



RISK MANAGEMENT SECTION

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

Risk



Management

December 2008, Issue No. 14

Published in Schaumburg, Ill.
by the Society of Actuaries

Table of Contents

EDITOR'S NOTE

Spread of Risk ... Articles
by Sim Segal _____ 2

CHAIRPERSON'S CORNER

Outgoing Chairperson
by Ron Harasym _____ 4

Incoming Chairperson
by Don Mango _____ 6

GENERAL

**The Banks Invented ERM and They Blew Up,
So Why Should We Bother?**
by David Ingram _____ 8

To Read or Not to Read: That is the Question
by Naveed Shahid _____ 10

RISK IDENTIFICATION

**Opportunities for Actuaries in the Emerging
Australian Carbon Market**
by Nicholas Linacre _____ 12

RISK QUANTIFICATION

From Subprime Crisis to Risk Management
by Daniel Hui _____ 16

Capital to do What?
by Craig Turnbull _____ 22

Reducing Risk in Risk Assessment Models
by Trevor Howes _____ 27

RISK RESPONSE

Pandemic Planning and Recovery
by Jim Toole _____ 29

RISK CULTURE & DISCLOSURES

Can Bad Culture Kill a Firm?
by Stephen W. Hiemstra _____ 34

**Financial Regulation and the Maginot Line
Defense Strategy**
by Dave Sandberg _____ 37

Spread of Risk...Articles

Sim Segal



To do this, we need your help, for which we are offering a reward. While we usually have an abundance of articles for the “General” and “Risk Quantification” categories, we are always in need of articles in the categories “Risk Identification,” “Risk Response,” and “Risk Culture & Disclosures.” To generate more articles in these categories, we will award \$500 to the author of the best article in one of these three topic categories every issue. In addition, we will award \$2,500 to the author of the best article in any category every two years.

We hope that the broader spread of risk articles will keep you even more informed on all things ERM. If there is something we can do to improve, or if there’s something you particularly like, please email me at sim.segal@watsonwyatt.com. To generate comments, we will award \$50 to the two contributors with the best suggestions or comments every issue; we plan to publish all comments and suggestions (with attribution, if permission is received) in a “Reader Feedback” section starting with the March 2009 issue.

I want to thank the SOA staff liaison to *Risk Management*, Kathryn Wiener, our assistant editors, Steve Craighead and Valentina Isakina, and Dave Ingram, who continues to be an engine of support in procuring quality authors. ♦

In this issue, you will notice a change in our format and content. We have separated articles into five categories—a general category and four others corresponding to different steps in the ERM process cycle. The categories are:

- 1) General
- 2) Risk Identification
- 3) Risk Quantification
- 4) Risk Response
- 5) Risk Culture & Disclosures

See Table A for examples of topics by category.

We pledge to (try to) publish at least one article in each topic category every issue, and we have succeeded in doing so in this issue. This new format, along with this pledge, should help us provide you with a broader and more balanced range of ERM content.



Sim Segal, FSA, CERA, MAAA
US Leader of ERM Services
Watson Wyatt Insurance &
Financial Services, Inc.
sim.segal@watsonwyatt.com
(917)699-3373

Table A**1) General**

- a) ERM trends
- b) Deep dive on a single risk type
- c) Topics that cross multiple categories
- d) Other

2) Risk Identification

- a) Environmental scanning, benchmarking and techniques to identify emerging risks
- b) Risk categorization and definition
- c) Internal qualitative assessment and prioritization

3) Risk Quantification

- a) Developing risk scenarios
- b) Quantifying individual risks: Financial risks (market, credit, liquidity, etc.); insurance risks; strategic risks; operational risks
- c) Quantifying enterprise risk exposure (based on all risks interacting)
- d) Metrics/key risk indicators (value, capital, etc.)
- e) Models (economic capital, value-based models, etc.)
- f) Modeling methods (real-world vs. market-consistent, etc.)
- g) Economic capital and its integration into ERM
- h) ALM and its integration into ERM

4) Risk Response

- a) Defining risk appetite and risk thresholds
- b) Managing exposures to within risk appetite: Exposures include all risks: Financial risks (market, credit, liquidity, etc.); insurance risks; strategic risks; operational risks
- c) Making decisions with ERM information, including strategic planning, tactical decision-making, pricing, M&A, etc.
- d) Managing within rating agency requirements and regulatory constraints

5) Risk Culture & Disclosures

- a) Risk Culture
 - i) Risk Framework
 - (1) How ERM is organized functionally (process cycle, scope, decisions, etc.)
 - (2) Defining ERM
 - ii) Risk governance
 - (1) How ERM is organized hierarchically
 - (2) Roles and responsibilities (Board, ERM committee, internal audit, etc.)
 - (3) Policies and procedures
 - (4) Rating agency requirements
 - (5) Regulatory requirements
 - iii) Integration into performance measurement (internal reporting) and performance management (incentive compensation)
- b) Risk disclosures (integration into external communications)
 - i) Communications to rating agencies
 - ii) Communications to regulators
 - iii) Communications to stock analysts
 - iv) Public disclosures (e.g., published quarterly or annual reports or filings)

Financial Crisis is Opportunity

Ron Harasym



The rapidly expanding world of risk management just took another quantum leap in exposure and scrutiny as pain from the financial crisis blasted its way from Wall Street to household Main Street like a category 5 hurricane. In just the past few months, we have seen the collapse of large, long-established, seemingly strong and once well-respected companies. Given the rapid sequence of large-impact and hard-to-predict events beyond the realm of reasonable expectation, the financial crisis could very well be categorized as the latest entry to the “Black Swan” list. Some day, we will look back over the past few months and ponder with amazement how so few managed to get so many into such a devastating mess. A moment in history when the financial and economic landscape, while convulsing and contorting due to massive self-inflicted internal injuries, suddenly fractured and changed forever the way we look at risk.

Something just isn't right when (estimated) 1-in-10,000-year events suddenly become monthly, then weekly, then daily events. Consider your

risk assessment if someone several years ago presented to you the following scenario (with multiple dependencies of course):

- Mortgage lenders abandon traditional prudent loan practices and make an extraordinarily high number of poor quality subprime loans;
- Mortgage lenders grossly over-leverage capital as these loans are packaged into securities, which in turn are sold to raise capital to support more imprudent lending;
- Downstream, risk exposure becomes heavily concentrated in government-sponsored mortgage entities and mortgage loan insurance companies;
- Securities sold by the government-sponsored mortgage entities are repackaged by various financial institutions into complex collateralized debt obligations (CDOs), structured in a manner that obscures the underlying risk;
- Investors, who don't fully understand these securities, flock to purchase these high-yielding securities that contain tranches of subprime loans;
- And finally the kicker—a change in macroeconomic conditions triggers a rapidly increasing number of subprime loans to become toxic with the ripple through impact of placing the whole house of cards in jeopardy of collapsing.

You sincerely might have answered that this scenario is too far beyond the realm of normal expectations to coherently comment upon. In such a scenario, policymakers and other



Ronald J. Harasym, FSA, CERA, FCIA, MAAA, is vice president and actuary at New York Life Insurance Co in New York, N.Y. He can be reached at ronald_j_harasym@newyorklife.com

participants would clearly be operating in uncharted and unknown territory. Perhaps you might reply that with so many unknown unknowns, an overwhelming and quick response is the only logical approach. And as such, quick and decisive action must be taken to control the hemorrhaging, break the dependencies and bring back a sense of financial confidence in order to avoid a complete financial meltdown. But only if it were so easy!

As companies and policymakers react to the fall-out of the financial crisis, one can only hope that risk management practices don't become Sarbanes-Oxleyed (for a lack of a better term). Risk management is not purely a mechanical exercise about minimizing or eliminating risk; it is about understanding risk and ensuring adequate compensation for risk undertaken. Leading up to the financial crisis, clearly there were widespread and unsupportable conceptual gaps in risk management walk versus talk.

The financial crisis and meltdown has split wide open an exceptional opportunity for actuaries to step up to the plate and establish themselves as the leading profession in the field of risk management. The basic training required to become an actuary provides a great foundation for a risk management role. We know how to gather and assess information. We know how to identify,

categorize, quantify and qualify risk. We know how to define risk appetite and risk thresholds and how to develop risk responses and countermeasures. And most of all, our training instills in us not to jump to unfounded and unsound conclusions.

It is important to extract what lessons we can from the financial crisis. It is important to understand more about what happened, what risk management practices were in place, why these practices failed, and leverage our learnings to help anticipate and develop proactive responses to help manage the next emerging risk.

In my final remark as the outgoing Section Chair, I would like to thank all the Section Council members, friends of the Section Council and the SOA/CAS/CIA staff for their dedicated efforts over the past year. Kevin Dickson, Valentina Isakina and John Nigh will also be leaving the Section Council. I would also like to take this opportunity to pass the torch over to Don Mango, the incoming Section Chair, as well as to welcome our new Section Council members—John Manistre, Mike Stramaglia and Judy Wong. All in all, I had a “blast” over the past year working with everyone as the chair of the Joint Risk Management Section and look forward to continuing my involvement as a friend of the section. ♦

“

Risk management is not purely a mechanical exercise about minimizing or eliminating risk; it is about understanding risk and ensuring adequate compensation for risk undertaken.

”

Chairperson's Corner

Don Mango



Donald F. Mango, FCAS, MAAA, Chief Actuary Guy Carpenter & Co, LLC in N.J. He can be reached at Donald.F.mango@guycarp.com.

I am looking forward to being Section Council chair during what promises to be another watershed year for risk management. By the way, how many of these years in a row can we stand? For my inaugural Chairperson's Corner column, I would like to review the credit crisis and ask whether opportunities exist for actuaries to play a larger role in risk across the board.

I will begin with a staggering opening statement: “When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you’ve got to get up and dance. We’re still dancing.” This statement was made July 10, 2007 by Chuck Prince, then CEO of Citigroup. It summarizes what I believe to be a core lesson permeating risk management for all of financial services: we have met the enemy, and it is us.

Perhaps I was too limiting: our true enemies (in credit or insurance) continue to be greed,

stupidity and fear. During the credit crisis, the greed was rampant as evidenced by the extreme leverage and almost total disregard for parameter estimation, stress testing or correlation; stupidity was most apparent in the incentive systems which remunerated producers on volume; and sadly, fear manifested itself in herding, panic and liquidity crises.

The Need for Financial Risk Professionals

The insurance industry as a whole has thus far weathered the crisis better than the banking and lending sectors. While there is still extensive forensic work ahead, there may be great opportunities for the actuarial profession to teach the capital markets about illiquidity and the value of a *financial risk profession*.

On the illiquidity front, it is safe to say the luster has worn off “mark-to-market.” Many in the banking community are calling for a serious review of the process, claiming mark-to-market practices may have been pro-cyclical and exacerbated the crisis. Mark-to-market relies upon a liquid market filled with expert traders whose valuations are backed by their own positions—that is, the market valuations are granted credibility in part because serious players are betting their own money. However, when one seeks a market price in an illiquid market, this assumption breaks down. There are no traders willing to quote, no trades to observe, and no prices to discover. Under such conditions, what is one to do?

This liquidity breakdown troubled capital market financial risk professionals greatly. However, I will venture that most actuaries, if in the same position, would not have been as bothered, because our traditional roles are to provide valuations on portfolios of illiquid,

untraded, over-the-counter derivatives on unobservable underlyings (data on whether a car crashes or a person dies is not available on Bloomberg). Our approaches are principled, model-driven valuations—exactly what some critics of mark-to-market are calling for as an alternative when liquidity dries up.

Go a step further: credit risk analysis lacks a single professional body. Professions bring consistent basic education, licensing or certification examinations, standards of practice, continuing education and professional discipline. While we cannot dream to replace all credit analysts with actuaries, we can think about exporting our professional model to the credit world. There are many professional mod-

els the regulators could consider, but I suggest actuaries are the closest comparable. First, the “actuarial method” is one generally accepted approach in credit risk analysis. Second, actuaries know how to work with statistics and correlations, limited information and stochastic modeling. Third, as mentioned above, actuaries value illiquid portfolios and provide official opinions of those valuations that are then used for tax and regulatory purposes.

It seems to me there is a real opportunity for the actuarial profession to make the case to those who will be seeking long-term solutions to the credit crisis. Who knows, in the future we may be welcoming “credit actuaries” into our professional fold. ♦

Pay Your Dues and Section Memberships Online*

Using your credit card and our easy-to-use online payment system, you can pay your dues, renew section memberships or sign up for new section memberships. For your convenience, you can also sign up for IAA special interest sections at the same time you renew your SOA membership.

*To pay by check, visit the site below to print your invoice.

Renew today at <http://dues.soa.org>!



The Banks Invented ERM and They Blew Up, So Why Should We Bother?

David Ingram

Seat belts have been widely touted to be highly effective in reducing fatal injuries from auto accidents. Yet, despite requirements that drivers and passengers “buckle up,” there are still about 40,000 traffic fatalities every year in the United States. So one might conclude that seat belts just do not work all that well. But if you go past the headline and read the whole story, you find that in about 60 percent of the fatalities, the person was not wearing his seat belt. So putting seatbelts in all cars and requiring their use is not sufficient—people must actually use them!

So it is with ERM. A number of people have observed that banks, long the advocates of ERM, have been struggling mightily in the past year and struggling because they have mismanaged their risks. But if you dig a little deeper into the story, you find that just like the seatbelts, ERM must be effectively applied to have the desired result.

Below are the conclusions of an excellent spring 2008 report produced by an international group of banking regulators.* The report analyzed the experiences and ERM practices of 11 major banks and securities firms in 2007 through the first part of the current financial market turmoil. The report looks at the differences in ERM practices between the banks that were more successful during 2007 from the practices they observed, and the firms that experienced greater difficulty.

Four differences in practices emerged:

1. The better banks quickly shared risk and exposure information broadly among busi-

ness unit, risk management staff and top management. This meant that they started reacting to the emerging issues as much as 12 months earlier than the banks without these practices.

2. The better banks used rigorous internal practices to evaluate their risk positions. These practices and models were consistent across all businesses.
3. The better banks had a centralized area that coordinated cash planning. They generally tried to avoid or limit activities that created large contingent liquidity needs and set incentives to make that activity unattractive to business unit management.
4. The better banks used multiple risk assessment tools and metrics and generally had very adaptive risk models. They tended to track net and gross positions as well as notional and market values.

The graduates of the school of hard knocks are often very well prepared, but the tuition is usually very high. Here is a situation where most insurers get to audit this particular course for a very low cost. However, these types of reports give great insights, but require the reader to spend some time in translating the results into the insurance environment.

So what can insurers take away from the banks' experience? First and foremost, it is apparent that ERM was not the cause of the banks' problems, but it was rather their lack of effective execution of ERM. In just the same way that traffic fatalities are not necessarily evi-



David Ingram, FSA, CERA, FRM, PRM is an ERM advisor to insurers at Willis Re in New York, N.Y. He can be reached at david.ingram@willis.com.

*Observations on Risk Management Practices during the Recent Market Turbulence March 6, 2008 Senior Supervisors Group.

dence of ineffective seatbelts, bank subprime losses as indicated by the supervisors' report indicate a failure to effectively implement risk management. ERM can appear as though it is implemented while in benign markets, but a half-hearted ERM program will usually not have the desired benefit when times get tough.

From this report, insurers can see that they should be concerned if they find that:

- Business units are empowered to add significantly to risk concentrations without frequent disclosures and/or justifications to top management.
 - Business units all have their own risk models.
 - Risk sign-off sometimes relies totally on the presumption that someone else is doing good analysis.
 - They do not usually identify contingent risks.
 - They need to plan out a year in advance to make changes to their risk models.
 - "Nobody believes those stress tests anyway, so we don't put much time into them."
- Low reliance on third party risk evaluations;
 - Identification of and plans for contingent risks;
 - Incentives for business units to minimize contingent risks;
 - Multiple risk management tools and metrics;
 - Flexible and adaptive risk models;
 - Aggregation of net and gross exposures in addition to expected losses; and
 - Stress testing results that are credible to top management, such that management action can and does occur.

And they should be encouraged if they can say that their risk management programs include:

- Open communications between business units, risk management staff and top management;
- Enterprise level decision-making about major risk accumulations;
- Systematic internal evaluation of risks;

The report also notes one major difference between the banks with better results in 2007 and their less effective peers. The better banks were able to keep their degree of attention on risks in their fastest growing area proportional to the level of activity, while the worse banks did not increase risk scrutiny as the business increased. This component is absolutely the most difficult aspect of risk management and requires not just support from the top, but specific direction from them as well. Challenging the high growth area of company business can only be done from the top. ♦

“

Insurers should be concerned if they find that risk sign-off relies on the presumption that someone else is doing good analysis.

”

To Read or Not to Read: That is the Question

Naveed Shahid



Naveed Shahid, is senior manager, Investments, Actuarial & Strategic Planning Department, at EFU Life Assurance, Ltd. in Karachi, Pakistan. He can be reached at naveedshahid@efulife.com.

INTRODUCTION

In June 2008, the International Network of Actuarial Risk Managers (INARM) decided to compile a list of books that might interest risk managers. INARM has about 300 members from 30 countries who share information via e-mails and blogs. This article summarizes the results of an INARM member survey conducted to identify and rank books with ERM-related content.

Survey Facts

- Response rate: 11 percent.
- Response by region: 64 percent from North America; 15 percent from European Union; 9 percent from South America; rest from South Asia, Far East Asia and Oceania. Response by employer: 53 percent from insurance companies; 22 percent from consulting firms; the rest from banks, software and other types of companies.

“Must Read” Books

Two books by Nassim Taleb topped the “must read” list (see Table 1A).

Rank	Book	Author
1	Black Swan	Nassim Taleb
2	Fooled by Randomness	Nassim Taleb
3	Enterprise Risk Management	James Lam
4	When Genius Failed	Roger Lowenstein
5	Against the Gods	Peter Bernstein

The same two books by Nassim Taleb also topped the “most read” books (see Table 1B).

Table 1B: “MOST READ” LIST

Rank	Book	Author	Readership %
1	Black Swan	Nassim Taleb	76%
2	Fooled by Randomness	Nassim Taleb	70%
2	Freakonomics	Steven Levitt and Stephen Dubner	70%
3	Against the Gods	Peter Bernstein	58%
4	Enterprise Risk Management	James Lam	52%
5	When Genius Failed	Roger Lowenstein	48%

“Should Read” Books

There were 14 books that were rated as “should read” (see Table 2 on page 13).

“Nice to Read” Books

The remaining books fell under the category “nice to read” (see Table 3 on page 13).



Table 2: "SHOULD READ" LIST

Rank	Book	Author
6	Liar's Poker	Michael Lewis
7	Irrational Exuberance	Robert Schiller
8	The (Mis)Behaviour of Markets: A Fractal View of Risk, Ruin and Reward	Benoit Mandelbrot and Richard Hudson
9	Managing Credit Risk: The Next Great Financial Challenge	Ed Altman
10	Plight of the Fortune Tellers	Riccardo Rebonato
11	The Art of the Long View	Peter Schwartz
12	A Demon of our Own Design	Richard Bookstaber
13	Freakonomics	Steven Levitt and Stephen Dubner
14	Risk Management	Michel Crouhy, Robert Mark and Dan Galai
15	The Great Crash	J.K. Galbraith
16	The Risk Management Process: Business Strategy and Tactics	Christopher Culp
17	9-11 Commission Report	
18	Infectious Greed: How Deceit and Greed Corrupted the Financial Market	Frank Partnoy

Table 3: "NICE TO READ" LIST

Rank	Book	Author
19	Enterprise Risk Analysis for Property-Liability Insurers	Guy Carpenter
20	My Life as a Quant: Reflections on Physics and Finance	Emanuel Derman
21	Origins of the Crash	Roger Lowenstein
22	Making Enterprise Risk Management Pay Off	Thomas L. Barton, William G. Shenkir and Paul L. Walker
23	Enron	Loren Fox
24	Fortune's Formula: The Untold Story of the Scientific Betting System That Beat the Casinos and Wall Street	William Poundstone
24	Inevitable Surprises: Thinking Ahead in a Time of Turbulence	Peter Schwartz
26	Predictable Surprises	Max Bazerman and Michael Watkins
27	Simple Tools and Techniques for Enterprise Risk Management	Robert J. Chapman
28	Seeing Tomorrow	Ron Dembo and Andrew Freeman
28	Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina	
30	The New Financial Order	Robert Schiller
31	Wisdom of Crowds	James Surowiecki
32	Fischer Black and the Revolutionary Idea of Finance	Perry Mehrling
33	Trading Risk: Enhanced Profitability through Risk Control	Ken Grant
33	Risk Management and Insurance: Perspectives in a Global Economy	Barbara Andaya and Harold D. Skipper
35	Capital Ideas Evolving	Peter Bernstein
36	The HHH Royal Commission	Hon Justice Owen
37	Risk	David Ropeik and George Gray
38	Risk Intelligence	David Appgar
39	A History of the Theory of Investments	Mark Rubenstein
40	Bull! A History of the Boom 1982-1999	Maggie Mahar
41	Business Fairy Tales	Cecil W. Jackson
41	The Great Risk Shift	Jacob S. Hacker

Reading Groups

Once survey results were compiled, INARM formed four reading groups on the INARM weblog. The books selected for reading were: *Black Swan*, *Making Enterprise Risk Management Pay Off*, *Enterprise Risk Management* and *Against the Gods*. *Black Swan* generated the most active discussion. ♦

Opportunities for Actuaries in the Emerging Australian Carbon Market

Nicholas Linacre

Editor's Note: This article originally appeared in the August 2008 issue of Actuary Australia. Permission to reprint has been granted by The Institute of Actuaries of Australia.

Accounting firms, law firms and investment banks are active in the development of carbon markets. These organizations have existing business-client relationships that create opportunities for the development of carbon risks management services. Actuaries, insurance companies and reinsurers also have opportunities to participate in the development of carbon markets through the provision of risk management services. However, few actuaries or actuarial service providers have ventured into this emerging market or have appointed business development managers. Therefore this article covers domestic and international developments, offers some reflections on potential opportunities for actuaries in the carbon markets and finally provides insights into the skills needed to develop a successful carbon market practice.



Nicholas Linacre, Ph.D., is adjunct fellow at the Melbourne School of Land and Environment, The University of Melbourne, Australia. He can be reached at nlinacre@unimelb.edu.au.

Domestic Developments

It is anticipated that the Australian Emissions Trading System will be established by 2010, and is projected to trade AUD \$105 billion at a carbon price of AUD \$25 per tonne. In addition to Australian Emissions Permits (AEPs), it is also anticipated that international linkages will occur through:

- Kyoto Certified Emission Reduction units (CERs), produced by carbon projects that have been certified by the UNFCCC's Clean Development Mechanism (CDM) Executive Board; and
- Emission Reduction Units (ERUs) created through Joint Implementation (JI) projects,

which allow the transfer or acquisition of trading units between states engaged in emissions trading.

It is also anticipated that the Australian scheme may allow a regulated operator to use other types of offset projects to create carbon credits to comply with obligations under a cap and trade system.

International Developments

Major international developments include the EU phase II implementation of the emissions trading system, the development of the U.S. voluntary and compliance markets and post-2012 uncertainty for the CDM market. Both the EU phase II and developments in the U.S. market suggest continued commitments within major markets to address or to start to address climate change. However, China recently became the world's largest emitter of greenhouse gases (GHGs), which reinforces the need to rapidly bring China into a global or regional cap and trade system to limit the further expansion of GHG emissions.

Opportunities

The development of a domestic carbon market with internationally sourced CERs and ERUs creates opportunities for:

- The development of new risk management products for sale to accounting firms, superannuation funds and investment banks;
- A new asset class for insurance companies and superannuation funds that may provide additional opportunities for portfolio diversification;
- Provision of carbon portfolio managements services; and

- New consulting services for: estimation of carbon footprints; environmental auditing; and compliance.

The creation of risk management products centers on traditional commodities portfolio risk management tools, such as derivatives, and the development of novel products that address specific risks associated with carbon markets. Carbon risks may be classified under one of the following headings:

- Price risks arising from the over- or under-allocation of emission trading units, or as a result of supply or demand constraints in the market;
- Valuation risks arising from changes in methodologies used to value emission reduction units;
- Overcrediting risks resulting from over-estimation of the carbon reduction from a project;
- Impermanence risks arising from the estimated carbon reductions not being maintained, which is a common problem encountered in forestry offset projects;
- Mismatch risks arising from misestimation or mismatching of carbon credit requirements that may result in the organization's need to purchase additional offsets or permits in the market at spot;
- Regulatory (e.g., issuance of CERs) and political risks; and
- Taxation risks arising from ill-defined taxation treatments.

Product development opportunities exist to create products that provide risk mitigation of issuance, valuation, overcrediting and impermanence risks. Products that address these issues may be useful to superannuation funds seeking to minimize the risks associated with investing in CDM projects that create CERs, while obtaining portfolio diversification benefits from these investments. Regulatory risks associated with issuance of new CERs are complicated by potential moral hazard if the speculative nature of applications can be passed on to insurers.

The creation of a new asset class also provides additional opportunities for portfolio diversification for insurance and superannuation funds. However, work needs to be done to establish the role and potential value of investing in AEPs, ERUs and CERs. Actuaries are well placed to help superannuation funds establish financial valuation methodologies for medium- to long-term investments in these securities. Medium- to long-term investments in these assets are complicated by the significant regulatory risks associated with carbon markets and additional political risks associated with projects that create CERs. Organizations developing projects to create CERs have tended to focus on markets, especially China, where the political risks are perceived to be low.

Superannuation funds may also be able to construct portfolios with similar performance characteristics to portfolios of AEPs, ERUs and CERs by directly investing in clean technology funds and commodities markets. There is a strong linkage between regulatory risks and the likely performance of these asset classes. A recent example of the regulatory risks faced by clean technology is the adoption of means testing of government subsidies

“

... few actuaries or actuarial service providers have ventured into this emerging market ...

”

continued on page 14

Opportunities for Actuaries ...

▶ continued from page 13

for solar electrification. Such changes can dramatically affect the demand and hence value of a particular segment.

As superannuation funds and insurance companies look to invest in AEPs, ERUs and CERs, opportunities will be created for actuarial services at different parts of the project pipeline. Actuarial consulting firms may be able to capitalize on client needs by developing and selling carbon portfolio management services to their client base. To illustrate the types of services needed, it is useful to examine the project development process for CERs (Figure 1). The types of projects that may be undertaken include: wind power, hydroelectricity, landfill gas, energy recovery, energy switching, tidal power and geothermal power.

Based on the project development process, potential carbon advisory services include:

- The assessment of client risk management needs;
- Carbon credit origination (creation of CERs);
- Provision of investment assessments;

- Project structuring and financing to create CERs, which may be done in conjunction with investment banks;
- AEP, ERU and CER portfolio management services;
- Back-office services for the issuance, tracking and management of certificates; and
- Carbon footprint, environmental auditing and compliance services that are related to risk management and mitigation.

Skills

The ideal carbon market actuary has technical skills in finance, environment and development, but also brings significant skills in working with clients to quantify the financial implications of carbon risks and risk management and mitigation measures. To provide clients with risk management solutions, actuaries will need to develop business relationships with originators and other service providers. This leads to a need for actuaries to move into exciting and challenging business development roles and away from traditional consulting work.

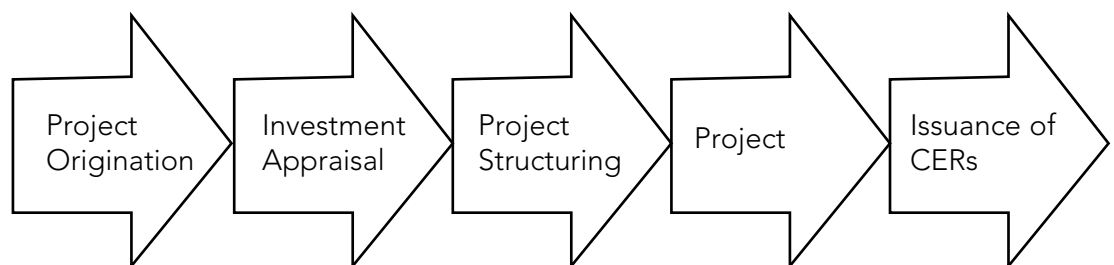


Figure 1. The Project Development Process for CERs

In this environment, networking, communication and sector knowledge are likely to be as important as knowledge of general risk assessment and management principles.

Conclusions

The actuarial profession has yet to grasp the challenge of developing business models and expanding business opportunities in the emerging carbon markets. However, opportunities still exist for actuaries to exploit established linkages with insurance companies and super-annuation funds and take a significant stake in the carbon markets. It therefore makes sense for actuarial firms and actuaries to be actively engaged in carbon-management services for their clients that have carbon-risk exposures. The alternative is that the major accounting firms and the accounting profession will capture this market. The best evidence for this is the active recruitment of personnel by accounting

firms in this sector and the active participation of accounting firms at major carbon expos. A possible “way in” for actuaries is to seek to join firms already moving into these areas, such as multi-function firms like KPMG, PwC and the like. A number of other professionals are either active or taking steps into these areas as well—carbon footprint auditing is already growing as an industry. Specialized emissions auditors are in place (the big accounting/consulting firms consult in that area). Actuaries are as well-placed as accountants to participate in the emerging carbon market, and the actuarial profession should consider ways to facilitate and encourage participation in this new market. ♦

“

Product development opportunities exist to create products that provide risk mitigation of issuance, valuation, overcrediting and impermanence risks.

”

SPONSORED BY:




Economic Capital and Market-Consistent Embedded Value

Bringing it all Together

Feb. 23–24, 2009
Orlando, FL

Co-sponsored by the Society of Actuaries and the Tillinghast insurance consulting business of Towers Perrin, this seminar is focused on providing practical, in-depth expertise to insurance companies on building and implementing market-consistent techniques for product pricing and financial reporting. In addition, it will cover how to apply risk management tools like economic capital (EC) and market-consistent embedded value (MCEV) in day-to-day business decisions.

LEARN MORE AT WWW.SOA.ORG.

From Subprime Crisis to Risk Management

Daniel Hui

“One dollar can get you a large soda at McDonald’s, a used VHS movie at 7-Eleven or a house in Detroit.”¹ A house was listed and sold for one dollar in Detroit. There is another house and an empty lot listed for one dollar also. I cautioned my colleagues that this happened in Canada in the early 1980s when the interest rate was double-digit and could happen here in the United States. It is happening in Detroit right now.

This crisis started first in the subprime mortgage securities market and quickly spread across the credit derivative market like wildfire. According to the timeline of events published by Reuters, there were signs of trouble at subprime lenders around the end of 2006. So far, this fast-moving financial storm has swallowed up two Bear Stearns hedge funds with subprime exposure, the British mortgage lender Northern Rock, the big U.S. mortgage lender Countrywide Financial, Bears Stearns itself, a U.S. regional lender IndyMac, Fannie Mae, Freddie Mac, Lehman Brothers, Merrill Lynch, AIG and Washington Mutual. Who will be next?

Stephen Roach summarized the changing nature of this crisis well in a recent article. “The credit crisis is the first stage. Sparked by the subprime meltdown that began in the summer of 2007, a cross-product contagion quickly spread to asset-backed commercial paper (ABCP), mortgage-backed securities, structured investment vehicles (SIVs), interbank offshore (LIBOR) financing, leveraged lending markets, auction rate securities, so-called monoline insurers, and a number of other opaque products and structures.”²

Isn’t commercial paper supposed to be a relatively safe short-term instrument? Why is it

a problem now? The problem is that ABCP is backed by asset-backed securities (ABS) with subprime exposure. The ABCP business model is to borrow in the low-yielding commercial paper market and invest in the higher-yielding ABS market. When the ABS market was in a tailspin, nobody wanted to buy the commercial paper.

What is the problem with subprime ABS? Why did the investment community take so long to figure out the location and the extent of the damage? This is due in part to the cross-product contagion that Roach mentioned above. The credit derivative on mortgage securities that led to the destruction at AIG is a very interesting topic. For now, we will focus on the complex mortgage securities like ABS and CDO. I hope the readers will begin to appreciate the complexity of this crisis and the difficulties that risk managers are facing.

The Setup of a Perfect Storm

In order to prevent the U.S. economy from going into recession after the dot-com bubble burst in 2001, Greenspan and company lowered the interest rate to a historically low level. This, however, paved the way for another asset bubble, which burst in 2007. House prices kept on increasing for several years before the summer of 2007. Everybody thought that buying a property was a sure win that could never go wrong.

As house prices went up, buying a home was getting out of reach to a lot of people, including the now infamous NINJA (No Income No Job & Asset) borrowers. In the interest of writing more business and therefore bigger bonuses, mortgage lenders simply looked the other way. People could take out mortgages with low



Daniel Hui, MBA, FSA, FCIA, CFA, works for AIG ERM Quantitative Analysis in New York, N.Y. He can be contacted at Daniel.Hui@aig.com.

1 <http://www.detnews.com/apps/pbcs.dll/article?AID=/20080813/METRO/808130360>.

2 Stephen Roach, “Pitfalls in a Post-Bubble World,” Morgan Stanley, Aug. 1, 2008.

documentation or no documentation on income. In the United Kingdom, this is called a self-documentation loan, so it is not strictly a U.S. phenomenon. As interest rates went higher, the interest-only loan and adjustable rate mortgage (ARM) loan became more popular. The problem with the ARM is that the low initial rate would be reset several years after initiation to a much higher rate. Some of the ARMs launched several years prior hit the reset date in 2007, and higher delinquencies and foreclosures started to show up. The values of mortgage securities with sub-prime exposure were depressed.

As ARMs reset, the borrower has the choice of (1) refinancing at a higher rate, (2) selling the house or (3) walking away. In general, (1) was neither affordable nor readily available and (2) might not make sense because some homes were already below water. Therefore, more people chose to walk away from their properties. The refinancing option was almost closed for the NINJA borrowers because of the tightening lending standard. Harvard economist Martin Feldstein said the following regarding the severity of the negative equity situation: "Because of the decline in house prices that has already occurred, more than 10 million homeowners now have mortgages that exceed the values of their house. This is 20 percent of the all homeowners with mortgages. For half of that negative equity group, the debt exceeds the house value by more than 20 percent."³

The story would not be complete without mentioning, as one of my colleagues put it, "the systematic risk created by accountants." This assertion may be controversial and could well be worth another article by itself. The fact is that most of the financial companies have adopted

the market value accounting under FAS 157 in 2007, and other companies were doing the same at the beginning of 2008. Under this regime, assets are marked using observed market prices where available or market implied parameters where appropriate. The problem is that the trading in ABS and CDO screamed to a halt as the credit crisis unfolded. Now, marking to market in an illiquid market is extremely difficult and has to be performed every quarter nonetheless. As house prices continue to drop, the expectation for mortgage defaults will continue to go up, and the prices of mortgage securities will go down. It has taken several iterations to mark these asset prices down step by step. People have complained about the reasonableness of the market expectation of default, but to no avail; this is how the accounting regime works at the moment.

Unpredictable Consumer Behavior

In previous economic cycles when households were under stress, consumers would keep paying their mortgages and car payments, so that they would have a roof over their heads, and so they could go to work and pay their credit card bills. However, this is now being turned upside down. In recent months, consumers appear to be more willing to keep their credit cards current but send their house keys back to the mortgage company in "jingle" mails.

Modeling mortgage defaults turns out to be more challenging than modeling prepayments. Loan level data (analogous to policy data) is required to do so. Up until now, MBS modeling was done by grouping loans into buckets (analogous to model points). While consumers taking out mortgages at the same time period would have

continued on page 18

“

Modeling mortgage defaults turns out to be more challenging than modeling prepayments. Loan level data (analogous to policy data) is required to do so.

”

³ Martin Feldstein, "How to Shore up America's Crumbling Housing Market," Financial Times, Aug. 27, 2008.

From Subprime Crisis to ...

▶ continued from page 17

similar loan rates and could be reasonably modeled by grouping, the same consumers would have different creditworthiness (FICO scores) and different loan-to-value (LTV) ratios (the ratio of a mortgage loan to the property's value). However, the price of their houses in different states are affected by very different local economic conditions. Furthermore, a loan that is 90 days overdue is more likely to default than a loan that is 30 days overdue. These are the key variables used in modeling mortgage defaults, but since they are heterogeneous, it is difficult to group them.

In the originate-and-distribute model, MBS are supposed to be on a bank's book for a few months before being sold. When a famous quant was asked about MBS modeling in an International Association of Financial Engineers (IAFE) meeting, he observed that no serious attempt was made to model these products since they were supposed to be short-lived on the balance sheet. This was true until the market crashed and banks had to hold a large number of unsold securities. The development of default models is still in the early stages. Also, there are proprietary default models in broker dealers' shop, and there are other newly developed default models available but not yet widely implemented. Most importantly, none of these models were really tested until the subprime crisis.

**Conflicting Data Sources**

The dilemma between using policy data or model points in building liability models is not new to actuaries. Our fellow actuaries would probably say, "Tell me about it." So what is the big deal?

Andrew Davidson observed that there are many participants⁴ in the secondary market for non-agency mortgages, which include the subprime mortgages. In the ABS structure where loans are securitized, there are rules set up to direct the flow of interest and principal payments and the allocation of losses in the case of mortgage default. Generally, a trustee is set up to monitor and report the performance of the ABS as well as to direct payments according to the rules. When ABS and perhaps CDO tranches are packaged into a CDO, another set of rules and trustees is created. In a typical ABS securitization, there could be up to 9,000 underlying mortgage loans. The default calculations generally begin with a cash flow projection at the loan level. The loan level cash flows and losses are then passed through the waterfall (cash flow rules) to construct the tranche cash flows and losses at the security level. In the case of a CDO, the security level cash flows and losses are then passed through the CDO waterfall to build the CDO tranche cash flows and losses. This layering of rules and structure is very tedious, time consuming and computationally intensive.

The collection of, and the selling of, information within this sector is big business, and present another set of difficulties regarding the modeling of defaults. For instance, there is a specific company (that will remain nameless) that collects information from mortgage servicers and trustees, groups underlying loans into buckets and then finally models the cash flow rules for each deal. This company literally holds a monopoly, which risk managers love to hate. Even if the loan level information that the company

4 <http://www.ad-co.com/newsletter/issues2007/SixDegreesofSeparationAug07.pdf>.

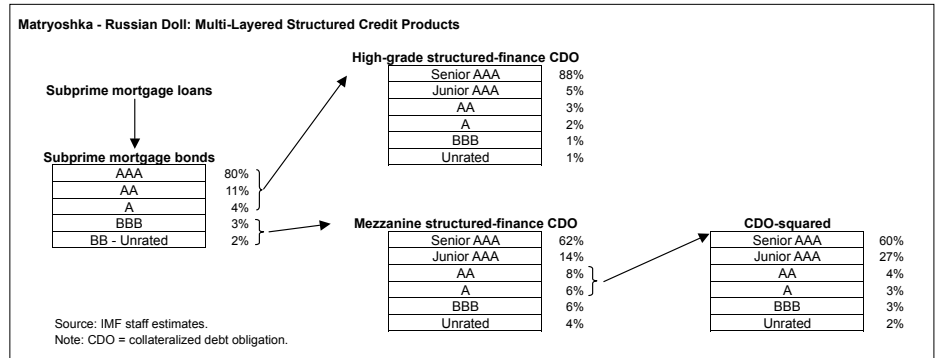
provides is not adequate, at the same time the risk managers cannot do without the cash flow modeling for mortgage securities that the company provides.

There is another company that specializes in the collection and maintenance of loan level information. It provides the best source for mortgage loan information that is also a necessity for modeling defaults. However, this company does not model the cash flow rules of the various securitized deals. Risk managers need both the loan level information from the second company and the cash flow rules of each deal from the first company to perform risk calculations. Unfortunately, there is no linkage between these two data sources.

When is an AAA not an AAA?

Actually, this question did not come up before this credit crisis. In the past, AAA-rated securities were taken at face value, and we now know that this is part of the underlying problem. Not all AAA securities are the same. Rating agencies are called to give their blessing on the quality before a securitization is complete. For the lack of better knowledge, the same methods for rating corporate bonds were applied to these structured-finance products. However, these structured-finance products turned out to be very different, and this has led to many downgrades within this sector, as the delinquency and foreclosures have skyrocketed. Fitch was the first one out to revise its rating methodology of structured-finance products that has led to permanent downgrades of many such products. Fitch was met with a great deal of protest and resistance, but now the other agencies are expected to follow suit.

The following diagram that outlines the linkage between ABS and CDO securities is taken from the International Monetary Fund, Global Financial Stability Report.⁵



Reproduced from "Global Financial Stability Report", April 2008, IMF

Starting from the top left corner, subprime loans are securitized into ABS. According to the IMF estimate, some 75 percent of recent U.S. subprime mortgage loans have been securitized as ABS using over-collateralization (OC) and subordination. Of these, 80 percent have been funded with AAA-rated tranches. The problem is within the bottom 5 percent, rated BBB and below. A large number of investors are not allowed to buy below-investment-grade securities, but this was solved by securitizing these BBB tranches in a CDO structure; so BBB-rated ABS tranches were turned into AAA-rated mezzanine structured-finance CDO tranches. However, the distinction between AAA and BBB began to get blurry. Investment banks obtained higher profits, and the investors got higher-yielding AAA securities. Everybody was happy before the meltdown, but now we ask: "Is an AAA really an AAA?"

Valuation of MBS with Credit Loss

Valuation is an important step within risk management. To value an MBS security with credit loss, we need: the underlying theory, prepayment and default models; deep liquid markets to observe the market prices of similar instruments; a method to extract the implied prepayment and default rates; a model of house price movements; and finally an interest rate

continued on page 20

5 International Monetary Fund, Global Financial Stability Report, April 2008.

From Subprime Crisis to ...

▶ continued from page 19

model that correlates with the house price movements. These are all very important topics that require a substantial amount of research and effort to bring to fruition. In fact, there is disagreement as to whether all these steps are necessary or even achievable at all.

Levin and Davidson pointed out the difficulties of MBS modeling in a recent issue of the *Journal of Portfolio Management*. They said, “Development of MBS modeling has traditionally been delegated, with few exceptions, to practitioners. Mortgage modeling generally involves both theoretical and empirical analysis because borrower behavior cannot be determined by theoretical considerations alone.”⁶ Historically, different shops would have put a different price on the same MBS based on their own models. This is due to the fact that most models are based on their own empirical analysis. So, at this time, there are no generally agreed methods to extract the implied prepayment and default rates.

When valuing a bond without default, a risk-neutral interest rate model is usually employed. For MBS, there are two main risk factors—interest rate and house price movements. We need a model for both risk factors. How should one go about modeling house price movements within a risk-neutral world?

Next there is the question of discounting. After an MBS security cash flow is projected with the proper prepayment rate and default rate, the same cash flow has to be discounted to obtain a price. Should the discounting be done at LIBOR flat or at a spread? At what spread if a spread is required?

Closing Thoughts

Well before the onset of the subprime crisis, I met a risk manager from a monoline insurer. Monoline insurers generally receive periodic

premiums and pay credit default losses after a deductible is subtracted. The manager was worried about the sources of the underlying risks along with their liquidity risk exposure. Their portfolio statistics indicated that default losses were negligible, and in the meantime premiums kept rolling in. Where was the risk? I was dumbfounded.

Historical statistics can be misleading. First of all, the stability of the ABS and CDO structure was not tested in any crisis before. Without getting into the product details and identifying the key drivers, it is easy to underestimate the risk. Credit insurance differs from pure life insurance in that there are systemic factors that drive the credit risk. The law of large numbers cannot be relied upon in this situation to accurately predict the possible impact of the claims.

House-price bubbles are not unique to the United States. According to the work published by the International Monetary Fund in its *World Economic Outlook of April 2008*,⁷ house price increases that were not explained by fundamentals were higher in Ireland, the Netherlands and the United Kingdom than in the United States. Also, the outstanding mortgage debts as a percentage of GDP in Australia, Denmark, the Netherlands and the United Kingdom were all higher than in the United States. Relative to the United States, there are countries where house prices have risen more and where households are even in greater debt. These countries will also be in trouble should their house prices start to fall. In fact, the house prices in the United Kingdom have started to fall recently. Shall we stay tuned? ♦

6 A. Levin and A. Davidson, “The Concept of Credit OAS in Valuation of MBS,” *The Journal of Portfolio Management*, Spring 2008.

7 International Monetary Fund, *World Economic Outlook—Housing and the Business Cycle*, April 2008.

ENTERPRISE RISK MANAGEMENT

ERM

Symposium

*Where Cutting Edge Theory Meets
State of the Art Practice*



2009 ERM Symposium
April 29-May 1, 2009

Sheraton Chicago Hotel & Towers
Chicago, IL

Visit

WWW.ERMSYMPOSIUM.ORG

to learn more about this global conference.



Capital to do what?

Craig Turnbull



The last five years have borne witness to a fundamental and global shift in approach to the assessment of capital requirements for insurance groups, both for regulatory and internal management purposes. Traditional, prescriptive, actuarial formula-based approaches have given way to principle-based approaches that empower firms to use internal risk management models to assess their own particular risks.

This trend has been seen in many of the world's largest insurance markets. In Europe, the United Kingdom's FSA was one of the first regulatory regimes to fully embrace principle-based reserving. The Solvency II process will roll out a similarly principle-based regime across the European Union over the next few years. In North America, the Academy of Actuaries' Principle-Based Approaches pursues a similar agenda for U.S. insurance regulation. And South Africa recently implemented a sophisticated principle-based regulatory capital regime for its insurance sector.

The shift from prescription to principle-based capital assessment can revolutionize the measurement of the often complex market risk exposures that sit on insurance group balance sheets. This richer risk measurement information can be used in a number of core areas of financial management for insurance groups: it can facilitate and incentivize more rigorous capital and risk management strategy; ensure a better alignment of risk and capital; and bring transparency and discipline to product pricing and design. Of course, these benefits do not come for free. The development of internal models often requires significant actuarial and IT resources. For the users of principle-based capital results (regulators, rating agencies, auditors, analysts, internal management), there is a requirement for sophisticated skills to be used in the appraisal of the firm's implementation of the capital assessment process (which in turn requires firms to make appropriate disclosures and communications to meet these demands).

One of the most striking requirements of a principle-based approach is the need it creates for an unambiguous definition of what capital adequacy means. In other words, what is the purpose of prudential capital? What definition is used to determine how much capital is enough?

Capital to Do What?

Broadly speaking, two distinct schools of thought have emerged on the definition of principle-based prudential capital.

The first defines capital as the amount required to fund all future liability cash flows from existing business as they fall due, at some specified level of confidence.¹ This is perhaps



Craig Turnbull, FIA is regional head, North America at Barrie & Hibbert Inc in New York, N.Y. He can be reached at craig.turnbull@barrhibb.com.

¹ This is typically defined as the 95th percentile, i.e., how much capital is required to ensure all liability cash flows can be funded in 95 percent of stochastic simulations. Some territories use a conditional tail expectation (CTE) as an alternative definition of the required confidence level. For example, a 90 percent CTE means capital is held to meet the average additional capital required in the worst 10 percent of simulated scenarios. This type of confidence definition is most commonly used in North American capital assessment.

the most natural probabilistic implementation of traditional actuarial thinking on the purpose of prudential capital. We refer to it as the run-off approach.

The second approach takes a different perspective: instead of asking how much capital is required to fund the run-off of all existing liabilities and their embedded risks, this approach looks at how much capital is required to fund the short-term transfer of liabilities and their risks to a willing third-party, again at some specified level of confidence.² This amount is assessed by calculating market-consistent values for liabilities and projecting the market value balance sheet (usually over a one-year horizon). Required capital is then defined as the amount needed to ensure sufficient assets are available to meet the year-end market-consistent liability value at the specified confidence level (this is usually referred to as the value-at-risk). We refer to this as the VaR approach.³

Which is the Right Approach?

These two capital definitions represent fundamentally different perspectives on what capital is there to do.

- Proponents of the VaR approach argue that the insurance firm's option to transfer its risk to a third party should be recognized by the capital assessment definition. They might also argue that, as the market-consistent liability value represents the current cost of hedging, it should be a floor for the required capital, and that any asset strategy that does not hedge should incur an explicit additional capital charge. The VaR approach has those properties.

- Proponents of the run-off approach argue that short-term market price volatility should not be the focus of long-term insurers' prudential capital assessment. They will point out that, in the short term, markets often get it wrong and overreact. And in any case, the size and illiquidity of insurance liabilities makes the "cost of transfer" a purely theoretical quantity, and prudential capital isn't theoretical.

Pragmatists might consider an alternative perspective on this question: of these two definitions, is one of them clearly easier to objectively calculate? We like this approach. However, even this question has no clear-cut answer.

Run-off assessments can suffer from significant sensitivity to a range of very difficult long-term modelling assumptions—from assumed management actions that would be taken decades from the assessment date, to very long-term assumptions regarding the size of the equity risk premium.

However, under the VaR approach, there are also challenges. In particular, the market-consistent valuation of long-term liabilities is difficult when so many of insurers' market risk exposures are not generally traded in an observable market (e.g., 30-year S&P 500 market-implied volatility, any real estate volatilities, long term equity / interest rate correlations, etc.).

Fundamentally, calibrating stochastic models to measure risks that are very long-term and illiquid must involve considerable subjectivity, and this is true irrespective of the prudential capital definition.

continued on page 24

“

The shift from prescription to principle-based capital assessment can revolutionize the measurement of market risk exposures on insurance group balance sheets.

”

² This is usually defined at a higher level than the run-off approach (because risk is being assessed over a shorter time horizon) and is typically around the 99.5 percent confidence level.

³ Other names such as the exit value approach are equally applicable and perhaps more appropriate given that capital could be defined using CTE rather than VaR under this approach. However, the VaR terminology is more globally recognized.

Capital to do What?

▶ continued from page 23

However, there is perhaps one additional advantage that the VaR approach has to offer: at its core is a market-consistent valuation of liabilities. This value, in our view, is a crucial element of economic management of an insurance business, irrespective of whether it plays a part in the prudential capital definition. It is a fundamental measure of economic profitability: financial theory and recent history tell us that offering investment guarantees at prices below their market-consistent cost is unsustainable and value-destroying. In recent years, the European insurance market has learned that the hard way. Market-consistent VaR implementation can help others avoid making the same mistakes.

Having market-consistent liability valuation at the core of prudential capital helps to align product development, pricing, investment strategy, risk management and capital assessment more clearly and consistently. Incentivizing and supporting economically rigorous financial management and decision-making is, in our view, the single greatest prize of a principle-based approach to capital adequacy. We believe it is not coincidental that many of the most rigorous and successful market risk management programs have occurred in territories where market-consistent valuation has been a core part of risk capital assessment. For this reason, we believe that the market-consistent VaR approach is the right choice for prudential capital assessment.

So What is the World Doing?

The last five years' developments in global principle-based approaches to prudential capital can be considered in two categories: the development of principle-based capital regimes that have been adopted by regulators; and the

development of firms' internal economic capital frameworks. The methods used in the latter are, of course, subject to less public disclosure than the regulatory requirements. Nonetheless, many global insurance groups have been publicly transparent about their approach to economic capital assessment. The table below summarizes the prudential capital definitions used in the various regulatory and publicly disclosed major internal principle-based capital implementations (note that while a number of North American insurance groups have EC implementations underway, they have to date tended to be less public in their disclosure of their methodologies).

	Market-Consistent VaR	Run-off Cash Flow
Regulatory Capital	Denmark (2002) Netherlands (2004) South Africa (2006) Switzerland (2004) United Kingdom (2004) EU Solvency II (scheduled for 2011)	United States (C3 Phase II; ongoing PBS process) Canada (Capital for segregated funds)
Internal Economic Capital	Allianz AIG Aegon Aviva ING Munich Re Zurich Financial Services Some North American Life Groups	Some North American Life Groups Global P&C groups

Exhibit 1: Some Principle-Based Capital Implementations in Global Insurance

Perhaps the most striking feature of the above Table is that the North American regulatory regimes are going down a different path to most of the major implementations of principle-based insurance capital publicly seen or planned in the life sector in recent years. This can be partly explained by the fact that real-world run-off projections have been successfully used for many years in the North American life sector in areas such as asset-liability management—much more so than was historically the case in Europe prior to 2003.

It is interesting to note, however, that significant use of market-consistent liability valuation occurs presently in North America in the area of variable annuity (VA) valuation and hedging. Indeed, this is arguably the most sophisticated implementation of a principle-based market-consistent valuation framework anywhere in the global insurance sector. And it has led to what are unarguably the most comprehensive market risk management programs in use in the global insurance sector.

The North American VA hedging experience is a powerful example of how principle-based market-consistent ALM frameworks can provide platforms for improved and sophisticated risk and capital management. We believe that this success, the success the above regulatory regimes and global insurance groups have had in using market-consistent valuation as a core part of principle-based capital and the positive impacts this has had on the development of rigorous risk management processes merit the attention of North American regulatory policymakers.

In Summary

The assessment of insurance group capital requirements is undergoing a fundamental and global shift from prescription to principle-based approaches. We believe this shift is a crucial catalyst that will drive improvements in the financial management and reporting of market risks on insurance group balance sheets.

A principle-based approach to capital adequacy requires a quantitative definition of the required level of capital. Two distinct approaches to this definition have emerged—the run-off approach and the VaR (or exit value) approach. Both of these approaches have their relative advantages and disadvantages regarding implementation and ease of understanding. We believe both are reasonable approaches, and the implementa-

tion of either approach will produce significant benefits for insurance groups.

We believe the VaR (or exit value) approach has at least one additional “spin-off” benefit. In particular, its foundation in the market-consistent valuation of liabilities means that capital assessment can be more easily aligned with the assessment of the economic profitability of the business. This can be important in developing a coherent and consistent overall approach to financial management that applies to risk and capital assessment, product design and pricing, investment strategy and capital management.

Across the globe, most of the publicly disclosed internal economic capital implementations of major insurance groups have adopted the VaR approach (though it should be noted that a number of U.S. insurance groups currently have EC implementations underway where the methodology has not yet been publicly disclosed). Similarly, most principle-based regulatory capital implementations across the globe have used a VaR approach. The main exception to this has been in the United States and Canada, where the emerging principle-based regulatory approaches have so far eschewed the use of market-consistent liability valuation and focused solely on a run-off basis for regulatory capital assessment. We would encourage North American regulatory policymakers to further explore whether the use of market-consistent valuation and the VaR approach can offer additional insights to insurance group regulatory capital assessment. ♦

“

Having market-consistent liability valuation at the core of prudential capital helps to align product development, pricing, investment strategy, risk management and capital assessment more clearly and consistently.

”



ReFocus2009

SEE THE FUTURE FIRST

...March 1-4, 2009, Four Seasons, Las Vegas, NV

A Global Gathering for Senior Life Insurance and Reinsurance Executives

You're invited ...
to attend the third annual
ReFocus conference,
a distinctive, one-of-a-kind
event. ReFocus 2009
features more top-notch
speakers, forward-looking
sessions and superior
networking opportunities.



What last year's attendees said:

"Wow, what a rewarding investment of time. The content touched on many current issues. I was very impressed by the presenters, and found the interaction very valuable as well. The real test of a meeting's value is do you plan to attend again. For me the answer is simple...yes."

"Lots of good information and a good place to mingle with industry players."

"This meeting includes great presentations, a well-designed program and high-level attendees. It's a gamble not to attend."

"If you haven't attended a ReFocus meeting, you need to do it. The topics and speakers are superb."

Sponsored by:

ACLI

Financial Security. For Life.



Learn more and register now at www.ReFocusConference.com.

Reducing Risk in Risk Assessment Models

Trevor Howes

Complex actuarial models are becoming increasingly important to the management and financial reporting of life insurance companies in North America, elevating the scrutiny placed on those models by regulators, ratings agencies, auditors and company stakeholders. While a key use of such models is risk assessment, the models themselves pose risks. A new report released by the Canadian Institute of Actuaries in August 2008 provides useful guidance to actuaries who are charged with designing, implementing and using advanced models as well as to those who oversee such work.

The report is titled *Risk Assessment Models* and was written by the Solvency Framework Sub-Committee Model Working Group of the Committee on Risk Management and Capital Requirements of the Canadian Institute of Actuaries, as part of the larger project of developing a new framework for capital assessment of insurance companies in Canada. This initiative is being led by the MCCSR Advisory Committee (MAC), which includes representation from the Canadian insurance industry, the actuarial profession in Canada and the supervisory authorities.

The regulators (OSFI and AMF in Quebec) accepted and posted the MAC vision paper on their Web sites in 2007 inviting comment. Both have subsequently communicated their intent to continue working in the direction described in the vision paper, while preparing for the pending adoption of IFRS in Canada for public reporting.

The framework proposed for Canada follows a principle-based approach to solvency regulation. Consistent with capital assessment trends around the world, this framework provides the opportunity to incorporate results of advanced internal models of an insurer's business, which may depend on stochastic analysis.

Internal models offer the opportunity to tailor capital assessment to the specific circumstances of each insurer, including the risk characteristics of their business in force and the risk mitigation strategies they adopt. Internal models can also be more adaptable to changes in the environment while providing useful information on the relative significance of different risks and the potential impact of management decisions and actions. The use of internal models could thereby lead to more appropriate levels of capital held by individual companies and support optimal risk-based business decisions.

However, internal models are challenging to develop and implement as the technology and modeling techniques involved are still relatively new. This approach poses risks to both the insurance companies and the regulatory bodies assessing capital needs based on their results. Accordingly, there is a generally acknowledged need for guidance on how such models should be designed and governed to help assure the accuracy of results, comparability between companies, consistency between valuation dates and between risks, transparency of models, reliability of results and practicality of the model's implementation and use.

This is a daunting set of objectives for any guidance paper. The report of the CIA Working Group has attempted to address them in a thorough document running 68 pages including appendixes. The report is a comprehensive summary of things to consider, rather than a prescriptive modeling guide. The body of the *Risk Assessment Models* report addresses the objectives noted above in five main sections. A few highlights from each section are provided below.

Model Design: It is of course critical to carefully design a model to ensure it is appropriate for its intended use, and a number of key considerations are discussed in the re-



Trevor Howes, FSA, FCIA, MAAA, is vice president and actuary at GGY AXIS in Toronto, Canada. He can be reached at Trevor.Howes@ggy.com.

continued on page 28

Reducing Risk in ...

▶ continued from page 27

port. Risk and capital assessment models have a number of unique calculation requirements, according to the framework being supported, and may differ from more familiar planning and reserve calculation models. They will be run under more extreme scenarios, may need more approximations to practically implement, and will tend to measure risks individually rather than in combination, thus requiring an aggregation process. Stochastic analysis, if required, will depend on risk element scenario generators as input. These generators will in turn entail their own selection and design considerations.

Model Implementation: Given a model design, the implementation of a working model involves its own set of considerations. Input processes for assumptions, parameters and business data must be planned and developed. Information technology decisions must be made and acted on which anticipate the operational demands of the model, the resources available and other constraints such as transparency, validation and control. These constraints are of course exacerbated by the likely need for stochastic processing components.

Validation and Calibration: Complex models are difficult to check and validate, but the validation process is that much more critical because of that complexity. The validation should address both the design and its implementation. A variety of general model validation processes are described, and the issue of calibration of model parameters to historic data or current conditions is also considered.

Governance: With the critical importance of these models within the risk management function and the regulators' potential reliance on the results of the models for capital assessment and supervision, model governance is a key issue. The responsibilities of senior management and the board of directors with respect to the development, use, review and validation, documentation and approval of the model need to be well understood and accepted. Key positions must be adequately staffed and supported.

Reporting: Reporting considerations include not only the reporting of results but also internal reporting on model development, implementation progress and all review and approvals. Risk analysis reports must be flexible yet robust and controlled, and must meet prescribed specifications. External disclosures of model design, methodology and key assumptions may also be necessary for transparency and to ensure comparability across the industry.

While the need for a new solvency framework in Canada has guided and inspired the creation of this report, many of the principles and considerations discussed are entirely applicable to complex actuarial models used for any purpose. In fact, a key requirement which regulators will look for is the pervasive use of the model within the insurance organization, which reinforces the commonsense notion to make the model flexible and adaptable to multiple purposes.

The *Risk Assessment Models* report is comprehensive and informative. The Working Group benefited from the variety of perspectives and experience of its members, bringing together actuaries representing regulators, consulting firms, insurance companies and software providers. They also exchanged opinions and shared draft copies of the report with several workgroups preparing similar documents on behalf of the International Actuarial Association (IAA) and the International Association of Insurance Supervisors (IAIS).

And, finally, this report is just a start. The future solvency framework is still evolving; the skills, practices and technologies required are being developed; and the appropriate guidance must grow and change over time. Hopefully this report will stimulate discussion and be considered a worthwhile addition to the list of resources available to actuaries planning and developing risk assessment models. ♦

Pandemic Planning and Recovery

Jim Toole

Editor's Note: This article has been reprinted with permission from On The Risk Magazine.

Pandemic preparedness, a subset of the “all hazard” planning process, is becoming more ingrained in American business culture. Every moment spent planning for a pandemic prepares a firm to better weather catastrophes large and small, from the loss of a hard drive to the loss of a key employee, to a large-scale natural disaster. Disaster planning is becoming a competitiveness issue, as vendors are being evaluated on their ability to continue providing services, not just price alone. This is, of course, consistent with enterprise risk management and the efficient frontier model, where investment decisions integrate risk and return into price.

Current research typically focuses on quantifying the effects of a pandemic. More emphasis needs to be placed on practical steps that should be taken to prepare for a pandemic, and, more importantly, how the insurance industry can position itself for recovery if a pandemic strikes.

1.1 Pandemic Planning

A full discussion of disaster recovery and business continuity planning is beyond the scope of this article. This piece addresses some of the aspects specific to the insurance industry. The broader discipline of enterprise risk management is active in this space, encompassing assets, liabilities and operations; obviously a pandemic affects all of these areas.

1.1.1 Protecting Brand Equity

Next to solvency, the greatest risk posed by a pandemic to the industry is the deterioration of the industry’s brand—the breaking of the brand promise. This might take place at the industry level (for example, if the industry as a whole

fails, even a strong performer will be lumped in with the rest of the industry) or at the level of a particular enterprise whereby the company fails to keep its promises and lags behind its peers. Some insurers have 100-year-old brands; companies should be making plans to survive not just financially but with their brand promise intact so that rather than having to spend time rebuilding their brand, customers would turn directly to them post-pandemic.

1.1.2 Communication

Companies need a communication strategy for before, during and after a pandemic, to both internal customers (employees) and external customers (policyholders, shareholders, rating agencies and regulators). Companies need to decide how to position themselves to respond to the event—or the media will decide for them. Given the speed and force with which events will unfold, prudent companies will not want to be responsible for developing strategies on the fly during an event or relying on the availability of their public relations firm.

To the extent they are available, solvency communications should be distributed to stakeholders long in advance. During the pandemic period, a company will want to communicate with its employees and customers regularly. The company will want to keep the channels of communication open and let interested parties know that it is staying abreast of the situation. Sample press releases should be prepared in advance for strategic points pre-, during, and post-pandemic.

From a broader perspective, society places a significant reliance on the accuracy and timeliness of the news. This is a reasonable assumption in normal conditions, but during times of upheaval, reporting in traditional news media



Jim Toole, FSA, MAAA, is a managing director, life & health, for MBA Actuaries in Winston-Salem, N.C. He can be reached at jim.toole@mbaactuaries.com.

continued on page 30

Pandemic Planning ...

▶ continued from page 29

will often lag behind actual events, at times significantly. It is clear that, in an event as broad and fast-moving as a pandemic, incidents will get ahead of reporters whose institutions will themselves be subject to the events at hand. In these conditions, there will be important aspects of the pandemic and its progression that they are not aware of; individuals on the ground communicating through blogs and Wikis may provide a better sense of the true situation than the traditional media.

It is important to be aware that early in the progression of the pandemic, official confirmation of incidences will be delayed, at times significantly. The delay and resulting undercount may make the progress of the disease appear to be less virulent than it actually is; at times there will be a wide disparity between probable, reported and confirmed cases. It is important to realize that during a situation like this, one must be skeptical about information while realizing important decisions will have to be made without access to perfect data.

1.1.3 Accounting and Solvency

Year-end reporting for companies might well occur in the middle of a pandemic. Valuation actuaries are well aware of the challenges they face under the best of times; it may not be possible to meet the requirements of an unqualified actuarial opinion during these conditions. Would reporting deadlines be extended? Would actuaries sign qualified opinions, and what would the response of rating agencies be? What might the regulatory response be to incomplete cash flow testing? How will life actuaries, lacking historical data on incurred but unreported (IBNR) claims, come to a conclusion as to setting their IBNR reserve? Will potentially insolvent companies be allowed to delay filing annual statements? What purpose would it serve to force premature judgment given the volatility in reserve estimates, asset values and statutory surplus? These and many other difficult issues

would arise if a pandemic were to occur before or during year end.

1.1.4 Reinsurer Solvency

Reinsurers are not party to guarantee associations. If a reinsurer were to go bankrupt, direct writers would not be able to rely on other reinsurers to make up the difference. The burden is on the direct writer to fulfill its obligations; direct writers are ultimately responsible for their obligations.

What would it mean to direct writers if a reinsurer were to enter bankruptcy? If it were a smaller reinsurer, it probably would not have much impact in the overall scheme of things. Once the company were declared insolvent, reserves and surplus would be allocated between all claims equally—be they pandemic-related or claims that would have been expected during the normal course of events. Because statutory reserves have some redundancy, reserves would likely extend further than anticipated.

A failure in one of the top reinsurers, however, would be a very different thing, with ripple effects throughout both the industry and global capital markets. Cash flow would be a problem: while a failed reinsurer might ultimately be able to honor a high percentage of its liabilities, it would likely take many courts in many jurisdictions many years to ultimately decide on its disposition. This could lead to a liquidity crisis for some. Reinsurers and direct writers alike might find it in their best interests to invoke the “too big to fail” rule and find a mechanism to stabilize the company and calm markets.

1.1.5 Other Issues

There are specific business practices that put the industry at risk. One of the biggest ones is fraud. If a severe pandemic were to occur, all aspects of our public recordkeeping systems would be overwhelmed. It is not unreasonable to suspect that, in some areas, this might provide a window of opportunity for fraud on an organized scale.

Public officials in 1918 were overwhelmed with paperwork. Society is far less prepared today to deal with the specter of unrelenting sickness and death than it was in 1918.

Another feature that may put the direct life insurance industry more at risk is the fact that there are many small, regional companies. Insurance is regulated at the state level, which is one of the drivers of the fragmentation. Public health records from 1918 show the impact of the flu varied greatly by city and region. Thus, for companies whose exposures are relatively localized, some may escape relatively unscathed, while others may be more seriously impacted. Results for national companies whose books of business are more geographically diversified would be less volatile. Note also that, barring action within the NAIC, the regulatory response to the event would certainly be uneven, impacting companies from different domiciles differently.

1.2 Recovery

What might recovery look like for the insurance industry? A moderate scenario produces little more than a bump in a road to be driven around or bounced over by the vast majority of the insurance companies. However, a severe scenario would pose great challenges for the industry on top of the difficulties faced by society at large. But even under a severe scenario, it can be assumed that more than 99 percent of the U.S. population will survive, so not having a strong recovery plan in place will put firms at a disadvantage vs. competitors. And although this article has not addressed implications for society at large and for the global supply chain, recovery will be taking place in an extraordinarily challenging environment.

1.2.1 Globalization

Over the last 15 years there has been a marked increase in foreign insurers purchasing compa-

nies in the United States to gain entry into this important market. Likewise, U.S. companies have invested capital in all the major markets in the world. It is difficult to say what will happen to capital flows post-pandemic. Certainly, capital searches for the best return. However, human capital, which is critical to making financial capital yield an ROI, may not be as mobile post-pandemic as pre-pandemic.

Despite the industry's best efforts and those of global emergency health providers, many expatriates will undoubtedly find themselves stranded in foreign countries for weeks or months without access to the kind of support and medical care they are accustomed to. To the extent that this core group of expatriates is burnt out and chooses not to renew their assignments, it may be some time before a new generation steps up to take their place.

Cultural memory is short, but it might well take half a decade or more to rebuild this team of foot soldiers, yielding a competitive advantage to companies that are able to respond more nimbly deploying human and financial capital. Companies that rely on flexibility and a decentralized command structure will likely fare better during and following a pandemic than companies who rely on a more hierarchical command and control structure.

1.2.2 Consolidation and Convergence

In comparison with other major markets in the world, the U.S. market is very diffuse, both in terms of consolidation and in terms of the sheer number of insurance companies. Just as companies that were already under regulatory scrutiny might be pushed towards insolvency by the stress of a severe pandemic,¹ companies that were not under observation but had an

continued on page 32

“

Next to solvency, the greatest risk posed by a pandemic to the industry is the deterioration of the industry's brand—the breaking of the brand promise.

”

¹ Toole, Jim, “Potential Impact of Pandemic Influenza on the US Life Insurance Industry,” Society of Actuaries, May, 2007, p. 10.

Pandemic Planning ...

▶ continued from page 31

RBC ratio of less than 300 percent might find themselves under regulatory scrutiny. These weakened companies would be looking for capital, and companies with capital would be looking for investment opportunities to round out their portfolio. Guarantee associations and regulators may well be eager to push weakened companies into the arms of willing suitors to get potential liabilities off their balance sheets.



Much has been made of financial services convergence over the past decade.² The difficulties that the insurance sector faces during a pandemic might well convince fence-straddling banking executives that insurance risks are best left alone. Banking portfolios will certainly face their own challenges in weathering the financial impact of a pandemic.

1.2.3 Bankruptcy Surge Capacity

Insurance bankruptcies are particularly complicated due to the long-term nature of the liabilities and regulation at the state rather than the federal level. In a normal year, the National Organization of Life and Health Insurance Guaranty Associations deals with no more than a couple of insolvencies. Under a period of economic stress, there may be as many as a half dozen. However, under a severe pandemic scenario, it may be anticipated that a substan-

tially greater cohort of companies would find themselves in a position where their statutory liabilities exceed their assets. Some companies might be required to shutter their doors after the first wave of a pandemic, while others might hang on but be put under by a second wave. A drop in asset values would only exacerbate the situation.

Given the administrative burden and length of time that it takes to work out an insurance bankruptcy in normal situations, consumers could lose value or suffer unnecessary delay in benefits payments during a period of significant financial and emotional stress. It is in the interests of both regulators and the industry alike to ensure measures are put into place both to provide flexibility and to streamline the process.

1.2.4 Regulation

The regulators' response to an ongoing pandemic emergency will play a significant role in how the event ultimately impacts the industry. The industry is highly regulated, but statutory guidelines are inflexible and assume incremental changes over time; they are not constructed to respond effectively to the impact of a severe pandemic.

The accounting and solvency issues previously discussed are better considered in advance than in the heat of the moment. There is no "emergency powers" act enabling insurance commissioners to waive certain statutory requirements at their discretion or based on discrete triggers. If model legislation were introduced that at least considered and covered some of these situations, it would give guidance to states as to how to respond. Individual state legislatures could then decide if, when and how to implement the model. Without a model response already considered, insurers will face a hodgepodge of uncoordinated and potentially conflicting regulatory responses. This will no

² Toole, Jim, "Financial Services Convergence: Big Bang or a Whimper?" *The Actuary (U.S.)*, Vol. 2 Issue 6, January, 2006.

doubt open the door for expensive litigation, taking away resources from claims and ultimately policyholders.

1.2.5 *Non-guaranteed Elements*

Much of the life insurance in force in 1918 was participating. Nearly all companies cut or stopped their dividend payments in 1918. Although many of the products in force today have non-guaranteed elements, it remains to be seen whether they would provide enough flexibility to address the needs of a pandemic.

First, changes would need to occur in a timely fashion. Changes in non-guaranteed elements would need to be created and implemented, and in some jurisdictions filed and approved in a regulatory environment severely stressed by the impact of the pandemic. Weaker companies may already find themselves in a difficult position as policyholders surrender products for policies with stronger companies; changes in non-guaranteed elements might exacerbate the trend.

It is important to note that, in calculating new non-guaranteed elements, the assumption is that it reflects expectations of future conditions (e.g., mortality); changes are not intended to recover past losses. Companies that need cash in the short term to stay afloat will not find changing non-guaranteed elements an attractive option, although it certainly will be one of the tools to rebuild capital over the long term.

1.2.6 *New Business*

New business production will be impacted during and after the pandemic. Interest in life insurance products will surely rise even as the industry will be taking steps to mitigate the risks assumed. Distribution, products and capacity will all be at issue, and companies will need to take steps to plan new business strategies in advance.

Different distribution channels will no doubt be treated differently, depending on the degree of control that the companies have over the channel and the extent to which their respective financial interests are aligned. Brokers will likely find themselves at a disadvantage to agency forces during a pandemic. Although the expense of agency distribution is a perennial thorn in the side of the industry, the agency force is typically more effective in serving as a first line of defense against fraud. Companies may reduce up-front commissions to both reduce strain and encourage selection. Direct marketing may well receive a boost with little increased risk to the company, as benefits are usually limited to the return of premiums in the first two years.

It is apparent that certain product types will be hit more heavily than others due to a combination of factors including face amount, reserve, reliance on reinsurance and overall economic status of the individuals buying the insurance. Joint and last survivor products may well be hit particularly hard, as a 1931 study indicated higher co-morbidity once the disease was introduced into a household. Writers of term insurance will likely be more at risk than writers of universal or whole life.

Finally, production capacity will also be an issue. Underwriting resources may be unavailable during a pandemic and in short supply for some time afterwards. Some direct writers may be short on capital, and reinsurers may also lack capacity, a critical one-two punch for capital intensive products. Thus, products with lower up-front commissions, statutory reserves and RBC requirements will likely be favored. ♦

“

... not having a strong recovery plan in place will put firms at a disadvantage vs. competitors.

”

Can Bad Culture Kill a Firm?

Stephen W. Hiemstra¹

The buzz this past April at the Enterprise Risk Management (ERM) Symposium in Chicago revolved around several incidents over the past year, including: the Bear Stearns failure; the \$7 billion rogue trader event at Société Générale; and the sub prime crisis. Chief risk officers' (CROs') comments included: Problems do not exist in a vacuum; Controls should assure that rogue traders cannot exist; models were adequate, but incorrectly used. If risk measurement in 2007 was adequate, why are so many CROs looking for work in 2008? One hypothesis is that weak corporate cultures left firms exposed to risks which managers thought had been assessed and mitigated.

Several attributes of the current environment exacerbate the influence of weak corporate culture in ways that threaten losses and insolvency:

- Monetary bubbles running through markets weaken traditional analysis and controls;
- Technological innovations concentrate information and decisions in the hands of new experts and senior managers.
- The postmodern environment undermines the preconditions for modern corporations.
- Predatory elites increasingly threaten firms because the current environment favors peers over traditional managers.

The good news is that the firms serious about implementing ERM are better positioned to cope with the challenges of a changing corporate environment.

Little Bubbles Make for Big Risk Management Challenges

The U.S. economy has been rocked by monetary bubbles since the late 1990s. *Monetary bubbles*

consist of price inflation that concentrates in particular sectors or markets. Bubbles have characterized stock markets, housing markets and, most recently, commodity markets, including energy, metals and foodstuffs.

Why has a bubble economy undermined corporate cultures? Monetary bubbles reward firms that adopt a timing strategy in managing their trading positions. Bubble persistence and the high rates of return of innovative firms eventually generate a me-too response from traditional firms. This new line of business (or expanded line of business) alters the distribution of winners and losers within the firm to favor traders and derivative experts which traditional managers find especially hard to understand and manage.²

Technology Allocates Information to Favor Experts

Many observers have lauded the new democracy of information created by the Internet boom. While access to information has improved for everyone, not everyone can make sense of it. The principle at stake is that access to technology and information is a necessary but insufficient condition for making informed decisions.

For example, consider the effect of installing a new statistical package. The software automates techniques which require serious expertise and experience to understand and use. Everyone on the staff may be given a copy, but few are likely to use it correctly. Access to the software accordingly provides a necessary but insufficient condition for effective use.

Ease of information access can automate errors. Consider day trading. Day traders presumably benefit from more timely information than other traders. Because of the steep learning curve, however, most new entrants suffer large losses.



Dr. Stephen W. Hiemstra is a financial engineer in Centreville, Va. He can be reached at Hiemstra@yahoo.com.

1 Dr. Hiemstra is an economist and financial engineer living in Centreville, Virginia. In 2007 and 2008, he served on the program committee for the Enterprise Risk Management Symposium. For more details about the ERM Symposium, see: www.ERMSymposium.org. Dr. Hiemstra has also been a contributor to research of the Enterprise Risk Management Institute International (www.ermii.org).

2 It is unclear in 2007 that any of the market players in subprime markets correctly called the changes that took place. The only contender for this honor was Goldman Sachs (Anderson and Thomas). Questions have circulated, however, ever since on the prudence of their actions (Clark).

Survival depends on capital management, carefully study, focus on particular markets, and disciplined execution. Success yields extremely high rates of return, but few amateurs succeed.

The moral to the story here is that in current market environment efficiency in learning potentially carries a high rate of return. At the same time, ineffective learning carries enormous risk.

Postmodern Firms May Fail under Modern Management

We live in a peer culture. Changes in the legal environment to level the playing field among ethnic groups, age groups and genders reinforce this peer culture. Managers and directors still have formal authority to make decisions, but peers rule the postmodern firm. This is, in part, true because of the concentration of information and decisions in new key individuals and, in part, because of the extension of the democratic ethos of society into the firm.

In the early 1990s, an information technology manager told the story of a surprise visit to the local office of a software company by a senior management team. Appalled by the personal hygiene of one of the local programmers, the senior-most manager wanted to fire him on the spot. The office manager pulled him aside and told him, "You cannot fire this man. He is the only one on the staff that knows how our software products work."

Uneven dispersal of technical information has also seriously affected the performance of government agencies. For example, a recent post-mortem on the Challenger disaster associated the disaster to a rigid management structure at NASA that ignored warnings from its engineering staff (Campbell). The need to respond promptly to decentralize terrorist threats has motivated the U.S. military to adopt a more open information-sharing architecture (Cartwright). These adaptations would be unnecessary if

modern bureaucracies were still competitive in the emerging postmodern world.

The rise of a peer cultural ethic legitimizes democratic principles in the context of the firm, not unlike the legitimization of democratic principles among nations (Fukuyama, p. 21). While this is an appealing idea, the ethos of the firm is likely also influenced by relative costs of transacting business under alternative corporate cultures. The peer culture likely evolves more rapidly and more often in organizations and firms that can afford the relatively high transaction costs involved in consensus-style decision processes. Where resource constraints are tighter, other cultures likely dominate. It also seems likely that resource constraint changes would favor the development of more efficient corporate cultures.

Predatory Elites Pose Special Threat

The rise of a peer culture carries the special risk of predatory elites. *Predatory elites are key individuals who use expertise, position or authority to blackmail the firm to enhance personal prestige, authority or compensation at the expense of the firm.* In effect, predatory elites are the principal-agent problem on steroids.³

The principal-agent problem is more pervasive in the current postmodern firm because the concentration of information and decisions in new key individuals expands the scope and volatility of their activities. Performance measurement and monitoring is easier for specialists than for generalists and easier for stable job functions than for volatile job functions. Predatory elites are more likely to evolve in the evolving, high tech environment. Changes in the legal, social, and philosophical environment can likewise provide fertile ground for predatory elites. These are circumstances that lead to an adult supervision problem (Iacocca).

continued on page 36

“

If risk measurement in 2007 was adequate, why are so many CROs looking for work in 2008?

”

³ Principal-agent conflicts occur when one party, the principal, contracts with a second party, the agent, to perform a task for the principal. The agent chooses to maximize the agent's benefit from the contract at the expense of the principal's benefit. The conflict happens because it is difficult to enforce a duty of loyalty to the principal, since the principal cannot monitor the agent perfectly (Kane).

Can Bad Culture Kill ...

▶ continued from page 35

Examples of predatory elites abound throughout organizations worldwide, including:

- Executives who earn extra-ordinary bonuses while their firms lay off workers and/or miss earnings targets.
- Corporations fail due to *rogue trader* events or destroyed reputations.
- Government agencies unable or unwilling to focus on legislated missions.
- Nation states exploited by narcotic traffickers, warlords and unscrupulous multinational corporations.
- Church leaders that engage in criminal acts.

In each of these cases, the problems posed by predatory elites are out in the open for everyone to see and are as shocking, in some cases, as the assault and murder of Kitty Genovese in 1964 in New York City where 38 people witnessed the event and did nothing (White). This openness of this predatory behavior makes the predatory elite a key symptom of a bad culture.

ERM Provides an Antidote to Bad Culture

Several characteristics of Enterprise Risk Management mitigate the effects of bad corporate culture, including:

- The whole firm is considered the system in view (holistic characteristic).
- Peers are empowered to lead in positive ways (intensive management characteristic).
- Risk taking should be separated from risk management (objective assessment characteristic).
- Risk management is a key corporate value, second only to profit maximization (post-modern characteristic).

The elevation of risk management to be a key corporate value makes ERM a postmodern

management philosophy because senior management profit-maximization objectives are no longer the only objectives that count. Key staff across the firm must buy into ERM, or losses will rise in ways that senior managers cannot control. ERM firms necessarily need to worry about attitudes and incentives throughout the firm that affect risk. In the words of one director, “risk management is all about corporate culture.” Implementing ERM assures that your corporate culture is moving in the right direction. ♦

Bibliography

Anderson, Jenny and Landon Thomas, Jr. 2007. “Goldman Sachs Rakes in Profit in Credit Crisis.” *The New York Times*, Nov. 19.

Campbell, Alexander. 2006. “*The Real Rocket Scientists*.” *Risk*, June, pp. 50–51.

Cartwright, James E. 2006. “Information Sharing is a Strategic Imperative.” *CrossTalk: The Journal of Defense Software Engineering*. www.stsc.hill.af.mil/CrossTalk/2006/07/0607Cartwright.html. 4 pp..

Clark, Andrew. 2007. “Success Shines Unwelcome Spotlight on to Goldman Sachs.” *The Guardian*. Dec. 21.

Fukuyama, Francis. 2006. *The End of History and the Last Man*. Free Press. New York. 432 pp.

Iacocca, Lee. 2008. *Where Have All the Leaders Gone?* Scribner. 288 pp.

Kane, Stephen. 1999. *Teaching Principal-Agent Problems using Examples from Popular Music, Financial Practice and Education*, pp. 116–120.

White, James Emery. 2004. *Serious Times: Making Your Life Matter in an Urgent Day*. InterVarsity Press. Downers Grove, Ill., pp. 154–157.

Financial Regulation and the Maginot Line Defense Strategy

Dave Sandberg

After World War I, the French were determined to never again be at risk of a German invasion, so they built an impressive defense system out of concrete on their border with Germany. Yet this impressive risk mitigation technique became useless when the Germans just went around it by invading Belgium and the Netherlands first. As we look at the history of the financial regulatory system through the savings and loan crisis, the failures of Executive Life, LTCM, First Executive and now the credit crises, there is heard the familiar resigned refrain that we can never know ahead of time where the next new financial invasion may be coming from. While individual failures can occur, can we only passively wait for the next systemic crisis to occur? I think not. I think there are sets of principles and a methodology in the emerging Enterprise Risk Management (ERM) framework that will allow regulators and companies to more proactively respond to emerging new risks without finding all of the guns embedded in concrete facing the wrong direction.

Below, I make three observations and raise two questions exploring how ERM has and could be leading to important improvements in regulatory oversight.

Observation #1: The Rise in Enterprise Risk Management

The last decade has seen substantial progress in the use of ERM as a formal company discipline and initiative. Ten years ago, ERM was first being elevated as a generalized approach beyond the traditional linkage to just asset/liability management of interest rate risk. The use of ALM for life insurance had become well institutionalized in the 1990s, but unlike ALM, which had also been mandated by regulatory requirements for cash flow testing, the institutionalization of ERM in this decade has occurred

without any regulatory mandate.¹ It seems almost too obvious to state that the value added by the proposition of insurance to the larger economy is the value of managing pooled risk. But it seems only recently that we have begun to recognize this formally through the designation of a chief risk officer, who is accountable for that function within the organization. Since there have been no legal requirements, this widespread development of the ERM function must reflect the view of the board of directors that ERM is a skill set and process that adds to shareholder value.

Question #1: So What is the Source of That Shareholder Value?

A popular simplification is that since pooling of risk brings diversification, then it is size that brings value. This would imply that ERM is nothing more than a measuring tool to demonstrate the amount of value that has been added through aggregation. Rather, I think that more substantive sources are:

1. Creating accountability. This occurs through the institution of a common language or framework within the company to measure risk and with which to make decisions that can be transparent to shareholders and management.
2. Methodology and process. This allows one to create testable hypotheses about the current and future corporate risk exposures.
3. Change in corporate culture. ERM should strengthen the intellectual capital and learning speed of the firm about the risks it is managing.
4. Capacity to analyze the future. This goes beyond just assessing current risk expo-

continued on page 38



Dave Sandberg, FSA, CERA, MAAA, is a vice-president and corporate actuary at Allianz Life in Minneapolis, Minn. and also chairs the American Academy of Actuaries Risk Management and Solvency Committee. He can be reached at dave.sandberg@allianzlife.com.

¹ While both regulators and ratings agencies have encouraged its introduction, they have not required it. In fact, the formal review of ERM practice by ratings agencies represents its reality as a part of company practice that needs to be evaluated by the rating agency.

Financial Regulation ...

▶ continued from page 37

asures. Thus, the interaction of future risk changes and possible management responses can be contemplated and prepared for today.

5. An aggregate view. This allows one to see the overall impact of individual risk deci-



sions. This reveals both opportunities and dangers that cannot be seen in isolation.

**Observation #2: Core
Organizational Principles of ERM**

I have come to the conclusion that there are three key elements that form an effective ERM discipline/methodology.

1. A Risk Control Process

This is similar to a systems control process for computer programs or Sarbanes-Oxley procedures in that it focuses on processes, but it is constructed on the following principles:

- a. Identify all the risks that are being accepted. Do not accept (or write) risk that you do not understand or cannot manage, hedge or reinsure. You must also include an examination of the tail events and options (not just the median or “likely” events). Also, the determi-

nation of various management options for these situations is critical.

- b. While there is a myriad of events that may create risks, risk can only “manifest itself” or impact the company in the following categories:

- i. Financial risk via equity, interest or credit
- ii. Insurance risk
- iii. Policyholder behavior
- iv. Future management decision risk
- v. Operational risk.

The risk control process does not need to “predict” why financial risk changes, but it needs to understand that, given a change in the risk, what is the exposure to the company of the change in say, interest rates or policyholder behavior? This strengthens the review and reporting process from being just a focus on the specific number to report today. It expands the review process to include the ability to understand the sensitivity of one’s risks to a discrete grouping of exposures and thus plan how to manage them in the future.

- c. For any product offered by the company, identify which of these listed risks are then being taken on by the company.
- d. A first necessary step for a risk to be managed is that it must be measured and reported on. To not measure is to gamble instead of offering insurance.²
- e. Establish independent verification or validation processes for the defined measurement process.
- f. Examine the timing and impact of options in the future, to determine when

2 One exception to this might be operational risk. While there are certainly quantitative approaches used by banks, a scenario analysis of management responses and financial impact may be more relevant than frequency and severity measurements for some OR risks.

and if the management of that risk becomes unprofitable.

- g. Once measured, set appropriate reserves, capital, company action levels and risk limits.

Establishing a risk control process will assure that risk cannot disappear from the system and—as the process is followed—major breakdowns or surprises from chasing higher yield will not occur. Now let's look at the Actuarial Control Cycle.

2. Actuarial Control Cycle

I believe that the actuarial control cycle requires one to:

- Specify the problem
- Develop a solution
- Review and monitor.

The control cycle assures that a solution is proposed as well as a process to allow refinements to emerge over time. This is sometimes more simply called a feedback loop. This process, when correctly implemented, can have a powerful effect on sustaining a learning focused corporate culture that can also be used as a basis for internal incentives and penalties to align diverse corporate interests. It also implements a healthy check-and-balance process to identify, address and resolve divergent views. For example, the control cycle can change the focus and impact of internal models previously based on tracking relationships and using somewhat arbitrary estimates (as often portrayed in the popular press) to become a focused scientific-based baseline that documents and verifies actual to expected results. Also, by following the control cycle, corporate risk competence increases via the organized learning process since it is based on clear accountability.

In conclusion, following this process ensures that the corporation will be at the cutting edge,

aware of market transformations and positioned to evaluate them as they emerge (instead of afterward, when it is too late to act).

3. Consistent Set of Risk Metrics

Depending on the regulatory jurisdiction, the company may have both economic and regulatory metrics that vary from CTE to VAR to MCEV. While it is essential to have a consistent set of metrics, in my experience they do not produce a magical answer for rule-based decision making, but the metrics become the basis for making informed risk decisions about the business. More importantly, metrics allow the implementation of measurable risk limits to be considered and included in growth plans and product designs. Through this, there is now a mechanism for the company to safeguard its rating through estimating and setting limits on profit volatility that could impair its rating.

Question #2: Could the Use of the Corporate ERM Process by a Regulator Improve its Corporate and Risk Culture in a Way that the Regulator's Measurement and Subsequent Decision Making Builds "Public Value" by Building off of the Shareholder Value Being Created by the Company's ERM Process?

First of all, what would an ERM-based process look like for a regulator?

It could start, where applicable, by building off of the company's efforts to manage its earnings volatility and shareholder return targets. While the regulator's emphasis is with solvency, not with diminished corporate profits and returns, a regulator could still build an oversight process off of the corporate ERM process already in place. For example, it could start with a "Principle-Based Product Approval Process" where it is not the product that is approved, but the risk management strategy of the product. It

“

... the control cycle can change the focus and impact to internal models to become a baseline that documents and verifies actual to expected results.

”

continued on page 40

Financial Regulation ...

▶ continued from page 37

could entail, for example, requirements for the company to:

- 1) Provide a comprehensive, conceptual documentation of risks created by the contract as defined in Observation 2, 1c above
- 2) Identify risk mitigation strategies
- 3) Identify new risk exposures of used mitigation options and retained risks
- 4) Identify how each risk will be measured³ (and the impact if any are not measured), explain the intended usage and expected impact of management options (levers) and document the intended corporate risk limits that will be placed on the product
- 5) Identify frequency and format of needed reporting so that management and regulatory actions can prevent failure. Here profits and solvency limits will have different trigger or action control levels⁴
- 6) Identify the actual to expected validation and reporting process (including model tracking error and source of objective benchmarks) for all modeled risks, including management actions⁵ and
- 7) Items 5 and 6 would then be agreed to by both regulator and company prior to product approval.

What Would Be the Likely Outcomes of this Process?⁶

- 1) A much more efficient way for regulators to understand the risk exposures of the companies under their review and under review by other regulators. They would:

- a) Know when a company is “gambling” within specified risk tolerances (previously shared with the regulator) that only affect the level of profits.
 - b) Be “put on notice” by a requirement to notify the regulator when and why those internal risk limits have changed.
 - c) Have previously reviewed various sensitivity testing results and the regulator would know how they impact various reserve and capital needs and their potential impact on solvency.
 - d) Obtain a series of interim reports regarding the leading risk indicators of the company at a mutually agreed to frequency. This would save time for both company and regulator where, for example, the quarterly statement for life companies is of little interim value to the regulatory risk review process
- 2) A defined accountability for the company to identify, measure and manage their risk in a more transparent fashion to the regulator since the regulator can use the transparency that has been built to manage the company.
 - 3) A regulator could now review and assess the “competence” of the company’s risk management via the company’s own self-monitoring processes for its internal models and risk exposures.

- 4) A regulator can now obtain an ongoing view of the “integrity” of company management in either adhering to its planned management actions and acceptable risk limits or in its ability to take action and responsibly manage based on revised management

3 Measurement includes risks at all significant moments of risk distribution.

4 Defining the several moments of the risk distribution helps resolve how frequent the reporting needs to be to manage the “deltas.” This could include the “delta” of filing and obtaining a rate increase, for example.

5 This is the issue of regulatory approval of internal models used to measure the risk. Can these measures be independently verified, calculated in alternative ways as a reality check or build in their own “self-validation” procedures?

6 I recognize that in the United States., there are confidentiality issues to be resolved for various elements of this process.

levers and/or limits. While this does not limit in any way management's discretion to "gamble" on profits, it also introduces awareness that its actions and "integrity" are being observed.

- 5) Implementing this type of an organized ERM process would mean that each state in the United States, for example, would not need their own "rocket scientist" trying to "catch" the mistakes of the industry's "rocket scientists." Instead this methodology requires that the basic skill set required for the regulator is to have good analytic and coordination abilities, as well as, have adequate communication skills with occasional access to various levels of expertise. But more importantly, the regulator is allowed to learn, in an organized way from the leading practitioners, and to be able to quickly identify and highlight companies in need of regulatory attention.
- 6) A double entry "accounting" for risk. Identifying the risks taken on and how they are either managed or passed on to someone else is the base for risk not "disappearing" from the system. This creates an "audit trail" or genealogy record of the risks. This is not meant as an accounting ledger but a risk ledger.

Observation #3: Progress Already Made and Missed Opportunities

Canada (OSFI) took a major step forward in this arena in the mid 1980s when its public and regulatory reporting became based on a company's own assumptions. This allowed for the modernization of the regulatory process through the use of several tools (carrots and sticks) to balance company and regulatory discretion when assessing the uncertainty of the future. The regulator's application of the actuarial control cycle principles has driven continued enhancement of company reporting and regulatory oversight. These tools have included:

- 1) Actual to expected reporting

- 2) Independent peer review
- 3) "Jawboning"—i.e., the possibility of a public disclosure that there is a company and regulatory disagreement on appropriate assumptions or risk exposures has meant that OSFI has not had to actually ever make this disclosure public.
- 4) Grading of the quality of actuarial reports
- 5) Annual meetings with an industry executive group, which reviews past issues and future concerns of both parties
- 6) The ability to compare a company's specific assumptions to that of the broader industry.

In the United States, a recent major accomplishment is to require that all state supervisors conduct a risk-focused examination beginning in 2010. This has already been required for some time for several states. The review process means that a company must:

- 1) Identify all risks taken on
- 2) Identify how the risk is hedged, reinsured or managed
- 3) Identify the net retained risks.

Both regulators and companies have typically found that this exam is quicker, less expensive and more effective by reviewing only the significant items. The structure for this type of review resulted from various NAIC and FSA dialogues in the early 2000s.

Some history from the Australian Prudential Regulatory Authority (APRA) is one of the more powerful examples of how modernizing financial regulation can work to prevent future problems. In 2003 they realized:

“

Models and scenarios like those of Australia demonstrate the important distinction between a regulatory system that is stuck in a Maginot Line paradigm, always prepared for a previous failure, versus a regulatory approach that anticipates and prepares for the future.

”

continued on page 42

Financial Regulation ...

▶ continued from page 41

Looking ahead, the main potential source of risk to financial stability would be a substantial correction in the housing market, impacting on the balance sheets of authorized deposit-taking institutions through mortgage defaults. The concern would be a sharp jump in mortgage defaults ...⁷

Therefore, APRA requested that its banks and mortgage insurance companies execute a series of stress tests, which included a 30 percent one-year reduction in housing prices plus an increase in defaults. This stress test identified several weaknesses within the system, which resulted in changes being made to capital requirements and reductions to acceptable concentration risks. As a result, today, PMI Australia has a rating higher than that of its parent and Australia has obtained international recognition as a strong and robust bank and mortgage insurer market.⁸

Models and scenarios like those of Australia demonstrate the important distinction between a regulatory system that is stuck in a Maginot Line paradigm, always prepared for a previous failure, versus a regulatory approach that anticipates and prepares for the future.

If an ERM methodology for the regulator had been set up within the United States, it could have “saved the day” even if the anticipatory scenarios had not been run as in Australia.

Consider for example:

- 1) If in approving a risk management program for muni insurance a warning would have been raised whenever a risk was being covered without having a measurement process in place regarding the primary risk

of defaults⁹ and no access to the data that would drive that risk (such as underwriting criteria).

- 2) If actuarial models would have been required, identifying issues such as the potential impact of moral hazard and how it would be managed, instead of relying on an external rating agency certifying very low risk.
- 3) If an assessment would have been made in advance of what scenarios could “break the bank” and what leading indicators should be tracked to allow action while still resolvable.
- 4) If management action to diversify into risky products was “dictated” by rating agencies, this should have triggered earlier discussion with regulators.
- 5) If a risk-focused approval process would have highlighted the gap in the financial system, so insurance regulators could have raised issues with bank regulators and/or ratings agencies much sooner.

A major irony in current quick and superficial critiques of the credit crises is the tendency to round up all the usual suspects and then hang the models. Models that are built improperly to explain the past and/or report current earnings should be properly viewed with skepticism. Yet an ERM process that properly executes and reviews the modeling will allow both companies and regulators to better shine the light of understanding into the future and in so doing improve the ability to see the next financial invasion and be better prepared to address the relevant issues as they emerge. ♦

7 http://www.apra.gov.au/Speeches/03_20.cfm.

8 It is true that the Australian financial system is increasingly impacted by the disruption in international financial markets, including the slowdown in funding flows in the banking system and declines in the equity markets as well as the broader economic impacts from a global recession. However, economic commentators are suggesting that Australia is better placed than elsewhere as they have more room to use monetary and fiscal policy to address any slowdown in growth as their interest rates are higher and their budget is in surplus.

9 The irony being that once a breakdown occurs, little of the useful data has been captured, so trying to build a valid internal model is made all the more difficult.



Investment SYMPOSIUM



March 30-31, 2009
Marriott New York Marquis
New York, NY

-  Unique sessions on **HOT TOPICS** related to asset class, financing and investment risk management, and investment strategy
-  **TOP-NOTCH** insurance and investment professionals speaking on important issues
-  Networking **OPPORTUNITIES**

Visit www.investmentsymposium.org
to learn more.

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 sim Segal, editor, at sim.segal@watsonwyatt.com.

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

<i>Publication Dates</i>	<i>Submission Deadlines</i>
March 2009	January 1, 2009
August 2009	June 1, 2009

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:



Sim Segal, FSA, CERA, MAAA
US Leader of ERM Services
Watson Wyatt Insurance & Financial Services Inc.
875 Third Avenue
New York, NY 10022-6225
ph: 917.699.3373
e: sim.segal@watsonwyatt.com



Steven Craighead, ASA, MAAA
Actuarial Consultant
Towers Perrin
TSS
One Alliance Center 3500 Lenox Road
Suite 900
Atlanta, GA 30326-4238
ph: 404.365.1287
e: steven.craighead@towersperrin.com



Valentina Isakina, ASA, CFA, MAAA
Manager
Bain & Company
3280 Peachtree Road NE
Atlanta, GA 30305
ph: 404.846.5206
e: valentina.isakina@bain.com

Risk Management Issue No. 14 December 2008

Published by the Society of Actuaries
475 N. Martingale Road, Suite 600
Schaumburg, IL 60173-2226
phone: 847.706.3500
fax: 847.706.3599
www.soa.org

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.

2008-2009 SECTION LEADERSHIP

Editor

Sim Segal
e: sim.segal@watsonwyatt.com

Assistant Editors

Steven Craighead
e: steven.craighead@towersperrin.com

Valentina Isakina
e: valentina.isakina@bain.com

Council Members

Donald Mango, FCAS, MAAA
Matthew Clark, FSA, MAAA
David Gilliland, FSA, FCIA, MAAA
Todd Henderson, FSA, CERA, MAAA
Steven Craighead, ASA, MAAA
A. David Cummings, FCAS, MAAA
B. John Manistre, FSA, FCIA, MAAA
Henry M. McMillan, FSA, CERA, MAAA
Larry H. Rubin, FSA, FCA, MAAA
Barbara Snyder, FSA, FCA, MAAA
Michael P. Stramaglia, FSA, FCIA
Judy Ying Shuen Wong, FSA, MAAA

SOA Staff

Kathryn Wiener, Staff Editor
e: kwieners@soa.org

Meg Weber, Staff Partner
e: mweber@soa.org

Sue Martz, Project Support Specialist
e: smartz@soa.org

Angie Godlewska, Graphic Designer
e: angie@kredodesign.com

Facts and opinions contained herein are the sole responsibility of the persons expressing them and should not be attributed to the Society of Actuaries, its committees, the Risk Management Section or the employers of the authors. We will promptly correct errors brought to our attention.

♻️ This newsletter was printed on recycled paper.

Copyright © 2008 Society of Actuaries.

All rights reserved.
Printed in the United States of America.



Canadian
Institute of
Actuaries



Institut
canadien
des actuaires



SOCIETY OF ACTUARIES