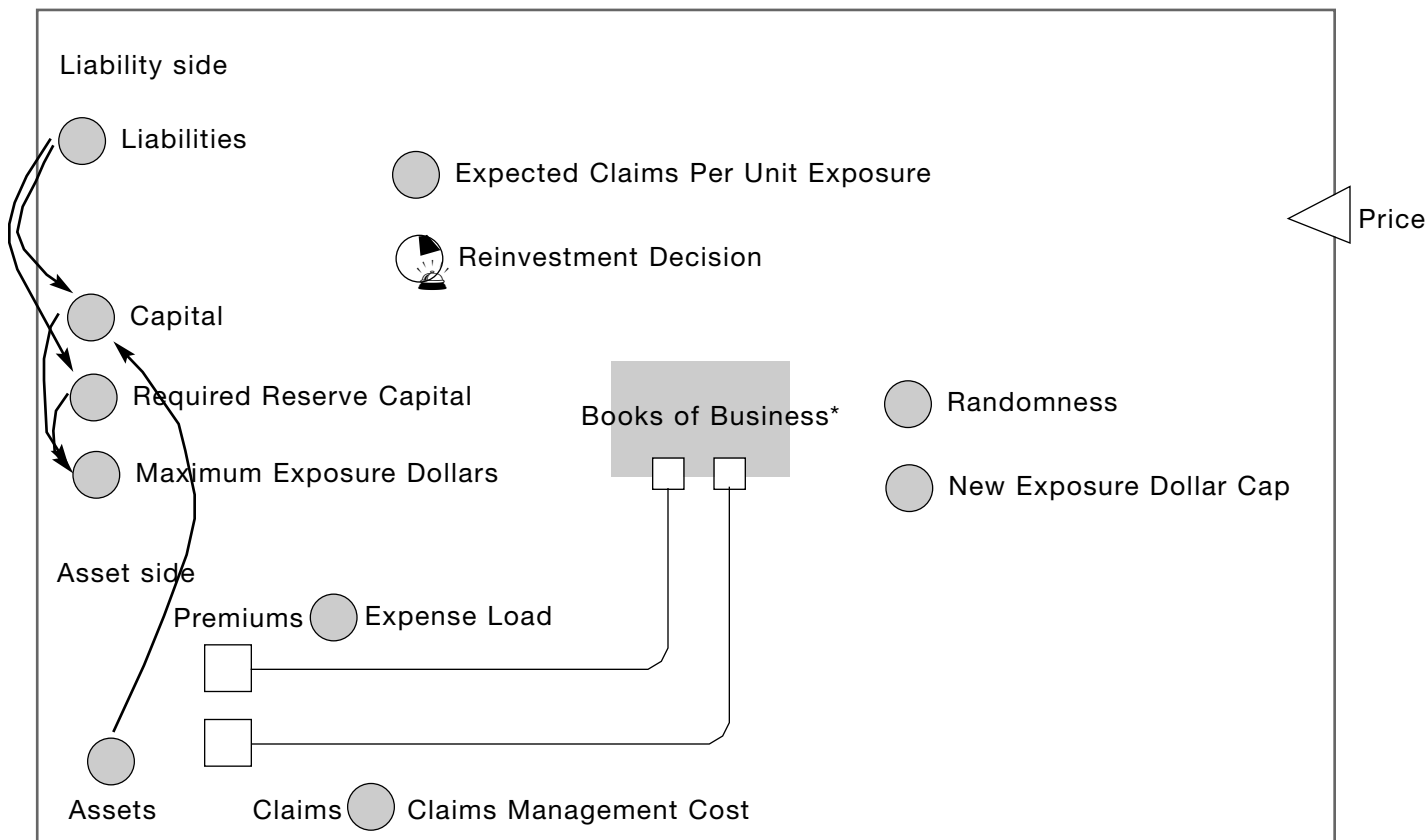
share given its financial constraints. The model is constructed using three reinsurers without any new entrants into the market.

The structure will be built up as follows:

- Reinsurance is underwritten into a *book of business*. Each *book of business* becomes an isolated object that is part of a reinsurer, and that communicates with the *reinsurer* object through ports—fixed points that receive the claims and the premiums generated by the individual *books of business*.
- Each book collects premiums and generates claims. As it is written, the following variables are established: number of exposure units (i.e., capacity underwritten), price per exposure unit and expected claims (loss costs) per exposure unit.
- Premium (revenue) = exposures * price per exposure unit.
- Total ultimate loss payments = exposures * claims per exposure unit.
- As the book ages, it establishes a *reserve liability*—a provision for the remaining claim payments. It is equal to the total ultimate loss payments minus the cumulative amount of loss payments to date.
- The model considers only a single type of *book of business* as characterized by the cash flows: all premiums are received in year one, while all claims payments are stretched equally over four years.
- The price depends on the market conditions, but the break-even price is

Business

Figure 2



fixed at \$400 per policy, the expected loss cost.

- A reinsurer (the business) holds a collection of *Books of Business*, known as a portfolio.
- A reinsurer is a financial entity with assets and liabilities. The liabilities are the sum of the reserve liabilities for the books in the portfolio.
- The assets increase for premium, and decrease for expenses and claims payments.
- The difference between assets and liabilities is the capital.

Figure 2 shows the major elements of the reinsurer agent.

Capital gives the reinsurer underwriting capacity—the ability to take on units of exposure. The constraint on underwriting is *required capital*, which is implemented here as factors multiplied by exposures. The reinsurer can only underwrite exposure units until its *capital adequacy ratio (CAR)*—actual capital divided by required capital—hits some constraint value

(e.g., 200 percent). Typically, the constraint is a function of the reinsurer’s desired counterparty rating as given by one of the rating agencies (e.g., Standard & Poor’s, A.M. Best).

Simplified Reinsurance Market

Once a year each reinsurer will be asked for its *offered capacity* (expressed in exposure units = number of policies), in what is known as the reinvestment decision. We assume only one product type is available, with a known expected loss cost of \$400 per exposure unit. The model assumes that each of the three reinsurers bids the maximum exposure units allowed subject to its maximum CAR. The bidding is simultaneous and blind—each reinsurer knows only its own bid. The resulting market price is a function of the aggregate capacity offered by all three agents combined, and is revealed after the bids are submitted. A simple demand curve (see Figure 3, p. 16) is used to determine this market price.

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Concurrent Simulation...

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During the initialization phase, each reinsurer is given some assets and a starting *book of business*. However, these are not in equilibrium. We allowed 60 cycles of ramp-up for the market to reach a quasi-stable state, characterized for each reinsurer by:

- Assets ~\$190 million;
- Liabilities ~\$100 million; and
- Capital ~\$90 million.

At period 60, we introduce a *catastrophe* that wipes out approximately 20 percent of the capital of each reinsurer. We observe what happens to the prices over the next 20 years (see Figure 4). As one can see, the prices show a dramatic price cycle with a cycle time of approximately five years. The cycle time does not seem to depend on the time period over which claims are paid out (and liabilities exist) for a given *book of business*, nor the shape of the demand curve. Instead, it is a function of other model construction parameters. The demand curve slope around the \$400 (break-even cost) price influences the degree of damping observed. By modifying the demand curve, one can create scenarios in which price fluctuations escalate over time or are dampened out. The critical insight: even with many simplifying assumptions (e.g., known expected loss cost), the interaction effects of the strategies themselves introduce cyclical market behavior. One could speculate

that the relaxation of the simplifying assumptions would in all likelihood not act to dampen or reduce the cyclicity.

Making The Simulation Interactive

The first generation simulation featured only simplified capacity usage strategies for each reinsurer. In a second generation of the simulation we wanted to introduce more complex strategies. Two possible paths are: (1) to design and implement complex strategies into the reinsurer agents themselves (one could even use learning reinsurers) or (2) to have people take the role of the reinsurers. In order to encode strategies into an agent, the mechanics must be well understood by industry experts who can dictate formulaic rules to a programmer. This was not the case. In fact, one ancillary use of this model would be to teach reinsurer management teams about the impact of various capacity deployment strategies. So the second option was the only realistic one available to us.

We therefore developed an interface that presents, once per time period, the relevant reinsurer financial information and price history to each player. The players review the presented information, then make and submit volume decisions blind to each other. Once all decisions are submitted, the price is calculated and revealed, and the new *books of business* are created for each reinsurer. The model progresses one cycle (one year), then the players are presented

Figure 3

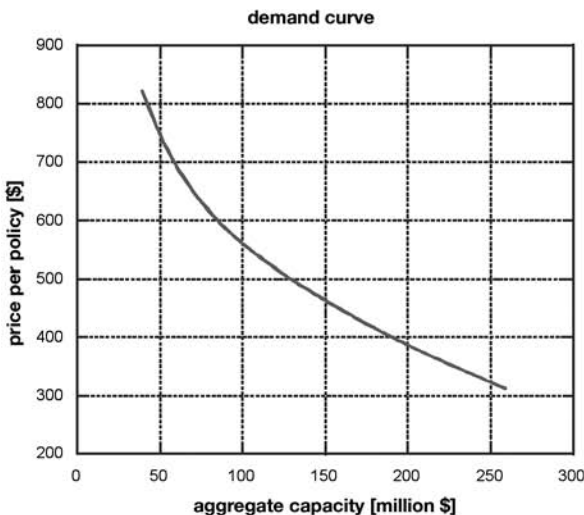


Figure 4

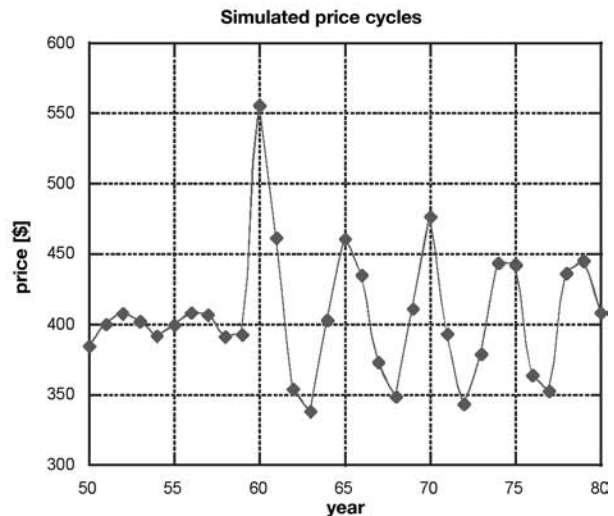


Figure 5

with the new information to review and decide on, and so on. This tool was found extremely helpful in communicating the market dynamics and decision implications to decision makers.

In the next generation, the tool was taken a step further to create more realistic scenarios (see Figure 5):

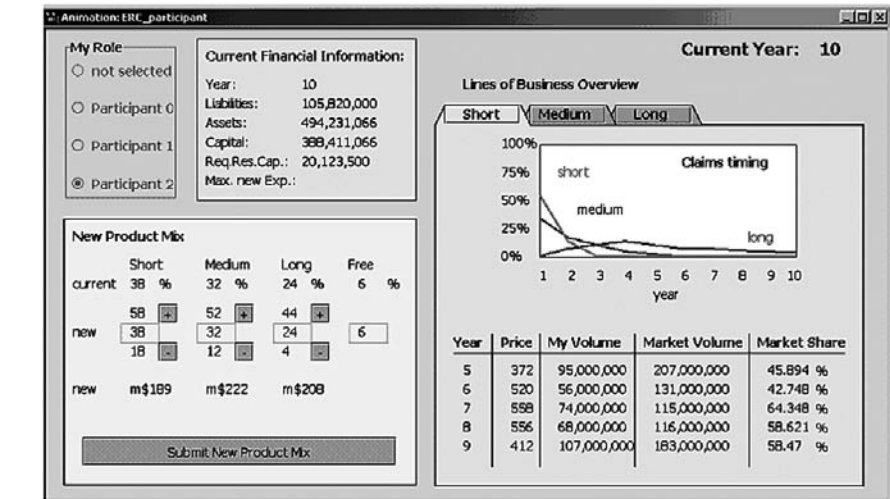
- Three types of products (known as “lines of business”) were introduced, with varying claims payment profiles. These can be seen on the right side of the input screen, referred to as Short, Medium and Long (as in time horizon to complete claims payments).
- Each player is given the choice to allocate capacity among the three different lines in hopes of maximizing profit from capacity usage.
- Changes from period to period to the percentage allocation devoted to one line of business are constrained to be no greater than +/- 20 percent. This is a realism constraint reflecting the market reality that your “mix of business”—the percentage composition of your portfolio over all available product lines—cannot change too dramatically period to period.

These changes increased the realism of the model, yet introduced additional moving parts that substantially increased the complexity of the dynamics. The clarity of the feedback, and therefore the learning opportunities for the target audience, were reduced. This clearly demonstrates the trade-off, particularly in ABM, between realism and comprehensibility.

Conclusions and Areas for Further Research

A model of the reinsurance market with three reinsurers was developed. Despite the simplifying assumptions made, the model exhibited a price cycle behavior similar to the one observed in the real marketplace. It is thereby concluded that the real world price cycles are due in part to the mechanics of the market place and the interaction of participant strategies. A parallel conclusion was indicated by the work of Farmer and Joshi (2002) using a simplified capital market.

Although we set up the model to dampen out price fluctuations over time and employed a “catastrophe” to trigger price swings that we could then observe, the actual trigger that starts the



price fluctuations doesn't seem to matter. The key learning is that the market itself is not stable against any trigger.

In an attempt to bring these learnings to the decision makers, the simulation was modified to include more real-world complexities. We also allowed the decision makers to interact using the simulation with their peers in a virtual fast paced environment where a business year can be reduced to seconds.

For immediate next steps, we do not see tremendous benefit in adding more complexities to the model. While it may give more apparent accuracy and realism, it will provide only limited further insight, and may actually confuse the situation by muddying the signal. However, automated strategy development and strategy robustness testing using the tool are likely fruitful avenues. By playing multiple scenarios with varying parameters and counter-strategies, strategy robustness can be assessed. ♦

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- Meier, U.B., and J.B. Outreville. 2003. The Reinsurance Price and the Insurance Cycle. Presented at 30th Seminar of the European Group of Risk and Insurance Economists (EGRIE), Zurich, September 15-17. Online at www.huebn-ergeneva.org/documents/Meier3.pdf.

Skills for Risk Management

by H. Felix Kloman

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I've argued for some years that there is no one skill set that qualifies a person for risk management responsibilities. Much depends on the nature of a particular organization and on the specific risks that loom large on its horizon. An energy company needs someone versed in energy trading. A financial institution manager must understand credit and market risk analyses and derivatives. In the public policy arena, decisions on risk issues require the most sensitive forms of communication with various interest groups. In agriculture, weather is the dominant risk. For an insurance company, the knowledge of an actuary may position that person for CRO responsibilities. Even these specialized skills are secondary to more qualitative capabilities such as judgment, integrity, intuition and experience.

Yet many major associations and societies continue to champion their particular members as "uniquely" qualified to take the mantle of risk management. It just isn't so! As John Roberts, the risk manager of BC Ferries, in Vancouver, Canada wrote recently to me, "ERM is too broad to belong to any one discipline." He added, "Enough of this turf war!" Roberts is right. What provoked both of us was a recent article by Lawrence Quinn, "The New Gospel: Actuaries and Risk Management," (*Contingencies*, May/June 2005) where he cited the arguments by some in the actuarial profession that they are best suited to lead ERM. I know many actuaries and some of them could easily serve as a CRO, not only for an insurance company, where most are employed, but for other financial and non-financial organizations.

But actuaries must overcome three limitations. The first is the public view of their work and experience. The old adage that an actuary drives a car down the road by looking through the rearview mirror has more validity than many imagine. Yes, the past often replicates itself, but real "risk," the chance of something unexpected occurring, is seldom susceptible to rearview analysis. The public, perhaps unfairly, pigeon-holes actuaries in the role of cruncher of old numbers. Can they overcome this view?

Their second limitation is an over-emphasis on quantifying everything. This leads inevitably to

the fallacy of: "If it can't be measured, it can't be managed!" Many of the most important operational and reputational risks lack a credible database, even using global rather than organizational records. That makes them less susceptible to quantitative modeling. Quinn cites Dr. Shaun Wang, Georgia State University, on this point: "As I got involved in the ERM process, I learned that analytical skills are one thing; understanding the businesses—the local culture and dynamics—is quite another."

And third, as actuaries are required to spend an inordinate amount of time studying mathematics, many lack critically important communication skills so essential to modern risk management.

All of these potential actuarial shortcomings of actuaries can be corrected. I, for one, welcome the fresh interest in ERM shown by the Society of Actuaries and the Casualty Actuarial Society. I attended their last two ERM conferences in Chicago (see RMR June 2004 and June 2005), two of the best in my recent experience. Their contributions will enlarge our understanding of risk but, at the same time, I trust their leaders will be listening as acutely to the representatives of the other risk management disciplines. These sub-disciplines are not "threats" to one another but rather part of a new dynamic and inclusive approach.

I sum up this comment with a quote from another reader, Chris Duncan, Marsh in Atlanta, who wrote me recently: "As a (former) risk manager and CRO, I always described myself as the 'world's worst risk manager' as I viewed it as my job to find a way to say 'yes' and help my companies take intelligent risks, not say 'no' to any and all risks. In general, I've found that the people drawn to the risk management profession are pre-disposed to be risk adverse, and trained to exaggerate that trait professionally, which impacts the function's credibility with senior leaders whose job is to move forward. Progress is only made when people (companies, governments and societies) look uncertainty in the eye, do what they can to mitigate what they must, and step out anyway."

Duncan's comments mesh with the keynote of the SOA ERM effort: "Turn Risk into Opportunity." After all, risk is opportunity! ♦



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Research Team Issues New Requests For Proposals

Subject: Linking Risk Management, Capital Management and Financial Management

by Steven Siegel, SOA Research Actuary

Recently, the Risk Management Section formed the Joint CAS/SOA Risk Management Research Team. The team's mission is to develop and produce innovative research in risk management and to showcase actuaries as leading experts in this area. With this in mind, the team set to work this summer on developing and refining several research ideas. In addition, as part of its recognition of the critical importance of risk management for actuaries, the SOA earlier this year decided to dedicate a significant portion of its annual research project budget towards supporting risk management efforts. Undoubtedly, the formation of a dedicated research team backed by significant funding resources will lead to an even greater level of visibility and recognition for actuaries in risk management.

The research team, chaired by Fred Tavan, engaged in several brainstorming sessions this summer to distill and formalize a number of ideas that had been proposed by the Risk Management Section Council. As a result of these sessions, two formal Request for Proposals (RFP's) were drafted and finalized. The two RFP's were posted on the SOA web site at the end of September and have been publicized in several different venues.

The first request for proposals starts with the premise that in order to be premier risk management professionals, actuaries need to understand how to speak the language. Risk

management terminology can vary significantly both across industries and worldwide. At the same time, the benefits of enhanced communication can directly lead to more competitive companies and improved financial results. Consequently, this RFP seeks researchers to create a guide that would detail the differences in risk management terminology among insurance and other major industries. The ultimate deliverable would be a report that defines commonly used concepts and terms noting commonality and distinctions by industry. The goal of the project would be to have the end user of the report be able to confidently communicate with Risk Management peers from other industries.

In a similar vein, the RFP is also interested in proposals that would summarize, at a high-level, existing risk models expected to have cross-industry interest. Information would be collected on the major model characteristics, data used, methodologies, etc. and summarized in a report. Expected future model developments would also be noted. This RFP could be found on the SOA web site at:

<http://www.soa.org/ccm/content/areas-of-practice/finance/research/rfp-risk-man-term-and-models/>



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Request for Proposal Linking Risk Management...

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The second request for proposals explores the linkage between Risk Management, Capital Management and Financial Management. Clearly, these three activities are vital responsibilities for insurance companies. But, how do these activities connect with one another? Furthermore, what processes or infrastructure should be put into place to ensure proper coordination of these activities and that they are efficiently leveraged and utilized by companies? An examination of these questions with specific focus on (1) Measurement/Metrics (2) Common Definitions between the Activities and (3) Global Regulatory Action/Rating Agencies interests is the objective of this RFP. Existing literature that has explored these questions would be reviewed and analyzed leading to a guideline for how to optimize this linkage. The complete RFP can be found on the SOA website at:

<http://www.soa.org/ccm/content/areas-of-practice/finance/research/linking-risk-man-cap-man-and-fin-man/>

Both RFPs are intended to result in short term projects with expected timeframes of six to nine months. So stay tuned!

In the meantime, if you have any questions on these RFPs or other ideas for research, feel free to contact me at ssiegel@soa.org. ♦

Hedging Variable Annuity Guarantees With Long-Dated Equity Derivatives

by Mark Evans, Roma Jakiwczyk, Michelle D. Smith and Edward Wilson

Introduction

Competition for space in distribution channels has resulted in a proliferation of exotic options embedded in variable annuity (VA) products. This comes at a time when there is enhanced focus on risk management capabilities from external constituencies such as rating agencies and equity analysts, and internal constituencies such as senior executives and boards.

Meanwhile, the accounting and regulatory framework governing quarterly reporting to shareholders and reporting to regulators for solvency purposes continues to evolve. The NAIC looks set to pass the new risk-based capital (RBC) rules for VA guarantees (known as C-3 Phase II) effective for this year-end 2005, and is in the process of revising statutory reserving rules. In addition, interpretations of GAAP accounting rules for embedded guarantees continue to evolve as new product features are developed, and as capital markets for various hedging instruments become more liquid so as to increase the reliability of data available for GAAP mark-to-market calculations. This changing GAAP and regulatory environment has increased the focus on the need to manage capital efficiently and on certain drivers of GAAP earnings volatility.

Given these developments, insurers have added incentive to find more efficient ways to transfer their VA guarantee risks into the capital markets. “Best in class” insurance companies at the forefront of risk management have begun to approach hedging as an integral part of competing in a crowded marketplace by:

- Incorporating hedging strategy design into the product development and pricing process, to ensure that rider charges adequately cover hedging costs.
- Actively managing in-force blocks to reduce risk accumulations and to free up capital for future business.

In response to the demand driven by these developments, derivatives markets are offering a wider range of solutions to support insurance

company risk management efforts. The evolution of a relatively liquid long-dated derivatives market has changed the risk management toolkit available to insurance companies. This will enhance insurers’ capabilities to manage their risk and capital efficiently and to comfortably grow their books of business and innovate product design. The rapidly growing long-dated derivatives market and the implications for insurers are the focus of this article.

Putting the Spotlight on Vega Risk

VA policies with living and/or death benefit riders include long-term options sold to policyholders for a rider fee. The value of these options is a function of (among other factors) equity market volatility, interest rates, rate volatility, policyholder behavior and some fixed time period or expected lifespan.

Prior to the bursting of the tech bubble in 2000, many VA riders were priced using assumptions very different from those used in the derivatives markets. In particular, equity scenarios often assumed an equity risk premium in the mean returns—based on historic equity market performance—and this resulted in rider fees considerably lower than those charged today for similar riders. Following the bursting of the bubble and the subsequent withdrawal of reinsurance capacity, hedging using capital markets instruments took over as the primary risk transfer mechanism for VA writers. Hand-in-hand with this development went a change in certain VA rider pricing practices to become consistent with those used in the derivatives markets in which companies were purchasing hedging instruments. Most notably, companies



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Hedging Variable Annuity Guarantees...

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started using risk-neutral scenario sets with no equity risk premium.

However, some common pricing practices still incorporate a hybrid of market-consistent and historical market performance assumptions. One example of this is the term structure of equity market volatilities (i.e., the assumed width of the projected market distribution over time) used in pricing VA guarantees, where a variety of practices exists. One common approach to setting the term structure has been to use implied volatilities from the exchange-traded options market for short terms, and to grade to a long-term historic average volatility for long terms (of 10 years or more). This hybrid approach was developed several years ago, before the emergence of today's more liquid and transparent long-dated equity derivatives market—a development that is described more fully in the following section.

The pricing practice of using historic long-term market volatility assumptions can lead to rider fees that apply over long new business issue periods, regardless of changes in implied volatility over that time and hence, regardless of changes in the price of the derivative hedge. Thus in times of high volatility, the insurer may be writing long-dated options at significantly below their market-consistent value, and consequently, below the cost of hedging the guarantee. This could be considered to have a detrimental effect on shareholder value since, for taking on a similar amount of risk, the shareholder could have written a similar option at the higher fair market price.

By issuing options priced using historic long-term volatility assumptions, companies are selling long-term implied volatility in return for a rider fee based on historic volatility. A company that then wishes to delta hedge with futures would use that fee to pay for actual realized volatility over the life of the contract, including the cost of any market dislocations or “gaps.” Actual realized volatility may be significantly more or less than either implied volatility at the contract issue date or historic volatility used to the price rider fees. The important thing to note is

the exposure to these volatility and gap risks over a long time horizon if they are not hedged.

While a number of companies have established sound delta hedging programs, many companies have accumulated significant vega (or volatility) and gap exposures that may not be fully captured by risk metrics currently in use (such as marked-to-market values or the new C-3 Phase II RBC component), to the extent these metrics also rely on historic volatility assumptions. However, now that there is more reliable implied volatility data emerging from the long-dated equity derivatives market, this may change.

While there has been a trend toward more vega hedging in the past few years through the use of both variance swaps and long-dated options, it is still a sizeable exposure at many companies. It is likely that more comprehensive risk management practices will develop here as companies start to utilize implied volatilities from the long-dated derivatives market, and rely less on historic volatilities in both pricing and financial reporting.

A disciplined risk management practice would be to price riders using current market implied volatility (and other market) assumptions, and to use the rider fees to finance hedges priced using these same market assumptions. This may require flexibility for pricing riders for new business more frequently as a function of market parameters and/or other product development innovations to facilitate hedging at costs consistent with the rider fee. Another option may be to lock into volatility for new business issued over a certain period at the same rider fee, by possibly buying hedges in advance of sales (state investment and other laws permitting.)

The Evolution of the Long-Dated Equity Derivatives Market

Over the past few years the market for long-dated derivatives (10 years and beyond) on equity indices has grown to unprecedented levels, driven partly by demand from the insurance sector. On the supply side, broker-dealers and hedge funds have become large and active players in this market.

Liquidity has improved in the inter-dealer market to the point where large amounts of long-dated equity derivatives trade frequently,



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enabling more efficient risk transfer amongst broker-dealers. Insurance companies will find considerable consistency in pricing across the market as a result of this development. In the past year alone, insurance companies have purchased notional amounts of long-dated equity derivatives totaling several billion dollars, and these volumes are growing rapidly.

All this means that a much deeper and more liquid market in long-dated equity derivatives now exists compared with the situation several years ago. The development of a liquid, transparent, inter-dealer market means that there is reliable data to support fair market values for these long-dated options that can be used both for insurer pricing of VA guarantees and for financial reporting mark-to-market calculations.

Figure 1 at the right shows three points on the term structure of implied volatility over the past three years. Implied volatilities are displayed for options struck at-the-money-forward with terms of one year, five years and 10 years.

Implied volatilities moved from highs of over 30 percent in the latter half of 2002 to less than 20 percent by August 2005. It is notable that this decline in implied volatility occurred in the face of rising VA hedging demand, and is an encouraging sign of the deeper liquidity and maturity of the long-dated derivatives market.

Implied volatility at every term varies over time, as does the relationship between long- and short-term implied volatility. It should be noted that in late 2002, when the S&P 500 index was at the 800 level, one-month implied volatility traded above 40 percent, while 10-year implied volatility only reached the high 20s. Principally, this differential represents expectations about future volatility—in 2002, market participants did not expect the high levels of market volatility to be sustained.

Conversely, in the recent low volatility environment, the implied volatility of options at longer terms relative to short terms suggests that market participants believe equity volatility will rise in the future. This partly explains the upward sloping term structure of implied volatilities over the past year.

Another factor not often considered when analyzing the term structure of implied volatility is

Figure 1: Term Structure of SPX (S&P500) Implied Volatility July 2002–August 2005



Source: Goldman Sachs Equities Division

the impact of interest rate volatility on the equity forward price. In recent years long-term interest rates have reacted to a stressed equity environment by falling as stock prices fall. The decline in the risk-free rate implied by bond prices rising causes equity forward prices to fall faster than their spot prices. This effect has been used to explain the somewhat steeper term structures of implied volatility in recent times. Whatever the magnitude of this effect, lower stock prices (poor asset performance) and lower interest rates generally represent the worst-case scenario for writers of VA guarantees.

Companies that delta hedge have, in the past, shown some reluctance to paying the extra premium between short- and long-dated implied volatilities (when the term structure is positively sloped) and locking into a known volatility cost upfront. In addition to companies taking certain views on the direction of future market volatility, this reluctance may also be partly due to not pricing in the full-implied volatility curve when rider fees were set. Rather, companies may have used historic volatilities at long terms and have expectations that, on average, historic volatilities will be realized over this period. Where the full-term structure of implied volatility has not been incorporated into the rider pricing process (including implied volatilities for terms of 10 years or more), it can become costly to hedge vega risk once the business is on the books.



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Hedging Variable Annuity Guarantees...

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A final, and important, development in the long-dated derivatives market has been the growth in long-dated structures in addition to plain *vanilla* long-dated put options. Such structures may be tailored to better approximate the economics of various features of variable annuity guarantees such as ratchets, roll-ups and extended withdrawal periods. As the long, dated vanilla market has grown over the past few years, so too has the trading activity in these more exotic instruments.

What Do These Market Developments Mean for Insurers?

Insurers have been writing long-dated equity derivatives embedded in variable annuity policies since the mid to late 1990s. However, only relatively recently has hedging activity by insurance companies become significant.

Hedging of variable annuity guarantees increased markedly after reinsurance capacity contracted following the bursting of the tech bubble and the end of the long bull market of the 1990s. Another key driver of hedging activity was the development of VA guarantees that are marked-to-market under GAAP accounting, particularly guaranteed withdrawal benefits, and their phenomenal growth since 2002.

Now that the long-dated derivatives market is more liquid, insurers have the opportunity to re-think their hedging programs. Companies may also conclude that they should be charging policyholders market prices for vega risk and for other market risks that might be mitigated through hedging with long-dated equity derivatives. In that case, newly priced rider fees should be made sufficient to cover the cost of hedging these market risks so that insurers can avoid accumulating volatility, gap and other market exposures on their own books. By laying off these risks to the capital markets, companies can focus more on managing actuarial and policyholder behavior risks.

The developments in the more structured long-dated derivative market, where simple equity puts are enhanced with features that better mimic the hedged guarantees, such as ratchets,

roll-ups and extended withdrawal periods, create more opportunities for product development and more effective risk management. Companies now have a more extensive suite of tools available to them during the product development process to price guarantees in light of the costs of hedging their major market exposures and to develop the hedging program hand-in-hand with product development.

The View from Outside

Shareholders, analysts, regulators and rating agencies are increasingly focused on the risk exposures in variable annuity blocks and the types of hedging strategies companies are implementing to mitigate these risks. They are likely to respond favorably to a pricing and risk management framework that takes advantage of these developments in the long-dated equity derivatives market.

With the increased liquidity of the long-dated equity derivatives market, it is possible that GAAP accounting practices for marking-to-market VA guarantees classified as derivatives will shift to using implied volatility to the 10-year time point and beyond. With this development, vega hedging would mitigate the resulting GAAP earnings volatility.

In terms of credit for hedging from both an RBC and rating agency perspective, the case for capital relief can be much simpler to demonstrate for currently held long-dated derivatives whose payouts are well defined, than for hedges expected to be put on in the future under a dynamic hedging strategy. Furthermore, gap risk—the risk of being subject to discontinuities in times of market stress (as is more likely in the tail scenarios that drive capital needs)—is significantly reduced by entering into long-dated hedges prior to market distress. Long-dated derivatives can provide significant capital relief today, as well as protection against significant unexpected increases in required capital in the future.

Finally, utilization of some of the more exotic structures being traded over the counter should have a positive impact on required capital levels and rating agency views. Specially tailored derivatives that better match the economics of VA guarantees are more efficient (than vanilla options) in that you only pay for protection that more closely matches the exposure, and they

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Now that the long-dated derivatives market is more liquid, insurers have the opportunity to re-think their hedging programs.

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tend to be much more effective in tail scenarios than plain vanilla options.

Where to from Here?

Despite the growing use and benefits of long-dated equity derivatives, some insurers have been reluctant to enter this market. They often cite the following reasons for not trading larger volumes in this market:

1. Do not wish to pay the extra premium to hedge volatility and gap risk over a long period.
2. Fearful of over-hedging if lapses are higher than expected, or of mishedging if other policyholder behavior is different than expected.
3. Fearful of not being able to liquidate positions if hedge strategy changes.
4. To date, only the S&P 500 long-dated options market has significant depth, but insurers have significant amounts of underlying funds that are more closely correlated with other equity indices (e.g., NASDAQ, Russell 2000).

The first concern was discussed extensively in the prior sections of this article. Basically, this concern can be addressed through rider pricing practices that are more in line with derivatives market pricing so rider fees can cover the cost of locking into a fixed volatility over a long time period.

The primary market-related risk that any hedging strategy will have difficulty addressing is market-sensitive policyholder behavior. While long-dated derivatives are effective in mitigating other key market risks, their effectiveness as policyholder behavior deviates from expected will vary depending on their structure. Customized options can be designed to withstand a range of possible behaviors other than lapse and fund allocation changes. In contrast, unexpected lapse and fund allocation changes may require changing the notional amount of a hedge (increasing or decreasing). Another way to address these concerns may be to use a combination of core long-dated derivatives supplemented by dynamic hedging to provide added flexibility in responding to unexpected policyholder behavior.

Liquidity in long-dated equity derivatives is expected to continue as long as there is demand for

this product. In terms of liquidating more exotic options, transparency in pricing and structure, and ability to replicate with simpler instruments, combined with competitive pressures in the vanilla market, should help to alleviate insurers' concerns here.

As to the concern about indices, this can be addressed in a fashion similar to the concern about policyholder behavior. That is, companies can use core hedges that are S&P 500 based. Because the S&P 500 index is imperfectly correlated with other indices, the differences might be hedged through dynamic hedging with futures and shorter-dated options. In any case, as happened with S&P 500 derivatives, more liquid markets for long-dated options on other indices may develop in the future if demand persists.

As insurers become more comfortable with transacting in the long-dated equity derivatives markets, we expect to see hedging strategies incorporate a growing amount of long-dated derivatives, and increasing alignment between hedging strategy design and the product/rider development process. Such a change in product development, more aligned with derivatives market practices, still offers tremendous value to the consumer by providing them with access to exotic options generally unavailable elsewhere in the retail market. This change in practice also ensures that their insurance company can access the capital markets to distribute this risk more broadly, rather than accumulate significant portions on its own books. Regulators, ratings agencies and shareholders should be similarly pleased with this increased ability to distribute risk. ♦



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Update on Continuing Education (CE) Activities

by Hubert B. Mueller

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ERM has developed significant momentum in the marketplace. The original impetus was to improve corporate governance and make management accountable for the risks that they undertake.

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The Risk Management Section Council has been involved in a number of continuing education activities, including:

- Sponsoring or co-sponsoring a total of seven sessions and events at the upcoming SOA Annual Meeting (November 13-16) in New York.
- Participation in the planning committee for the 2006 ERM Symposium, to be held April 23-25, 2006 in Chicago.
- Co-sponsoring the Canadian Institute of Actuaries' Stochastic Modeling Symposium to be held April 3-4, 2006 in Toronto.
- Sponsoring an ALM seminar conducted by *Institutional Investor* magazine in New York (June 2005).

In addition, we will be involved in a number of other seminars, webcasts and meetings, as further described below.

SOA Annual Meeting

We have been busy with planning a slate of sessions and half-day seminars for the upcoming Annual Meeting. Many of these sessions are co-sponsored with other sections. Highlights from the sessions, section breakfast and luncheon are provided below.

1. Enterprise Risk Management Seminar (November 14)

(Co-sponsored with Investment and Financial Reporting Sections)

Insurance companies are dedicating significant resources and budgets to developing enterprise risk management (ERM) capabilities. Business processes, management procedures and information systems are being retooled to comply with emerging regulations and standards of practice. Nevertheless, there is much to be done in developing both the theory and practice of ERM. This half-day seminar takes a detailed look at ERM from two perspectives—the outside-in and the inside-out views.

Part 1 – An Outside-In Perspective (Session 15) – Panel Discussion

Moderator: Prakash Shimpi

Panelists: Prakash Shimpi, Michael Barry and Eric Berg

The Market Perspective (30 minutes)

ERM has developed significant momentum in the marketplace. The original impetus was to improve corporate governance and make management accountable for the risks that they undertake. In the insurance industry, there has been a shift away from the focus on compliance to a broader shareholder value creation objective. This segment highlights the market forces that are at play and the possible future directions that ERM may take.

The Rating Agency Perspective (30 minutes)

Rating agencies impose quite a number of requirements on insurance companies. A rating agency representative answers the following questions. How much weight do rating agencies give ERM in the overall rating? How do rating agencies assess the quality of a firm's ERM capabilities? Does ERM give them additional information on a company's credit worthiness?

The Shareholder Perspective (30 minutes)

Equity analysts provide shareholders with expert analysis on a firm's prospects. It can be argued that equity analysts already consider the risks of a firm in developing their recommendations. If so, do investors recognize that? One of the reasons cited for the need for ERM is the shareholders' desire for greater transparency. Does ERM fulfill that promise of greater transparency? Is there a danger of information overload? What ERM-related information do equity analysts utilize and how do they filter that to give investors the most useful information? In this segment we learn what weight an equity analyst puts on this new source of information.



Hubert B. Mueller, FSA, MAAA, is principal with Towers Perrin in Weatogue, Conn. He can be reached at *Hubert.Mueller@towersperrin.com*.

Part 2—An Inside-Out Perspective (Session 38) – Panel Discussion

Moderator: Prakash Shimpi

Panelists: Craig Raymond, Gideon Pell, Michael Slipowitz, John Hele

The ERM Business Environment (30 minutes)

One of the greatest challenges to implementing ERM is organizational inertia. ERM creates its own processes that can impose additional demands on the firm's resources. In order for ERM to deliver value, it must reside within a corporate environment that allows information to flow freely. In this segment we hear from a practitioner who has faced these issues and learn how they were addressed.

The ERM Analytical Framework (30 minutes)

ERM processes generate large amounts of data, which needs to be turned into knowledge through an analytical framework. Is there an overarching framework that applies to all risks and all business operations? How useful is economic capital? Does the analysis provide enough detail at the business unit level? Are there some risks that just cannot be included in the analysis? How does the analysis lead managers to make better decisions? This segment gives us the opportunity to learn from a practitioner who has had to implement such an ERM framework.

Case Study for ERM Implementation (30 minutes)

A company representative provides a case study of how their company implemented ERM, including suggestions for the quantification of both financial and operational risks.

Seminar attendees receive an understanding of ERM and its use in managing, controlling and creating value from risks inherent in life insurance businesses.

2. Annuity Risk Management Seminar (November 15)

(Co-sponsored with Investment, Product Development and Financial Report Sections)

Annuity products present unique risk management challenges, which are a function of the guarantees, crediting strategies, policyholder behavior and ultimately the investment strategy. Risk management becomes a blend of product design, product management, reinsurance and strategic investing, including implementing hedging programs. This half-day seminar presents case studies illustrating how different risk management techniques can mitigate exposure to risk.

Part 1: Overview of Annuity Risk Management

(Session 63) – Panel Discussion

Moderator: Hubert Mueller

Presenters: Hubert Mueller, Denis Tauscheck

This part presents the key concepts to this topic. The panelists present the implications of recent regulatory changes on product design, pricing and risk management. An overview of best practices for annuity risk management in a changing and dynamic economic environment is provided. Each major type of annuity product (variable, fixed and equity indexed), is discussed, with a focus on how companies apply these risk management techniques to their overall product management strategy today.

Part 2: Stochastic Modeling for Annuity Risk Management

(Session 101) – Panel Discussion

Moderator: Hubert Mueller

Presenters: Pritesh Modi, Andy Rallis

The use of stochastic modeling has increasingly been applied to the unique challenges of annuity product and risk management. The presenters cover various subjects and present case



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Update on Continuing Education (CE) Activities

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studies regarding stochastic modeling of variable annuities (VA), including guaranteed minimum death benefits, guaranteed living benefits, dynamic hedging of derivative benefits, and the application and significance of VA risk-based capital and reserves.

Seminar attendees receive an understanding of current market practices and recent trends for the risk management of fixed and variable annuities.

3. Credit Risk Management Seminar (November 14)

(Co-sponsored with the Investment Section)



Credit risk management practices are evolving with new and more sophisticated approaches being adopted by insurance companies. This half-day seminar describes current practices within the insurance industry and takes a closer look at the various techniques being used to measure and manage credit risk exposure.

Credit Risk Management Practices (Session 16) – Panel Discussion

Moderator: Frank Sabatini

Panelists: George Holt and Adam Girling

Review of Credit Risk Management Practices (45 minutes)

This part begins with a review of the evolution of credit risk management approaches used by insurance companies and examines the various techniques.

Yield Enhancement Strategies and Credit Risk (45 minutes)

This session illustrates a number of yield enhancement strategies including the use of credit derivatives and the impact on the overall credit risk exposure.

4. Corporate Governance and Enterprise Risk Management – (November 16, Session 127) – Interactive Forum

(Co-sponsored with Investment and Financial Reporting Sections)

Moderator: David Ingram

Panelists: Doug Brooks, Larry Rubin, Mike Moriarty

Risk management is more than just a set of algorithms and assumptions for calculating value-at-risk or economic capital. To be effective, risk management must have the proper place within the governance system of an enterprise. For actuaries to be effective in the risk management arena, they must have the ability to apply their professional skills and judgment to advise senior management on the nature and extent of risks and liabilities. Company governance issues that relate to risk management and actuarial roles include:

- Reporting relationships of CRO.
- Board and CEO involvement in risk management.
- Internal distribution of risk position reports.
- External disclosure of risk positions and risk management processes.
- Independence of actuarial opinions on liabilities and risk.
- Coordination of liability and risk measurement.
- Audit and risk management committee roles.
- Sarbanes-Oxley compliance / Impact of Risk Management.

Attendees learn how the success of an ERM program can be helped or hindered by the corporate governance approach of an enterprise.

5. Operational Risk: Recent Trends (November 16, Session 140) – Panel Discussion

Moderator: Samir Shah

Panelists: Joel Aronchick, Raj Mittal

Operational risk management continues to receive increased attention as companies struggle to develop the appropriate tools and techniques. This session focuses on recent trends in operational risk management including qualitative and quantitative assessment methods. We learn from companies who have made progress in managing their operational risks, as well as from external solutions providers who continue to develop new tools and methods.

Attendees receive an understanding of current practices for measuring and managing operational risk.

6. Risk Management Section Continental Breakfast (November 16, Session 115)

Chairpersons: Frank Sabatini and Dave Ingram

Members of the Risk Management Section Council discuss current issues of interest and section activities over breakfast.

This session is open to all section members. If you plan to attend, please register in advance.

7. Luncheon: Enterprise Risk Management (ERM) – The Reinsurers' Perspective (November 14, Session 21)

(Co-Sponsored with Reinsurance Section)

Moderator: Frank P. Sabatini

Panelists: Doug Brooks, Mike Pado, Prakash Shimpi and John E. Tiller Jr.

As ERM becomes the mantra for today's insurance organizations, companies can fail to assess the real impact of reinsurance in the ERM integration process. Reinsurance has historically been an effective risk mitigation tool and should

be an integral part of any ERM process. The luncheon speakers draw on their experience as ERM and reinsurance professionals to discuss the role of reinsurance solutions in the ERM framework, and the role risk management plays inside a reinsurer.

Attendees learn the following:

- Perspectives on the role of reinsurance in an ERM framework.
- Reinsurers' alternative approaches to managing enterprise risk.

This luncheon is open to all meeting attendees. There is a nonrefundable charge of \$25 per person. Please include the additional fee with your registration.

We hope to see many of you at the meeting!

I) ERM Symposium – 2006

We have begun planning for the 2006 ERM Symposium, to be held from April 23-25, 2006 in Chicago. The challenge will be to do better than this year's ERM Symposium, which attracted a record audience of almost 500 participants, including many attendees from outside the United States.

We are still looking for speakers and volunteers to help with the planning of this event. Please contact the author (*Hubert.Mueller@towersper-rin.com*) or Julie Young at the SOA (*JYoung@soa.org*) if you would like to help or are interested in speaking.

II) Stochastic Modeling Symposium – April 3-4, 2006

The Risk Management Section is also co-sponsoring the Stochastic Modeling Symposium organized by Canadian Institute of Actuaries. The overall theme for this symposium will be "Practical Actuarial Applications of Stochastic Models." The symposium and the Call for Papers will focus on the following three main topics as they apply to the world of insurance:

1. Use of stochastic models in valuation of assets and liabilities;

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As ERM becomes the mantra for today's insurance organizations, companies can fail to assess the real impact of reinsurance in the ERM integration process.

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Update on Continuing Education (CE) Activities

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2. Use of stochastic models in enterprise risk management; and
3. Use of stochastic models in credit risk management.

Timely submission of papers is critical to the success of the symposium. Authors are advised to communicate their intentions to submit a paper as soon as possible to Gilbert Lacoste, chair of the organizing committee at *Gilbert.Lacoste@sunlife.com* or to section council member Ken Seng Tan at *kstan@uwaterloo.ca*. All papers should then be submitted by Nov. 30, 2005 via e-mail to *stochastic@actuaries.ca*.

For more information on the symposium or the Call for Papers, please visit www.actuaries.ca/publications/2005/205022e.pdf.

III) ALM Seminar

In June of this year, we co-sponsored a seminar on ALM organized by *Institutional Investor* magazine, which was held in NY.

IV) Other CE Activities

We are planning a joint seminar with the Professional Development Section, which will be held later this fall. We will also be sponsoring the Basel Summit, a global risk management conference scheduled to take place in December, 2005 in Basel, Switzerland. Also, we will assist Harry Panjer with providing input on behalf of the SOA for the upcoming 2006 International Congress of Actuaries (ICA) in Paris.

Also, an ERM webcast was held in October. Materials from the webcast, plus other relevant materials on ERM (e.g., from this year's ERM Symposium) will form the base of an ERM online training tool, which is scheduled to be rolled out next year.

Right now, we are working on developing risk management sessions for the 2006 Spring Meeting. We are also in the process of soliciting feedback from section members on what other

CE activities you would like to see, including regional section meetings, seminars and webcasts. We will update you on the feedback we receive in the next RM Newsletter.

Please contact Hubert Mueller if you are interested in speaking or are willing to help with any of these activities. ♦

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We will also be sponsoring the Basel Summit, a global risk management conference scheduled to take place in December, 2005 in Basel, Switzerland.

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Risk Management: Some Guidelines for Practitioners

by Kevin Dowd

Risk management is a complex and subtle subject, and being a good risk manager requires a dauntingly wide range of skills. Inevitably, most of these are not “taught” but “learned” (i.e., on the job) and every experienced risk manager will have learned these the hard way and formed their own unique perception of what risk management really entails.

The nature of this subject is also such that no one can speak with absolute authority. However, it is possible to suggest guidelines, and this article offers a collection of them. The guidelines suggested here fall under four general headings: your role in the organization, general risk management, the use of derivatives and risk measurement systems.

Your Role in the Organization

Before taking the job, try to work out what your employers really want, what kind of people they are, and so on. If you have reservations on any of these points, don't take the position in the first place. You can also expect major problems if different people have different expectations about your role and about who you are “really” accountable to, and the prospect of such problems is another good reason for not accepting a position. However, having accepted the post:

- Make sure you know the business in which your firm is engaged and know the risks this line of business entails
- Be clear about your role, what your job description involves, and so forth.
- Be clear about what others expect your role to be, and make sure that others are aware of what you see it to be. If these expectations are not in harmony, you have a problem and need to do something about it.
- Be clear about your own ethics, and expect at some point to have your ethical values confronted. Make it clear what you will not put up with—if you are ever put in an untenable position, you must either make it tenable or leave.
- Understand the moral and legal implications of your position as a company officer: your obligations to stakeholders, your

obligations to look after other people's money and the like.

- Remember that you are always accountable: you are always responsible for what you choose to do, even if you are operating under pressure.
- Learn to be politically aware, and try to avoid repeating the same mistakes: experience is a costly school. Be aware of the dangers of being compromised (e.g., going along with what you know to be wrong, humoring other people to avoid upsetting them, etc.). Always consider your exit strategy such as what you will do if things go wrong.
- Refine the following skills: observe human behavior, study how organizations work, learn how to read people, know whom you can trust (and whom you cannot), develop your interpersonal skills (e.g., courtesy is intrinsically right and costs nothing) and keep up to date with what is going on. It also helps to read good books, and keep in mind that the old classics are much better than any book spouting the latest in “management thinking.”
- Don't indulge senior management when they say risk management is expensive. The cost of risk management is not the salaries and other expenses required to have a risk management department, but what might happen if risks are not managed. Don't let them regard risk management as a drain on profits.
- Don't expect to be popular with senior management: your job is to warn them of the risks the firm faces, and this will sometimes require you to take a difficult position that flies in the face of the “corporate vision.” If you have to upset the CEO, remember to be careful—the trick to survival is to keep a straight face and laugh afterwards.



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Risk Management: Some Guidelines for Practitioners

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On General Risk Management

Make sure you know your own business and the risks it entails. You should also have some idea of the risks your firm is taking and why. The objective of risk management is not to eliminate or even minimize risks, but to manage them appropriately, taking into account the potential benefits from risk-taking. Remember that risk management is a form of engineering: it *uses* science, but ultimately *depends* on judgement. Judgement is everything.

- The ultimate protection against risk is good judgement and alertness—your own and that of your colleagues. Observe what goes on elsewhere and learn from the mistakes of others. If you are sufficiently concerned about similar problems occurring in your firm, do something to prevent them. It is particularly important to learn from others when they lose huge amounts of money or go bankrupt. When you see that happen, ask yourself if your firm is *really* covered. Remember that when firms get into major difficulties, the problems involved are usually ones that senior management persuaded themselves they had taken care of. It is the operational risks—rogue traders and the like—that usually bring institutions down (e.g., Barings). The best defenses against operational risks are sound systems of management control and vigilant managers.
- Be on the lookout for the obvious: business units that are apparently earning very large profits for no clear reason, figures in reports that are suspicious, sudden deteriorations in performance, junior managers under severe stress, high turnover of staff, etc.
- Find good people you can trust, pay them well and back their judgement. Good people are far more valuable than good systems. Never think that a fancy risk management system takes care of your risks for you and thereby relieves you of the need to stay alert. Understand the limitations of your risk management systems. Be clear about the risks your systems do not cover well, especially operational ones. Ask what could go wrong, ask yourself if the results seem right and so forth. Always ask where you might be vulnerable.

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The ultimate protection against risk is good judgment and alertness: your own and that of your colleagues.

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- Have your risk management systems occasionally checked over by outside experts, and listen to their advice. Listen to your auditors as well. Remember that risk management is definitely not an exact science, so don't be fooled by spuriously precise answers or be impressed by people who talk in such terms. Remember that stress testing and contingency planning exercises are key features of good risk management.
- Policy statements should give substantial objectives and policy guidelines, as opposed to the meaningless platitudes that abound in modern corporate life. When drawing guidelines up, you should ask yourself: “Do they come across as just so much more management nonsense that no-one ever pays any attention to? Do they give the impression that they are merely written to protect the management against criticism or lawsuits? Are they condescending to workers, shareholders and other stakeholders? Do they exaggerate the priority really given to risk management issues?”

Dealing with Derivatives

Don't be put off by the use of derivatives by well-publicized problems with derivatives. Derivatives are very useful tools, when used properly. Remember that derivatives have one or more of many uses: to take a position, i.e., to speculate, to hedge or to reduce funding costs. If you are thinking about using derivatives, be clear why. Derivatives can therefore increase or decrease your overall risks, depending on how you use them.

- Be aware of the leverage, i.e., the potential for gains or losses, in your derivatives positions—particularly leverage that might be hidden in complex derivatives positions. If you are using derivatives to reduce funding costs, make sure you understand why/how the contract gives you lower funding costs. In particular, make sure that you have not agreed to hidden options or other contingent payoff clauses that could later lead to large losses.
- When dealing with derivatives providers, recognize that they always know more than you do. When considering contracts with derivatives providers, satisfy yourself that *you* broadly understand the risks you are thinking of taking on. When considering any derivatives contracts, satisfy yourself that you *want* to take on the risks involved.

- In assessing a derivatives contract, particularly a complex one, have the contract reverse-engineered into its basic building block components—this helps in understanding the risks involved—and consider whether you would be better off taking on the building blocks instead.
- Shop around for quotes from different derivatives providers before agreeing to a particular contract. Protect yourself against unscrupulous providers by seeking qualified second opinions. You can also protect yourself by asking questions and insisting on full written answers. Questions should focus on prospective losses for different realizations of the underlying risk variable(s), i.e., scenario analyses. If you are not sure what questions to ask, seek guidance from your own risk managers or outside consultants. Always check with them anyway before signing anything. Also, if the answers you get are incomplete, unclear or otherwise unsatisfactory, don't get involved in long, drawn-out negotiations. Just assume the worst and take your business elsewhere.
- Know your exit costs. When negotiating with providers, try to nail down your likely liquidation costs in advance by asking for written quotes that specify the terms on which they would unwind your derivatives positions later. Before finally agreeing to any contract, decide on your stop-loss position, so you know *in advance* the maximum loss you will tolerate before bailing out. Ensure that everyone else involved also knows the stop-loss position. Having established your stop-loss strategy, keep to it.
- When dealing with outside consultants, deal with people you can trust. As a general rule, employ consultants who have no axe to grind because they are not trying to sell you their own systems.

Dealing with VaR and Associated Systems

Understand clearly what different risk measures—VaR, expected shortfall, etc.—and actually mean. More important still, understand what they don't mean (i.e., understand that VaR does not give the maximum possible loss, and so on). Recognize that there are serious problems with the VaR as a measure of financial risk (e.g., VaR does not tell us what loss we might suffer if we get a loss exceeding VaR, the use of VaR in risk-expected return decision making can lead

to highly undesirable outcomes, etc.). Most of all, VaR is a poor measure of financial risk because it is not subadditive.

- Understand subadditivity—risk of the two positions combined will never exceed the sum of the risks of the two positions separately considered—and appreciate that it is a basic requirement of any “sensible” risk measure. This said, VaR does have its uses. For example, the VaR is a quantile, and quantiles are often useful in probability-of-ruin type problems.
- Fortunately, there are much better risk measures than the VaR, most particularly, the expected shortfall (ES), which is what we can expect to lose if we get a loss exceeding VaR. (This measure is also closely related to the conditional tail expectation, and similar measures.) The subadditivity of the ES makes it a much better risk measure than the VaR. Recognize too that ES-type measures are becoming increasingly widely used, and also are being adopted by regulators for capital adequacy purposes.
- Modern risk theory (e.g., the theory of coherent risk measures) also suggests that the outcomes of stress testing exercises satisfy many of the requirements we would expect of sensible risk measures. You should treat stress tests as “bona fide” risk measurement exercises and not look down on them as inferior to probabilistic risk measurement exercises (e.g., VaR).
- Remember that you never really understand any risk measure until you have estimated it a few times. Try to get some feel for what the different risk measurement systems involve: their strengths, their potential uses, their limitations and weaknesses, etc. Familiarize yourself with related systems, such as cash-flow-at-risk (CFaR) systems. Familiarize yourself with enterprise-wide risk measurement (ERM). You should appreciate what benefits ERM might bring, but also appreciate what ERM actually entails (i.e., in terms of



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Risk Management: Some Guidelines for Practitioners

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changing the organization and how it operates).

- You should investigate what benefits these various systems (VaR systems, CFaR systems, ERM systems, etc.)—could bring to your particular firm. However, recognize that the benefits can vary a lot from one firm to another, depending on each firm's particular business and circumstances.

If you decide to adopt any of these systems, be clear why. There is only one good reason: you should adopt them if and because they fit your business needs.

- *Don't* adopt VaR and associated systems just because your competitors are doing so. Resist the temptation to behave like a lemming.
- *Don't* adopt them just because you have some vague idea that they will help you steal a march on the competition. You are unlikely to steal a march on the competition if you don't know what you are doing.
- *Don't* adopt them in response to pressure from shareholders or systems providers. Shareholders pay you to make these decisions for them and systems providers are looking for business.

Pay attention to what other firms are doing, and learn from them.

- *Don't* be hurried, and remember that there is always the option of wait and see. Waiting allows you to see what mistakes other firms make so you can avoid them. Waiting until later will also be cheaper, because costs will fall over time.
- Think carefully (and seek advice) about the level of technology that is adequate for you.

Establish the level of technology that is adequate to your needs—historical simulation, variance-covariance, or Monte Carlo simulation.

- The systems with the lowest level of technology are historical simulation ones, the highest tech ones are Monte Carlo systems, and variance-covariance systems are some where between.
- As a general rule, you are better off adopting the system with the lowest adequate level of technology. The higher the level of technology, the greater the expense, the

more difficult the system is to use and the greater the chances of something going horribly wrong.

- Don't ever buy a complex system without justifying that you really need it—don't buy an expensive Monte Carlo system, say, when a simple historical simulation system will do.
- Be discriminating. Systems must suit your particular business needs. As a general rule, large firms need systems fitted for them, as opposed to systems just bought off the shelf and imported without much thought. Be wary of buying expensive systems off the shelf, and be wary of providers who would sell you complex systems that only rocket scientists can understand. Shop around for systems and service providers, and don't confuse expense with quality. It is very easy to spend a lot of money on a poor or inappropriate system. Never, ever, buy complex systems that no one in your firm is comfortable with. Either the systems are unnecessarily complex or else you need to hire people who can work with them.
- Make sure you have access to advice from people who understand the area. When setting up risk measurement systems, ensure that you also develop good stress testing capability. Make sure that you use these systems in conjunction with regular and detailed stress tests. Take some interest in stress testing exercises, if only to inform the broader planning process.
- You should insist that your risk reports be informative, but not unnecessarily so. They should be short and to the point and written in plain language. Besides reporting key numbers, they should also warn of important problems or qualifications that you should be aware of.
- Insist on periodic longer reports that go into more detail and keep you warned of medium-to longer-term problems and other issues that would not make it into your more regular risk reports. Keep in mind that no system ever gives guaranteed results.

Conclusions

There are of course no absolute guarantees in the risk management business. However, if you follow these (or similar) guidelines, you are unlikely to get into serious problems. At the end of the day, the key to good risk management is simple: be conscientious. ♦

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As a general rule, you are better off adopting the system with the lowest adequate level of technology.

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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.

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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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