



RISK MANAGEMENT SECTION

"A JOINT SECTION OF SOCIETY OF ACTUARIES, CASUALTY ACTUARIAL SOCIETY AND CANADIAN INSTITUTE OF ACTUARIES"

Risk Management



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Actuaries

Risk is Opportunity.®

Diversity is the Spice of Life!

Ronald J. Harasym



A fabulous thing about enterprise risk management (ERM) is the diversity of issues that one can become involved in. Timing is everything! There is no question that the operating environment keeps increasing in complexity over time. Add to this a few emerging risks in concert with some systemic risks and you have the ideal setting for the call to action of ERM professionals.

It is the diversity of ERM issues that as actuaries, we have the opportunity to apply our training, skills, and knowledge to many different types of issues well beyond what we could have imagined just a few years ago. The basic training to become an actuary provides a great foundation and solid grounding for an ERM role, but it is important to recognize that our training not only prepares us with the specific issues that are part of our education, but also to apply those principles to new, non-traditional areas.

As is true for anyone who wants to do well in any role, a critical element of success is to stay current and educated on the latest thinking, trends, practices, and experiences. From an ERM perspective, an easy way to do this is to volunteer and get involved in the Joint Risk Management Section's activities. Over the past several years, the section has been actively involved in education, meetings, webcasts, networking sessions, and research. The Joint Risk Management Section has been reaching further out into the international risk management arena with the translation of the section's newsletter into French, Spanish, and Chinese. There are areas for all interests and opportunities for everyone to actively participate, contribute, and share experiences.

Looking at some of the articles in this issue of the newsletter, there is a wide and exciting range of topics. Wayne Fisher discusses what it takes to successfully embed ERM in a firm, the development of models and setting parameters, and the importance of research. As discussed in the article by Stephen Hiemstra, supervisory ERM differs from firm ERM because loss exposures and consequences differ. However, in order to be effective and efficient, the two need to work and evolve in harmony with each other. ERM provides a company's management the opportunity to inform and communicate with supervisors. Without this window, supervisors must make risk assessments at a distance and with a lag—clearly not a good situation.

Jean-Pierre Berliet's article discusses how the application and integration of ERM into the decision making process has faced many challenges and how ERM will be more effective in companies that identify and correct design weaknesses in their approach. Sim Segal's article highlights that even common practice in risk identification is suboptimal in several aspects and how companies can better execute the risk identification phase of the ERM process cycle. As the results from a survey of emergings risks for financial services by Max Rudolph show, any given group will have differing views and bias based on their knowledge, location and experience.

All in all, there is still much we can learn with respect to ERM. We have a strong foothold on ERM positions in the insurance industry and we have a basis for competing for ERM positions outside of the insurance industry. The Section Council has acknowledged that acquiring and improving our skills is a critical part of the equation. Together, we can succeed. So get involved in the section. Volunteer! ♦



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Let Your Voice Be Heard!

THE SOA 2008 ELECTION POLLS ARE NOW OPEN AND WILL CLOSE ON SEPTEMBER 10 AT 11:45 A.M. CENTRAL STANDARD TIME. ONLINE VOTING FOR THE ELECTION IS OPEN 24 HOURS A DAY.

Visit the SOA Web site at <http://www.soa.org/elections> to learn more about the candidates. You'll find:

- Video recorded campaign speeches by President-Elect candidates.
- President-Elect roundtable discussion moderated by Past President Ed Robbins.
- Photographs and biographies of Board Candidates.
- Biographies of Section Council candidates.
- Entire ballots including the Board, Bylaws amendment and proxy information and Section Council candidates.

This election has a SOA Bylaws amendment proxy to allow Associates—who have been members of the Society for five years or more—to vote in elections for President-Elect, Vice Presidents and elected Board of Directors. Remember: all information—including the suggested Bylaws amendment—can be found at <http://www.soa.org/elections>.

Let your voice be heard! Please vote!



ERM Perspectives

Wayne H. Fisher



Note: A truncated version of this article originally appeared in the February 2008 issue of the Casualty Actuarial Society's Actuarial Review. Reprinted with permission.

Timing is everything and these are exciting times for chief risk officers. The subprime phenomena has led to such visibility that you can't open a newspaper these days without mention of a firm's ability or, all too frequently, its inability to manage its risk. And that's where we can step in. We're the risk people!

And as always, risk creates opportunity. Personal risk is high as boards and regulators probe the adequacy of risk measures and controls. Even CEOs have been fired. But the opportunity to contribute to a firm's value is greater than ever with all of the focus on identifying and quantifying risk, whether in appropriately valuing assets and liabilities for extreme scenarios, managing limits for a firm's risk profile to minimize the next problem, and bridging the various risk elements to create a truly enterprise view.

Fortunately, CROs have now typically made it to the "C" suite, which is critically important for access to information and the ability to ensure remedial actions are actually implemented. But the challenge now, in these times, is staying in the "C" suite and balancing personal risk management with the enterprise's risk management.

Personal experiences always influence our perspective and in my case I was fortunate to see just how an engaged CEO and board, with a real commitment to risk management, can build real value. Zurich Financial Services (ZFS) went through a "near death experience" in 2002 with financial guarantees emerging from the woodwork, reserve inadequacies, little data on risk accumulations on the underwriting and investment side, subsidiaries operating very independently, and on and on. Jim Schiro entered as CEO and immediately launched a large number of critical improvement actions, including raising capital, selling assets, implementing expense measures, and putting a focus on core businesses and systems. And one of these critical initiatives was a solid mandate to build a state-of-the-art risk management program and embed it in the organization. Thereafter, in every move we made, we always knew we had the full backing and support of our CEO. That's unquestionably the single most important key to success in implementing a risk management framework.

In June 2007, five years later, S&P returned ZFS to "double A" status, and in its press release particularly noted improvements in risk controls and management. Then in October 2007, it was announced that Jim Schiro would receive an award from St. Johns University as "Insurance Leader of the Year," which singularly noted that he was an "exceptional leader with a comprehensive view of risk taking and risk management." This showed me that

during all that time, when we had our meetings and he was looking at his Blackberry, he really was listening!

This article will address three themes:

1. Successfully embedding ERM in the firm
2. Developing models and setting parameters
3. Incorporating and supporting the latest ERM research

1. Embedding ERM in the Firm

Most critical to embedding ERM in the firm is the interest and involvement of the board of directors. Today that might not be an issue, but today's risk failure headlines won't always be at the top of the mind.

Risk tolerances, and how the firm monitors compliance with the agreed tolerances, are a good starting point as they are at the heart of the board's governance responsibilities and, as a practical matter, the discussions quickly become engaging. Basic questions should address what the board wants for maximum volatility, quarterly or annually, in an agreed period of time (e.g., one in ten years), in the following areas: net income (posting a loss, for example), ability to maintain dividends, solvency and rating agency capital at levels not impacting operations or strategic initiatives, and franchise value (performance vs. peers).

These are followed by more intriguing questions, such as how to balance a maximum loss on a hurricane vs. an operational risk loss. Or consider foreign exchange trading vs. non-investment grade bonds. All affect the balance sheet the same way but the perceptions from the investors may well be vastly different. Thinking through the *New York Times* test, with the goal of avoiding the "whatever were they thinking" questions, also makes for good engagement with the board.

The board sets the tolerances at the highest level. The risk framework then extends this tolerance to units at the operating level, with the intent of providing transparency and an internally consistent framework. Generally this leads to a risk policy with internal limits on almost everything, at unit and divisional levels, and that allows such limits to be actionable and monitored at the lowest levels. It's the risk modeling and the risk management function that ensures and reports that the actionable limits, when aggregated across the firm, reasonably meet the risk expectations implicit in the board's high-level tolerances. It's also important for the board to review and agree on the internal operating risk limits, again, to engage the limits, but also to provide an element of clout within the firm to ensure adherence.

Another measure to engage the board is what we call total risk profiling. This is a structured exercise with a senior management group that develops and evaluates scenarios for risk implications and reviews remedial plans and the status of agreed-upon follow-up actions. Including the board and senior management provides for the broadest views on stress scenarios and is a solid way to get real involvement and ownership. This is key to considering bold scenarios, as the CFO of Goldman Sachs recently remarked, "The lesson you always learn is that your definition of extreme is not extreme enough." You need the leadership and involvement from the top to try to identify Donald Rumsfeld's "unknown unknowns"...the risks "we don't know we don't know."

Discussions of emerging risks are an important element. We must consider not just which ones might in fact emerge (e.g., nanotechnology, climate change, pandemics, cell mutations) but also why they might be relevant to our firm. We must also consider major changes in foreign exchange or the credit markets—how

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The lesson you always learn is your definition of extreme is not extreme enough. You need the leadership and involvement from the top to try to identify Donald Rumsfeld's "unknown unknowns"... the risks "we don't know we don't know."

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might they be relevant? The CRO needs to do the homework, of course, on the stress scenarios and relevant exposure numbers, but such an exercise is a good way to embed risk management in the organization. If the “top dogs” at the board level do it, you can quite effectively get the businesses to emulate the exercise at their levels and to stiffen up the scenarios they consider. Then you can really harness the creative power of the organization.

With the board involved and demanding information, the mandate is there to establish risk committees at all levels in the organization. Designated CROs, too, even if not full time, should organize the risk activities, including the risk profiling, reviewing risk exposures vs. risk policy limits, measuring progress on remedial actions, and providing relevant information upwards. The breadth provides an important comfort to management and the board, but it’s also valuable in embedding the risk culture in the organization. The enterprise view necessarily requires bridging the silos in an organization. My experience is that it is best if the CRO allows each functional area to carry out its own risk management. While risk management coordinates these risk management activities, ensuring rigor and that the limits fit the overall risk profile, I advise leaving responsibility for the day-to-day risk

oversight in the specific risk area. Why? It is important to assign ownership within the area and then risk management can be the “auditor” and keep its primary focus on correlations, aggregations, modeling, and scenarios at the enterprise level, which are at the heart of an ERM program and where the real value is added.

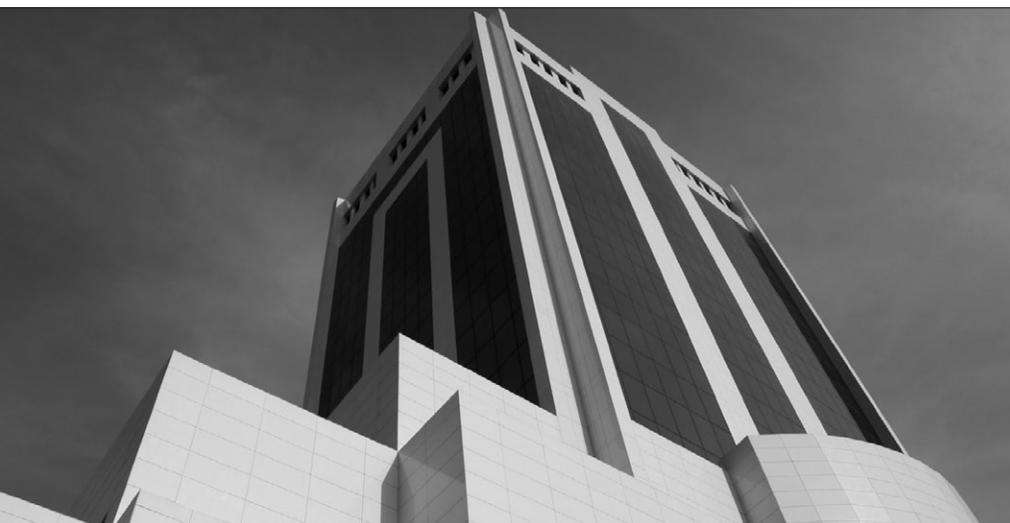
Operational risk (including business continuity management) is another way to increase awareness and involve local management. Subtleties such as allocation to line and geographical unit help to strengthen the reliability of data collection, for example, and ensure other follow-through actions are implemented. More important than the rigor, though, is the idea that you are doing allocations and that makes it important, and so actions follow. If there are no consequences, then it becomes a “nice to-do.” Operational risk losses can have greater consequences than, say, a hurricane loss—one is our business and the other is a sign of weak controls and management. This sends a tough signal to the markets.

Collectively, actions like these engage the board and drive ERM into the organization. Nirvana is when the audit committee (or finance committee) gets so engaged with risk issues that the board decides to create a risk committee... which ZFS did in 2006.

2. Develop Models

Collecting relevant data is critical. A mantra of Zurich’s Jim Schiro is: “What gets measured gets done” (and paid attention to). This requires addressing system incompatibilities, standardizing definitions, and the like, so that measures of risk exposure can be aggregated on a consistent and meaningful basis.

The models, of course, are what provide the overall framework to aggregate the firm’s risk tolerance to specific risk limits by segment (e.g., credit risk, investment risk, ALM risk,



underwriting risk, F/X) while incorporating assumptions on correlations and distributions. The models are unquestionably important but almost more important than the models and their “results” is the discipline in setting the myriad internal risk limits, monitoring compliance, and aggregating relevant accumulations across the organization. That’s where real risk management value gets added.

Assessing aggregate credit exposure is a good example of the complexity and need for data capture across the firm: Reinsurance assets, exposure in the UPR, bonds, equities, security lending, performance guarantees, and surety bonds, E&O and D&O all have the potential to aggregate into a loss in a stress situation for a firm. Examples in the insurance arena include group life, workers compensation, property on the building, D&O, E&O, equities, bonds, guarantees of various types, etc. All present complicated data capture issues, especially in an international organization, not to mention referring and acting on incidents of excess accumulation. Later, I’ll address some research that Enterprise Risk Management Institute International (ERMII) members are conducting in this area.

Collective input on correlations is important, particularly correlations for stress scenarios. Valuing underwriting exposures and assets and liabilities in stress situations are important, too. Richard Bookstaber the author of *A Demon of our Own Design*, observed, “We must move from the technicalities to judgment.” The “KISS” principle (Keep it Simple, Stupid) is alive and well. In identifying the key parameters, especially correlations, we need to get outside and inside views and create a transparent process for the final selections and related probabilities, both for buy-in from senior management and the board and for the explanations when and if an incident arises. We must balance the sophisticated with the practical if one is to avoid what

Ben Bernanke describes as the all too frequent “misunderstanding of financing models among senior management, or a failure to recognize and cover limitations of the models.”

A typical scenario that would provide valuable discussion with the management group would be how interconnected global markets should make the world economy more stable, with risk spread more widely. But, Richard Bookstaber writes that “It’s not happening.” What’s different now is how closely international markets are correlated with one another. Bookstaber continues, “Everyone tends to invest in the same assets and employ the same strategies...As markets become more linked, diversification doesn’t work as well.”

Bookstaber further points out that “global markets may actually be more risky than in the past, as the same types of investors are taking on the same type of risky bets and then simultaneously heading for the exits when trouble comes,” making the hedging fail or become unavailable. Stress scenarios we need to consider for their impact on a particular enterprise need to contemplate such unfolding economic relationships.

The models are also necessary for capital allocation (but again much of the value isn’t in the allocation, but in the understanding that capital is being allocated and if one effectively and transparently manages risk it leads to less capital—an important outcome).

This is much more important than the nuances on the allocation. It’s the same for the operational risk allocation. Too often, we don’t allocate such expenses because we can’t provide sufficient “accuracy” but it’s the idea that it is being allocated that lines up the “hearts and minds.” Another aspect of the models and relevant data is to question values under extreme stress scenarios. The subprime meltdown is, of course, a recent glaring example. But as a general rule,

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and going back to Shiro's "What gets measured gets done," perhaps it should be expanded to "Don't do what you won't be able to measure." You don't want to go to your management with a quote like Ben Bernanke's on collateralized debt obligations, when he said: "I'd like to know what these damn things are worth." And in this vein, we have preliminary plans in place for ERMII to develop a joint workshop in the spring with Columbia on valuing illiquid assets. In addition, the research track at the ERM Symposium will include work on certain aspects of quantifying credit risk.

3. Incorporate and Support Latest Research

Why is research important? It's partly defensive—if adverse circumstances develop, you want to be able to demonstrate an appreciation and work toward "state of the art." And there is some good research work going on now. The task is to determine which best practices could meaningfully and reasonably be incorporated in the risk models, impacting stress scenarios, correlation parameters, and so forth.

ERMII members are one good source for such research. The CAS and SOA are sponsors of ERMII, as is the Institute of Actuaries in Australia. ERMII has a clear research focus. Academic institutions are the members, and include Columbia University, University of Lyon, Carnegie Mellon, University of New South Wales, Georgia State, Wuhan University in China, and others.

ERMII has held a research workshop in Lyon, France on evaluating diversification at the group level, which was typical of a number of such research activities. The presentations included one by Shaun Wang of Georgia State on "Correlation Modeling and Correlation Parameters for Economic Capital Calculations," which examines various drivers of correlation, along with their diversification benefits or contagion effects. Wang's project also included some tail correlation models, including correlation between risk factors, business lines, and geographic regions. Alexander McNeil, from

Heriot-Watt University in Scotland, explained how mixture models for random vectors may be useful in risk modeling. Steve Kou, of Columbia University, tackled the question of what is a good risk measure. Gary Venter had an excellent presentation on pricing the "option" a subsidiary has on the firm's capital. All of the presentations were interesting, with practical insights. The presentations are on the ERMII Web site. Please visit the site to see which ones might be relevant to your organization.

Broadly, the subjects are extremely relevant now. The real internal value is in discussing the relevance to a firm's risks and the discussion of parameters, stress scenarios, etc.—getting the risks identified and getting senior management involved in determining them. Also, participation in such research work on correlation factors might well provide some "safe harbors" for the modeling and firm if and when a stress incident occurs. And since the Lyon workshop we've held a workshop with Columbia University on valuing illiquid assets, a timely subject for sure. We've also worked with the PRMIA Institute on the research track for the ERM Symposium in April.

Plans are under way for a research conference November 12 on commodity risk, which we will co-sponsor with S&P. The venue will be New York. Details will follow.

If anyone is interested in participating with one or more of the ERMII research groups on topics such as the treatment of risks with different time horizons in a market-consistent way, or the interplays between liquidity, market value and long-term value, and how one might value a series of deposits (as in a life policy), please contact me. This would be another way to ensure that you are incorporating state-of-the-art research and techniques. My final thought is that the ERM techniques described here readily apply to non-financial services industries. Longer term, using our quantitative risk skills to expand into these other industries presents strong growth opportunities for actuaries. ♦



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An Enterprise Risk Management View of Financial Supervision

Dr. Stephen W. Hiemstra

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INTRODUCTION

Financial supervision refers genetically to the many activities used by government financial regulators to promote safe and sound firm management, including:

- Recommending that Congress pass laws and promulgating regulations and policies to implement those laws that enhance firm safety and soundness.
- Monitoring firm activities through on and off-site risk analysis, including examination.
- Requiring firms publish financial statements and supporting information on their operations.
- Legal and regulatory sanctions imposed on firm staff and management and corporate entities.
- Administration of deposit and other insurance funds.
- Requiring firms maintain adequate levels of reserves and capital.
- Verbal and written public comments about firm operations.

Traditionally, the definition of safety and soundness has been kept vague to preclude regulated firms from undermining regulatory and legal requirements through honoring the letter, but not the spirit of the law.



SAFETY AND SOUNDNESS SUPERVISORS FOCUS ON FIRM SOLVENCY

Financial firms play a key role in assuring a healthy economy through the expansion of credit. They are able to play this role in a safe and sound manner, however, only if the firm is profitable and remains solvent. If a financial firm is not profitable, it cannot expand credit and credit could contract as underwriting standards are tightened and loanable funds are no longer available. When it becomes insolvent, then its creditors cannot be compensated for their investment, borrowers cannot be served, employees cannot be paid, and management has an incentive to make imprudent investments. For these reasons, governments frequently tie the privileges of operating a financial firm to the requirement that they remain solvent and submit to financial supervision.

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¹ I have quoted occasionally from presentations at the 2006 Enterprise Risk Management Symposium in Chicago. The slides and recordings of the presentations can be found at: www.ERMSymposium.org/handouts.php. Look for General Session 3: The Role of ERM in Regulation and Concurrent Sessions 4: Case Studies of ERM in Financial Regulation. This problem is starting to be noticed. See, for example: (Altman, 2006).

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Virtually every decision made by supervisors is predicated on concern about future firm solvency. A formal statement of this concern is to measure the impact of a decision on the chance that a firm will become insolvent over a period of time into the future. We define the risk of a future loss resulting insolvency as the probability (a percent between zero and one) of insolvency over the next X years.

Because insolvency is usually a rare event, supervisors typically disaggregate and analyze the firm's losses. In doing so, they are implicitly arguing that likely losses associated with particular activities or investments are correlated with the risk of insolvency. This implicit argument is normally weak because firms offset their day-to-day losses with insurance, reserves, and formal hedging activities. In fact, the argument for focusing on disaggregated losses is only materially significant when insolvency risk is high because only then does hedging not offset disaggregated losses. Understanding the nature and timing of threats to solvency therefore validates the focus on disaggregated losses and provides the supervisor with appropriately weighted priorities in all aspects of normal operations.

The conditions that lead to insolvency are accordingly the focus of financial supervisors and, by implication, the focus of supervisory ERM.

STAKEHOLDERS SHARE PROBABILITY NOT LOSS

The supervisory focus on insolvency risk is not necessarily shared by other stakeholders and may vary between supervisors. Short term pressures on supervisors from staff, firms, and others make it hard to maintain focus.

Supervisory ERM differs from firm ERM because loss exposures differ. The losses associated with insolvency depend on one's relationship with

and stake in the firm. Because of limited liability, stock and bond investors will only lose the amount of their investment. Counterparties will lose only the amount of their contractual obligation. Managers and employees may only lose their jobs.

The view of losses taken by supervisors may also differ depending on the mix of activities—chartering authority, insurance fund management, and policy responsibilities—bundled with the safety and soundness mandate. Chartering supervisors will lose the revenue associated with their fees. Indirect (spillover) costs may be extensive and may include:

- Loss of reputation, charter value, and relationship with any financier;
- Market transmission of lower prices for collateral, inputs, products, and securities; and
- Higher risk premiums.

Supervisors managing insurance funds may additionally lose resolution costs.²

Supervisors with program responsibilities may additionally fail to meet program objectives. Insolvencies of large firms can even have tertiary effects like undermining local economies, reducing the local tax base, and exacerbating social tensions. For all these reasons, supervisors are likely to define ERM much more broadly than private managers who focus mostly on shareholder losses.³

For all these reasons, while firm managers are likely to define ERM differently than supervisors, supervisors need the firm to execute ERM. ERM provides senior managers a window into firm risk taking that also informs supervisory. Without this window, supervisors must make risk assessments at a distance and with a lag.



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²Resolution costs are the costs of closing a depository institution.

³A good text discussing the conventional view of ERM is provided by: (Lam, 2003).

ANALYTICAL FRAMEWORK FOR SUPERVISION

The theory of the firm, as articulated by Coase,⁴ says that the firm will sell a product when its cost of production is below the market price and buy a product when its cost of production is above the market price. In other words, the efficiency of the firm's operations determines whether it is a buyer or seller.

This theory suggests that the value of ERM to firm managements is a function of market competition. If the firm is inefficient in managing operations, it will be forced to buy more products—limiting its future prospects. Likewise, if the firm improves its efficiency in management, it will be able to sell more products. Over time, it is likely then that competitive markets will encourage better management. Likewise, oligopolistic markets are likely over time to encourage or at least tolerate weak management. They may also lead to inefficient operations.

What this theory implies for supervisors is that because the value of ERM rises with market competition, supervisors encourage ERM when they promote market competition. In like manner, allowing oligopolistic practices to evolve discourages ERM.

Supervisors can encourage competition in a number of ways, including:

- Permit new firms to enter the market either through issuing new charters or by permitting acquisition of existing market participants, or both;
- Remove excess market capacity by taking weak firms into receivership promptly;

- Improve market transparency by publishing financial statements, reporting price and loss data, and encouraging objective underwriting standards and collateral appraisal;
- Discourage vertical arrangement among firms that limit competition or market transparency;
- Strengthen corporate governance regulations to encourage director independence and provide compensation incentives to promote prudent risk taking and a risk management culture; and
- Reduce barriers to market entry by competing firms.

While supervisors can improve competition and are in some instances legally obligated to promote competition, government regulation more frequently serves as a barrier to market entry protecting established firms from competition.

DEFINING THE SUPERVISORY PROBLEM

Because financial supervisors focus on providing information, supervisors need a theory of learning behavior. A key impediment to supervisory learning about safe and sound operations is the *peak-load problem* that characterizes and dominates financial losses.

LEARNING IS A PROBLEM SOLVING PROCESS

How do government agencies learn and how do they act on lessons learned? They learn by the process of solving problems.

A *process* is a sequence of related actions that bring about a result. *Learning* is the acquisition of ability through experience or study.⁵ Johnson (1986) outlines 8 steps in the learning process, including:

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⁴Coase, Ronald. 1937. *The Nature of the Firm*. *Economica*, 4 No. 4. November. pp. 386-405.

⁵**Process:** 1. A series of actions, changes, or functions bringing about a result: *the process of digestion; the process of obtaining a driver's license*. 2. A series of operations performed in the making or treatment of a product: *a manufacturing process; leather dyed during the tanning process*. **Learn:** 1. To gain knowledge, comprehension, or mastery of through experience or study. 2. To fix in the mind or memory; memorize: *learned the speech in a few hours*. 3. To acquire experience of or an ability or a skill in: *learn tolerance; learned how to whistle*. (see: www.answers.com).

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- Articulate a felt need;
- Define the problem;
- Assemble observations and data;
- Analyze the data and observations;
- Decide on a plan;
- Execute the plan; and
- Bear responsibility for the decision and execution of the plan.

As shown in chart 1, these steps are informed by both objective (positivistic knowledge) and subjective (normative knowledge) information. Steps may be taken out of sequence and may be repeated as new information becomes available.

The repeating of steps in the supervisory learning process should be anticipated. New subjective information, such as what might arise from an election, can easily motivate an agency to rethink its decisions and come out with new research or new programs. New objective information, such as the results of a recent study, can likewise lead policy makers to rethink their preferences.

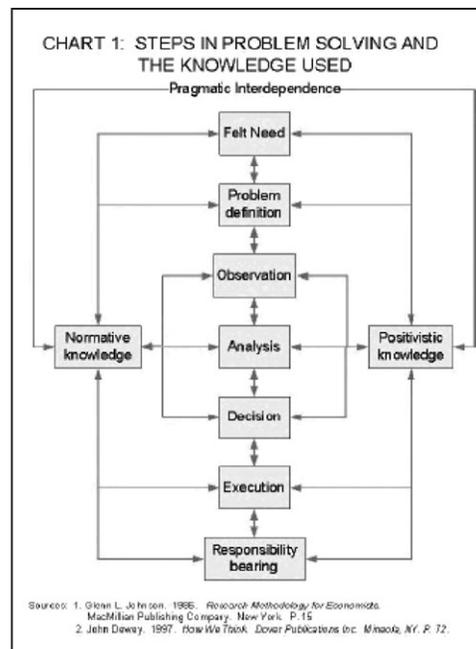
Given this framework, it is easy to see why supervisory agencies have trouble making course corrections. If one assumes that objectives may

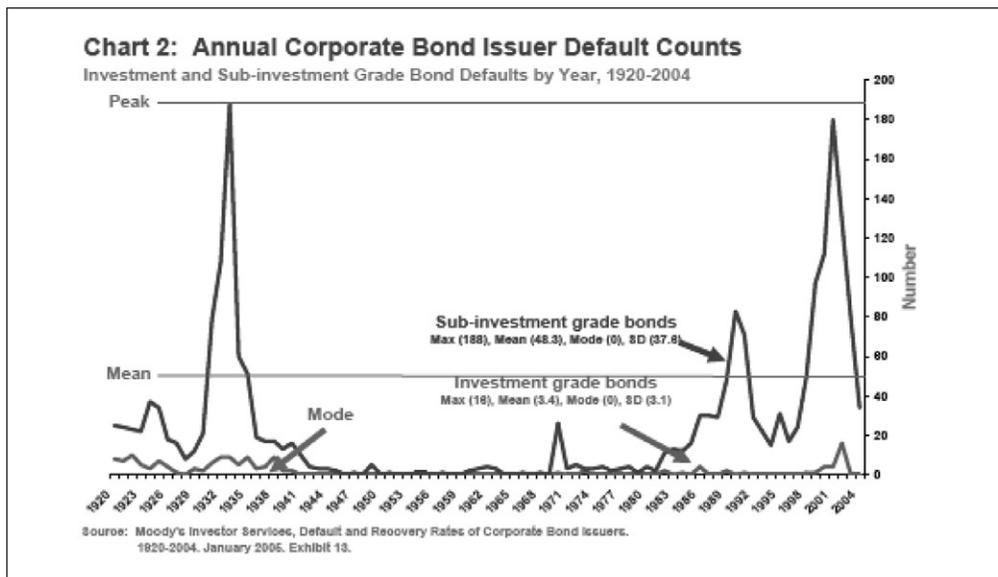
be unclear, significant organizational problems require a multiyear effort to resolve and leadership changes occur frequently (the average federal appointee serves about 24 months), it is obvious that progress in solving problems can be difficult.

Although steps can be taken out of sequence, if steps are the likelihood of success is reduced as knowledge gaps become obvious and credibility suffers. The easiest way for a new manager to loose face with staff, for example, is to make a decision without checking to see whether it has been tried before and what was the outcome. Another favorite path to failure is to infer that an action be taken based on a felt need that is not obviously linked to the proposal. The process of problem solving implicitly provides a vehicle for developing a consensus for proposed solutions and for joint responsibility sharing should problems arise with the execution of the proposal. Taking steps even perceived out of sequence can accordingly be perilous for those making the attempt.

Interestingly, the learning process plays a key role in risk-management for the U.S. military. A recent study reported that making information available to all members of the military—irrespective of rank—plays a key role in responding to the threat of terrorism. In other words, the military's information needs to be more decentralized, in part, because it is hard for a topdown management culture to respond to a threat from a decentralized opponent (Cartwright, 2006). Peak-Load Problem Complicates Loss Measurement and Management.

Chart 2, on page 13, shows annual corporate bond issuer default counts from 1920 through 2004. The characteristic of these data that jumps out at you is that most of the bonds defaults are bunched up in time. This bunching up of losses in particular periods is known among engineers as a *peak-load problem*. The peak-load





problem in the financial markets has generally associated with market contagion. This problem has important implications for regulation, risk management, and long-term planning which are not well understood.

Special Problem Posed by Contagion

Contagion is a medical term that refers to the rapid diffusion of a disease among a host population. One person with the disease exposes another person who quickly becomes sick and infects still other people. An important characteristic of contagion is the observation that the health of the patient prior to infection does not inoculate the patient against the disease—resistance is a function of previous exposure and the presence of antibodies, not general health.

In financial markets, contagion arises when financial weakness in one firm spreads to other firms in the same market. Supervisors usually think of contagion as having two transmission mechanisms—bank runs and bank correspondent relationships—reflecting the treatment of contagion in the academic research on commercial banks. The more general transmission

mechanism, however, is contagion within the market itself.

Supervisors need to resolve troubled financial institutions quickly to avoid financial contagion. For banks, the Federal Deposit Insurance Corporation (FDIC) is responsible for resolving insolvent banks. A resolution normally involves finding a strong bank to purchase or merge with the insolvent bank. The new, larger bank presumably has sufficient capital to mitigate the need for rapid liquidation of the weak bank's assets which can undermine the pricing of financial assets in other firms.

When trouble financial firms are not dealt with promptly by supervisors, these firms can undermine asset pricing in several ways, including:

- Selling assets to raise capital;
- Placing imprudent bets in asset markets; and
- Under-pricing assets in their transactions.

Asset pricing is important because financial viable firms need to earn a rate of return greater than their cost of funds plus administrative costs. If they cannot earn a reasonable rate of return in

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Table 1: Summary of Annual Corporate Bond Defaults, 1920-2004

	Investment grade	Sub-investment grade	Total bond defaults
Default counts			
Sum	148	2,076	2,224
Mean	3.4	48.3	51.7
Maximum	18	188	197
Minimum	0	0	0
Mode	0	0	0
Standard deviation	3.1	37.6	39.5

Note: Data correspond to chart 2.

Source: Moody's Investor Services, *Default and Recovery Rates of Corporate Bond Issuers, 1920-2004*. January 2005. Exhibit 13.

their usual markets, then they compete more aggressively in new markets where they may drive down pricing in those markets as well causing the problem to spread further. This problem is especially severe for large firms with low per-unit mark-ups because any loss in output volume raises per-unit costs pressuring the firm to maintain volume precisely when the lost profitability signals a need to pull back from—not expand into—that particular market.

Falling market prices can drive sound financial institutions towards insolvency, if they operate at a loss. Contagion accordingly leads to a clustering of financial losses in particular locations, industries, and time periods that may be hard to contain.

Implications for Decisions under Uncertainty

The peak-load problem in financial losses poses a challenge for regulator learning because average losses are a poor proxy for peak losses. Most of the losses during the credit cycle are concentrated in a very short period of time, in specific locations, and in specific industries. This shows up statistically as a very large difference between the mean and mode⁶ of the distribution of losses (table 1).

The existence of a peak-load problem complicates both risk analysis and decisions under uncertainty. Risk is the probability of a future loss. Managers do not possess perfect knowledge of their businesses or the future. Regulators possess even less knowledge than managers. A peak-load problem further limits the usefulness of averages of financial indicators and exacerbates volatility in the measurement of losses. Let me address these two problems briefly.

The peak-load problem makes average loss data misleading. Holding a capital against an average loss is like building a levy against an average flood: half the time your average levy will be inadequate and your losses will be catastrophic. Levies are typically built based on the high-watermark flood adding in a margin for error that depends mostly on financial capacity.⁷

The peak-load problem leads to volatility in measured risk. The probability of future losses changes dramatically over time. Model error, for example, that is inconsequential in normal market periods can threaten firm survival during peak periods. Managers and supervisors accordingly provide their largest value added by recognizing early on when market conditions have changed and acting on that knowledge.

Losses are Correlated, Not Random

Concentrating losses, like bond defaults and credit losses, in short time periods by itself suggests that losses are correlated and are not randomly or uniformly distributed in time as assumed by most loss models.⁸ This problem implies that loss models are likely to

⁶The mode of a distribution is the most frequent observation. It differs from the mean and the median of the distribution.

⁷The economic capital approach takes this problem into account by assuming that average losses are accounted for in product pricing. Capital is held against the difference between expected loss (the mean) and unexpected loss (the mean plus X number of standard deviations). The key problem with the economic capital approach is the practical problem of getting access to data sufficient to account for the historical peak load periods.

⁸Most modelers use logit models to estimate these equations. Logit model explicitly assume independence because they use maximum likelihood estimation (MLE). MLE works by assuming you know a distribution and fitting your data to it. Because MLE assumes that independent observations are multiplied by one another in the likelihood estimator, covariance among the observations leads to an exponential increase in error and a much more complex functional form than is typically assumed. For this reason, econometricians will argue for hours that their observations are independent rather than account for the covariance. This problem is starting to be noticed. See, for example: (Altman, 2006).

underestimate losses just when the models are most needed.

Chart 2 makes the concentration of losses in time fairly obvious. There is, however, a second source of correlation in the chart. Note that losses on investment grade bonds typically peak at close to the time when the sub-investment grade bonds default. Sub-investment grade bond losses are greater, but they are correlated to the investment grade losses. This observation implies contagion both within and across industries. Because these are national figures, this observation also implies contagion across geographic regions of the country.

At least during peak periods, losses are not normally distributed. The statement that loss events are normally distributed implies that:

- The mean values provide useful information about typical losses and
- The tail values are well-behaved and can be accurately estimated.

If losses are concentrated in time (that is, are not normally distributed), both observations are misleading. The mean values provide little insight into the distribution as a whole and tail values are highly volatile and cannot be measured with any degree of precision. This is another way of saying that historical events are unique.⁹

Conflict between Short Run Profitability and Long Run Solvency

Accounting for the peak-load problem in financial losses over time draws attention to a conflict in incentives between managing for

short-run profitability and maintaining long-run solvency.

Economists distinguish two kinds of costs in the theory of the firm: variable and fixed costs. Variable costs vary in the short term with the level of output. Fixed costs associate with long term investment. Risk is the probability of a future cost to the firm. Credit and market risks tend to be short run and tied to current business decisions like variable costs. Operational risks that threaten firm solvency tend to be long run and tied to firm structure. This gives them fixed cost characteristics.

In a competitive market, economic theory suggests that prices should be set close to variable costs. Competition has this effect because the pricing of fixed costs is arbitrary and large firms are able to lower their per-unit fixed costs by expanding their output up to a point of diminishing marginal returns. The implication for financial regulators is that in competitive markets firms will pass on the costs of prudentially managed credit and market risks, but not the costs associated with operational risks. Firms are less likely to be able to pass on the costs of operational risks because of the fixed cost characteristics of operational risks. Pricing operational risks, like the peak load losses associated with systemic risk, is likely to invite new entrants, customer substitution away from products, and regulatory arbitrage.¹⁰

Firms May Not Anticipate Ratings Downgrades

Chart 2 provides some insight into the effect of a systemic event. In a systemic event, counter

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Operational risks that threaten firm solvency tend to be long run and tied to firm structure. This gives them fixed cost characteristics.

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⁹ Central tendency—the law of large numbers—which statisticians use to draw many common inferences does not apply when historical events are unique and do not tend to show regularity.

¹⁰ Parenthetically, when fixed costs need to be imposed, they need to be imposed on the entire industry and all competitors within the industry. A classic example is the imposition of labor contracts on the meat industry during the Second World War. The federal government created a wartime labor relations board to maintain production to support the war effort. Master labor agreements were imposed on the entire meat industry to preclude strikes and competition that would lead to strike behavior. This raised the cost of meat, but labor got a higher standard of living not undermined by industry competition. These master agreements amount to government sponsored collusion and were only eliminated in the 1980s when structural changes in the meat industry introduced.

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parties fail resulting in loss of credit enhancement. Investment grade firms may accordingly be downgraded to sub-investment grade status. The probability of default accordingly follows the path of the sub-investment grade firm—not investment grade firms—where default levels are substantially higher.

The downgrade effect can mask true risk measurement efforts in several ways, including:

- Firm planning may assume investment grade status when sub-investment grade status is the more appropriate assumption.
- Capital is typically allocated after credit enhancement. If credit enhancement fails, capital is by definition inadequate.
- Defaults are typically recorded by those that bear the cost. If counterparties typically absorb normal defaults, the defaults are recorded by the counterparties, not the firm.

Estimating loan defaults based only on firm records may accordingly understate the true risk of default because the observed loss data is really the residual loss, not total loss.¹¹

The downgrade effect accordingly suggests that the assumptions about firm losses in a systemic event can be much higher than anticipated by typical worse case scenarios.

These effects can be illustrated with a numerical example from table 1. If risk managers mitigate against an annual bond default event with only a one percent probability and assume losses are normally distributed, investment grade bond losses are likely not to exceed 10.6 bond defaults (3.4 + 2.33*3.1). This estimate is too low to offset even average losses of 48.3 for sub-investment grade bonds. This observation suggests that loss mitigation efforts, such as credit enhancement,

can hide significant loss surprises in firms that do not anticipate them.

The downgrade effect noted here is really a proxy for the problem of firm revaluation. When firms are revalued, the risk premium associated with a firm's securities rises and the value of the firm falls from market towards liquidation value. Private rating companies may or may not anticipate this revaluation. Depending on the quality of the analysis done, ratings can be downgraded before or after these changes in market valuation, depending on the quality of the analysis done.

RISK MANAGEMENT IS ATTACHING INCENTIVES TO INFORMATION

Managers work with directors to define clear firm strategic objectives, translate those objectives into a plan, communicate the plan to staff, and execute the plan in daily operations (chart 1). Because managers cannot do everything themselves, the most critical elements in their work are information processing, communication, and incentives. An effective supervisory program targets these critical elements.

Problem Definition, Observation, and Analysis.

In risk management, timing is everything. Taking advantage of market opportunities and avoiding catastrophic losses both require timely responses. The higher portfolio turnover rates that have evolved in recent years exacerbate the timing problem. For risk management, monitoring loss data is key.

Two pieces of loss information drive risk analysis:

- Identifying trends that suggest losses are rising; and
- Recognizing changes in product loss covariances that may undermine the efficiency

¹¹ The technical term for this problem used by statisticians is data censoring.

of hedging relationships (basis risk) and indicate rising model risk.¹²

Both signal the transition between normal markets and peak-load periods.

A peak-load problem potentially leads to under-investment in prudential measures for two reasons:

- A principal agent problem¹³ arises because the term of office of managers and regulators does not typically extend long enough to account for the next peak load period; and
- Because future losses are potentially separated by decades of prosperity, losses are discounted over several decades and their present value may approximate zero.

All forecasts are subject to uncertainty. Until everyone agrees a problem exists nothing gets done. If no one has an incentive to account fully for the risks borne, both firm and supervisor are likely to under-invest in prudential measures.

Communication. Once a problem has been defined, information gathered, and analysis undertaken, people must be informed and then convinced to act on it. The first part of this process is providing information. Articulating risk analysis information accurately to directors, managers, and staff in time to take corrective action requires effective written and oral communication.

Incentives Matter. Even when people agree that a problem exists, fixing the problem must become a priority. In an administrative context, priorities are communicated through the performance management system—what does boss think is important enough to evaluate staff on? Risk management information, once created, need to be communicated and to be attached to incentives communicated through performance management imperatives. ♦

¹² The standard guideline used to undertake model risk examinations is available online. See: (Brown and Dick, 2000). Also see: (Derman, 1996).

¹³ The idea of a principal agent problem is at least in part analogous to the asset-liability mismatch problem in interest rate management. Also see previous footnote.

Increasing the Usefulness of ERM to Insurance Companies

Jean-Pierre Berliet

I am indebted to Robert Stein of Ernst & Young, Robert Rosholt, of Nationwide Group, Thomas Rogers, of Zurich Financial Services, Stephen Steinig of New York Life and Valentina Isakina of Bain & Company for insightful and stimulating comments on this paper. I am responsible for errors and ambiguities that remain.

Background and Overview

Although many independent studies suggest that Enterprise Risk Management (ERM) may be coming of age in the insurance industry—efforts to integrate risk considerations into daily decisions appear to progress slowly and meet resistance. As a result, it is far from clear whether ERM is a factor in actual decisions and is having a beneficial impact on the financial performance of companies. In many companies, executives have also been wondering whether costs incurred to establish ERM have produced commensurate benefits.

This article is based on discussions I had with many executives of insurance companies regarding the challenges they are encountering to establish ERM and in preparing for discussions with rating agencies or regulators. Observations they shared suggest that, in many companies, the effectiveness of ERM and related risk adjusted performance measurement frameworks is impeded by design weaknesses, especially the absence of a mechanism to reconcile the solvency concerns of policyholders and the value concerns of shareholders.

Design weaknesses are an important source of resistance to ERM implementation. Some are subtle and thus often remain unrecognized. However, seasoned business executives recognize readily that decision signals from ERM can be misleading in particular situations in which these design

weaknesses can have a significant impact. This generates much organizational heat and can create a dysfunctional decision environment.

Discussions with senior executives suggested that decision signals from ERM would be more credible and that ERM would be a more effective management process if ERM framework were shown to:

- Reconcile the risk concerns of policyholders and shareholders.
- Support management of operational risk.
- Produce credible and useful risk adjusted performance measures.
- Align performance metrics with management's performance measurement philosophy.
- Integrate ERM into daily management activities.

The following five sections discuss these issues and suggest action steps that insurance companies should take to establish ERM as a more robust and valuable management process.

Reconciling Risk Concerns of Creditors and Shareholders

Creditors—including policyholders and rating agencies or regulators whose mission it is to protect creditors—and shareholders are all interested in the financial health of an insurer, but in different ways. Creditors want to be assured that an insurance company will be able to honor its obligations fully and in a timely manner. For creditors, the main risk question is: what is the risk of the business? This is another way to ask whether the company will remain solvent.

Shareholders, however, are interested in the value of the business as a going concern—in how much this value might increase and by how



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much it might decline. For shareholders, the main risk question is: what is the risk to the business? Shareholders are interested in what ERM can do to increase and protect the value of their investment in a company. While both creditors and shareholders are interested in the tail of the distribution of financial results—as an indicator of solvency risk—shareholders are also very interested in the mean of these financial results and their volatility, which could have an adverse impact on the value of their investment.

Policyholders' and shareholders' views are different but not incompatible: a company could not stay in business if it were not able to persuade regulators that it will remain solvent and should be allowed to keep its license, or obtain from rating agencies a rating suitable for the business it writes. Its value to investors would be significantly impaired.

Insurers recognize that the main drivers of their risk profile are financial risks, including insurance risk accumulations and concentrations, and the related market risk associated with their investment activities. They understand that resulting risks are best controlled at the point of origination through appropriate controls on underwriting and pricing and through reinsurance and asset allocation strategies that limit the vol-

atility of financial outcomes. Stochastic modeling is being used more broadly by companies to understand how such risks accumulate, interact and develop over time and to evaluate strategies that enhance the stability of outcomes. Capital adequacy is the ultimate defense against severe risk “surprises” from insurance and investment activities. It is of interest to policyholders who want to be certain to collect on their claims, but also to shareholders who want assurance that a company can be viewed as a going concern that will write profitable business in the future.

Methodologies used by rating agencies on behalf of creditors describe in detail how the rating process deals with the three main drivers (insurance risk, investment risk and operational risk) of a company's financial position and of the volatility (risk) of this position. In response to rating agency concerns, insurance companies focus on determining how much “economic capital” they need to remain solvent, as a first step toward demonstrating the adequacy of their capital. Analyses they perform involve calculation of the losses they can suffer under scenarios that combine the impact of all the risks to which they are exposed. This “total risk” approach and the related focus on extreme loss scenarios (“high severity/low frequency” scenarios) are central to addressing creditors' concerns.

To address the solvency concerns of creditors, rating agencies and regulators and the value risk of shareholders, insurance companies need to know their complete risk profile and to develop separate risk metrics for each group of constituents. Knowledge of this risk profile enables them to identify the

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Methodologies used by rating agencies on behalf of creditors describe in detail how the rating process deals with the three main drivers of a company's financial position and of the volatility (risk) of this position.

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Comparing Perspectives on Risk:
Policyholders vs. Shareholders

	Policyholders	Shareholders
Risk	Insolvency	Value Loss
Risk Management Objective	Protection of Capital and Ratings	Protection of Company Value
ERM Focus	Financial Risks <u>of</u> the Business	Operational and Strategic Risks <u>to</u> the Business

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distinct risk management strategies that they need to maintain high ratings while also protecting the value of their shareholders' investment. Leading ERM companies have become well aware of this requirement and no longer focus solely on tail scenarios to develop their risk management strategies.

ERM frameworks must also recognize that tools and processes required to address value risk concerns of shareholders are different from those required to address solvency risk concerns of policyholders. Measuring and managing shareholders' value risks requires tools and processes capable of addressing risk issues on a "going concern" basis, including explicit consideration of operational risk, with special focus on its strategic component.

To reflect these critical considerations, companies need to:

- Create a risk measurement capability (e.g., a stochastic risk analysis model) for their business, at an appropriate level of granularity, to analyze the combined effects of underwriting and investment strategies on the company's ability to withstand plausible stress scenarios and the volatility of its earnings.
- Seek agreement on the level of earnings volatility acceptable to investors, relative to the volatility of results evinced by companies of similar capitalization.
- Assess the impact of alternative underwriting, investment, reinsurance strategies on the volatility of their financial results and capital positions and their ability to carry out their strategy on a going

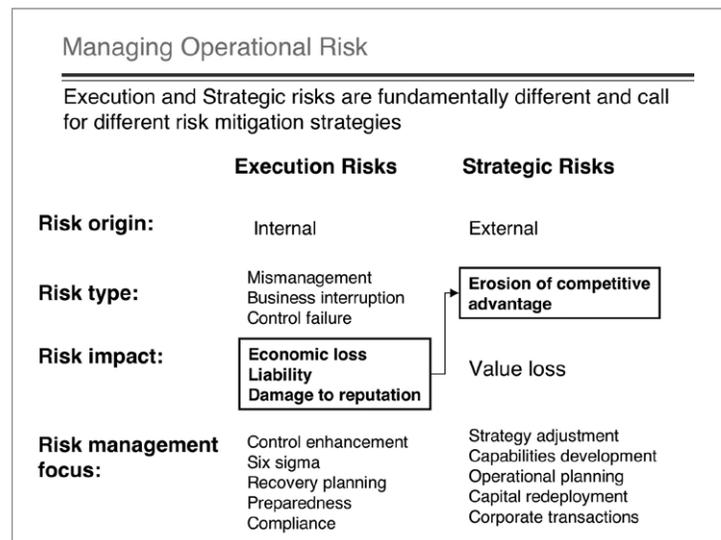
concern basis (e.g., over the next three or five years).

- Integrate insights from risk modeling and analysis into strategic and tactical decisions, including capacity and capital deployment across business lines or segments, underwriting/pricing, risk retention and risk transfer, asset allocation.
- Seek formal approval from the Board of Directors on proposed strategies, expected returns and the related confidence level.
- Establish processes to identify and manage exposures to material operational risks—including recovery programs and appropriate oversight and compliance mechanisms—and strategic risks that can inflict severe value losses to shareholders.

Managing Operational Risk

Operational risk comprises two different types of risks: execution risk and strategic risk.

These two categories of operational risk are important to policyholders and shareholders because they can reduce both the insurance strength and the value of insurance companies. Strategic risk stems from external changes that can undermine the profitability and growth expectations of a company's business model and strategy, and therefore have a significant impact on its value. Execution risk originates



in internal failures to manage the operations of a company competently, with the needed level of foresight, prudence, risk awareness, and preparedness. Execution and strategic risks impact insurance companies differently and, as a result, call for distinct mitigation strategies.

Execution Risks

Although financial risks are the primary determinant of the volatility of financial results of insurance companies, execution risks can also cause material adverse deviations from expected financial results.

Execution risks include, for example, economic losses resulting from

- Delays in alleviating adverse consequences of changes in the volume of activity (mismanagement).
- Events that can interrupt business operations whether man made or natural (lack of preparedness).
- Failures in controls that cause economic losses, create liabilities or damage the company's reputation (market conduct, regulatory compliance, bad faith in claim management, fraud, IT security, etc.).

Execution risks reduce current financial performance and company valuation. Company valuation is reduced investors because

- Often view negative earnings deviations as predictors of future decline in profitability and
- also performance volatility can derail the execution of a company's growth strategy.

Execution risks are relatively easy to identify, if not to mitigate for company management. Although stochastic modeling tools and event databases could be used to simulate the impact of execution risks on financial performance and fine tune mitigation strategies, undertaking such modeling is very costly and may be of limited

value. Company management has fiduciary obligations to set in place processes designed to avoid execution risks, establish post event recovery procedures and to ensure compliance.

Both policyholders and shareholders need to note that

- Execution risks can impact financial performance significantly in the year or period of occurrence but may have a more or less pronounced impact on performance in subsequent periods and company valuation, depending on the availability of recovery strategies and the preparedness of a company.
- The impact of execution risks on a company's market value can be derived from estimated adjustments to free cash-flow projections. This is particularly significant in connection with risk events that erode a company's competitive advantage or damage its reputation. Such events can reduce the market value of a company significantly by reducing its volume of business or its pricing flexibility.

Management processes and management action—not capital—are the natural remedy for execution risks. Board of Directors or Audit Committees of such boards have become increasingly involved in exercising oversight of execution risks and their management by operating executives.

Strategic Risks

Strategic risks can undermine the economic viability of the business model and future financial performance of insurance companies. They can have a significant adverse effect on a company's insurance ratings and the credit worthiness of its debt and also its market capitalization. Strategic risks can cause otherwise solvent companies to lose a substantial share of their market value in a short time,

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provoke legal action by disgruntled shareholders, inflict serious economic losses to Directors, senior executives and other employees, and induce potential raiders to attempt a take over.

Strategic risks are also very important to policyholders, (especially those who have bought protection against slowly emerging liabilities or policies that provide indemnification benefits in the form of annuity payments), because strategic risks that undermine the ability of companies to earn formerly expected returns also reduce the credit worthiness of these companies. Strategic risks stem from external changes in the regulations, institutional arrangements, competition, technology or demand that can erode the competitive advantage of an insurance company and its ability to operate credibly and profitably as a going concern in the future.

Strategic risks do not receive as much attention as they should because they are difficult to identify and assess, and are often viewed as “uncontrollable.” At any point in time, it can be very difficult to assess whether a quantum change in any element of strategic risks is close to happening. When such a change occurs, however, its impact on future performance can cause a swift decline in the market values of a company.

To identify and manage strategic risks, companies need to:

- Conduct and challenge a periodic defensibility analysis of their business model and competitive advantage.
- Monitor market developments for emerging trends with potential adverse effects (loss of business to competitors, emergence of new risk transfer technologies or product innovations, regulatory developments, etc.).
- Develop appropriate responses to adverse developments through adjustment in

capabilities, redeployment of capacity, change in composition and level of service provided, industry level lobbying of lawmakers and regulators, sponsorship of and participation in industry associations, etc.

- Communicate reasons for and objectives of needed changes to both customers and shareholders.
- Integrate the planned strategic response into action plans, budgets and objectives of business units.

Insurance companies need to include in ERM a process that provides consistent and updatable insights into strategic risks to which they are exposed. Because the insurance industry has been highly regulated, many insurance companies have not developed deep strategy development and assessment skills. It will be a challenge at first for such companies to establish strategic risk assessment frameworks powerful enough to yield robust insights but simple enough to be user friendly.

Conducting systematic reviews of strategic risks is important to all constituents. A number of companies that have already implemented comprehensive risk management frameworks have begun addressing strategic risks more formally. In one company, the CEO stated to me that he bore ultimate responsibility to shareholders for being both his company’s Chief Risk Officer and Chief Return Officer.

Producing Credible and Useful Risk Adjusted Performance Measures

Risk adjusted performance measures (RAPM) such as Risk Adjusted Return On Capital (RAROC), first developed in banking institutions, or Risk Adjusted Economic Value Added (RAEVA) have been heralded as significant breakthroughs in performance measurement for insurance companies. They were seen as offering a way for risk bearing enterprises to relate financial performance to capital con-

sumption in relation to risks assumed and thus to value creation.

Many insurance companies have attempted to establish RAROC/RAEVA performance measurement frameworks to assess their economic performance and develop value enhancing business and risk management strategies. A number of leading companies, mostly in Europe where regulators are demanding it, have continued to invest in refining and using these frameworks. Even those that have persevered, however, understand that framework weaknesses create management challenges that cannot be ignored.

Experienced executives recognize that the attribution of capital to business units or lines provides a necessary foundation for aligning the perspectives of policyholders and shareholders.

Many company executives recognize, however, that risk adjusted performance measures can be highly sensitive to methodologies that determine the attribution of income and capital and that earnings reported for a period do not adequately represent changes in the value of insurance businesses. As a result, these senior executives believe that decision signals provided by risk adjusted performance measures need to be evaluated with great caution, lest they might mislead. Except for Return on Embedded Value measures that are compar-

tively more challenging to develop and validate than RAROC/RAEVA measures, risk adjusted performance measures are not typically capable of relating financial performance to return on value considerations that are of critical importance to shareholders.

To provide information that is credible and useful to management and shareholders, insurance companies need to establish risk adjusted performance measures based on:

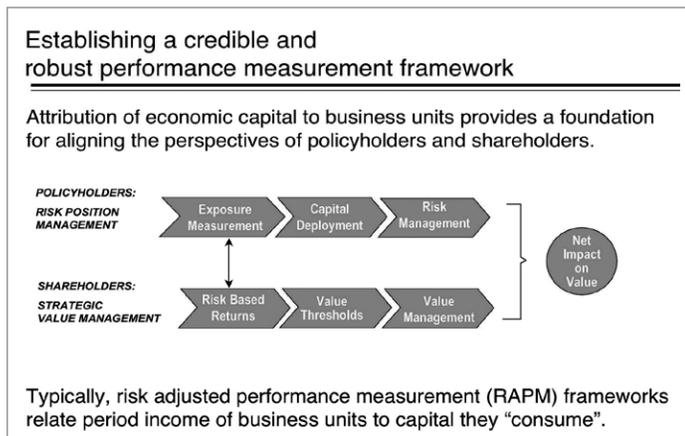
- A (paid up or economic) capital attribution method, with explicit allowance for deviations in special situations, that is approved by directors;
- Period income measures aligned with pricing and expense decisions, with explicit separation of in-force/run-off, renewals, and new business;
- Supplemental statements relating period or projected economic performance/ changes in value to the value of the underlying business;
- Reconciliation of risk adjusted performance metrics to reported financial results under accounting principles used in their jurisdictions (GAAP, IFRS, etc.);
- Establishment and maintenance of appropriate controls, formally certified by management, reviewed and approved by the Audit Committee of the Board of Directors.

In many instances, limitations and weaknesses in performance measures create serious differences of view between a company's central ERM staff and business executives.

Capital Attribution

To be useful, a RAROC framework must be based on a credible and robust method of attributing a company's

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capital to its individual lines of business or business segments.

Many calculation methods, often based on stochastic corporate models of insurance, have been developed for the purpose of attributing capital. Unfortunately, these methods have been shown to produce results that are sensitive to the methodology selected and to changes in risk measures and tolerance targets, correlations assumptions, the relative growth and performance of individual segments and the applicable risk assumption horizon. Instability of capital attribution results undermines the confidence that senior executives can place in RAROC as a guidepost for decisions.

Meanwhile, investors and directors insist on understanding how management “allocates” capital across activities. From their vantage point, capital “allocation” refers to how capital (as a proxy for “insurance capacity”) has been or will be deployed across lines and business segments as a result of explicit decisions to seek particular exposures or types of business. They correctly see that management moves (i.e., “allocates”) capital across lines and business segments whenever underwriting activities are redirected. As a result, they seek to hold management accountable and demand that executives be able to demonstrate that capital is or will be deployed toward uses in which realized returns are commensurate with risks assumed.

Performance Benchmarks

It is customary to compare RAROC performance to a company’s cost of capital or to its return on equity target, depending on whether the capital attributed to business segments is the company’s “economic capital” or the company’s available capital measured under GAAP accounting rules. Both ways can be misleading, for different but important reasons.

Comparing RAROC to a company’s cost of capital is problematic when attributed economic capital is used for calculating RAROC. Since economic capital is derived from consideration of the company’s total risk and represents an amount of assets available to pay obligations to creditors, return on economic capital cannot be compared to the company’s cost of capital. The company’s cost of capital represents expectations of return by investors in compensation for systematic risk assumed for owning shares of the company, not for being exposed to total risk, a part of which can be diversified away. Further, this cost of capital performance benchmark should be used to assess returns on the value of investors’ ownership positions rather than returns on the nominal amount of economic capital supporting a business segment or a company. Adjusting a RAROC measure to reflect the impact of these complexities and make the resulting adjusted RAROC comparable to a cost of capital estimate derived from observations in the capital market would not be straightforward, and appears to involve resolution of methodology issues for which no approach has yet been developed. Much caution is needed to use a calculated RAROC to assess financial performance and drive business and risk management decisions.

Comparing RAROC to a company’s ROE target can also be misleading when the company’s available capital measured under GAAP rules is used to calculate RAROC. The potential for misleading signals exists because there is no direct and simple relationship between measures of ROE under GAAP, measures of economic returns (such as GAAP income return on economic capital; economic income on the “fair value” of net assets; and return on embedded value), and a company’s cost of capital. Accounting adjustments needed to reconcile risk adjusted return metrics with reported statements are neither simple nor easy to grasp intuitively. Although it would be possible to develop a mapping of GAAP ROE into corre-

sponding measures of economic performance, I am not aware that any company has actually attempted to do this to calibrate its performance benchmarks. In any case, relating such benchmarks to a company's cost of capital with confidence would remain problematic for reasons explained in the preceding paragraph.

It is important to note that methodology issues discussed above in connection with the calculation and interpretation of RAROC would also apply to other measures of risk adjusted performance, such as RAEVA. They would not, however, apply to return on embedded value metrics (or the more recently developed return on European Embedded Value metric), based on a framework that aligns the calculation of returns with the change in value orientation of calculations made by investors in the capital market.

In a number of leading companies, difficulties involved in calculating and interpreting correctly RAROC or other measures of risk adjusted performance such as RAEVA are leading management to fall back on traditional performance measures, such as loss ratios and combined ratios or investment spreads, calibrated to reflect differences in risk levels, and to explore the feasibility of adopting additional performance metrics such as earnings at risk or embedded value at risk.

Aligning Performance Metrics with Management's Performance Measurement Philosophy

To provide useful guideposts for business decisions, the risk adjusted performance measurement framework supporting ERM needs to reflect senior management's views regarding alignment of responsibilities and performance metrics. Alignment is ensured by

- Matching of the structure of the financial management reports to the boundaries of business segment,
- Accurate attribution of capital, premium revenues, investment income and expenses to business segments, and
- Segregation in financial reports of the results associated with the current period from the impact of business written in prior years.

This alignment ensures appropriate distinctions between results of current and past decisions and a sharp focus on differences in drivers of performance.

In practice, leading companies are making explicit decisions about the design and features of the financial performance measures they develop by developing customized answers to questions such as the following:

- Are business segments to be evaluated on a stand alone basis or in a portfolio context (i.e., after attribution of a capital credit for diversification)?
- Are business segments to be evaluated as if assets they earned risk free, duration matched investment income? Or the average rate of return on the investment portfolio?
- Are business segments to be evaluated in relation to their "consumption" of economic capital? Regulatory capital? Rating agency capital?
- Should individual business segments bear the cost of "excess" or "stranded" capital?
- Should performance benchmarks vary across business segments, in line with differences in the volatility of their total risk? Or differences in exposure/premium leverage across lines? Or contribution to corporate debt capacity?
- How granular does such reporting need to be?
- Should performance metrics be developed in a policy/underwriting year framework?

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Comparing RAROC to a company's ROE target can also be misleading when the company's available capital measured under GAAP rules is used to calculate RAROC.

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Would such metrics need to be reconciled with metrics based on fiscal year GAAP reported numbers?

- How should the period performance of the in-force (or liabilities run-off) be measured and separated from the performance of the “new business?” To what extent and how should the performance of “renewal” policies be separated from that of policies written for new customers in property, casualty companies?
- Should the performance reporting framework provide only period measures of performance or should it be extended to capture the longer term economic value of insurance contracts, such as the change in the embedded value of the business?
- Should the performance reporting framework be extended to incorporate stochastic performance metrics such as Earnings@Risk or Embedded Value@Risk?

Leading ERM practitioners, especially in Europe, have found that the usefulness, but also the complexity and cost of risk adjusted performance metrics are determined by the desired level of granularity in reporting, and design decisions in risk measurement, capital measurement and, financial reporting. The availability and quality of risk and financial data determine to a significant degree the level of granularity that can be built to support ERM.

In my experience, success in establishing ERM is highly dependent on the level of effort that companies devote to designing a reporting framework that the organization can understand and embrace intuitively, without having to be trained in advanced financial or risk topics. In this area, setting out to develop the most rigorous and actuarially correct framework is likely to result in poor acceptance and much resistance on the part of decision makers who run the business day by day.

Integrating ERM into Daily Management Activities

Many senior executives recognize that establishing an ERM process is an obligation that cannot be avoided in today’s environment. They also have a strong intuitive sense that the science of risk measurement and analysis offered by the actuarial profession and other specialists in risk does not yet provide robust answers to many important questions that are asked by people who manage the operations of insurance companies day by day. Differences in perspectives between executives in the corporate center and the managers of business units hamper the effectiveness of ERM. Bridging these differences is a major challenge to the establishment of ERM. This challenge is rooted in fundamental differences in the roles and responsibilities of these actors.

ERM change management challenge:
Securing buy-in from operating units

ERM effectiveness can be hampered by differences of perspective between the corporate center and operating units.

	Corporate Center	Business Units
Primary audience	Shareholders	Policyholders
View of risk	Aggregate, across business portfolios	Customer and product related
Strategic risk decisions	Capital deployment Reinsurance Asset allocation	Product design and pricing Product mix
Operational risk decisions	Management of shared services	Management of operations and quality
Value protection focus	Strategic capital allocation	Competitive advantage

Corporate center executives who operate under oversight of the Board of Directors are highly sensitive to risk concerns of shareholders. It is natural for these executives to take an aggregate view of risk, across the business portfolio. They contribute to corporate performance by making strategic risk management decisions in connection with capacity deployment, reinsurance and asset allocation, and also operational risk management decisions principally in connection with the management of shared services. Their most important risk decisions, related to capital allocation, involve significant strategic risks.

By contrast, business unit managers have a different outlook. They are typically more focused on meeting the needs of policyholders. They are more likely to view risk as stemming from products and customers. From their point of view, risk management starts with product design, underwriting and pricing decisions, control of risk accumulations and concentrations, product mix and customer mix. With regards to operational risk, their activity places them on the front line to control the “execution risk” elements of operational risk. Business unit managers tend to view requests for support of ERM as distractions from serving policyholders and accomplishing their goals. They believe that they help protect shareholders from value loss by focusing on establishing and maintaining a competitive advantage.

The CFO of a very large insurance group confided to me recently that aligning the perspectives of executives at the corporate center with that of business managers was a challenge of great importance. He expressed the view that results from risk models cannot be used simplistically and that experience and business judgment are needed to guide decisions. Caution and prudence are especially important in interpreting decision signals when model results appear unstable or when complexity makes it difficult to recognize possible biases. He had become interested in using a combination of approaches to develop reliable insights into strategy and risk dynamics in his company. He was particularly focused on finding ways to bring these insights to bear on the daily activities of employees who manage risk accumulation, risk mitigation and risk transfer activities, on both sides of the balance sheet. In his judgment, borne out by other discussions and my experience with clients, ERM comes to life and creates value best when a top down framework initiated by senior management is embraced bottom up throughout the organization.

Consistent with these considerations, ERM appears to work best in companies in which operating managers have “bought in” ERM and embraced the perspective it provides. In many of these companies, one observes that:

- Risk management responsibility is owned by operating managers.
- Product definitions and investment boundaries are clear and matched to explicit risk limits.
- Policies and procedures have been co-developed with operating personnel.
- Product approval and risk accumulation are subject to oversight by the central ERM unit.
- Risk and value governance are integrated through a committee with authority to adjudicate decisions about trade-offs between risks and returns.
- Compliance and exceptions are subject to review by senior management.

Note that none of these requirements are about the technical components of risk management. Rather, they define a context for empowerment and appropriate limitations on the activities of people who run day to day operations.

Conclusion

In earlier times, when markets were both less competitive and less turbulent, experienced insurance executives could rely on insights from experience to manage their companies successfully. This is no longer the case. Some of the most successful companies in this country and in Europe have set out to move from a focus on managing individual risk silos to establishing frameworks and processes that can deal with the interaction of risks on an “integrated” basis. The companies that have made more progress have recognized that methodology weaknesses can be overcome by practical “work arounds” that keep ERM credible and relevant

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Increasing the Usefulness of ERM ...

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to people who run their businesses day by day. They establish structures and processes that combine actuarially based risk measurement with linkages to operations and strategy.

In practice, the integration of ERM into operations of an insurance company is easier to accomplish in areas that are managed centrally (e.g., investments, ceded reinsurance) and for which financial modeling can provide strong analytical insights. This integration is harder to accomplish with regards to capital redeployment issues and activities conducted to generate revenues and manage resulting risk accumulations and concentrations. These decisions can have a direct impact on the status and compensation of executives and can generate much resistance.

It is time for executives of insurance companies and ERM professionals to recognize that ERM frameworks are not developed enough, and may never be developed enough, to address and resolve conclusively all the risk issues that insurance companies need to address. In spite of the initial claims, this was never a realistic expectation. Many senior executives seem now ready to support less ambitious but practical approaches to ERM. ERM would be institutionalized in areas where well tested methodologies are clearly advantageous (e.g., financial risks), but would be introduced very gradually in other areas where available methodologies just do not fit well (e.g., strategic risks). In these areas, “work around” based on other disciplines would be created to provide the insights needed to support decision making.

ERM will be more effective in companies that identify and correct weaknesses in their approach. In final analysis, it is unproductive to insist upon the development of a complex and

costly risk capture, measurement, and analytical infrastructure if the data collected is not used to produce insights that executives believe to be credible and relevant. Rather, it matters a great deal to design and establish an approach that can reconcile the perspectives of the most critical constituents, policyholders and shareholders, and produce results that managers can understand and find useful. With a proper focus on the data elements that illumine key material risks, simpler, better designed frameworks will help management identify and resolve important risk issues more effectively and more rapidly.

ERM professionals and executives of insurance companies need to engage in a constructive debate about the limits of risk management methodologies, to reach agreement on what we do not know and determine how best to reach the next level of effectiveness in ERM. ♦

Risk Identification: A Critical First Step in Enterprise Risk Management

Sim Segal

Enterprise Risk Management (ERM) is often defined as a process to identify, measure, manage and disclose all key risks to increase value to stakeholders. ERM is still an emerging concept, and those companies adopting it are in varying stages of implementation. The first phase in the ERM process cycle, after developing the initial ERM framework and plan, is risk identification.

Risk identification typically involves three types of activities:

- Defining and categorizing risks;
- Conducting internal qualitative surveys on the frequency and severity of each risk; and
- Scanning the external environment for emerging risks.

Since risk identification is the first phase in the ERM cycle, some assume that by now the approach must have matured, and that common practice is essentially “best practice.” However, through our research and client work, we have found that common practice in risk identification is suboptimal in several aspects, and produces misleading information not only in risk identification, but also in all downstream ERM phases: risk quantification, risk management and risk disclosure. Relying upon this flawed information puts management at risk of:

- Focusing on the wrong priorities;
- Making poor decisions; and
- Producing improper risk disclosures.

To have a successful ERM risk identification phase and avoid these problems, companies must:

1. Define risks by source
2. Categorize risks with consistent granularity
3. Identify risks prospectively

4. Gather data appropriately
5. Define frequency-severity clearly

Defining Risks by Source

Risks are often defined by their outcome rather than their source. For example, “reputation risk” is a risk commonly found on a company’s key risk list. However, this is not a source of risk, but rather an outcome of other risks. There are several risks—such as poor product quality, poor service, fraud, etc.—that might rise to a level whereby reputation is negatively impacted.

Another example is “ratings downgrade.” Again, this is not a source of risk, but an outcome that can result from several different risk sources, e.g., strategy risk, execution risk, etc. A poor strategy, for example, might result in a rating agency downgrading the company.

This is a common practice, yet defining risks by their outcome, rather than their source, results in several suboptimal ERM steps. It degrades the qualitative survey results; survey participants have an inconsistent understanding of the risk they are assessing, since each person may be considering a different risk source and scenario triggering the event. This also makes risk quantification more challenging and uneven; risk experts have difficulty constructing specific risk scenarios for quantification, since the risk is defined so ambiguously. Finally, management struggles to identify and evaluate mitigation alternatives, since risks are generally mitigated at the source rather than the outcome. For example, it’s easier to consider mitigation of potential sources of reputation risk (e.g., poor product quality, poor service, internal fraud) than it is to mitigate an amorphous concept like reputation damage in the abstract.



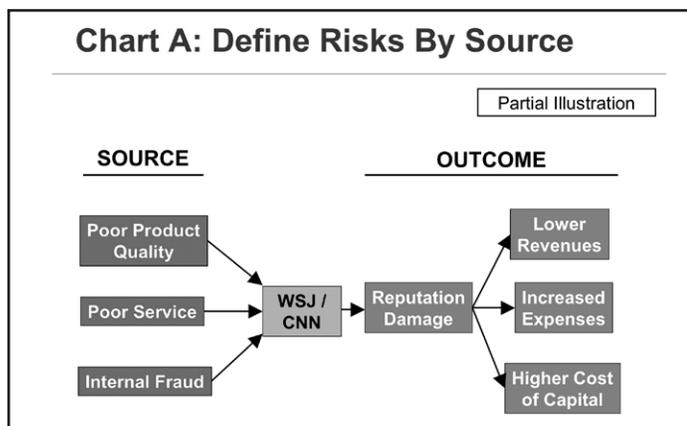
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Risk Identification ...

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To avoid these difficulties, management must define risks by their source. In our prior example of “reputation risk,” we listed three examples of risk sources that might involve reputation damage in an extreme scenario. Chart A shows these risks along with a partial illustration of the relationship of risk sources to intermediate impact(s) and to outcomes. In the chart, the arrows show how each risk can trigger media coverage, resulting in reputation damage, followed by financial repercussions.



With risks defined by their source, the ERM steps flow well. There is data integrity in the qualitative survey; since each risk is clearly defined by its source, survey participants have a consistent understanding of each risk, resulting in a coherent assessment. This also makes risk quantification easier. Since risks are defined so clearly—each with its own specific source—risk experts can more easily develop risk scenarios, following logical downstream

impacts from each originating source. Finally, management can clearly identify and evaluate both pre-event and post-event mitigation alternatives, since both the source of risk and the downstream events are apparent.

Categorizing Risks with Consistent Granularity

Risks are often categorized with inconsistent levels of granularity—either at too high a level or too low a level.

It is common to find a risk list that includes some risks defined at too high a level of abstraction—the risk is really a category of risks that should be refined into a set of smaller, individual component risks. For example, “talent management” —a type of human resources risk—should be broken down into its individual risks, such as “ability to recruit/retain,” “succession planning,” etc.

Defining risks at too high a level, results in suboptimal internal qualitative surveys. It leads to uneven scoring by survey participants, since the larger category obscures its several component risks. However, when risks are consistently defined at the individual risk level, the assessment is more meaningful, since participants can consider and assess each risk individually.

It is even more common to find risks defined at too low a level of abstraction—the risk is really only one of a larger category of risks. For example, “lack of innovative products” is only one specific risk in a larger category. This should be elevated to a higher level of abstraction, and included in the category of “strategy execution.”

Defining risks at too low a level, threatens the environmental scanning activity. It can cause a failure to identify all related types of risk in the larger category. In our example, management may not have considered other risks to strategy execution, for example, “inability to achieve planned growth,” “failure to expand into key new markets,” etc.

Chart B: Consistent Granularity

CATEGORY: OPERATIONAL RISK	
Sub-Category: Human Resources Risk	
Employee productivity	Employees not performing at the level of productivity expected
- Training & development	Training and development program not matching expectations
- Change management	Management unable to lead cultural changes as planned
- Organizational structure	Org structure results in productivity not matching expectations
Talent management	Management of talent not matching expectations
- Ability to recruit / retain	Ability to recruit or retain staff not matching expectations
- Succession planning	Ability to develop new leadership not matching expectations
- Critical employees	Unexpected loss of critical-path employees (unique knowledge/skills)
- Labor/producer relations	Employees/unions or producers take unexpected action against firm
Conduct	Poor or criminal conduct by employee/management
- Public behavior	Poor public behavior by employees or management
- Internal fraud	Fraud/theft by employee or management (other than I/T-related)
- Internal destructive acts	Destruction of company property (not I/T-related) by employee / mgmt

A partial example of how to categorize risks at a consistent level of granularity is shown in Chart B for human resources risks.

Identifying Risks Prospectively

Risks are often identified retrospectively. Some risks are on the key risk list merely because they occurred recently and management wants to see them there. This is called “fighting the last battle” syndrome. In addition, these risks are often defined at too low a level of granularity, since they are descriptive of the recent specific event.

Including these on the risk list, in this way, can skew the qualitative survey results. These risks are often over-weighted; participants are more sensitized to them and are not fully aware of the mitigation that has likely been put in place following the recent occurrence. Retrospectively defining risks also negatively impacts environmental scanning; it is a distraction from identifying the next risk event (as opposed to the last risk event).

Identifying risks prospectively can help avoid these difficulties. It reduces some of the bias in the risk assessment, by not confusing recent experience with future likelihood and impact. It also focuses management away from the past, and concentrates attention on what might impact the company’s ability to deliver on its strategic objectives going forward. This enables a robust, untainted examination of where the company is, where it’s headed and what could get in the way.

Gathering Data Appropriately

In the risk identification phase, qualitative survey participants are usually asked to assess the frequency and severity of a large list of risks. However, in most cases, there is also an attempt to gather a large amount of additional data at this stage: key risk indicators; exposure metrics; historical frequency and severity; current miti-

gation in place; planned mitigation; anecdotal experience at competitors, etc.

However, it is counter-productive to gather all this data during the risk identification phase. Too much data is gathered. Most of this data is only needed for the key risks, rather than the long list of risks provided to survey participants. The primary purpose of the risk identification phase is to prioritize—to narrow down a list of (potentially hundreds of) risks to those key risks that will go to the next ERM phases: risk quantification, risk management and risk disclosure. All that is needed for prioritization is the frequency-severity scoring.

In addition, the data is collected too early. The data that is needed—the data for the key risks—is not needed until the risk quantification phase because it is used to develop and quantify risk scenarios. Since the data is collected too early, it is often deposited in a database where it languishes and as time passes, the quality decreases.

Finally, the burden of the sheer volume of data requested results in survey fatigue. This overwhelms survey participants and decreases the quality of the critical input—frequency and severity assessment.

These difficulties can be resolved by gathering the appropriate data at the proper stage in the ERM process. In the risk identification phase, the qualitative survey should focus participants primarily on assessing frequency and severity. At the risk quantification phase, data should be gathered for developing and quantifying risk scenarios for the key risks. This avoids gathering too much data, since the larger data request is not unnecessarily performed for those risks that are not key risks. In addition, data is more current, since it is gathered closer to the time it is needed. Finally, survey participants can do a better job, since they are not overwhelmed by excessive volume.

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Risk Identification ...

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Defining Frequency-Severity Clearly

When survey participants are asked to qualitatively assess a list of potential risks, the most common approach is to ask them to score each risk on both a frequency and severity scale. Guidance is usually provided in terms of scoring criteria. A simplified example is shown in Chart C.

Chart C: Illustrative Scoring Criteria

Frequency	Severity
5 = Very High	5 = Impact of \$100M+
4 = High	4 = Impact of \$50M - \$100M
3 = Moderate	3 = Impact of \$25M - \$50M
2 = Low	4 = Impact of \$10M - \$25M
1 = Very low	5 = Impact of less than \$10M

However, this approach often results in disparate impressions among survey participants as to how to score both frequency and severity, negatively impacting survey results.

To score frequency, participants must consider a specific risk scenario. Is it an end-of-the world scenario? Is it a most likely scenario? The former would solicit a lower frequency score than the latter. However, such guidance is rarely provided. As a result, each participant tends to imagine a different scenario, and collectively they are essentially not scoring frequency for the same risk event.

To score severity, participants must understand the metric impacted. Is it an earnings hit? Is it one-time or cumulative hit (and for how many years)? Is it a capital hit? Is it a hit to market capitalization? While guidance usually includes magnitude, as in our example, sufficient detail regarding the impact is often omitted. Again, participants have an inconsistent understanding and are not assessing on the same basis.

To resolve this, it is important to more clearly define frequency and severity prior to the qualitative risk assessment.

To define frequency clearly, participants must be given guidance as to the type of risk scenario to consider. One example of how to do this is to focus participants on a particular type of risk event, as shown in Chart D. A range of data points is shown in the chart, each representing a potential risk event. The ellipse illustrates that survey participants should consider a “credible

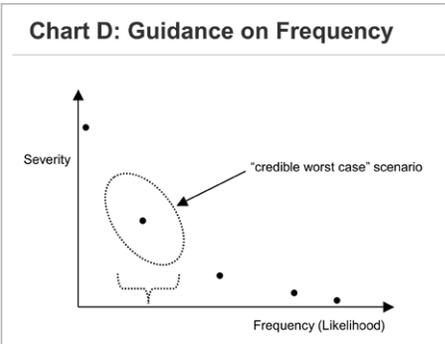
worst case”—not an (extremely unlikely) end-of-the-world event and not an event that occurs with moderate frequency.

To more clearly define severity, more specificity should be provided on the metric(s) intended. A leading practice is to express the scoring criteria in terms of a single metric that can capture all potential impacts—impacts to income statement, balance sheet, required capital and cost of capital. The only metric that captures all of these impacts appropriately is enterprise value—the present value of projected cash and capital flows into the future, where the projection is consistent with the strategic plan. This is not market capitalization. Rather, it is the value an investor should pay today, if the company were to perfectly execute its strategic plan and everything go precisely as expected.

The enterprise value metric is initially less tangible to some, since it’s a complex calculation. However, it is intuitive—the value of the firm is a concept everyone understands. In addition, simple illustrations of selected risk events and their relative impact on enterprise value provide survey participants with a general feel for this metric that is sufficient for qualitative assessment purposes.

Though risk identification is the first step in the ERM process cycle, appears to be the simplest, and is the most traveled, common practices are fraught with issues that can damage an ERM program. To avoid this, management must: define risks by source; categorize risks with consistent granularity; identify risks prospectively; gather data appropriately; and define frequency-severity clearly. Companies adopting these “better practices” have found that the risk identification phase is quicker, easier, more widely understood and produces higher quality results, paying dividends as well in downstream ERM phases. Those continuing with common practices may find themselves more at risk—of focusing on the wrong priorities, making poor mitigation decisions, and ultimately improper risk disclosures. ♦

Chart D: Guidance on Frequency



International Survey of Emerging Risks

Max J. Rudolph

Editor's note: This article also appears in the August 2008 issue of International News.

Emerging risks surprise us, they sneak up on us, and after they occur everyone wonders why we didn't anticipate them in the first place. Hindsight is, indeed, 20/20. Try to recall how often you thought about the likelihood of the most recent financial bubble or a recent natural disaster prior to its occurrence. Even if you were aware of it and wanted to take action, the markets were unlikely to recognize the risk.

Recently, a group was asked to complete a survey of emerging risks for financial services firms. The International Network of Actuarial Risk Managers (INARM) is a loosely organized group of actuaries who work to share best practices across the six continents where they reside. A total of 86 responses were received during this inaugural survey. The project is likely to be repeated periodically and should receive broader exposure.

Rather than ask responders to create their own list of risks, an existing set was chosen. The World Economic Forum report on global risks, completed in January 2007, listed 23 core risks for the next decade. Respondents were asked to choose their top five emerging risks from this list, and could select other risks in addition. General categories included economic, environmental, geopolitical, societal and technological risks. Not surprisingly, this group primarily chose economic risks as the highest priority. One might hypothesize that the risks of most importance to a group of actuaries would differ from a list compiled by farmers, military officers or technology experts.

The responders were more diverse than the typical actuarial crowd, with 47 percent from outside North America (Chart 1) and 40 percent employed outside the insurance industry (Chart 2. The

charts do not add up to 100 percent due to rounding). As the survey evolves, information such as primary practice area also may be included.

The survey asked for the top five emerging risks from the list, and 369 responses were made using the core risks listed. An additional 18 responses fell in the "other" category. The dominant response, with 57 percent, was oil shock/energy supply interruptions. Given the timing of the survey, in May 2008, it will be interesting to see how this risk stands up in less hostile energy environments. For more detail about the 23 core risks, see the attached glossary of risks.

Four of the top five responses reflected economic risks. In addition to oil, they were:

- Climate change (environmental risk): 40 percent
- Blow up in asset prices/excessive indebtedness: 40 percent
- U.S. current account deficit/fall in U.S. dollar: 38 percent
- Fiscal crises caused by demographic shift: 29 percent

The most interesting response is the last one, which pertains to looking at the trends caused by an aging population and their potential effect on the financial landscape. The business press reports on the other topics on a daily basis. Demographic shifts take longer to reach critical mass.

The next most popular responses are more diverse.

- Pandemics (societal risk): 26 percent
- Chinese economic hard landing (economic risk): 23 percent
- Breakdown of critical information infrastructure (technological risk): 22 percent
- Middle East instability (geopolitical risk): 20 percent



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International Survey ...

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Chart 1

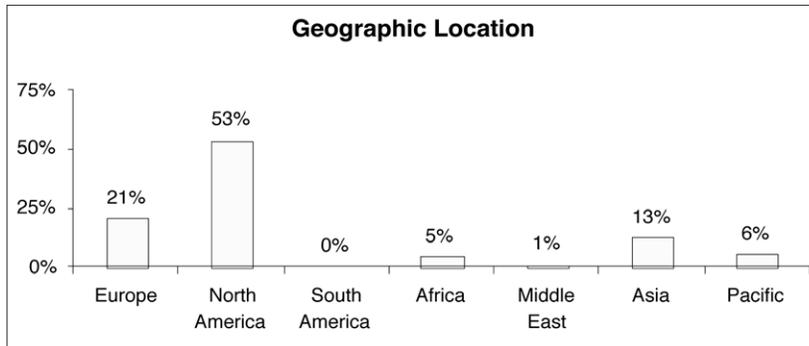
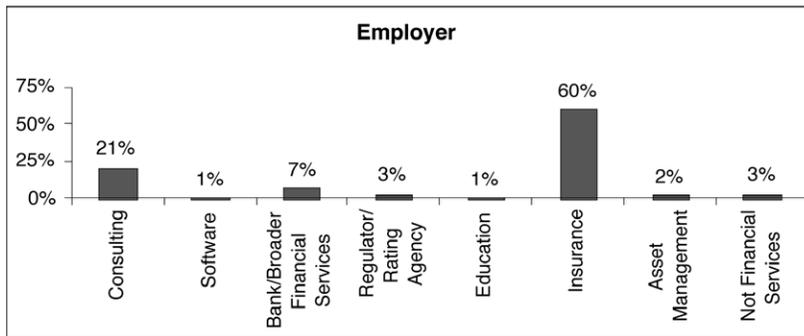


Chart 2



- Chronic diseases in the developed world (societal risk): 10 percent
- Liability regimes (societal risk): 10 percent
- Emergence of risks associated with nanotechnology (technological risk): 8 percent
- Interstate and civil wars (geopolitical risk): 8 percent
- Natural catastrophe: inland flooding (environmental risk): 7 percent
- Proliferation of weapons of mass destruction (geopolitical risk): 7 percent
- Transnational crime and corruption (geopolitical risk): 7 percent
- Natural catastrophe: earthquakes (environmental risk): 5 percent
- Failed and failing states (geopolitical risk): 5 percent

- International terrorism (geopolitical risk): 17 percent

These are the highest-ranking geopolitical risks. It is hard to classify these as emerging risks but instability caused by nation-states and organizations not tethered to physical geographic boundaries will continue to change history and be high-priority risks for world leaders.

Sorted by response rate, here are the remaining 13 risks:

- Retrenchment from globalization (geopolitical risk): 15 percent
- Natural catastrophe: tropical storms (environmental risk): 14 percent
- Loss of freshwater services (environmental risk): 10 percent
- Infectious diseases in the developing world (societal risk): 10 percent

With even the 23rd-highest response rate at 5 percent, the core risks provide a solid group with which to work. The response rates at another point in time would likely yield a different answer. It will be interesting to trend this survey over time. The current focus has been on energy imbalances and the subprime crisis, and that is reflected in the responses. Recent events, such as if a major metropolitan area like Tokyo had been hit by an earthquake or if a nuclear warhead had gone off somewhere in the world, will drive responses to some unknown extent. This is the opposite of the old saying, “Out of sight, out of mind.”

Those who decided that these 23 trends were not broad enough tended to look at societal and economic risks, sometimes combining them. An example of this is the combination of depleted resources and a shift in the balance of power from developed countries with stable populations to developing countries with growing populations. Other examples focused on food shortages, bioengineering developments and several who expressed concern about

the unintended consequences of accounting requirement changes.

Learnings

Any survey is limited by its size and participant expertise, but this group of INARM actuaries has provided a first look at what risk managers are worried about internationally as they gaze into their crystal balls. It also shows the bias that any given group will have based on their knowledge, location and experience. This survey can help other risk professionals, especially actuaries, improve their thought processes regarding emerging risks to provide better insights on the topic.

Functioning risk areas can include this type of information to help their efforts evolve. No matter which industry you are involved in, these risks have the potential to affect your company's results. This survey can help prioritize risk-education efforts. One way is to facilitate a workshop to prioritize current risks. By starting off talking about future risks, it puts some perspective on previous prioritizations and reminds participants that the list must evolve over time and not simply be copied from the last pass.

Glossary of Risks

The following 23 core risks were defined in "Global Risks 2007: A Global Risk Network Report," and can be found at www.weforum.org/pdf/CSI/Long_Global_Risk_Report_2007.pdf. What follows is a summary of these risks.

Economic Risks

- Oil price shock/energy supply interruption—Oil prices rise steeply due to major supply disruption.
- U.S. current account deficit/fall in U.S. dollar—U.S. current account deficit triggers a major fall in the dollar's value.

- Chinese economic hard landing—China's economic growth slows, potentially as a result of protectionism, internal political or economic difficulties.
- Fiscal crises caused by demographics shift—Aging populations in developed economies drive economic stagnation by forcing governments to raise taxes or increase borrowing.
- Blow up in asset prices/excessive indebtedness—Personal assets, such as housing, collapse in the United States and Europe, fueling a recession.

Environmental Risks

- Climate change—Climate change generates both extreme events and gradual changes, affecting infrastructure, agricultural yields and human lives.
- Loss of freshwater services—Water shortages.
- Affect agriculture, businesses and human lives.
- Natural catastrophe: tropical storms—Hurricane or typhoon passes over a heavily populated area, leading to catastrophic economic losses and/or high human death tolls.
- Natural catastrophe: earthquakes—Strong earthquake(s) occur in heavily populated areas.
- Natural catastrophe: inland flooding—Flooding associated with rivers causes significant economic losses, fatalities and disruption.

Geopolitical Risks

- International terrorism—Attacks disrupt economic activity, causing major human and economic losses. Indirectly, attacks aid retrenchment from globalization.
- Proliferation of weapons of mass destruction—Trend fatally weakens the Nuclear Non-

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Proliferation Treaty and leads to the spread of nuclear technologies.

- Interstate and civil wars—Major interstate or civil war breaks out.
- Failed and failing states—Trend of widening gap between order and disorder.
- Trans-national crime and corruption—Corruption continues to be endemic and organized crime successfully penetrates the global economy.
- Middle East instability—The Israel-Palestine conflict and Iraqi civil war continue.
- Retrenchment from globalization—Rising concerns about cheap imports and immigration sharpen protectionism in developed countries. Emerging economies become more nationalist and state-oriented.

Societal Risks

- Pandemics — A pandemic emerges with high mortality among economically productive segments of the population.
- Infectious disease in the developing world —HIV/AIDS continues to spread geographically. Other diseases could develop.
- Chronic disease in the developed world—Obesity, diabetes and cardiovascular diseases become widespread.
- Liability regimes—U.S. liability costs rise by multiples of gross domestic product (GDP) growth, with litigiousness spreading to Europe and Asia.

Technological Risks

- Breakdown of Critical Information Infrastructure (CII)—A major disruption of the availability, reliability and resilience of CII caused by cyber crime, a terrorist attack or technical failure. Results are felt in major infrastructure: power distribution, water supply, transportation, telecommunication, emergency services and finance.
- Emergence of risks associated with nanotechnology—Studies indicate health impairment due to under regulated exposure to a class of commonly used nanoparticles (used in paint, nano-coated clothing, cosmetics or health care), exhibiting unexpected, novel properties and easily entering the human body. ♦

Summary of “Variance of the CTE Estimator”

John Manistre and Geoffrey Hancock

The purpose of this article is to provide a high level summary of the paper “Variance of the CTE Estimator” by B. John Manistre and Geoffrey H. Hancock that appeared in the *North American Actuarial Journal* in 2005. We also expand on some of the results.

An actuary who is responsible for estimating reserves and capital using stochastic methods must deal with a wide range of issues. Not only must the actuary worry about the underlying stochastic model, its parameterization, data, assumptions and calculation formulae but he/she now has (or should have) the new issue of trying to quantify the precision of the estimated risk measure.

The Value-at-Risk (*VaR*) estimator (i.e., percentile or quantile value) is still often used as a risk measure. However, the Conditional Tail Expectation (*CTE*, also called Expected Shortfall or Tail-*VaR*) is becoming increasingly prevalent due to its desirable properties and ease of interpretation. A tool that can quantify the statistical precision of an estimated *CTE* is therefore important. That is, the sampling error in the estimate can be placed in perspective with other modeling issues, including parameter, model and assumption risk.

If all we were interested in was a regular mean then we would know what to do. We draw a sample (x_1, x_2, \dots, x_n) of size n from our model and calculate the sample average $\hat{\mu} = \frac{1}{n} \sum_i x_i$.

Statistical theory tells us three things

1. The sample average is an unbiased estimator i.e., $E[\hat{\mu}] = \mu$ the true mean. We expect to get the right answer.

2. The variance of the sample average is

$$VAR[\hat{\mu}] = \sigma^2 / n \text{ where } \sigma^2 \text{ is the true variance.}$$

3. If the sample size is large enough, and a few other technical conditions are satisfied, the estimator $\hat{\mu}$ has an approximate normal distribution.

The distribution's variance can be estimated from $\hat{\sigma}^2 = \frac{1}{n-1} \sum_i (x_i - \hat{\mu})^2$ and the actuary would then report the result of the work as $\hat{\mu} \pm \frac{\hat{\sigma}}{\sqrt{n}}$ giving any potential user a sense of how large the sampling error (i.e., statistical uncertainty) might be. Users can then judge whether this is large or small relative to other model sensitivities, such as a change in lapse assumptions for example, and react appropriately. In particular, users can judge whether the precision of the estimate is high enough for the intended application.

How does this process change when we start estimating Conditional Tail Expectations?

First, the bad news. There is no general set of formulas that are guaranteed to work in all circumstances. The distribution of a *CTE* estimator depends on a wide range of variables such as sample size, the actual distribution you are sampling from and the method of estimation itself.

Now, the (really) good news.

1. If the sample size being used is large enough, then there are approximate formulas analogous to those that apply for an ordinary mean. It is therefore possible to quantify the statistical precision of an estimated *CTE*.

2. There is a practical process, called a “variance verification” exercise in this article,



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that one can execute to test (and confirm) the validity of the approximate formulas for any particular application. An example is given at the end this article.

3. Some standard variance reduction tools such as importance sampling and control variate methods can be adapted to the CTE problem to improve, sometimes dramatically, the precision of a CTE estimator for a given computational cost. These techniques will be the topic of a second article on CTE variance.

So what are the approximate formulas? First, we need some notation. Suppose we want to estimate the Conditional Tail Expectation of a random variable X , with cumulative distribution $\Pr\{X \leq x\} = F(x)$ at the level α . Thus, we want to calculate the conditional expectation

$$CTE(\alpha) = E[X | X > q_\alpha]$$

where q_α is the α -quantile, defined as the smallest value satisfying

$$\Pr\{X > q_\alpha\} = 1 - \alpha$$

The α -quantile, is often called Value-at-Risk (VaR) and is used extensively in the financial management of trading risk over a fixed (usually short) time horizon.

The standard approach to this problem is to start with a random sample (x_1, x_2, \dots, x_n) of size n from the model and then sort the sample in descending order to obtain the order statistics $(x_{(1)} \geq x_{(2)} \geq \dots \geq x_{(n)})$. We can then calculate the *plug-in estimators* for the required parameters by looking at the observed empirical distribution. Let $\alpha = 1 - \frac{k}{n}$ so that practical expressions for the plug-in estimators are

$$\begin{aligned} \hat{CTE}_n(\alpha) &= \frac{1}{k} \sum_{i=1}^k x_{(i)}, \\ \hat{VaR}_n(\alpha) &= x_{(k)}. \end{aligned}$$

In terms of this notation statistical theory has the following three things to say

1. If the sample size is large enough, and a few other very technical conditions hold, then the pair $(\hat{CTE}_n, \hat{VaR}_n)$ has an approximate multivariate normal distribution.
2. The estimator pair is asymptotically unbiased. For any finite sample size the CTE plug-in estimator is negatively biased i.e. $E[\hat{CTE}] < CTE$, but the bias goes to 0 as $n \rightarrow \infty$. Practical experience suggests the bias is usually much smaller than the sampling error.
3. The following approximate variance/covariance formulas are also asymptotically valid

$$VAR(\hat{CTE}_n) \approx \frac{VAR(X | X \geq VaR) + \alpha(CTE - VaR)^2}{n(1 - \alpha)},$$

$$VAR(\hat{VaR}_n) \approx \frac{\alpha(1 - \alpha)}{n[f_X(VaR)]^2},$$

$$CoV(\hat{CTE}_n, \hat{VaR}_n) \approx \frac{\alpha(CTE - VaR)}{nf_X(VaR)}.$$

The notation $f_X(VaR)$ refers to the probability density $f_X(x)$ of the random variable X at the point $x = VaR$.

Several comments are in order

- CTE is clearly easier to work with than VaR. If we were using VaR as a risk measure then we would have to find a way to estimate the probability density $f_X(VaR)$ in order to apply the asymptotic formula. This can be very difficult in practice, especially in the tails of the distribution.
- The VaR and CTE estimators are positively correlated. This makes intuitive sense.
- The variance of the CTE estimator has two terms. The first term is the “obvious” extension of what was happening in the first ($\alpha = 0$)

case. The origin of the second term can be seen by conditioning on the observation of the estimated $V\hat{a}R$. We can then write

$$VAR[\hat{C}TE_n] = E\{VAR[\hat{C}TE_n | V\hat{a}R_n]\} + VAR\{E[\hat{C}TE_n | V\hat{a}R_n]\}.$$

Intuitively, we can say that when we estimate the CTE we are estimating both the CTE and the $V\hat{a}R$ and uncertainty in the $V\hat{a}R$ estimate increases the uncertainty of the CTE estimate. This is the origin of the second term.

Simple Example— The European Put

One way to test the formulas presented above is to pick an example that is simple enough that we can get closed form expressions for all the relevant risk measures. We can then perform simulations on the model to see how well the variance estimators perform. In the formal paper we chose the example of an “in-the-money” European Put option¹ at the $\alpha = 0.95$ confidence level. Here is an edited excerpt from the paper.

To be more specific, assume the option matures in $T = 10$ years with a strike price of $X = 110$. The current stock price is $S = 100$ and assumed to follow a log normal return process with $\mu = 8\%$ and $\sigma = 15\%$. That is, the stock price at maturity is given by:

$$S(T) = S \cdot e^{[\mu T + \sigma \sqrt{T} \cdot Z]}$$

where Z is a standard Normal variate with mean zero and unit variance.

Using a continuous discount rate of $\delta = 6\%$, the random variable whose CTE we wish to calculate is then the *present value payoff function*:

$$C = e^{-\delta T} \cdot \max[0, X - S \cdot e^{(\mu T + \sigma \sqrt{T} \cdot Z)}]$$

Using spreadsheet software, we can generate $n = 1000$ samples of this variable. From this sample, we can calculate the plug-in estimators for the CTE and VaR using the formulas developed earlier. To estimate the probability density $f(VaR)$ use the estimator:

$$\hat{f}(VaR) = \frac{\xi}{\hat{F}_n^{-1}(\alpha) - \hat{F}_n^{-1}(\alpha - \xi)}$$

with $\xi = 1/100$.

We can then calculate the Formula Standard Error (FSE) of each estimator as

$$FSE(CTE) = \sqrt{\frac{VAR(X_{(1)}, \dots, X_{(k)}) + \alpha \cdot (CTE - X_{(k)})^2}{n \cdot (1 - \alpha)}}$$

$$FSE(VaR) = \frac{1}{\hat{f}(VaR)} \cdot \sqrt{\frac{\alpha \cdot (1 - \alpha)}{n}}$$

$$C\hat{o}v(CTE, VaR) = \frac{\alpha \cdot (CTE - X_{(k)})}{n \cdot \hat{f}(VaR)}$$

Table 1 shows the results of two trials (first and last) and also the results of repeating the entire simulation 1000 times. The table also shows the exact values of the CTE and VaR for this problem, which can be calculated from closed form expressions that are given in the paper.

Table 1:
Monte Carlo Simulation without Variance Reduction CTE(95%) for a 10-year European Put Option (1000 Trials), $X = \$110$, $S = \$100$

	$\hat{C}TE(95\%)$	$FSE(\hat{C}TE)$	VaR	$FSE(VaR)$	$C\hat{o}v(CTE, VaR)$	$\hat{f}(VaR)$
Closed Form	13.80	n/a	4.39	n/a	2.37	n/a
First Trial	13.67	1.54	5.09	1.40	1.65	0.49%
Last Trial	14.93	1.95	3.33	3.07	4.91	0.22%
Minimum	7.72	1.01	0	0.19	0.22	0.09%
Average	13.70	1.63	4.50	1.91	2.42	0.40%
Maximum	18.89	2.27	9.17	7.31	13.05	3.65%
Std Deviation	1.63	0.18	1.76	0.77	1.06	0.19%

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¹A European put option gives the holder the right to sell the underlying asset on the maturity date for the specified strike price.

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Some key takeaways from this table are:

- Any given trial provides a reasonable estimate of what would happen if the simulation were repeated, but with a sample size of $n = 1000$ there is considerable variability, especially for VaR .
- The CTE plug-in estimator is biased below the true closed form value of 13.80 (i.e., average $C\hat{T}E$ is 13.70). However the bias is much smaller than the sampling error.
- The asymptotic variance formula for the CTE estimator performs quite well on average (i.e., average $FSE(C\hat{T}E)$ = empirical standard deviation of $C\hat{T}E$).
- The VaR plug-in estimator is biased high (average is 4.50), but again the bias is much smaller than the sampling error.
- The sample covariance for all 1000 pairs of estimators is 2.37, which is higher (lower) than the estimated covariance from the first (last) trials, but close to the mean of all covariance estimators.

A number of more realistic examples are documented in the paper using the same methodology as described above. In each case the asymptotic theory worked as expected. The examples were chosen to test a wide range of possible behaviours and practical problems facing insurers.

A More Practical Example—Variance Verification

Suppose you have a model that takes all night to run $n = 1,000$ scenarios. It would be impractical to repeat the run process hundreds of time in order to test the validity of the variance formulas as described above.

A more practical process for confirming the asymptotic variance formula, which we call Variance Verification, is as follows:

1. As part of model development, or in an off peak time, generate (once) a larger sample of say $N = 5,000$ scenarios. Let CTE_N be the estimated CTE based on this large sample and FSE_N the formula standard error for a given confidence level α .
2. From the large sample of size N , draw $m=100$ random sub-samples of size $n=1,000$ without replacement.
3. For each of the m sub-samples calculate a CTE estimate and an FSE estimate. Also check to see whether our best answer CTE_N lies in the approximate 95% confidence interval $CTE \pm 2 \times FSE$. If it does we set the CI (Confidence Interval) count to 1 and 0 otherwise.
4. Use the standard deviation of the CTE estimates from Step 3 to check the validity of the asymptotic formula. As we will see shortly a simple adjustment needs to be made to this number before comparing it to the formula estimates.

The table below shows the results of applying the above process to an inforce portfolio of U.S. variable annuities with GMDB, GMAB and GMWB features. The book is slightly out of the money. 5000 real world (P measure) scenarios

Table 2: Variance Verification

$\alpha = 90\%$ $N = 5,000$ Samples
 $CTE_N = 2214$ $FSE_N = 159$

$m = 100$ Random Sub Samples of Size $n = 1,000$

	CTE	FSE	CI Count
Mean	2,111	346	94%
First	2,004	355	1
Last	2,242	353	1
Min	1,558	262	0
Max	3,120	376	0
Std Dev'n	316	30	2%

Adjusted Std Dev'n 354 = $Std\ Dev'n / (1 - n/N)^{1/2}$

were generated and for each scenario the present value of guarantee benefits (claims) less the present value of related fees was captured.

The claims have been normalized so the mean $CTE(0)$ is 1,000. The fees were scaled so that $CTE(75)$ of the net (PV claims – PV fees) is zero. The example itself is for $CTE(90)$.

The first thing we note is that if the FSE based on the sample of size 5,000 is correct then we expect an FSE of about $159\sqrt{5} \approx 355$ when dealing with a sample size of 1,000. The FSE estimates are clearly consistent with this, but the standard deviation of 316 (of the 100 CTE estimates) is not. One possible explanation for this discrepancy is sampling error, but more testing shows this is not the case.

The standard deviation of the $m=100$ sub-samples is a biased estimate of the sampling error and it is not hard to understand why. The various sub-samples (each of size $n=1,000$) were all drawn from the same universe of $N=5,000$ so they are not independent. Because the various CTE estimates are using some of the same data they are positively correlated and so the set of estimates is more tightly clustered than if they were truly independent. This intuitive result is very easy to understand as $n \rightarrow N$.

It is possible to use the methods in our paper² to show that, in the large sample limit, the correlation of two sub-sample estimates is just $\rho = n/N$. A better estimate for the sampling error when using a sample size of 1,000 is therefore not 316, but³

$$\frac{316}{\sqrt{1 - \frac{n}{N}}} = \frac{316}{\sqrt{1 - \frac{1000}{5000}}} \approx 354 .$$

Our variance verification test is therefore to compare the empirical error estimate 354 with the mean formula estimate 346. We conclude that the asymptotic theory appears to be working for this model. That is, the asymptotic variance of the CTE Estimator agrees with “experiment,” after adjusting for the non-independence of the sub-samples.

The CI Count result is also consistent with the idea that the formula standard errors are working. The actual count of 94 is very close to expected value of 95 (i.e., a 95% confidence interval).

Finally, it might appear from Table 2 that there is evidence of material small sample bias since the mean of the 100 sub-sample estimates is 2,111, with an apparent precision of $316/\sqrt{100} \approx 32$, which is much less than the value 2,214 obtained from the sample of size 5,000. However, this analysis is misleading, again due to the non-independence of the sub-samples.

When samples are positively correlated the variance of the sample mean is larger $VAR(\bar{x}) = \sigma^2[\rho + (1 - \rho)/m]$ than it would otherwise be. A better estimate for the precision of the 2,111 number is then

$$346\sqrt{\frac{1000}{5000} + (1 - \frac{1000}{5000})/100} \approx 158$$

which is not materially different from the sampling error in the 2,214 value. Thus, while there is some evidence of small sample bias in that $2,111 < 2,214$, there is not enough data here to quantify it. The bias is lost in the sampling error. This is usually the case.

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²This result is not in the original paper.

³If we have m identically distributed, but correlated, samples from a distribution with finite mean and variance σ^2 then $E[\sum_i \frac{(x_i - \bar{x})^2}{m-1}] = \sigma^2(1 - \rho)$ where ρ is the correlation between samples.

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After going through a variance verification exercise a few times a practicing actuary will know whether the asymptotic formulas described here are working for his/her particular situation.

Conclusions

In the authors' experience, so far, we have yet to see a practical situation where the theory outlined here fails in a material way. Hence, we believe that practitioners can use the asymptotic formulas presented here to understand the sampling error in a given *CTE* estimate. A practitioner can go through a variance verification exercise if they want to prove to themselves, or others, that the asymptotic formulas are working in their particular situation.

Finally, we note that if a practitioner were using this tool then, on the basis of the first run of 1,000 scenarios, they would report a *CTE* estimate of $2,004 \pm 355$. Is a relative sampling error of roughly $355/2,004 \approx 18\%$ acceptable? The answer to that question depends on the circumstances.

If 18% is not an acceptable error then what are the alternatives? One option is to increase the number of scenarios. If we increase the number of scenarios by a factor of K then the sampling error scales by a factor of $1/\sqrt{K}$. Cutting the sampling error by a factor of 4 would require us to run 16,000 scenarios.

If simply increasing the run size is impractical then there are other tools that can be used to improve the precision of the *CTE* estimator without significantly increasing the computational cost. That will be the subject of our next article. ♦

Global Best Practices in ERM for Insurers and Reinsurers Webcast

Tsana Nobles

In January 2008, the International Network of Actuarial Risk Managers (INARM), which is an international ad hoc group formed by the Joint Risk Management Section of the North American actuarial profession, hosted the webcast “Global Best Practices in ERM for Insurers and Reinsurers.” The purpose of this webcast was “... to promote awareness of a global actuarial community by involving actuaries globally in one event, allowing people to share emerging and new risk management practices across different geographical regions ...” The program consisted of two tracks of sessions: one pre-recorded and one live.

The pre-recorded sessions included a basic introduction to ERM and covered:

- Emerging Risks
- Embedding ERM in the DNA of an Enterprise (Introduction)
- Economic Capital
- Risk Appetite

The live sessions took place on January 16 and covered:

- Stakeholder Views: Regulators, Rating Agencies, and Investors
- Embedding ERM in the DNA of an Enterprise
- Economic Capital: A Passing Fad or a Brave New World?
- Active Risk Controls

The webcast participation was fantastic. There were 530 registrants from 47 countries resulting in approximately 1600 viewers. The live sessions ran over three time zones: Asia/Pacific, Europe and Americas. Presenters in each time zone were from the region and the presentation material had specific application to that region.



The SOA, the Joint Risk Management Section, the Actuarial Profession (U.K.), and the Institute of Actuaries of Australia were all underwriters of the webcast. Milliman and Standard & Poor’s were commercial sponsors, and their sponsorship funds covered many of the fixed expenses so the webcast was offered at a nominal fee.

Viewers of the webcast volunteered to summarize some of the pre-recorded and live sessions to offer insight into the topics and specific material covered. Those summaries are listed below.

Emerging Risks Pre-recorded Session

Summarized by Clifford Angstman, FSA
AIG Life Insurance Company

This session included a large number of presentations on different aspects of analyzing and responding to emerging risks. Tony Campbell provided moderation and introductory material.

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The presentations are summarized below.

Nassim Taleb and Black Swan

Nassim Taleb discussed the concept of robustness of financial institutions to variations or modeling errors in tail-distributions for unusual but infrequent events. He also contrasted the differences in impact for those companies working in an “Extremistan” environment, as opposed to those whose risk work is more in the “Mediocrastran” realm.

Dr. Achim Regenauer (Munich) and Obesity.

Dr. Regenauer used graphical techniques to provide a fascinating description of the increase in obesity rates (BMI >30) in the U.S. and Europe from 1991 to 2005. He followed this with similar graphs on the development of diabetes rates. After discussing the impact of diabetes on health, he concluded that increased obesity leads to increased diabetes about 10-20 years later, followed by increasing heart disease incidence and with potential higher mortality.

Dr. Peter Hoeppe (Munich Re) and Geographical Risk.

Dr. Hoeppe reviewed evidence that rising sea temperatures have led to the doubling of the risk from heat waves, and increases of 50 percent in the intensity of hurricanes.

Manuela Zweimuller (Munich Re) and Environmental Scanning

Manuela Zweimuller looked for major trends in the global environment to develop an early warning system for risks as they develop. She provided an asbestos related example to explain the need for this process. The first asbestos related death occurred in 1900, and it took the next 100 years for society to fully develop its view of this risk issue, including how to prevent exposure, who was responsible for its impact, and how to compensate and treat those that were exposed. Thinking through this example, one

can see how it is important to consider a risk in light of all of the other societal developments that will influence its resolution. Understanding the correlations and connections with other key risk drivers is important to a thorough analysis of emerging risks.

Zweimuller mentioned a number of current trends, including improving longevity and obesity, globalization, communication changes, climate change, complexity, and regulatory initiatives.

Robert W. Wilson (Sun Life Financial) and Scenario Analysis.

Robert W. Wilson discussed the use of scenario analysis at Sun Life Financial. This process was used extensively by Royal Dutch/Shell (see also “The Art of the Long View,” by Peter Schwartz.) for the strategic management of risks. For those interested in utilizing this “war game” type of approach to improve management response to risks, this session provided a number of tips.

Jeff Smith (IAG) went through a similar scenario analysis example related to the Avian Flu. He described the organizational process for dealing with risk events, and how scenario analysis has allowed his organization to identify potential problems and improve their response plans. The Avian Flu scenario brings out issues of staffing, changes in business distribution, dealing with the media, and making operational changes in a period of stress.

Camilio Salazar (Milliman) and Disaster Recovery.

Camilio Salazar provided his real life experience in recovering from Hurricane Katrina, mostly from an operations point of view. It is very interesting to get the perspective of someone who has lived through such a significant event. He discussed many important issues in a recovery plan including dealing with the potential loss of intellectual and human capital as

employees may look to relocate elsewhere. He also discussed the significant communication issues they faced with a loss of phone, mail and e-mail for a time. This could have resulted in the loss of suppliers and producers. To ensure that these relationships remained intact, many personal visits were made with producers and suppliers to demonstrate their commitment to the business. His insights and practical experience on recovering from a disaster situation are useful to risk management professionals.

Mike Metzger (Gemworth) and the Event Risk Management Process

Mike Metzger discussed the use of a formal process to manage and resolve risk incidents that starts with indentifying and assessing the risk and ends with a post event debriefing stage. He also explained the management structure used to develop a coordinated response to risk events. He discussed the value of having an Emergency Preparedness Guide provided to every employee so that they understand their role in a crisis.

Dave Ingram (S&P) and Rating Agency Consideration of Emerging Risks

Dave Ingram provided a rating agency view of company's ability to manage emerging risks, and how this evaluation is used in the rating process.

Embedding ERM in the DNA of an Enterprise (Intro)Pre-recorded Session

Summarized by Max J. Rudolph,
FSA, CFA, CERA

Rudolph Financial Consulting, LLC

Presenters: Samuel Sender and Steve D'Arcy,
PhD, FCAS, MAAA

This session, lasting just over an hour, provided background on Enterprise Risk Management (ERM) and how we got to today's best practices. The presenters warned against the practice of

solely using ERM to meet an external stakeholder's requirements and suggested that best practice occurs when ERM is integrated into strategic planning and the firm moves toward and better understands their optimal result.

The driver of ERM has been the regulator in Europe, while in the United States, rating agencies have taken the lead. The speakers warn against a false sense of security that sophisticated models can provide, suggesting that the firm's culture is the true long-term competitive advantage.

Enterprise risk management has gone by a variety of names. Among these are: enterprise wide, holistic, integrated, strategic, and global risk management.

The person acting as Chief Risk Officer (CRO) of the firm should have direct access to the Board of Directors or risk being buried in bureaucracy.

There are many metrics being used by ERM practitioners. The common feature of the best ones is that they look at a distribution of results and focus on sections of it, often the tail. No one metric provides all the information, so it is important to consider several.

Reports should be tailored to the audience, with more graphics at the board level and more detail at lower levels. The owner of a risk, whose bonus depends on the result, should not also be the person measuring the risk.

Best practice ERM considers the major risks through a prioritization process, involves the board of directors, and is strategic in that it looks to optimize the risk/return relationship by making decisions that improve the firm's position. This will give a company a leg up on its competitors as future events unfold.

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**Economic Capital: Life/Non-Life
Prerecorded Session**

Summarized by Tsana W. Nobles, FSA, MAAA
Quantitative Analyst, Insurance Asset
Management

Dwight Asset Management Co.

Presenters: John F. Brierley, FSA, FCIA,
Gary Finkelstein, FIA, and Steve Lowe,
FCAS, MAAA

These two sessions offered high level information on the components of economic capital with some specific numerical examples.

John Brierley defined economic capital and stressed that all risks should be included in the calculation, not just those stressed by regulators. He stated that economic capital is used for pricing, is a fair and consistent way to allocate capital, and is a method to compare profit margins for dissimilar lines of business on a level playing field. He contends that the key risks captured in economic capital calculations are credit, operational, business, interest rate, fixed asset, goodwill, and insurance. John highlighted several challenges of calculating economic capital such as incorporating multi-year guarantees into a one-year time horizon as well as appropriately reflecting partial correlations and diversification.

Gary Finkelstein stressed that economic capital can be viewed from two different perspectives: the capital required to meet risk as well as the capital available. Capital management is “the marrying of these two” perspectives. Risk-adjusted performance measures were introduced. He presented specific numerical examples that highlight the difficulty in setting an appropriate correlation matrix and capturing diversification benefits. Gary cautioned that “correlations in the tail may not be the same as correlations at the mean.”

Steve Lowe pointed out that there is no right or wrong approach to building an economic capital model and that the chosen approach should reflect the company and management’s objectives. He stated that the approach will address six key decisions: the risk horizon, the definition of capital, the measure of security risk, the risks included, the quantification methodology, and the aggregation method. Currently there are two divergent views on the appropriate risk horizon for economic capital, one-year or run-off. Steve believes that all approaches to economic capital modeling present a spectrum of systems requirements and sophistication and feels that any criteria should be used in the selection of an appropriate model for general insurance risk such as data requirements, ease of implementation, type of risk measured, and whether it is amenable to a one-year risk horizon. Steve described in detail several well-known methods of modeling. Steve concluded with the idea that it is worth building an internal model in order to earn rating agency credit and to compete effectively. He added that eventually the economic capital modeling results will act as a springboard to economic performance measurement.

**Stakeholder Views: Regulators,
Rating Agencies, Sell-Side
Analysts/Investors (Americas
Focus) Live Session**

Summarized by Ashley Goorachurn, FSA, FCIA
Director, Risk Management

AEGON Institutional Markets

Presenters: Max J. Rudolph, FSA, CFA, CERA,
David Ingram, FSA, CERA, and
David Sandberg, FSA, CERA.

In this session, presenters discussed Enterprise Risk Management (ERM) from the perspective of investors and sell-side analysts (Max Rudolph), rating agencies (David Ingram), and regulators (David Sandberg).

Max Rudolph discussed how investors (specifically private investors) can look to the areas of compliance, culture, knowledge and value added, to better understand a company's strategy and risks.

Compliance can add value to a company when structured properly, but an investor must be skeptical of companies where compliance is the focus of their ERM framework.

Investors should look for a culture that supports proactive risk management at all levels of the organization. Also look for alignment between risk management and internal programs (incentive comp, etc.)

Investors should examine whether companies are accepting risk where they have a competitive advantage and avoiding or mitigating risk where they do not. Investors will also want to determine whether a company is accurately communicating its risk profile to stakeholders, and whether senior management understands the risks the company is taking.

Next David Ingram covered ERM from a rating agency perspective with his review of the ERM evaluation process at S&P.

In 2005, S&P created a framework to systematically evaluate firms' ERM practices. This ERM evaluation has become the eighth category of S&P's full ratings review process (the other seven are capital adequacy, management strategy, investments, financial flexibility, earnings, liquidity and market position). The weighting on the ERM evaluation varies by company and depends on the insurer's risk profile and its capacity to absorb losses.

S&P's ERM evaluation considers a company's risk control processes, emerging risk management, risk and economic capital models, risk

management culture and strategic risk management. While the first four categories largely focus on limiting losses, the assessment of strategic risk management focuses on the potential upside. An effective ERM framework will not only measure risk capital but also utilize this information to optimize the company's risk adjusted returns. S&P looks at whether a company is incorporating risk adjusted returns into their corporate strategic decision making processes such as product design, risk budgeting etc.

Finally David Sandberg discussed how ERM can add value for regulators.

Companies have adopted ERM because they believe it adds shareholder value. ERM can also add value to regulators by transforming the focus of the regulatory review process from verifying calculations and keeping of rules to ensuring that the reporting process enhances the learning of the regulator and the industry. To accomplish this, changes to the regulatory functions and processes must be made which enhance the effectiveness and comfort of the regulatory function. Exactly what these changes should be have not yet been clearly articulated.

Regulators (and industry) don't need complex models to understand every risk. While sophisticated risks typically require sophisticated risk management practices, some risks are better handled through other processes.

Economic Capital - Passing Fad or Brave New World (Americas)

Summarized by Hubert Mueller, FSA, CERA

Principle

Towers Perrin

Presenters: Mike Angelina, FCAS, Ellen

Cooper, FSA, CFA, Guogiang Li, CFA,

Jeff Mohrenweiser, FSA.

Moderator: Steve Lowe, FCAS

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The presenters discussed different perspectives on economic capital (EC).

Jeff Mohrenweiser (Fitch Ratings) provided a rating agency perspective, by illustrating Fitch's Global EC Model, Prism, and its unique attributes. He also discussed some of the challenges for a rating agency in assessing an insurer's capital adequacy from the outside.

Ellen Cooper (Aegon) discussed the use of EC for market-consistent pricing by illustrating a Term product example. In particular, EC provides a new tool to assess how new products add value on a market-consistent basis, using a stress testing technique consistent with the European Solvency II regulation. She also discussed the link from EC to a market-consistent framework.

Guo Li (AIG) discussed the governance aspects of EC, and its global applications and challenges for insurers and reinsurers. In his view, EC helps drive better decision-making by providing a tool for the various applications. He then described AIG's process for ERM and EC in greater detail.

Finally, Mike Angelina (Endurance) focused on the use of EC for optimal capital management and better management of earnings volatility. He mentioned several key principles for ERM and EC: optimal management of capital, eliminating risks that threaten solvency, managing earnings volatility, shaping the business by only taking risks that can be quantified, and creating behaviors that reinforce an ERM culture as the key objectives for ERM and the implementation of Economic Value. He also discussed several implementation issues and challenges for EC.

European Focus Live Sessions

Summarized by Jules Constantinou, ASA, FFA
Head of Marketing
Gen Re Life Health

The Stakeholder's views session was moderated by Nikos Katrakis:

- Paul Brenchley (FSA) specified ERM as a holistic process resulting in a framework responsive to changes to the firms' risk profile, regularly incorporating new risks and information. Sophistication should depend on the size and complexity of the enterprise.
- Keith Bevan (S&P) explained that ERM is a key part of the rating process. S&P has four ERM classifications for insurers, Excellent, Strong, Adequate and Weak. The evaluation includes risk controls, emerging risks management and models of risk and economic capital.
- William Allen (Bear Investments) was critical of the current risk frameworks, in particular citing exposure to recent events and the inability of firms to "foresee" these risks through their ERM platforms.

The Embedding ERM in the DNA of the Enterprise session was moderated by Lain Brown:

- Alister Esam (eShare Limited) outlined how important a role IT plays in the management of risk information;
- Roger Dix (HBOS) and David Dullaway (Tillinghast) jointly focused on risk-based pricing and the potential benefits of diversifying risk across different business units.
- Lukas Ziewer (Oliver Wyman) concluded by covering the need to having a clear and robust process in place to manage the sheer volume of risk information that enterprises are faced with.

INARM on the Web

David Ingram

The session on Economic Capital was moderated by Alessa Quane:

- Bernhard Bergman (Munich Re) questioned the relevance of economic capital to firms today.
- Colin Wilson (Barrie & Hibbert) discussed the challenges of using economic scenario generators within the modelling.
- Steven Vanduffel (X-Act Consulting) continued the discussion on capital modelling, focusing on current practices and why they perhaps should not be considered best practices.
- To end, Eric Paire and Eddy Vanbeneden (Guy Carpenter) spoke on the management of the capital through the use of reinsurance and allocation to various parts of the business.

The final session on Risk Control Hot Topics was moderated by Steve Nuttall:

Neil Allan (University of Bath, who dialed in from Brisbane) and Neil Cantle (Milliman) argued that a structured approach to strategic risk can help to avoid missing the big risks and identify hidden opportunities.

Nick Silver (Parhelion) discussed the challenge faced by insurers on managing climate change risk, including a summary of recent research amongst the profession on views on the impact of climate change to our current business and professional models. ♦

WHAT IS INARM???

You may have heard about it, but here is what the group is really about.

INARM is the International Network of Actuarial Risk Managers. It is a very informal group of folks who are interested in learning and sharing Enterprise Risk Management (ERM) practices across borders to enhance the actuarial ERM practice in all parts of the globe.

INARM is mainly a virtual group. We communicate via several modes and initiatives:

1. INARM Listserv

The SOA has provided an email listserv facility to get us started. This has been used by the over 200 listserv members to share articles, questions, answers, opinions, and program information. There are now about 280 people who get irregular and mostly topical emails from the listserv participants. Those emails have ranged from five to 15 per month. Topics ranging from subprime, to model risk, to historical risk management failures. Open to all. Sign up at link below:

<http://www.soa.org/news-and-publications/listservs/list-public-listservs.aspx>

2. INARM Blog

As an alternative to the Listserv, an INARM Blog has been created. Discussions of Sub Prime, the 2008 ERM Symposium, Fair Value, Limitations to Modeling, and Mortgage Lending in Asia have been copied there from the Listserv emails in March and April 2008. You can add your comments there without joining anything. <http://riskviews.wordpress.com/>

3. INARM Emerging Risks

In January 2008, INARM helped to create the Global ERM Best Practices for Insurers and Reinsurers Webinar. This program ran for 16 hours and drew an audience of 1,600 people from 47 countries. One of the programs was on the topic of Emerging Risks. Materials from that program plus new sources on the topic are now available in an open platform that allows users to add more materials as they see fit. This is accomplished with a Google Group called INARM Emerging Risks. Anyone can make comments. To add significant postings, you need to join the group. Instructions are there on the website. <http://groups.google.com/group/inarm-emerging-risks/web>

4. INARM LinkedIn Group

While the listserv is not anonymous, it does not provide for members to easily learn each other's identities. LinkedIn is a professional networking Web site that allows the formation of special groups. We have formed an INARM group. As of this writing, the INARM group on LinkedIn has over 80 members from more than 15 countries. To use this facility, you must join LinkedIn (please note that this should not constitute marketing for or against LinkedIn). There is a level of service on LinkedIn that is free and that you may find to be sufficient to make connections with other INARM members if you are interested in that. To join the INARM group <http://www.linkedin.com/e/gis/83735/3270834C5E91>

5. Other INARM citations on the Web. For more information about INARM, look at

<http://www.actuaries.asn.au/NR/rdonlyres/1C5D0157-1B4E-4059-B75E-32F751723D99/2700/INARMKit.pdf>

<http://www.soa.org/professional-interests/joint-risk-management/jrm-inarm.aspx>

If INARM sounds of interest to you, please join us in the discussions!

Enterprise Risk Management Symposium: Notes on a Conference

Dr. Stephen W. Hiemstra and Valentina Isakina

Another year, another terrific event. And this year, it was timelier than ever. We hope that the remarks below will give those unable to attend a good overview of the insightful discussions that occurred at this year's ERM Symposium.

Executive Summary

- **The quality of conversation about risk management among directors and managers is still below par.** Tough questions about project proposals and business operations are hard to ask particularly when profits are strong. A weak risk management culture and lack of organizational power for Chief Risk Officers (CROs) exacerbate this outcome.¹ Significant numbers of ERM Symposium participants reported that they experienced problems communicating risk management principles between different professional groups and levels of management within the firm.

- **Risk appetite adjusts to the quality of risk management.** Studies show that people driving safe cars drive faster and have similar numbers of accidents and injuries to other drivers. This outcome implies two things that are not necessarily intuitive. First, loss outcomes are not a direct measure of the quality of risk management. Second, temporary lapses in risk management or changes in the risk environment can have disastrous effects as managers practice brinkmanship with their perceptions of the state of firm risk management and actual practice changes without their knowledge. Pipeline risk apparently

led, for example, to the failure of Northern Rock Bank in the United Kingdom after loans were made that could not be resold.

- **The model risk contribution to the subprime crisis is still not understood.** Numerous speakers reported no problem with modeling in the crisis in spite of not anticipating valuation problems (see HPI chart on next page). Actuaries understand the issues in the inadequate housing loss data and model specification problems and follow the implications. But often, their managers cannot. Before the crisis, weaknesses in the subprime lending and marketing channels were not anticipated. After the crisis, some managers reported that stressing existing models with standard scenarios would have allowed them to anticipate the problems that emerged.

- **Other observations:**

- ▶ Insurance firms experienced relatively few losses in the subprime crisis relative to banks, investment firms, and hedge funds.
- ▶ Reputation risk was a significant factor in the failure of Bear Stearns. The firm was not liked on Wall Street and it refused to participate in previous bailouts, such as Long-Term Capital Management.
- ▶ The **broken glass** theory: crime is contagious. Allowing small crimes to go unchecked may signal it is okay to commit big crimes.² A similar principle may be at work in corporate cultures. Participants commented that broken corporate cultures, such as that at Bear Stearns, are a significant factor in operational risk and are asso-



Dr. Stephen W. Hiemstra is financial engineer and is also an ERM Symposium program committee member. He can be reached at Hiemstra@yahoo.com.



Valentina Isakina, ASA, CFA, MAAA, manager at Bain & Company, Inc. in Atlanta, GA. She can be reached at valentina.isakina@bain.com.

¹They are not invited to director planning retreats, they are underpaid relative to business line officers, and risk management is frequently not a viable career path in the firm.

²James Emory White. 2004. *Serious Times: Making Your Life Matter in an Urgent Day*. InterVarsity Press. pp. 158.

ciated with the rogue trader problem. This problem also affects nation states.³

- ▶ Focus on policy issues was small. Recognition of sub prime losses, financial policy, and liquidity concerns, which were the focus of a recent Basle study⁴ and other recent conversations in Washington, were not discussed in depth. Is this an opportunity to enhance the event discussions next year?
- ▶ The gold standard for crisis management certification: *Standard on Disaster/Emergency Management and Business Continuity Programs 2007 Edition*.⁵

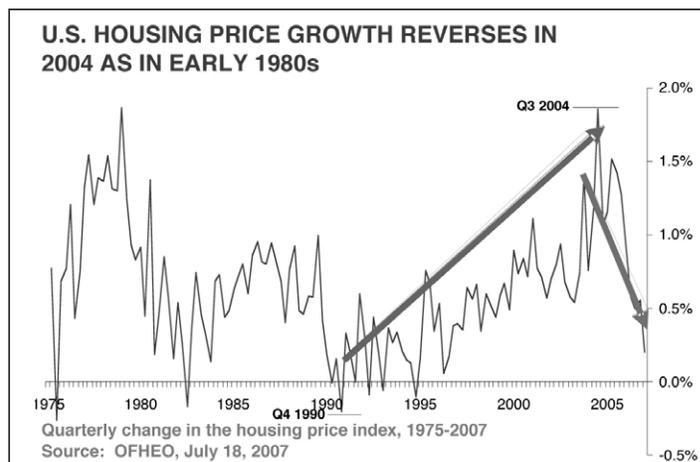
This year was a year of a record attendance (circa 600). Good Chief Risk Officer (CRO) participation and successful roll out of a new director's workshop suggest that the conference was an organizational success. However, an increasing non-insurance body of the participants cited a greater need for presenter and topic diversification.

Below we provide highlights from some of the selected sessions.

General Session: Is ERM Still Relevant—a Chief Risk Officer Perspective

Tuesday, April 15, 2008, 8:10 a.m.

Speakers: Marcello Cruz, AVIVA Randy Freitag, CRO, Lincoln Financial Tim Patria, Vice President and Director, Hartford Financial Services Group Anurag Saksena, CERO, Freddie Mac
Moderator: Paul L. Horgan, Partner, PricewaterhouseCoopers



Anurag Saksena:

- Two basic CRO operating strategies exist:
 - ▶ **Partnership approach**—where you have skin in the game. Are you respected enough to participate in decisions and have access to the Board?
 - ▶ **Watcher approach**—where you observe those with “skin in the game.”
- Can you communicate the risk story without resorting to jargon? What is the quality of the returns being earned?
- Everyone wants the same talent, but does not pay the same (e.g., market risk is less critical from a failure standpoint than credit risk, but the market risk managers get paid more).
- Is risk management a career track in your firm?
 - ▶ One firm required that all senior vice presidents spend at least two years in a risk management position.
- Observations:
 - ▶ Regulators now want more detail than they wanted 14 months ago.
 - ▶ The CRO's job is to reduce friction in the system.
 - ▶ Freddie Mac tracks nine categories of risks.

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³See, for example, Asharf Ghani and Clare Lockhart. 2008. Fixing Failed States: A Framework for Rebuilding a Fractured World. Oxford University Press.

⁴Senior Supervisors Group, Observations on Risk newsevents/news/banking/2008/SSG_Risk_Mgt_doc_final.pdf. Basle, Switzerland. March 6, 2008. Management Practices during the Recent Market Turbulence. www.newyorkfed.org/newsevents/news/banking/2008/SSG_Risk_Mgt_doc_final.pdf. Basle, Switzerland. March 6, 2008.

⁵www.nfpa.org/assets/files/PDF/NFPA1600.pdf

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- Current sub prime crisis has its roots in corporate governance problems.
 - ▶ Board of directors may be too far removed from the best practice risk principles partially because of a generational lag. Consequently, they may be unable to ask the right questions and understand the significance of the reports they hear. Director education is one solution to this problem.
 - ▶ Who do CROs report to? They need a double reporting line to allow them access both to senior management (e.g., CEO, CFO) and the Board.

Luncheon Speaker: Lord John Eatwell, President, Queens' College, Cambridge

EU Regulatory Changes in the Light of Recent Events

Tuesday, April 15, 2008, 1:00 – 2:15 p.m.

- Lord John Eatwell was one of the best presenters at the Symposium. He was clear, precise and very insightful. This presentation alone was worth the Symposium attendance.
- Much of the discussion focused on the recent credit crisis and how it should be shaping the regulatory activities.
- He proposed a new role of the regulator:
 - ▶ Assure that the firm has incentives to manage risk properly.
 - ▶ Enforce best practices management.
 - ▶ Focus specifically on systemic risk.
 - ▶ Develop countercyclical bank regulatory incentives, such as a required capital cushion during economic booms that could be dipped into during the downtimes.
 - ▶ Make sure financial firms have “skin in the game”—no off-balance transactions should be allowed.
- Northern Rock bank in the United Kingdom failed because of *market gridlock*—the chain of counterparties froze. Loans were made that could not be sold.

- Comments on the U.S. regulations
 - ▶ They are too cumbersome.
 - ▶ When too many groups are overseeing the economy, things are bound to “fall through the cracks.”
 - ▶ Simplification of the regulations could be a positive change.

General Session: In the Pursuit of Return, Have We Lost Sight of Risk?

Tuesday, April 15, 2008, 2:15 p.m.

Speakers: James C. Allison, Regional Risk Manager NA, Conoco Phillips Leo Tilman, Chief Institutional Strategist, Bear Stearns Larry Moews, Vice President and Chief Risk Officer, Allstate Insurance Company
Moderator: Jorge Montepeque, Global Director, Marketing Reporting McGraw-Hill Platts

Jorge Montepeque:

- Life styles are converging worldwide. An inflationary environment is evolving out of the Federal Reserve actions.
- Problems with rogue traders may arise when high-energy individuals make mistakes and prevent oversight due to their force of personality.

James C. Allison:

- What went wrong?
 - ▶ *Risk appetite adjusts to the quality of risk management.* Losses were higher because of our successes in risk management, not our failures. People with safe cars drive faster.
 - ▶ Risk transference created couplings not previously observed. Tension exists between product innovation (product differentiation) and market transparency. Firms make money being different, not uniform.
 - ▶ Stress testing—everyone talks about it; no one does it properly.

- Risk managers, directors, and buyers have an obligation to ask tougher questions about the business. We need to make sure that all disciplines and professions are talking the same language and engaged in decisions.
- Nearly all of the largest bankruptcies were due to preventable management failures—integrity problems and competencies.

Source: www.bankruptcydata.com/Research/15_Largest.htm

Larry Moews:

- Segmentation of duties makes it unlikely that there is such a thing as a rogue trader—too many (30+) people have to be involved. When bad news is disclosed, managers pile on all the bad news they know about so as to purge the system.

Leo Tilman:

- Nothing focuses your attention like the failure of a firm (LTCM) just like your own (Bear Stearns, for example).
- What went wrong?
 - ▶ *If firm risk appetite adjusts and is a problem, then hire more policemen.* In the case of the autobahn road deaths, fatalities were reduced through driver education.
 - ▶ *We did not ask the right questions. Risk managers continue to be called after decisions are made and are not invited to participate in planning retreats.*
 - ▶ Risk management did not fail. Nor was there a modeling failure.

General Session: View from the Top

Wednesday, April 16, 2008, 7:45 a.m.

Speakers: Dennis Chookaszian, Director, CME Holdings Branko Terzic, Global & U.S. Regulatory Policy Leader in Energy & Resources, Deloitte Services LP John Wengler, Chief Risk Officer, Entergy Services, Inc. (ESI)

Moderator: Matt Feldman, EVP, Operations, Chicago FHLB

Matt Feldman:

- A bad corporate culture can kill a firm. Risk officers used to be lone wolves.
- What we are frequently missing is good interaction between the company, the regulator and the customer. In that sense, the CRO plays a role like that of Henry Kissinger in the Nixon administration, getting everyone to talk constructively even when they do not get along on all issues.

Dennis Chookaszian:

- National Fire Protection Association (NFPA) 1600—the gold standard for crisis management certification: Standard on Disaster/Emergency Management and Business Continuity Programs 2007 Edition.⁶ SOX requires a risk review: an out of the box process for out of the box risks.
- After 80 years of playing the “bad boy” on Wall Street, Bear Stearns ended up friendless.
- CRO role: If you cannot change things, what are you doing here?
- The big corporate failures could mostly have been prevented.

John Wengler:

- What is frequently missing in risk management is *cultural competence*. Risk needs to be examined from a multidisciplinary perspective. We cannot be *married to our numbers* or use a lot of jargon. Phrases, like “six sigma losses,” do not communicate to most audiences.
- *The model for avoiding turf wars is to require that managers concur (not approve) that each proposal adequately describes risk management implications.* By requiring only concurrence, concerns can be

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⁶ www.nfpa.org/assets/files/PDF/NFPA1600.pdf

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expressed without offering a direct challenge to the proposing manager. Illustration is given of not looking a child in the eye (simian male challenge)—a sideways glance is preferred and less threatening.

- *Does your secondary staff feel secondary?* (They should not).
- *Question:* Did Bear Stearns executives know they were rolling the dice or was it an honest mistake that led to their failure? We may never know.

Branko Terzic:

- Does the CRO ask the right questions and have the support from senior management to do so?
- Reputational risk examples:
 - ▶ Schlitz Brewing Company failed from reputational problems after introducing a new brewing process that cut costs dramatically but left the beer maker with a dramatically reduced employee head count. Customers fled when the story was leaked because the company tried to position itself as a “traditional” brewer.
 - ▶ Arthur Andersen failed after playing a brinkmanship game with federal prosecutors who failed to realize that even filling an indictment of the firm would ruin their reputation and drive them out of business.
 - ▶ Tylenol enhanced the reputation of their firm by acting promptly and prudently when faced with a problem of poisoned product.

Luncheon Speaker: Dr. William Freund, Chief Economist Emeritus, The New York Stock Exchange

What Is Ahead for Business and Investors?

Wednesday, April 16, 12:30 p.m.

- Overall summary—great jokes, great insights. Some samples:

- ▶ “Of the many introductions that I have received, this one was the most recent!”
- ▶ “As Henry the Eighth told his wives—I won’t keep you long!”
- ▶ “An economist is someone who can make love 16 ways, but doesn’t know a girl.”
- ▶ “Greenspan: constructive ambiguity. Congressman, if you understood what I just said, I misspoke.”
- ▶ “Will Rogers: If the world comes to an end, I want to be in Cincinnati, Ohio because everything happens in Cincinnati 10 years later.”
- ▶ “Winston Churchill: In the end, Americans always do the right thing—after exhausting all the other alternatives.”

General Session: Strategic Risk—Making Models Relevant in Executive Decisions

Wednesday, April 16, 2008, 1:50 p.m.

Speakers: Scott M. Polakoff, Senior Deputy Director and Chief Operating Officer, Office of Thrift Supervision, Myron S. Scholes, Chairman, Platinum Grove Asset Management, L.P., Charlie Shamieh, Executive Vice President, AIG
Moderator: Thomas S. Y. Ho, President and Founder, Thomas Ho Company

Myron S. Scholes:

- Is there a difference between good management and good luck?
 - ▶ Good management is a marriage between good theory, experience, and luck.
- Was Bear Stearns insolvent or illiquid? We may never know.
- More information does not necessarily provide more value. Sometime we need to use *mushware* (our brains).

See you in Chicago in 2009! ♦

Third Year a Charm for ERM Symposium Scientific Papers Track

Steven C. Siegel

In 2006, the ERM Symposium established its first-ever annual call for ERM-related research papers to present the very latest in ERM thinking and move forward principle-based research. Originally the brainchild of Max Rudolph, the 2006 ERM Symposium Call for Papers set into motion high expectations for succeeding years in the quest for expanding the repository of ERM knowledge. Building on the successes of 2006 and 2007, I am pleased to report that the 2008 ERM Symposium Scientific Paper Track continues to push the envelope in terms of both quantity and quality of papers.



Max Rudolph, chair of the ERM Symposium Call for Papers

With 65 abstracts submitted for review—a 40 percent increase over 2007—the level of response again confirms the cross-industry interest in this topic. The papers review committee, chaired by Rudolph, included returning members Mark Abbott, Maria Coronado, Sam Cox, Steve Craighead, Krzysztof Jajuga, Jeanne Nallon, Dan Oprescu, Nawal Roy, Matthieu Royer, Richard Targett, Fred Tavan and Al Weller as well as newcomers John Birge, Dan Rosen, Greg Slone, and Robert Wolf. Choosing from among the 65 abstracts for nine presentation slots at the symposium required a great deal of review and careful consideration. Given the quality and number of abstracts, as in previous years, the committee wished there were more speaking slots available.

The final task of the committee was to select the prize winning papers. The three prizes awarded at the symposium are: the Actuarial

Foundation ERM Research Excellence Award for Best Overall Paper; the PRMIA Institute New Frontiers in Risk Management Award; and the Joint Risk Management Section Award for Practical Risk Management Applications.

The award winners along with the paper abstracts are shown below. Awards were presented at the ERM Symposium Opening session held on April 15th.

2008 Actuarial Foundation ERM Research Excellence Award for Best Overall Paper: “A Practical Concept of Tail Correlation,” by John Manistre.



John Manistre (right) accepts the third annual Actuarial Foundation award from Gary Josephson.

ABSTRACT

This paper shows how the results of copula based capital aggregation models can always be locally approximated by relatively simple formulas. The paper defines the concepts of diversification factor and tail correlation matrix and describes methods for estimating these quantities from simulated data. We show how these ideas can be put into practice as both computational short cuts and presentation tools. Some examples are then developed which suggest that, when copula based models are used to aggregate capital, two new phenomena emerge a) diversification benefits are reduced because of additional tail dependence in the copula and b) diversification benefits are increased when aggregating risks that have finite variance and the model does not have too much symmetry. Since

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few of the risks held by a life insurer are so heavy tailed that they have infinite variance, the paper concludes by arguing that simple, correlation matrix based, capital aggregation formulas are more defensible than previously thought.

2008 PRMIA Institute Award for New Frontiers in Risk Management: Klaus Bocker and Martin Hillebrand for “Interaction of Market and Credit Risk: An Analysis of Inter-Risk Correlation and Risk Aggregation.”



Klaus Bocker (right) accepts PRMIA Institute award from John Birge

ABSTRACT

In this paper we investigate the interaction between a credit portfolio and another risk type, which can be thought of as market risk. Combining Merton-like factor models for credit risk with linear factor models for market risk, we analytically calculate their inter-risk correlation and show how inter-risk correlation bounds can be derived. Moreover, we elaborate how our model naturally leads to a Gaussian copula approach for describing dependence between both risk types. In particular, we suggest estimators for the correlation parameter of the Gaussian copula that can be used for general credit portfolios. Finally, we use our findings to calculate aggregated risk capital of a sample portfolio both by numerical and analytical techniques.

2008 Joint Risk Management Section Award for Practical Risk Management Applications: Donald Pagach and Richard Warr for “An

Empirical Investigation of the Characteristics of Firms Adopting Enterprise Risk Management.”



Don Pagach (left) and Richard Warr (center) accept Joint Risk Management Section award from Fred Tavan

ABSTRACT

We use a hazard model to examine the factors that influence firm level adoption of enterprise risk management (ERM). We find that firms that are more levered, have more volatile earnings and have exhibited poorer stock market performance are more likely to initiate an ERM program. When the value of the CEO's option and stock portfolio is increasing in stock volatility, the firm is also more likely to adopt ERM. Our results suggest that ERM is being used for reasons beyond basic risk management. These other reasons include offsetting CEO risk taking incentives and seeking improved operating performance.

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

We wish to thank all the organizations and committee members for their support and for making this year's Symposium a success. Planning for the 2009 ERM Symposium call for papers has already begun and I invite you to contact me if you have ideas or feedback for next year. Until then, watch the ERM Symposium site for up-to-date information about next year's event. ♦

SOA⁰⁸



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SESSION 28	Monday, October 20	10:30 a.m. – Noon
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ERM: Opportunities for Actuaries to Make a Difference

SPONSORED BY THE JOINT RISK MANAGEMENT SECTION

Although there are a wide variety of actuarial practice areas, the core of the actuarial profession is measuring and managing risk. While all actuaries are trained and practiced in traditional risk management, this session will cover just how well these traditional actuarial skills map into the opportunities to practice enterprise risk management (ERM), what additional training or skills may be needed and the magnitude of employment opportunities.

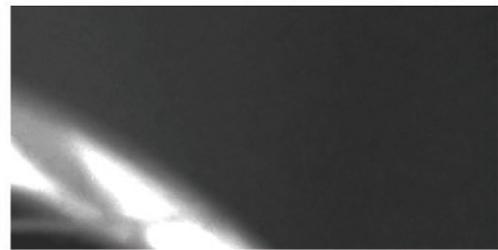
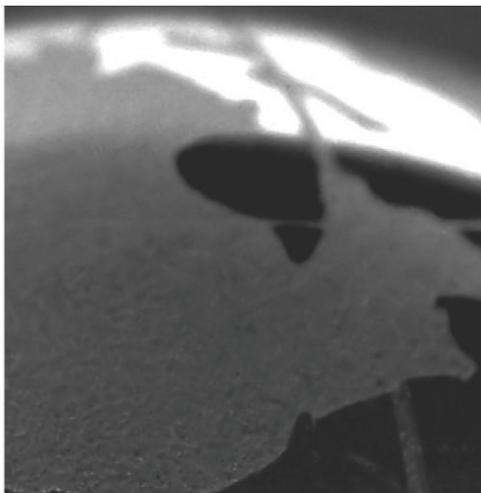
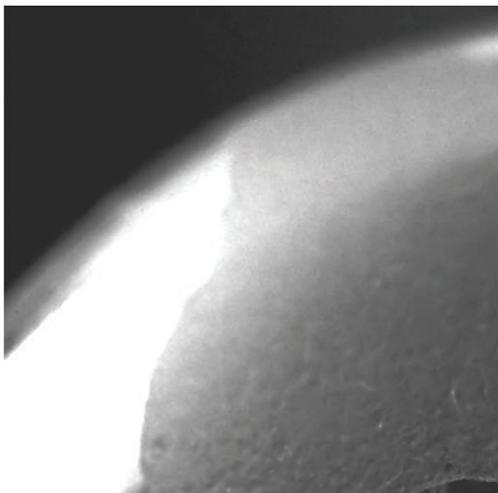
SESSION 30	Monday, October 20	2:00 – 3:30 p.m.
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Integrating Economic Capital and Enterprise Risk Management

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**LIMITED ATTENDANCE
SEMINAR ON PREDICTIVE
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AUGUST 20-21, 2008
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**REINSURANCE LIMITED
ATTENDANCE SEMINAR**
SEPTEMBER 15, 2008
NEW YORK, NY

**CASUALTY LOSS RESERVE
SEMINAR**
SEPTEMBER 18-19, 2008
WASHINGTON, D.C.

**PREDICTIVE MODELING
SEMINAR**
OCTOBER 6-7, 2008
SAN DIEGO, CA

CAS ANNUAL MEETING
NOVEMBER 16-19, 2008
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Also look for these upcoming
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- Reinsurance Webinar
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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 Valentina Isakina, editor, at valentina.isakina@bain.com or Steve Craighead, co-editor, at steven.craighead@towersperrin.com.

The next issue of *Risk Management* will be published:

<i>Publication Date</i>	<i>Submission Deadline</i>
December 2008	September 1, 2008

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 Kathryn Wiener, (847) 706-3501, at the Society of Actuaries for help.

Please send an electronic copy of the article to:



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This newsletter is free to section members. Current-year issues are available from the Communications Department. Back issues of section newsletters have been placed in the SOA library and on the SOA Web site: (www.soa.org). Photocopies of back issues may be requested for a nominal fee.

2007-2008 SECTION LEADERSHIP

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