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ERM in the U.S. Life and Annuity Industry: 2015 Survey—Summary Report

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Page 5

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Chairperson's Corner

By Mark Yu

Finally, summer is here! Growing up in South East Asia, I did not particularly look forward to summer there since the weather could be excruciatingly hot and humid. But having lived in the U.S. for almost 20 years, mostly in the Northeast, the long and sometimes brutal winter definitely changed my perspective of summer! Let me share some of the "hot" topics with you during summer time!

- **Brexit.** First things first, at the time of this writing, the U.K. is preparing to vote to stay or leave the EU. Working in the investment field, I experience first-hand how daily news, sentiments or polls can swing the capital markets. The Brexit undoubtedly has significant impact on not just global capital markets but also on insurance markets. One major insurer just announced last week (mid-June) that it would relocate its European headquarters from London to a different European city should Brexit occur. As a risk manager, I can foresee this "Brexit scenario" being included as a potential scenario for insurers' stress tests and scenario planning. By the time you read this article, hopefully, things will have turned out for the better rather than for the worst.

- **Negative interest rate environment.** As of Q2 of 2016, the countries with negative interest rates represented about a quarter of the global GDP. Although U.S. interest rates remained positive, the Federal Reserve Bank didn't rule out the possibility of making interest rates negative. Given the continuing low rate environment across the globe, it will be prudent for risk managers to incorporate negative interest rate scenarios in their cash flow testing and economic capital modeling. There has been enough interest on this topic that the JRMS is planning to conduct a research project on the implications of the negative interest rates for the insurance industry; stay tuned!

- **Cyber security.** Another most talked about topic is cyber security. Since the NAIC adopted the "Principle for Effective Cyber security Insurance Regulatory Guidance" in April 2015, the insurance industry has raised awareness of cyber risk management. The JRMS has issued calls for papers on this topic and received several papers and I encourage you to read the papers published on our website to learn more about cyber security and best practices. From a risk mitigation perspective, PC insurers are getting requests to provide cyber liability coverage. Given the infancy and emerging nature of cyber security, the PC industry needs to continue to define and clarify this emerging liability coverage. This is where PC underwriters and actuaries need to be disciplined and creative so they can develop a reasonable approach to underwrite and price the coverage.

- **JRMS Elections.** By the time this issue is published, we will be right in the midst of the SOA election cycle, which includes the JRMS Council elections. This year we have a record breaking 11 candidates running for the JRMS Council. It's encouraging to see this many candidates interested to support and serve the JRMS and I wish them the best of luck. I'm a firm believer that volunteering for professional organizations is a win-win-win scenario for the individual, the professional organization and the individual's employer. I've been involved with the SOA and American Academy of Actuaries for the last 15 years and it's been a fruitful experience for me personally and professionally. I would encourage you to do the same. The election is open from Aug. 22–Sept. 9. Don't forget to vote!

Have an enjoyable summer regardless of where you are! ■

Mark Yu, FSA, MAAA, is enterprise risk and capital management professional at General Re-New England Asset Management. He can be reached at *mark.yu@grneam.com.*

Editor's Note

By Robert He

In this new issue of *Risk Management*, the editor team is pleased to offer readers several thought-provoking articles on interesting topics.

Anna Berezovskaya and Tony Dardis from Milliman present a summary report of the 2015 survey of ERM in the U.S. life and annuity industry. From June–October 2015, Milliman interviewed senior management at 47 U.S. life and annuity writers to establish how the practice of ERM has evolved in the industry in recent years.

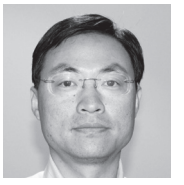
The Canadian Institute of Actuaries (CIA) published "Risk Aggregation and Diversification" in April 2016 and a summary report of the paper is included in this issue. The Committee on Risk Management and Capital Requirements (CRMCR) provided oversight of the project. The authors, Carole Bernard and Steven Vanduffel, review the academic literature on risk aggregation and diversification as well as the regulatory approaches.

The *IAA Risk Book* is an ongoing project being undertaken by the Insurance Regulation Committee of the International Actuarial Association. This 20 chapter document is aimed at multiple audiences and provides a good ground for supporting risk managers in their daily tasks. In this newsletter, we published the introduction to the *IAA Risk Book* written by David Sandberg. Readers can learn from David's view on a broad range of risk management issues and the background of this book.

In "A Discussion of Canadian and U.S. Capital Adequacy Requirements," Yi Zheng presents regulatory capital requirement of Canada and U.S. This article demonstrates and explains the differences between the current Canadian and U.S. capital regimes on life insurance companies.

In "ORSA Experience: a consultant's view," Syed Danish Ali shares with readers his experience of ORSA outside the U.S. The editorial team welcomes such articles that are less research oriented, but are based on work experience. If you would like to share your views with your fellow actuaries on a chosen topic, please feel free to reach out to the editorial team.

As usual, we would like to give a special thank you to David Schraub, Cheryl Liu and Kathryn Baker for helping us pull together this August issue. ■



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ERM in the U.S. Life and Annuity Industry: 2015 Survey—Summary Report

By Anna Berezovskaya and Tony Dardis

Milliman's 2015 Survey of Enterprise Risk Management (ERM) in the U.S. life and annuity industry highlights many positive developments around ERM since the global financial crisis of 2008 and 2009. In the current environment, insurers that prioritize ERM excellence clearly benefit from favorable regulatory, ratings, and market sentiment. But, perhaps even more importantly, a robust practice of ERM brings along the clarity and confidence needed to navigate organizations toward long-term financial success and stability, regardless of the current climate.

As interest rates look set to remain low for some time, insurers acknowledge that the financial consequences on the industry have far from fully crystalized. This theme especially elevates the urgency to advance ERM capabilities in order to determine and drive sustainable long-term strategies.

The industry now demonstrates strong risk controls and mature governance practices. But chief risk officers (CROs) must strive beyond the pure risk monitoring function and gain a voice in strategic business decisions. Ultimately, the success of ERM is measured by how well an insurer is able to execute on its risk strategy (and within its risk limits) to optimize long-term financial objectives.

BACKGROUND AND SCOPE

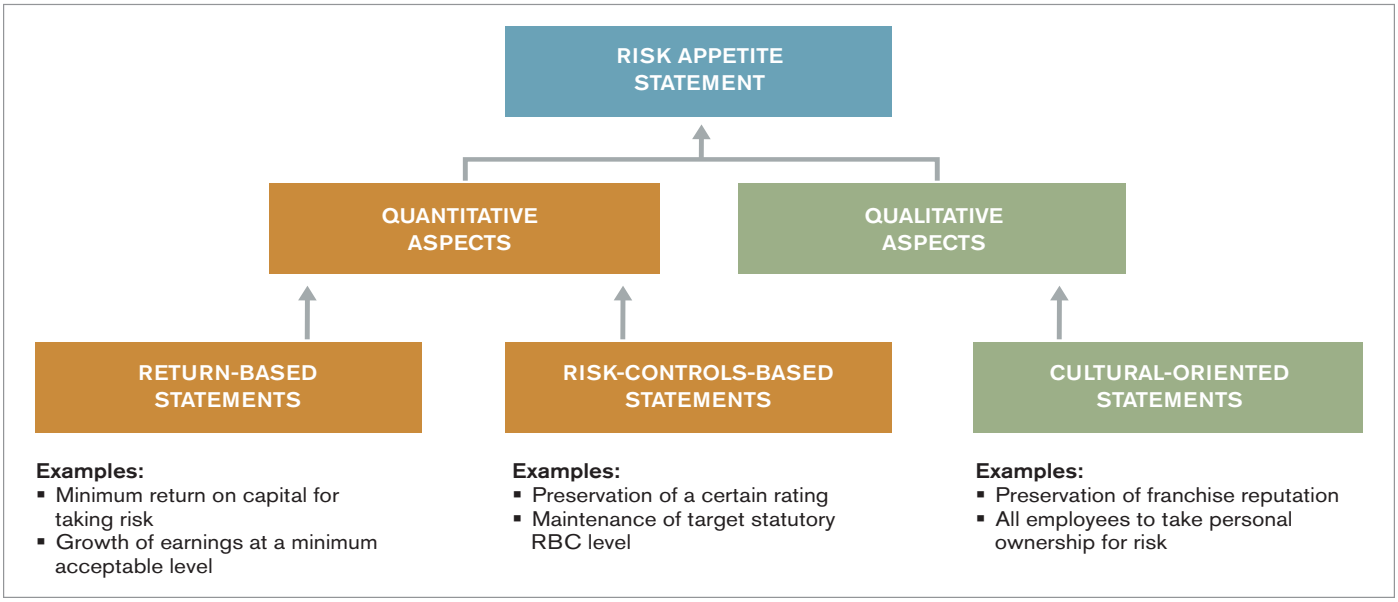
During June through October of 2015, Milliman interviewed senior management at 47 U.S. life and annuity writers[1] to establish how the practice of ERM has evolved in the industry in recent years. Our survey report presents the results of the survey interviews, examining best practices as well as those areas that still remain challenging.

Milliman has prepared a detailed report documenting the findings from the survey, and any questions about the full report should be directed to the authors, whose contact details are shown below. Some of the highlights and "calls to action" for the industry coming out of the survey are also highlighted below.

RISK STRATEGY AND RISK APPETITE

There has been considerable strengthening in how companies formulate risk strategy and risk appetite. The risk appetite statement has emerged as a core part of an ERM program and is used to articulate the extent of risk that a company is willing to take on and the risk limits within which the business should be operated. However, insurers also need to link these limits to their financial objectives and hence have risk appetite statements that address "return-oriented" goals as much as "risk-oriented" goals. Moreover, some companies are including "cultural-oriented" goals in their risk appetite statements. Figure 1 summarizes these concepts and gives a few examples.

Figure 1
Core Components of a Risk Appetite Statement



As a best practice, for every financial goal or business objective, an insurer should have a parallel risk appetite statement; moreover, a good risk appetite statement should help forge the right internal communications around strategy and risk.

Companies also need to look at their business from a variety of financial perspectives, or lenses (capital, earnings, cash flows, etc.). In viewing their risks through multiple lenses, companies must articulate their risk appetites in ways that provide transparency about the role and evaluation of each significant lens. A strategy that may look attractive through one lens may be problematic through another. Increasingly, companies are paying more attention to the liquidity lens, as well as earnings and capital lenses, and also to the impact of strategy on enterprise value.

INSURER'S RISK TAXONOMY

The identification of key risk exposures and the monitoring and management of these risks is at the foundation of any ERM program, typically starting at the line of business level. A great deal of consistency exists in how companies are defining and organizing their risk taxonomies. Generally, they tend to be variations around the theme of categorizing risks as insurance risk, market risk, credit risk, and operational and strategic risks.

As part of the survey, we asked companies to provide feedback on what they viewed as their "Top 3"/"Top 4" risk exposures, and the results are summarized in Figure 2. Some provided responses on both a "gross" and "net" basis, i.e., before and after allowing for explicit risk mitigation strategies such as reinsurance for insurance risk, or hedging for market risk and credit risk. In the current low interest rate environment, interest rate risk remains a problem even where hedging is in place. Also, credit (default) scores very high whether viewed on a gross or net basis.

Operational and strategic risks are now widely recognized as being at least as material as insurance, market, and credit risks. However, we observe a wide range in the level and sophistication around identifying and quantifying these risk exposures. Bearing in mind that it is mainly operational failures that historically have led to financial services companies going out of business, this has to be an area that the life and annuity industry pays more attention to. In the years to come, we expect to see more rigor put in place both around capturing what comprises the full operational and strategic risk taxonomy, and in quantifying the potential financial impact of these risks.

Coming out of the survey we have identified key ingredients of a "best practice" operational and strategic risks program, as summarized in Figure 3.

Figure 2
Participants' Key Risk Exposures (Net of Risk Mitigation Strategies)

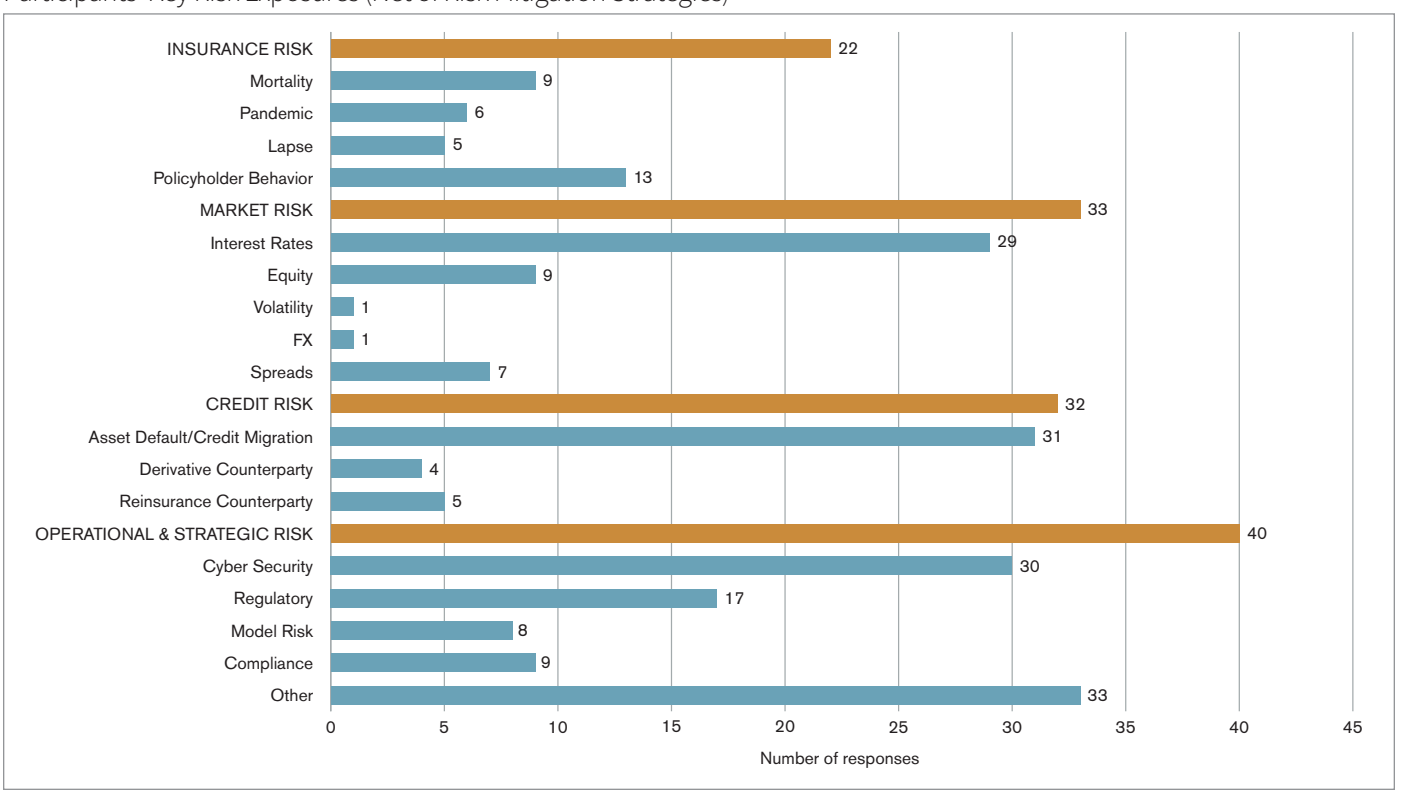


Figure 3
Key Ingredients to an Operational and Strategic Risks Program

1	Companies need to have a rigorous process in place to ensure that they have captured all the risk exposures in their operational and strategic risk spaces and are constantly monitoring those exposures.
2	Active, ongoing, internal dialogue across the company is an essential part of understanding operational and strategic risks. Having this dialogue is probably more important than trying to put a number on operational and strategic risks.
3	Retroactive operational risk reports showing loss amounts by different types of operational and strategic risk categories can be useful. But best practice companies have a formal process in place to record an operational or strategic risk "event" to carefully track the different circumstances that led to that event and to learn from this by implementing appropriate actions to minimize the chances that such an event will reoccur.
4	Operational and strategic risk stress testing is emerging as a valuable tool, i.e., looking at what events could bring about an operational risk stress. Such analysis can be extremely helpful in facilitating the internal dialogue around operational and strategic risks, in the absence of which such discussions can be somewhat nebulous.
5	The quantification of operational and strategic risk exposures, e.g., a determination of an amount of capital to hold in respect of operational and strategic risks, is still in its infancy, with most companies currently not attempting to put a number on operational and strategic risks for their internal capital evaluations, or just doing something approximate.

Also, the industry has now taken early steps to categorize emerging risk as its own bucket of risk and to begin work on identifying and monitoring those risks. Sometimes this can get into something of a hazy area (e.g., regulation), where there may be some blurring in distinction between what is "emerging" and what has "emerged."

RISK MANAGEMENT STRATEGIES

While variable annuity writers have evolved their product and risk management strategies over time in response to market volatility, strategies for other products have been slower to adjust and the clouds loom on the horizon as more years of low interest rates look inevitable. Insurers must respond to the low rate environment as aggressively as the variable annuity writers have responded to market volatility. So far, the search for incremental yield revolved around lowering of portfolios' credit quality and a shift toward a more diverse investment paradigm to include commercial mortgages, private equities, infrastructure, and other alternative investments.

But more will be called for as the locked-in yields of yesteryear disappear, and effective ERM, or its subset, corporate asset-liability management (ALM), is going to play a critical role in the success of life and annuity writers in the years to come. In particular, holistic or "macro"-based risk management strategies are emerging as companies become better equipped to aggregate risk across the enterprise and across risk lenses. The best practice companies are investing significantly in building out ERM tools and capabilities with scale and efficiency to enable ERM to be more tactical and strategic. Once the tools are in place, the ERM function will be better equipped to drive strategy analysis forward by producing timely and comprehensive data for management discussion.

With regard to insurance risk, one area of challenge often cited is policyholder behavior risk, which covers policyholder actions as a function of market performance (and would cover excess lapses that are due to changing market environment). The issue is particularly relevant in the context of trying to gauge the very real possibility of a sudden interest rate spike, and how it may impact a deferred annuity portfolio with surrender options. Outside of this area, insurance risk is monitored and managed very well by the industry. Some feedback from participants on this topic is shown in the sidebar below.

Participant Feedback

"It is extraordinarily important to think about how policyholder behavior links to market risks."

"We believe our mature, long-standing reinsurance relationships stand us in very good stead for continued, long-term effective management of our mortality exposures."

"We are looking very carefully at using Predictive Analytics, as a supplement to our traditional experience studies, especially in the context of helping us to better understand our exposures to anti-selective policyholder behavior."

"We are in the process of revisiting our dynamic excess lapse functions to get increased comfort that they represent the tails of the distribution better, especially in the context of extreme and sudden upward interest rate movements."

"In the absence of credible recent history of how policyholders may react in a spiked rate environment, we are relying more on stress testing as a means of assessing what our tail risk exposures are. For example one extreme stress we use is to look at the performance of the business assuming 60% lapse over a 3-year period."

CAPITAL

Internal capital is a valuable tool in the ERM toolbox. It provides an opportunity to demonstrate discipline and expertise around own risk assessment and serves as a foundation for risk-informed decisions and achieving risk efficiencies.

As summarized in Figure 4, a variety of methodologies, e.g., one-year value-at-risk (VaR) versus run-off, are in use in the industry and there are good justifications for their existence, reflective of different corporate structures, philosophies, and what companies view as important. Having an "internal view" of capital, and using this as part of the strategic decision making process, will help ensure a company makes decisions that bring about outcomes that are in line with what is important for the company and genuinely creates enterprise value.

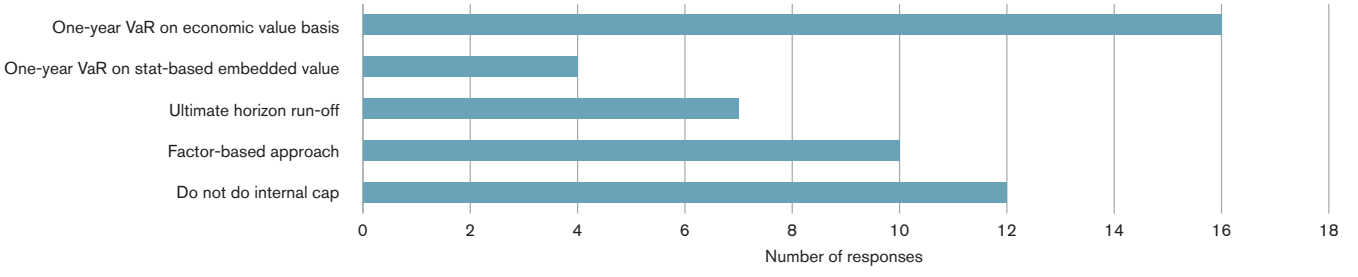
A recurring message from CROs is that they would like to see more sophisticated internal capital analytics produced much more quickly, e.g., on-demand stress testing of capital. We see this as a fast developing area for ERM in the next few years, with advances in making the internal capital production process more efficient and hence making the delivery of numbers more timely, which in turn facilitates broader usage of internal capital in driving management decisions.

As a second line of defense, ERM functions require their own tools and technology to be effective. Moreover, the strategic role of ERM means that tools need to extend beyond having a pure risk monitoring function and into support for strategy analysis. For example, a truly effective tool might enable a company to test alternative product or investment strategies for

different risk/ return metrics, including economic capital (EC) and a variety of constraints, all done in a timely enough fashion to be useful.

A number of companies surveyed are in the process of reviewing their system requirements around ERM but acknowledge it may take a number of years to get where they ideally need to be. That said, the developments are encouraging for the industry in terms of the new technology emerging and the investments being made in this area.

Figure 4
Internal Capital Methodologies



Note: The sum of the bars is 49 versus 47 total survey participants. This is because two companies in the survey perform two internal capital calculations, one to satisfy a group requirement, the other to better reflect a capital valuation that better suits the local business.

STRESS AND SCENARIO TESTING

Stress and scenario testing is an essential component of the ERM arsenal and has the advantages of relative simplicity and transparency, which aids communication. Companies identify such analysis as being invaluable for senior management's understanding of risk issues and general buy-in to ERM matters.

Federal Comprehensive Capital Analysis and Review (Fed CCAR) stress-testing requirements have driven the systemically important financial institutions (SIFIs) to raise the bar on stress testing. However, there is also overwhelming evidence that the remainder of the industry is following suit to expand analytics in this area. Indeed, many insurers are now examining the financial implications of the Federal Reserve's scenarios, even though they have no regulatory obligation to do so, and going well beyond in terms of the variety of stress and scenario tests.

Stress and scenario tests are often used to set risk appetite and establish appropriate limits for a business. Looking ahead, improvements can be expected in the areas of formalizing the stress testing process and wider usage in strategic decision making. We can also expect to see more analysis done around operational risk stresses, reverse stress testing (i.e., identifying the types of situations that could lead to risk tolerance breaches or a certain amount of financial pain), and combination stresses (e.g., pandemic in combination with severe recession).

GOVERNANCE AND COMMUNICATION

Best practice firms ingrain a deep risk culture throughout the corporation and establish risk processes that facilitate communication of risk information across the business. A successful ERM program is founded on a risk culture that starts with board buy-in, hence setting "the tone from the top," and runs right through the organization, "down to the call center."

Participant Feedback

"How many people do we have working in ERM? Well, we have an independent risk function of 20 people, but actually we have thousands of people actually working in ERM. Risk management simply runs throughout the fiber of the organization. We are all practicing ERM, every day."

It is common for insurers to discuss ERM as part of a three-lines-of-defense model, as depicted in Figure 5. However, ERM needs to be viewed as a lot more than part of a defensive strategy, and the successful companies of the future will be giving ERM much more of a strategic role.

Figure 5
The Three-Lines-of-Defense Model

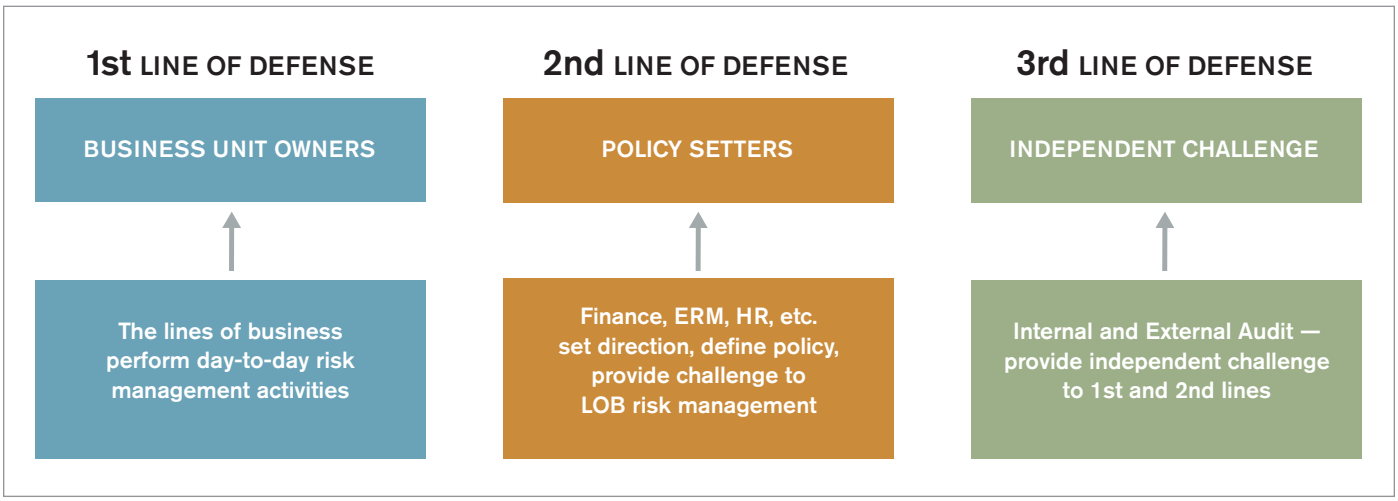
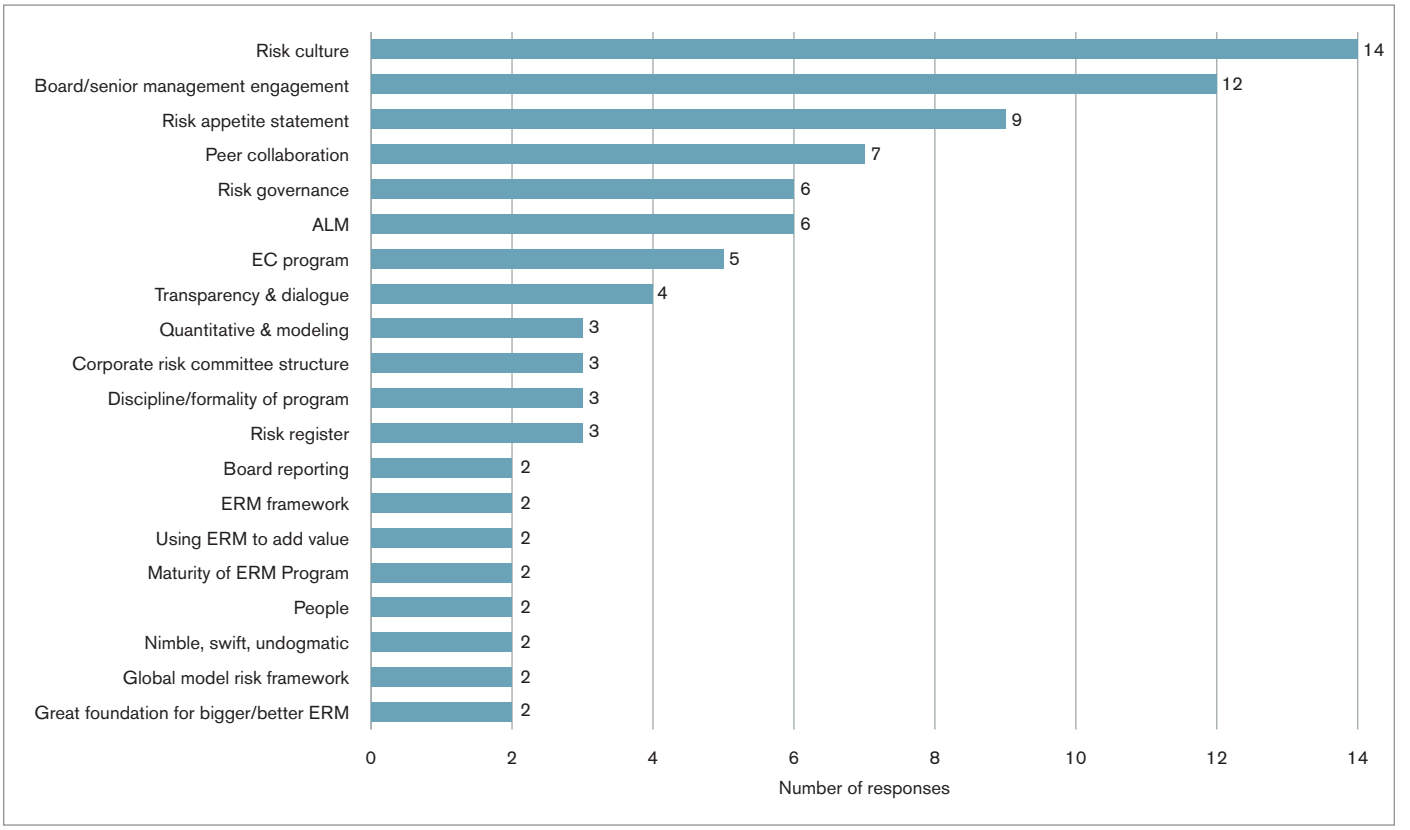


Figure 6
Relative Strengths of ERM Program



The U.S.-specific version of Own Risks Solvency Assessment (ORSA), now required in 2015 by the majority of state regulators, is generally viewed by the industry as a very positive regulatory development. For many, in practice, ORSA has been simply a documentation consolidation exercise, to capture the ERM work of the organization in one place (which indeed many companies were already doing before the regulators required it of them).

But for other companies, ORSA has helped focus attention on ERM, and especially demanded that companies think carefully about how to view their businesses on an aggregated basis. Even for those companies that may have already been on top of the issues, the benefits of formalizing the processes and having a single reference has proved tremendously useful. In particular, for many, ORSA has proved to be an invaluable internal educational tool, helping get a broader understanding of ERM across the firm and hence fostering a strong corporate risk culture.

LOOKING AHEAD

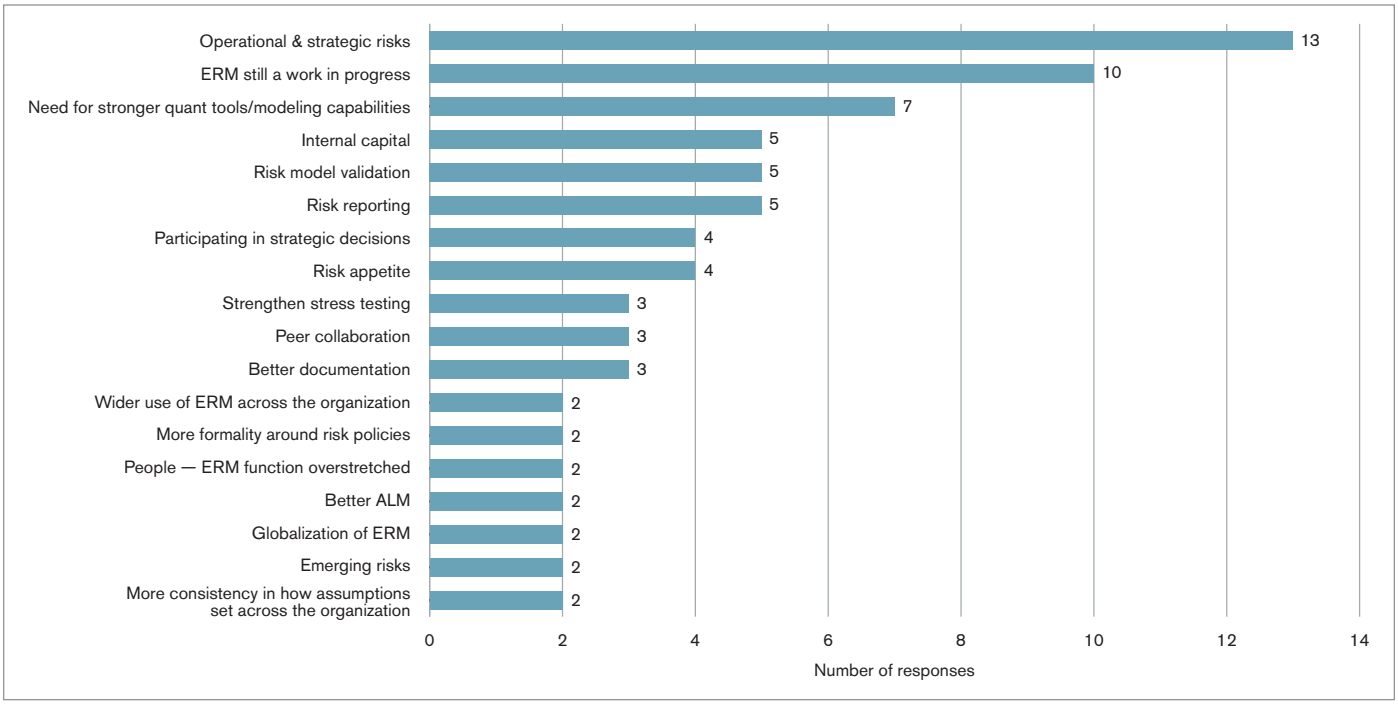
Survey participants were asked to discuss what they perceived to be strengths and weaknesses of their current ERM programs. A number of recurring themes emerged in response, and the charts in Figures 6 and 7 summarize some of those common themes.

As a general point, a number of companies specifically mentioned that their ERM programs were "still a work in progress," reminding us that ERM remains an area of practice in the U.S. insurance industry that is still in fledgling form.

Reference to "Peer Collaboration" in the charts (for seven companies a highlighted strength and for three companies a highlighted weakness) refers to ERM working collaboratively with other parts of the company, and the extent of buy-in to ERM around the organization.

For a copy of the full research report, please contact the authors. ■

Figure 7
Relative Weaknesses of ERM Program: Areas Looking to Enhance Going Forward



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ENDNOTE

[1] The 47 companies participating in the survey represent a broad spectrum of types of insurer across the industry: from very large to very small; companies with some overseas business versus U.S.-only; U.S.-owned versus international owned; life & annuity only versus multiline; public listed versus mutual; and direct writer versus reinsurer. Therefore, the survey reflects a good representation of the state of ERM in industry overall.

Risk Aggregation and Diversification

By Carole Bernard and Steven Vanduffel

This paper was published April 2016 by the Canadian Institute of Actuaries (CIA). The Committee on Risk Management and Capital Requirements (CRMCR) provided oversight of the project. The CRMCR is a practice committee which falls under the CIA's Practice Council and furthers the development of actuarial techniques in the areas of risk management and capital requirements for life and property and casualty insurers.

Download the full paper at *http://www.cia-ica.ca/docs/default-source/2016/216037e.pdf?sfvrsn=0*

OVERVIEW

This report reviews the academic literature on risk aggregation and diversification as well as the regulatory approaches. We will point out the advantages and disadvantages of the different approaches with a focus on model risk issues.

We first discuss, in section 1, the basic fundamentals of measuring aggregated risk. Specifically, we review the concept of a risk measure as a suitable way to measure the aggregate risk. We discuss desirable properties of risk measures and illustrate our discussion with the study of value-at-risk (VaR) and tail value-at-risk (TVaR).

Section 2 explores the question of diversification benefits associated with risk aggregation and the potential limitations of correlations as the only statistic to measure dependence. We go beyond correlations and explain that a full multivariate model is needed to obtain a correct description of the aggregate risk position.

We then explore the regulators approach to risk aggregation and diversification in section 3, and provide some observations on the implicit assumption made by international regulators and different approaches that can be taken.

We end our review by highlighting that model risk becomes a key issue in measuring risk aggregation and diversification. In section 4, we explore a framework that allows practical quantification of model risk and which has been recently developed in Bernard and Vanduffel [2015a][1] (building further on ideas of Embrechts et al. [2013][2]). Details are provided in appendices A and B. Appendix C presents the definitions of the mathematical notations used throughout the research paper.

INTRODUCTION

The risk assessment of high-dimensional portfolios $(X_1, X_2, \ldots, X_d)$ is a core issue in risk management of financial institutions. In particular, this problem appears naturally for an insurance company. An insurer is typically exposed to different risk factors (e.g., non-life risk, longevity risk, credit risk, market risk, operational risk), has different business lines or has an exposure to several portfolios of clients. In this regard, one typically attempts to measure the risk of a random sum, $S = \sum_{i=1}^{d} X_i$, in which the individual risks X_i depict losses (claims of the different customers, changes in the different market risk factors, etc.) using a risk measure such as the variance, the VaR or the TVaR[3]. It is clear that solving this problem is mainly a numerical issue once the joint distribution of $(X_1, X_2, \ldots, X_d)$ is completely specified. Unfortunately, estimating a multivariate distribution is a difficult task. In many cases, the actuary will be able to use mathematical and statistical techniques to describe the marginal risks X_i fruitfully but the dependence among the risks is not specified, or only partially specified. In other words, the assessment of portfolio risk is prone to model misspecification (model risk).

From a mathematical point of view, it is then often convenient to assume that the random variables X_i are mutually independent, because powerful and accurate computation methods such as Panjer's recursion and the technique of convolution can then be applied. In this case, one can also take advantage of the central limit theorem, which states that the sum of risks, S, is approximately normally distributed if the number of risks is sufficiently high. In fact, the mere existence of insurance is based on the assumption of mutual independence among the insured risks, and sometimes this complies, approximately, with reality. In the majority of cases, however, the different risks will be interrelated to a certain extent. For example, a sum S of dependent risks occurs when considering the aggregate claims amount of a non-life insurance portfolio because the insured risks are subject to some common factors such as geography, climate or economic environment. The cumulative distribution function of S can no longer be easily specified.

Standard approaches to estimating a multivariate distribution among dependent risks consist in using a multivariate Gaussian distribution or a multivariate Student t distribution, but there is ample evidence that these models are not always adequate. More precisely, while the multivariate Gaussian distribution can be suitable as a fit to a data set "on the whole", it is usually a poor choice if one wants to use it to obtain accurate estimates of the probability of simultaneous extreme (tail) events, or,

equivalently, if one wants to estimate the VaR of the aggregate portfolio $S = \sum_{i=1}^{d} X_i$ at a given high confidence interval; see McNeil et al. [2010][4]. The use of the multivariate Gaussian model is also based on the (wrong) intuition that correlations[5] are enough to model dependence (Embrechts et al. [1999][6], Embrechts et al. [2002][7]). This fallacy also underpins the variance-covariance standard approach that is used for capital aggregation in Basel III and Solvency II, and which also appears in many risk management frameworks in the industry. Furthermore, in practice, there are not enough observations that can be considered as tail events. In fact, there is always a level beyond which there is no observation. Therefore if one makes a choice for modelling tail dependence, it has to be somewhat arbitrary, at least not based on observed data.

There is recent literature on the development of flexible multivariate models that allow a much better fit to the data using, for example, pair-copula constructions and vines (see e.g., Aas et al. [2009][8] or Czado [2010][9] for an overview). While these models have theoretical and intuitive appeal, their successful use in practice requires a data set that is sufficiently rich. However, no model is perfect, and while such developments are clearly needed for an accurate assessment of portfolio risk, they are only useful to regulators and risk managers if they are able to significantly reduce the model risk that is inherent in risk assessments.

In this review, we provide a framework that allows practical quantification of model risk and which has been recently developed in Bernard and Vanduffel [2015a][10] (building further on ideas of Embrechts et al. [2013][11] and references herein). Technically, consider N observed vectors $\{(X_{1i}, \ldots, X_{di})\}_{i=1,\ldots,N}$ and assume that a multivariate model has been fitted to this data set. However, one does not want to trust the fitted multivariate model in areas of the support that do not contain enough data points (e.g., tail areas). The idea is thus to split $\mathbb{R}^d$ into two subsets, the first subset $\mathcal{F}$ is referred to as the "fixed part" and the second subset $\mathcal{U}$ is the "unfixed part," which will incorporate all the areas for the fitted model is not giving an appropriate fit. This incorporates the two directions discussed above for risk aggregation. If one has a perfect trust in the model, then all observations are in the "fixed" part ($\mathcal{U} = \emptyset$) and there is no model risk. If one has no trust at all in the fit of the dependence, then $\mathcal{F} = \emptyset$ and we are in the setting of Embrechts et al. [2013][12] who derive risk bounds for portfolios when the marginal distributions of the risky components are known but no dependence information is available. The approach of Bernard and Vanduffel [2015a][13] makes it possible to consider dependence information in a natural way and may lead to more narrow risk bounds. This framework is also supplemented with an algorithm allowing actuaries to deal with model risk in a very practical way, as we will show in full detail. ■

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ENDNOTES

1 This paper received the 2014 PRMIA Award for New Frontiers in Risk Management. Carole Bernard and Steven Vanduffel. A New Approach to Assessing Model Risk in High Dimensions. *Journal of Banking and Finance*, 58:166–178, 2015a

2 Paul Embrechts, Giovanni Puccetti, and Ludger Rüschendorf. Model uncertainty and VaR aggregation. *Journal of Banking & Finance*, 37(8):2750–2764, 2013.

3 In the literature it is also called the expected shortfall, the conditional value at risk and the tail value-at-risk, among others.

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5 It should be clear that using correlations is not enough to model dependence, as a single number (i.e., the correlation) cannot be sufficient to describe the interaction between variables unless additional assumptions are made (e.g., a Gaussian dependence structure).

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13 Carole Bernard and Steven Vanduffel. A New Approach to Assessing Model Risk in High Dimensions. *Journal of Banking and Finance*, 58:166–178, 2015a.

IAA Risk Book Chapter 1: Introduction to the *IAA Risk Book*

By David Sandberg

Note from the author: *We wanted to share with you an interesting project being undertaken by the Insurance Regulation Committee of the International Actuarial Association. Despite the Risk Book's self-description, suggesting a completed book, the Risk Book will be regularly renewed. Eleven chapters of interest have already been published, with nine more being actively worked on through the rest of 2016. The IRC would very much appreciate any comments or reactions you might have on the past, current or future chapter topics. Those topics can be found at http://www.actuaries.org/index.cfm?lang=EN&DSP=PUBLICATIONS&ACT=RISKBOOK.*

1. INTRODUCTION/OVERVIEW

The *IAA Risk Book* provides a set of high quality reference materials for use in managing the uncertainty of insurer risks. The IAA's aim in developing these materials is to help ensure both the sustainability of insurance programs and the protection of their policyholders.

This chapter of the Risk Book is organized into the following sections:

2. Opportunities
3. Challenges
4. Solutions
5. Stakeholder Tools – Supervisors
6. Stakeholder Tools – Insurers
7. Emerging Actuarial Tools and Processes
8. Conclusion

The terms "insurance regulator" and "insurance supervisor" are sometimes used inter-changeably despite some real differences in function. For ease of communication, this chapter uses the term "supervisor" (i.e., as in International Association of Insurance Supervisors) unless the term "regulator" is clearly more appropriate.

2. OPPORTUNITIES

Historically, actuaries have played many important roles for providers of insurance (e.g., pricing, product design, valuation, and risk and capital management). In addition, the actuaries have provided a unique and central interface between supervisors and the providers of insurance coverage to ensure both the sustainability of insurance programs and the protection of policyholders.

The actuarial profession has contributed significantly to the development of risk management tools and processes, both within and outside the insurance industry. Actuarial practice continues to improve the understanding, measurement and communication of risk and its implications through the development of tools (and increasingly processes) to manage the uncertainty of risk in a sustainable and transparent fashion. These tools and processes aim to trace, manage and mitigate the acceptance and transmission of the uncertainty of risk, perhaps serving in a similar aspirational capacity to the way that accounting debits and credits trace the acceptance and transmission of cash. This allows industry stakeholders, including actuaries, supervisors and management, to clarify risk exposures, recognize their sensitivities and provide sustainable, ongoing, management oversights.

The 2007-08 Global Financial Crisis (GFC) demonstrated that the world's financial systems, including both corporations and supervisors, need better processes to facilitate the effective provision of sustainable risk taking and risk pooling. Clarifying the necessary framework developed for insurance may also have relevance for other components of the financial system.

In 2004, before the GFC, the International Actuarial Association (IAA) published "**A Global Framework for Insurer Solvency Assessment**." Originally prepared for the International Association of Insurance Supervisors (IAIS), this book explored the elements needed for an international capital standard for insurers and provided a "best practice" approach available to all supervisors. It dealt with methods supervisors might use to assess insurers' current financial position, as well as to understand the range of their possible future financial positions.

This Risk Book adds to the IAA's 2004 work, as well as lessons learned from the GFC, by addressing professional developments in the areas of governance, management and regulation of insurance risks. These processes are needed to enable sustainable management of the uncertainties of pooled risks. They constitute part of the internal franchise value and intellectual capital of the company, as essential as economic capital is for ensuring sustainability. Each chapter in the Risk Book highlights key messages of interest to boards, senior management, financial analysts, actuaries, and supervisors. These messages apply to both established and evolving structures for pooling risk. Each chapter is valuable as a solo tool, but their real value comes from

applying multiple tools simultaneously and taking advantage of their synergies and implications to (and uses in addressing) the larger challenges of the financial system.

3. CHALLENGES

The governance, management and regulation of insurance risk are faced with a number of challenges.

1. Market complexity—The financial markets within which insurance operates are complex. The financial markets continually evolve as participants strive to remain competitive. This evolution fuels the birth and transformation of financial products such as banking, insurance and financial instruments. This stretches and reshapes the boundaries of conventional wisdom as to which products should be categorized as insurance, banking or securities. This evolution of financial products, including insurance, is healthy but at the same time represents challenges to: 1) supervisors attempting to fulfill their mandates; 2) insurers attempting to fulfil promises and achieve success for their stakeholders and 3) financial product consumers attempting to manage their financial needs (e.g., protection, investment and financing).

2. Uncertainty of risk—Unlike auditable cash and inventory, the assessment of risk is incomplete without addressing the underlying uncertainty. Claims are subject to uncertainty as to their level, trend, timing and volatility. The assets used to fund these future claims will also have risks associated with their ultimate value, especially for life insurers. The manner in which different risks will interact or be dependent on each other and on a common set of circumstances (e.g., scenario or stress) can also be uncertain. Although the measurement of the effects of past events can be an important basis for assessing the future, conditions can change in ways that cannot be predicted from past experience. As a result, past experience is not necessarily predictive of future experience. How to exercise sound judgment in a dynamic environment with the use of tools and techniques is the focus of much of this collection of chapters.[1]

3. Many dimensions of insurer risks—Governing, managing and regulating insurer risks is challenging due to the many dimensions of those risks. For example, a partial list of some of the dimensions includes:

a. Presence of credit, market, insurance and operational risks (among others)
b. Insurance product guarantees which can last for decades or lifetimes
c. Presence of substantive policyholder options (e.g., withdrawal, renewal and resets)

d. The nature of insurance products which tend to be a liability driven business requiring careful attention to asset liability management, notably for life insurers
e. The variation in coverage type; some insurer risks have loss distributions skewed to their tails (e.g., catastrophic earthquake insurance) while others have more "normal" distributions (e.g., group dental).
f. The nature and scope (and size) of non-life insurance risks continually change, such that data from a few years ago may not be fully relevant to current risks, and the type of risk can vary greatly from one product to another. Hence there tends to be a shortage of sufficient data to get precise measures of the risk before the risk changes. In addition, the data for one product is generally not relevant to another product.
g. The need to consider the integrated effect of all an insurer's risks, at both the entity and the group level when considering an insurance group. This means allowing for such factors as synergistic effects, diversification, fungibility constraints and liquidity needs.

As a result of these challenges, there is no single risk measure that provides sufficient information for the governance, management and regulation of insurance operations. Multiple tools are required to provide sufficient perspective.

Currently, the Financial Stability Board and the International Association of Insurance Supervisors (IAIS) are facing the substantial difficulties involved in creating a global Insurance

Capital Standard (ICS) for insurance. This is due, in part, to the challenges inherent in the governance, management and regulation of an insurer's risks. For example, the development of the ICS and capital requirement in various jurisdictions has focused on the merits and challenges of standardized approaches versus internal models. Both approaches have important benefits and shortcomings.[2]

Standardized approaches have the advantage that they are based on industry averages and consistent shocks (perhaps applied through factors multiplied by financial statement amounts) to all insurers, thereby achieving a form of apparent comparability. The disadvantage of standardized approaches is that by design they will not capture the specifics of an individual insurer's risks or the way in which those risks are managed and mitigated. An internal model approach enables the specifics of the risks faced by each insurer to be considered and modeled directly. Supervisors, however, face the challenge of making appropriate assessments of the models, their calibration, their validation, their governance and their use when internal models are used. In addition, supervisors are faced with the challenge of cross-insurer comparability of methods and key assumptions.

The need for multi-dimensional perspectives of an insurer's risks is illustrated by the use by insurers and supervisors of both the insurer's current financial position (e.g., point in time capital requirements), and its projected future financial condition, informed by processes such as ORSA or stress testing.

In the popular movie *Toy Story*, Buzz Lightyear says "To infinity and beyond." The chapters of the *IAA Risk Book* address the challenge "To future uncertainty and beyond." They provide a description of the tools and processes available to supervisors, insurers and actuaries to estimate and effectively manage pooled risks in a sustainable manner. The IAA hopes that these tools will be applied beyond their historically successful micro-applications (focused on the sustainability of individual insurance organizations) to also be of significant value to the macro issues involving the intersection of insurance, banking and other financial services.

4. SOLUTIONS

The actuarial profession is strategically positioned to contribute to and advance the development of risk management tools due to its emphasis on ensuring sustainable pooling of risk for all stakeholders. The aspects of the profession that contribute to making this possible include:

- A widely recognized body of learning derived from research, education, training and practical experience at a high level;
- Specialized and general knowledge and skills;
- Adherence to high ethical and technical standards;
- Being subject to a formal disciplinary process; and
- A self-declared professional mission to consider and contribute to the needs of the public beyond its members' personal gain.

From this foundation, actuaries have developed globally recognized skills and expertise to help ensure the long run sustainability of pooled risk ventures and arrangements. These open-ended problems, while complex, are manageable if approached in a disciplined and thoughtful manner.

Historically actuarial work with regard to the balance sheet largely involved developing reliable point-in-time numbers to report to stakeholders. Stakeholders, however, need more—they need to have the implications embedded in those numbers explained clearly, including the limitations of the underlying models, and they need to recognize that management understands the risks involved and is taking prudent steps to mitigate those risks. Risk management is the umbrella term used to describe identifying, managing (mitigating), and communicating all inherent risks and uncertainties not just those inherent in financial reporting.

The actuarial profession has stepped up to this challenge and undertaken pioneering research to develop risk management methodologies and processes. Some of these efforts are addressed in this Risk Book. It highlights tools and processes used by the various stakeholders to identify, manage, and report on risk which are at the heart of the actuarial approach to risk management, such as the actuarial control cycle.[3]

Depiction of the Actuarial Control Cycle

5. STAKEHOLDERS TOOLS – SUPERVISORS

The regulatory function may set out rules and regulations to be applied by insurers, while the supervisory function may focus on assessing compliance with applicable laws and regulations and carrying out such monitoring/intervention as are necessary and allowed for under the supervisor's powers. Many supervisory authorities also have regulatory powers. Jurisdictions may choose to retain legislative control over certain matters rather than fully delegate this power to the insurance supervisory authority.

A forthcoming chapter of this Risk Book—Resolution (of insolvencies)—is particularly germane to this topic. Although it is a detailed exposition by a UK actuary of the resolution process in the UK, the principles outlined are applicable globally.

A supervisor's authority to act stems from the enabling legislation of their jurisdiction. Such legislation will identify the nature of the powers granted as well as the scope of the entities subject to supervision. For example, one supervisor's enabling legislation includes the statement that their object is to "supervise financial institutions in order to determine whether they are in sound financial condition and are complying with their governing statute law and supervisory requirements under that law." Other supervisory powers that may be granted by enabling legislation might include market conduct, resolution, licensing and systemic risk monitoring. Each jurisdiction will assign these powers (or others) among one or more supervisory bodies.

Insurance supervisors exercise their powers through a variety of tools that cover the spectrum from "must comply" with regulations ("hard" tools) to moral suasion ("soft" tools). Some examples of the harder and softer tools[4] include:

1. Harder tools:
   a. Regulations (i.e., "must comply"—some jurisdictions also have other tools or use other names such as "guidelines" which may be a "hard" tool in some jurisdictions or a "soft" tool in others);
   b. Valuation and capital requirements;
   c. Statutory actuarial roles;
   d. Disclosure requirements, both public (such as financial reporting standards) and private (such as the ORSA);
   e. Intervention powers, including the ability to require changes to the insurer's plans and strategies to reduce its risk profile and improve its capital position, as well as to require the preparation of recovery and/or resolution plans (See Chapter [E] on Resolution for a through discussion of this tool);
   f. Quantitative assessments—were certain financial components determined correctly or are they within standards;
   g. Examination authority and authority to fine; and
   h. Authority to prohibit or restrict certain operations or transactions.
2. Softer tools:
   a. Supervisory framework—the process by which the supervisory authority will assess the insurers under its jurisdiction;
   b. Manner in which professionals such as actuaries and auditors (with their professional practice standards and discipline processes) are either relied upon or used (i.e., "trust but verify");
   c. Supervisory intensity—instead of supervisory reliance only on a submission of materials, there is the option to include considerable in-depth review by supervisory staff (especially those skilled in actuarial matters), along with regular in-person discussions with insurer staff);
   d. Moral suasion—works best in a climate of mutual trust and respect;
   e. Qualitative assessments—e.g., covering the effectiveness of governance and the actuarial function;
   f. Ability to collaborate with and learn from other supervisors as part of supervisory cooperation and coordination (e.g., supervisory colleges); and
   g. In depth discussions with management and access to private corporate information.

6. STAKEHOLDERS TOOLS—INSURERS

There is a suite of tools (often enhanced by actuarial standards) that is often used by insurers (depending on their scale, breadth and complexity) to meet the competing needs of the various stakeholders (e.g., shareholders, policyholders, supervisors and customers) for the effective governance of insurer

risks (identification, management and communication). These include:

1. Enterprise Risk Management (ERM) concepts such as risk governance, appetite, limits and controls;
2. Use of risk experts, with those from a profession (especially actuaries) being perhaps the most valuable;
3. Effective control functions for actuarial matters, risk management and audit, including how they are organized to address governance of internal models (especially their control and validation), which may include a version or variation of what is currently described as "three lines of defense";
4. Appropriate use of management tools such as reinsurance, both proportional and non- proportional (see chapters 6 and 7), hedging investment risks, and asset liability matching techniques (which will be addressed in upcoming chapters);
5. Current financial position assessment, which may involve consistent valuation of balance sheet items and an assessment of additional capital needs and regulatory capital requirements;
6. Future financial condition analysis including the ORSA process (which will also be addressed in an upcoming chapter);
7. Models, including both external vendor models and models developed internally, which include financial, catastrophe ("cat") and economic capital models;
8. Stress and scenario testing;
9. Responsible pricing, product design and inforce management;
10. Voluntary disclosures to both shareholders and policyholders; and
11. Traditional corporate management processes such as disaster recovery, strategic planning, compensation philosophy and market positioning.

The underlying challenge with this multiplicity of tools is that while each tool is important, the sheer number of such tools can create confusion within the insurer and reduce focus on the important risks involved. Not only can these tools be viewed as being redundant, rather than complementary, but the substantive cost of maintaining these tools will need to be justified. In addition, it is possible that the key messages from the different tools will be confusing or even lead to incorrect conclusions without proper orchestration of the tools and their results. Actuaries have a unique perspective to understand the many dimensions of risk. This allows them to be able to develop the key messages provided by the combination of risk tools available to the insurer. The actuarial function frequently works closely with the Chief Risk Officer (CRO) in these matters to help ensure that all policyholder promises and obligations are met, while also meeting shareholder expectations (e.g., profitability and sustainability).

The financial statements (balance sheet and income statement) are where serious mismanagement issues are ultimately revealed. As a result, management typically focuses on identifying and managing the leading indicators of risk *before* they arrive on the financial statements. Sometimes this can be achieved through mitigation techniques such as reinsurance, product design, group structures and hedging. At other times management identifies and measures risk and sets limits of acceptable risk through an ERM process. A key to understanding these topics is that each tool mitigates some, but not all, risks. In this Risk Book, we will clarify which risks each tool is best suited for, what residual risks will remain, and what might lead these residual risks to become material.

7. ACTUARIAL TOOLS AND PROCESSES

The IAA has created this Risk Book to provide insight into existing actuarial tools and processes and the synergistic value of their integrated use. The IAA also hopes the Risk Book will accelerate the development of, and added value arising from, emerging actuarial tools and processes, including:

1. **Roles and functions of the actuary—**There has been a growing global recognition of the role and importance of the actuarial function within insurers. Increasingly, supervisors recognize the actuarial function as a control function. Despite this recognition, uncertainties may remain over the important features of an effective actuarial function. This is explored further in chapter 2.

   As an example of various roles and functions, twenty five years ago in the United States, two actuarial roles were written into its statutory reporting requirements to address the inherent conflict between the use of factors and professional judgement. For life insurance products, the role of the actuary was to express an opinion and write a report (subject to both supervisory and regulatory requirements and to actuarial standards) that identified any risks that were missed by factor reserves and to increase the reserves, if needed. The role of general insurance actuaries was to opine on the "reasonableness" of the recorded claim liabilities (i.e., whether the recorded number fell within the range of possible estimates that the actuary considered reasonable). This was an explicit supervisory acknowledgement that the uncertainty inherent in such an estimate allows for a range of "reasonable" estimates. The actuarial role today is well suited to further expand on this concept of reasonable ranges for the uncertain future, while also recognizing that any estimates and/or ranges cannot be guaranteed to be "sufficient" in all possible scenarios. In both cases, the actuary provides a more

relevant risk context to an accounting number that may be subject to inappropriate interpretation without that context. By so doing, the tools used to estimate and manage risk can reveal and address the level of uncertainty/volatility that may accompany these estimates.

2. **Internal models—**It is increasingly recognized that internal models are an important part of insurer risk and capital management. However, their use is frequently subject to a mistrust reflected in a commonly referred to saying by George Box that "essentially, all models are wrong but some are useful." There can also be a concern that a "mark-to-model" mentality may result in management and boards not recognizing unmodelled risks or the limitations of the internal models. An important element in fostering confidence in the results of internal models is the development of effective governance processes for such models and their assumptions. An upcoming chapter of the Risk Book is devoted to this topic as are standard setting projects at the IAA and the US Actuarial Standards Board.
3. **ERM—**An emerging focus of the profession has been to identify the key processes needed for sustainable risk management. This has resulted in the development of standards for actuaries practicing in an ERM role (such as those adopted in the United States, and the model standards addressing ERM processes being developed by the IAA). This professional focus addresses many of the gaps and criticisms of the historical focus solely on financial statements (which can be backward looking by their very nature and hence poor at providing helpful forward looking assessments). The value of the forward looking aspects of ERM has recently been recognised in supervisory requirements on insurers' Own Risk and Solvency Assessment (ORSA). A forthcoming chapter of the Risk Book focuses on ORSA and the actuarial involvement in this important tool and process.

4. **Integrating micro and macro tools—**There has been a post-financial crisis development to better understand and communicate insights on interconnectedness, aggregation and systemic implications. We identify and suggest briefly how some of the micro tools discussed in this Risk Book may have relevance to macro needs. We hope that further elaboration will be developed by means of collaboration with others. Possible topics include:
   a. *Time horizon of risk*—How can we best incorporate the time dimension over which risk exposures are manifested, as well as for corrective action(s) that can/will be taken? What does risk look like one month, one year and three to five years into the future? What tools and processes are needed to address the longer time horizon inherent in many insurance risks? This will require addressing risk across various business models with different relative risk exposures and time horizons. We need to develop additional tools for this purpose.
   b. *Correlations*—How to assess the extent of the correlations between risks, especially how they change in stressed times compared to normal times?
   c. *Capital requirements and process requirements*—We have tended to address risk by cataloguing/aggregating all risks into risk factors (or models) to calculate required capital. However, while some risks can be mitigated by capital, others are better mitigated through improved processes. Since processes are the elements that create and maintain franchise value (separate from the balance sheet measurement of specific assets and liabilities), can we develop supervisory requirements that lead to reduced process risk exposures?
   d. *Stress testing*—We develop capital requirements based on stress testing and scenario testing. These requirements are based on a defined risk tolerance and presumed risk distribution. As a process, what are standardized languages and terms we could use to facilitate comparability across firms and sectors?
   e. *Interconnectedness tools*—Can we use network theory or other tools to build visual risk maps to better reflect and communicate the character and dependencies of risk instead of our traditional reliance on spreadsheets and pages of text? Can the map show a systemic landscape of risks and their current linkages?[5] Could a public mapping/

database of financial and economic variables apply to a company's unique risk profile? Can this mapping also reflect past observed correlations (including regime shifts) and include the ability to dynamically alter them?

8. CONCLUSION

We do not intend to create a "one and done" Risk Book, but rather build something like a dynamic Wikipedia summary of risk topics of current interest. We hope that this will spawn additional research into these topics, as well as relevant spin-off topics. Each chapter covers the central issues of its topic and includes references to additional information, where available. The IAA will update and maintain these chapters and their interrelationships on an ongoing basis on its website. The Risk Book is available to the worldwide actuarial profession and all those concerned with the sustainable governance (via identification, management and communication) of insurance operations.

This paper has been produced and approved by the Insurance Regulation Committee of the IAA on 29 September 2015. *To submit comments about this paper please send an email directly to riskbookcomments@actuaries.org.* ■

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ENDNOTES

1. An important contrast between banking and insurance is that insurers use these tools to estimate, report on, and manage their liabilities of unknown value in comparison with the usually straightforward market value determination of their assets. Banks have the reverse situation—the value of their liabilities (deposits) is easily known, but the value of their assets is not. Thus, banks have applied some of these tools and techniques to their assets (such as loans made to individuals and businesses), without, unless specified by their regulators, of a consistent professional approach and methodology that are effectively integrated into their regulatory framework.
2. A common approach will assume a frequency/severity model (or one based on frequency and/or timing) for calculating all risks. While applicable to most life and pension coverages, and for many non-life (property and casualty) offerings, each coverage and loss type can have its own frequency and severity distribution. In practice, for products with multiple loss types/coverages, the focus is generally on aggregate loss estimates over all loss types, not the individual "odds" or probabilities for frequency and severity (which may never be explicitly calculated for some products).
3. A colloquial (i.e., Wikipedia derived) definition for the actuarial control cycle is a set of specific activities that involves the application of actuarial techniques to real world business problems. The actuarial control cycle requires a professional within that field (i.e., an actuary) to specify a problem, develop a solution, monitor its consequences, and repeat the process. (*https://en.wikipedia.org/wiki/Actuarial_control_cycle*) Actuarial organizations worldwide are increasingly integrating the actuarial control cycle into their examination/qualification processes as a framework that helps to define actuarial projects. (*https://en.wikipedia.org/wiki/Actuarial_control_cycle)* Also, see diagram (x) at the end of this paper. This cycle has been the foundation for emerging actuarial professional processes for ERM and Model Governance that will be further discussed in this Risk Book. It is also a standard engineering concept used in many traditional engineering fields.
4. Many of these tools are also used by banking supervisors, but their perspective and purpose may differ. For example, the time horizon for identifying and addressing a banking crisis may be a matter of days, while for insurance it may be many months or years. In addition, once intervention actions are needed, the banking supervisor often has complete fungiblity to move capital throughout a series of legal entities within a group, while the insurance supervisor may need to freeze all funds in related entities.
5. And, could it also be interactive and show different levels of resolution (e.g., like Google maps) and serve as a mass collaboration tool to communicate and sense and respond to emerging risks?

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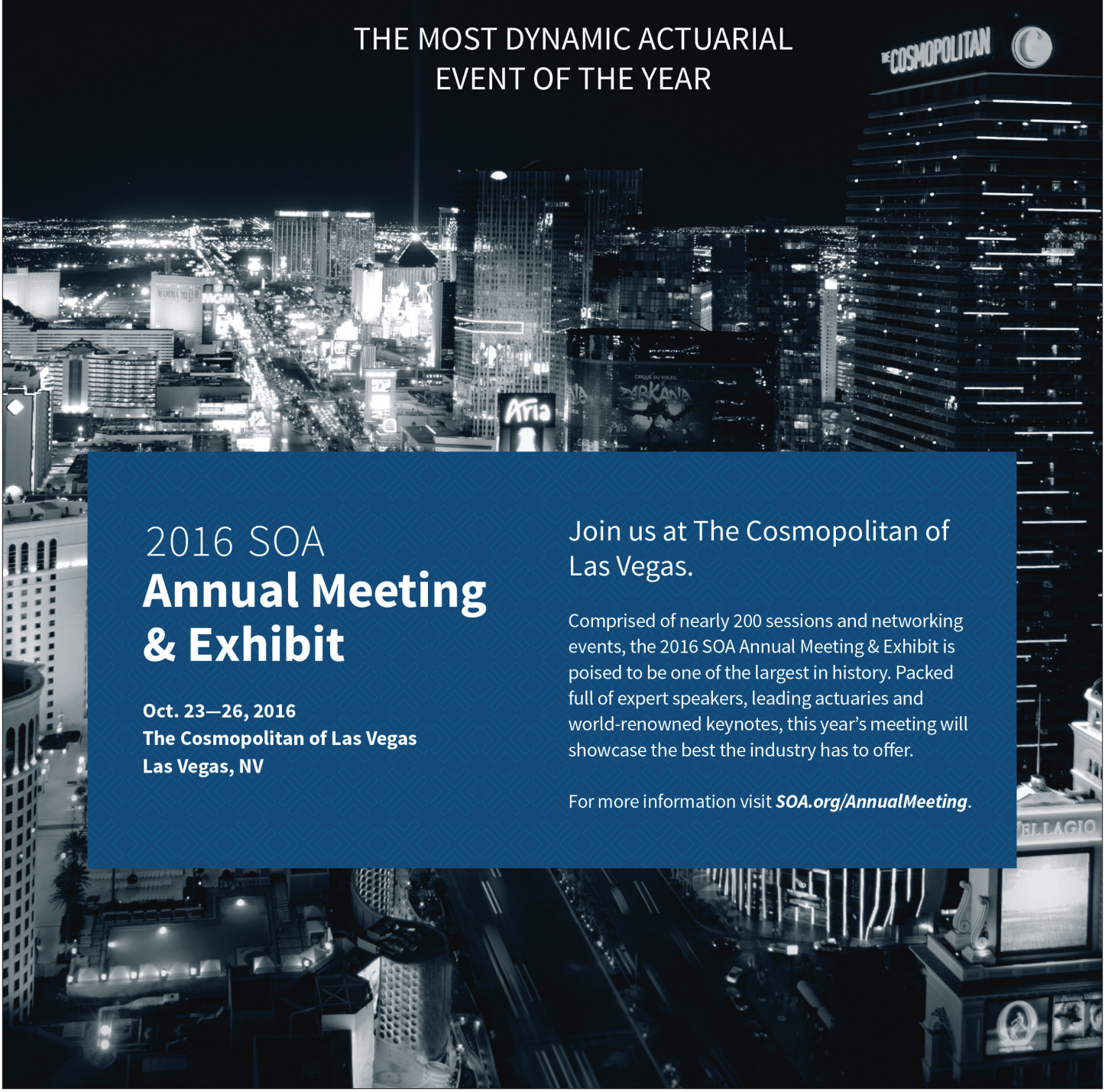

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A Discussion of Canadian and U.S. Capital Adequacy Requirements

By Yi Zheng

I. INTRODUCTION

The solvency regulation of financial institutions is undergoing significant changes in many countries and regions around the world. The globalization and integration of financial services, ever increasing complexity of insurance and financial products, the need to level the playing field, increased protection to customers and significant advances in the theory and practice of modern risk management are among the reasons for the changes in solvency regulation.

This article demonstrates and explains the differences between the current Canadian and U.S. capital regimes on life insurance companies. The concept and framework of regulatory capital is first introduced and Canadian regulation capital requirements—minimum continuing capital and surplus requirements (MCCSR) and U.S. regulation capital-risk based capital (RBC)—is explained and compared.

II. CONCEPT AND FRAMEWORK

1. What is insurance company's capital?

- Equity of shareholders of a stock insurance company
- Measured by the difference between its assets minus its liabilities
- Protects the interests of the company's policy owners

Generally speaking, capital is wealth in the form of money or other assets owned by a person or organization, which is available or contributed for a particular purpose such as starting a company or investing. Insurance companies worldwide, just like financial institutions (e.g., banks), are covered by a regulatory capital framework. Capital regulations aim to protect policyholders and creditors; they ensure that insurance companies maintain healthy capital in order to fulfill their policy obligations.

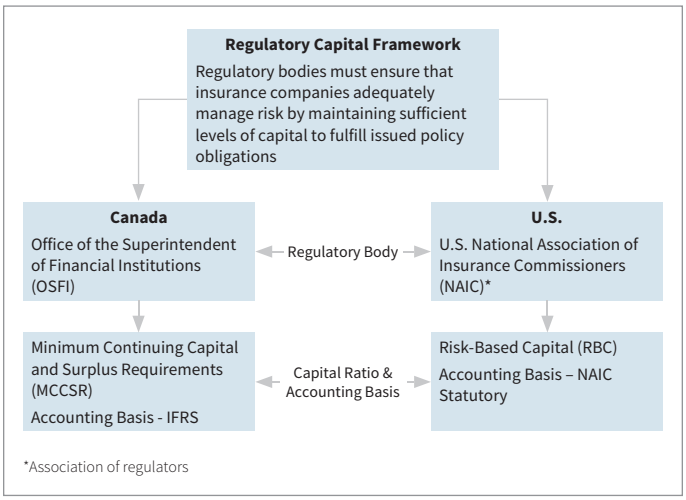
Canadian (MCCSR) and U.S. (RBC) regulatory capital is measured as a ratio:

$$\frac{\textit{available capital}}{\textit{required capital}}$$

Regulators require insurance companies to maintain specified levels of capital in order to continue to conduct business. While international discussions are driving some convergence in regulatory capital requirements around the world, there are still significant differences by countries.

This article focuses on Canadian and U.S. regulatory capital requirements with an emphasis on asset default risk.

2. Regulatory Capital Framework



III. MINIMUM CONTINUING CAPITAL AND SURPLUS REQUIREMENTS (MCCSR)

Available Capital	Required Capital
Based on IFRS Balance Sheet Capital Position	Based on explicit risk based requirements covering various types of risk (see below)
Tier 1: Core Capital Common equity Non-cumulative preferred shares Innovative instruments	**Asset Default and Market Risk:** Covers losses resulting from asset default and loss of market values of equities
Tier 2: 2A – Hybrid instruments 2B – Limited life instruments 2C – Other	**Insurance Risk:** Mortality, morbidity, and lapse risks
	Interest Rate Risk: Risk associated with asset depreciation arising from interest rate shifts

Available capital is comprised of two tiers:

Tier 1 (core capital) comprises the highest quality capital: e.g., common equity, perpetual non-cumulative preferred shares, certain innovative instruments. "Innovative Instrument" means an instrument issued by a special purpose vehicle (SPV), which is a consolidated non-operating entity whose primary purpose is to raise capital. A non-operating entity cannot have depositors or policyholders.

Tier 2 (supplementary capital) has three different grade levels (Tier 2A, 2B, 2C). Hybrid capital includes investments that are currently permanent in nature and that have certain characteristics of both equity and debt; Limited life instruments are not permanent and include subordinated term debt and term preferred shares; and other capital items.

Required capital is based on explicit risk based requirements covering various three major risks: asset default and market risk, insurance risk, and interest rate risk.

- **Investment returns (equity and interest rates):** assumptions are made about the rate at which future premiums will be invested and actual returns could fall below expectations. As well, for the annuities business, return assumptions are factored in, and actual returns could fall below expectations.
- **Credit:** life insurance companies are large investors in bonds, real estate, mortgages, etc., and while actuarial liabilities include an assumption for credit losses, actual experience could trend above expectations.
- **Mortality:** life insurance companies assume a certain level of individual death when setting up reserves (based on mortality tables) and actual experience could be worse. It is noted that for life insurance, higher mortality rates are bad, but for life payout annuity businesses, higher mortality rates are actually good for earnings.
- **Lapse:** life insurance companies assume that a certain percentage of policyholders stop paying premiums and let their policies terminate. When this occurs, under most circumstances, proceeds already paid are no longer required to back the terminated policy, and are used to support other policies. There could be fewer terminations than assumed and therefore less residual funds.

IV. RISK BASED CAPITAL (RBC)

1. RBC Application

The risk-based capital (RBC) ratio is used to evaluate the capital adequacy of insurance businesses in the U.S. by the National Association of Insurance Commissioners (NAIC).

- NAIC statutory reporting basis is used
- RBC measures the ratio of available capital to required capital
- RBC is calculated for all U.S. insurance companies
- The confidential calculation is filed annually with the state of domicile
- RBC is filed annually with the state of domicile

2. Risks Covered by Risk-Based Capital

- Asset Risk—Affiliates (C0): represents the risk of default on assets for affiliated investments and risk on off-balance sheet items, including non-controlled assets and guarantees on affiliates and contingent liabilities.
- Asset Risk—Other (C1): measures the potential for default of principal and interest or fluctuation in fair value of assets as well as concentration risk.
- Insurance Risk (C2): covers the possibility that policyholder premiums or reserves turn out to be insufficient to meet obligations.
- Interest and Market Risk (C3): measures risks associated with changes in interest rates as well as risk of losses due to changes in market levels associated with variable annuity products with guarantees.
- Business Risk (C4): based upon premium income, annuity considerations and separate account liabilities; also included in exposure is litigation and certain accident and health coverage.

3. Regulatory Action

The authorized control level is set at 200 percent. If not, here are some of the regulatory actions they may take.

% of Authorized Control Level RBC*	Regulatory Action	What This Means
>200%	No Action	Passed. No Action Required
150%–200%	Company Action Level	Company required to submit plan for corrective actions
100%–150%	Regulatory Action Level	Commissioner requires a corrective plan, performs examinations, and issues corrective orders
70%–100%	Authorized Control Level	Commissioner authorized to take all regulatory action to protect interest of policyholders and creditors
<70%	Mandatory Control Level	Commissioner authorized to put company under regulatory control

At the company action level, the plan could include adding capital, purchasing reinsurance, reducing the amount of insurance written, or pursuing a merger or acquisition.

Regulators are given the ability to react quickly and legal authority to intervene in the business affairs of an insurer that triggers one of the action levels.

V. CONCLUSION

In this article, the regulatory capital requirements under current Canadian and U.S. regulatory regimes are explained and compared. In Canada, public insurance companies use International Financial Reporting Standard (IFRS) which is based on economic valuation principle. In U.S., NAIC statutory accounting basis is used which focuses on tail factors impact. Better understanding of these two regimes will help insurance companies establish a better framework on capital risk management and increase the efficiency and effectiveness of business. ■

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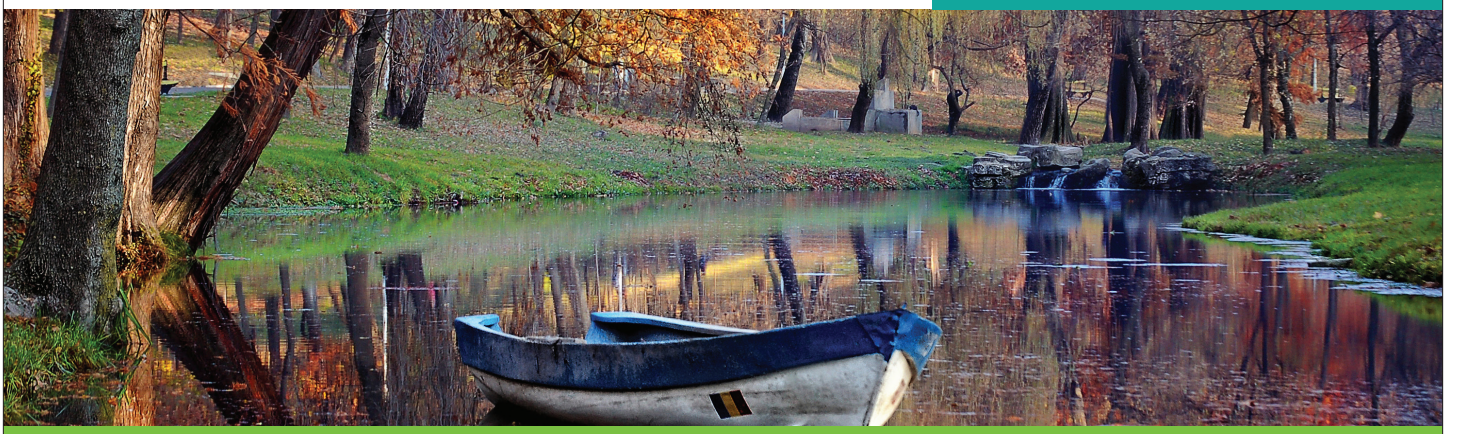

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ORSA Experience: a consultant's view

By Syed Danish Ali

This brief article details my observations as a senior consultant for a leading actuarial consultancy across the Middle East and South Asia. I have three years of experience working for insurance clients in the Middle East, Pakistan and Sri Lanka. It should be noted that in many countries where I have experience, Solvency 2 and ORSA are not regulatory requirements (so far I have only seen it in Qatar).

ORSA has been helpful in shifting the focus from results orientated to process orientated approach in companies where it has been implemented. A process oriented approach allows us to separate efforts from results, which are not positively correlated most of the time. External and complex factors, as well as some random factors with their interconnections, continue to dominate the space between efforts and results. Despite our best efforts, many external risks, like financial contagion to natural catastrophes, can potentially bring ruin in results of companies.

ORSA might be perceived as more technical then it actually is, due to communication gaps and barriers between the different stakeholders involved. To provide a more common ground for mutual understanding, we actuaries have to emphasize that ORSA is not just a problem to be solved—it is a process to be lived. That is why we should continuously try to nurture a mindset in which balancing of risk and rewards is fused in the very fabric of management decision making. We do recognize that better than many sophisticated terminologies, are simplified explanations that bring about clarification. At the same time, we appreciate that there is more reason in data than many of our opinions. One plus one is not generally two when taken across aggregate of huge datasets.

One of the most contentious debates is over the level of complexity to be adopted in the technical and business sides of operations. Technical specialists advocate higher sophistication whereas management usually prefers modeling that is understandable to them. In the context of ORSA, this can be brought to the surface via various issues. Formulaic approaches apply a well-established rule of thumb, or simple factors, to assess capital adequacy which are deterministic, whereas stochastic approaches favor increasing complexity and massive computing and modeling power.

Both sides have their own merits. Each side is just expressing a different perspective of a difficult problem. Factor based methods introduce a powerful simplicity in the calculations required, rendering it easier to narrow the communication gap between the management and the technical specialists. However, many products function non-linearly which is not so neat and simple, and stochastic modeling can uncover such non-linear impacts better.

Another way this conflict can be brought to the surface is management's emphasis on business realities being different from what the consultant advises—as they are isolated from market ground realities. In their pure extreme forms, management spectrum is as dangerous as the clichéd consultant spectrum.

Nassim Nicholas Taleb makes an excellent observation when he notes that the stakeholders do not have "skin in the game"—meaning their observation is divorced from action, leading to understatement of the true risks involved. This is exemplified in its pure and extreme form by the gap between the insurance company management and the consultants. Management is involved in ORSA usually for credit rating or for regulatory sake. Hence, it is seen mostly as a burden by them. On the other hand, consultants are far away from the action and the ground realities and hence focus on mathematical integrity and beauty while sitting on a stochastic time bomb, due to lack of appreciation of the true risks involved.

But in the more realistic grey areas, management and consultants can and do try to minimize communication gaps and complement each other, as management can bring in much needed business awareness and the consultants can merge it with their data orientation to reveal the bigger picture holistically.

Risk culture is foremost for any ORSA exercise because the financial and insurance sector is not solely run by quantitative numbers, but by the underlying human psychology as well. It is up to the risk culture to not antagonize in binary opposites, but reach the middle ground to converge communication and mentalities between different stakeholders.

Reaching this middle ground is worthwhile, considering the challenges for ORSA implementation that I have seen as a consultant:

- **Making ORSA mandatory is a double edge sword.** This is the biggest challenge I have seen in my experience. A company does not bother to do it, so some regulators—like those in Qatar—make it mandatory. But with making it mandatory, it comes to be seen as a regulatory burden rather than exercise in learning more about the business and the risks it faces.
- **ORSA does not come on its own.** When there is a focus on ERM or capital modeling, then as part of those initiatives,

ORSA starts getting attention, too. So if we want to make ORSA more commonplace—especially in countries where there are no regulations for ORSA—we should propagate ERM further.

- **Breaking down silos.** Silos are not perceived as a disadvantage by a company's management and are deliberately made so that no one function or department has the whole data and to prohibit the holistic data and its massive power going into another's hands through any form. We should acknowledge that we are aware of this criticism and that is why holistic data is only given to few top posts in the risk hierarchy with adequate safeguards and controls in place.

- **It is extremely difficult to break traditional hierarchies.** In traditional hierarchies, there is no risk department or Chief Risk Officer (CRO) at a director post. Trying to convince management of the need for a risk department or CRO means garnering a lot of lip service from management. The management does want to appear progressive and modern-but power sharing at the board level with a CRO is another matter altogether. That's why there is no senior CRO post at the senior management or director level and hence this lack of risk leadership means that not just ORSA—but other risk initiatives like ERM, capital modeling, catastrophe modeling, etc.—also suffer. My personal favorite suggestion is to focus on the shale oil and that we need to do stress testing as GCC is suffering from lower permanent oil prices due to shale oil at enormous magnitudes. Once an insurance company is convinced of stress testing, they become lenient and less hard to sell regarding approval for ORSA reporting. Life insurance marketing tactic works quite effectively here that once the customer agrees to do a small favor for the sales agent, they will also likely do bigger favors.

- **ORSA reporting without integration.** It is very easy to hire a consultant and make him draft an ORSA report after few days of interviews with the company's management, but it is extremely difficult for leading managers of the company to fully understand the ORSA reports and make it business-as-usual to integrate the findings and attitude obtained from reports in their daily working routine. As a result, once a year, a consultant makes ORSA report and after showing it to credit rating agencies or regulators, it is put in the cold storage for another year.

ERM programs are facing similar difficulties across the world: effective buy-in from management, compliance exercise vs. company owned management tool, balance between simplistic risk measurement and impenetrable stochastic models, fuzziness of risk culture and so on. These difficulties are heightened in the Middle and South Asia where ORSA is rarely a regulatory requirement. Thus ERM programs are facing headwind that could be detrimental to the quality of the decision making process at the company from this part of the world. ■

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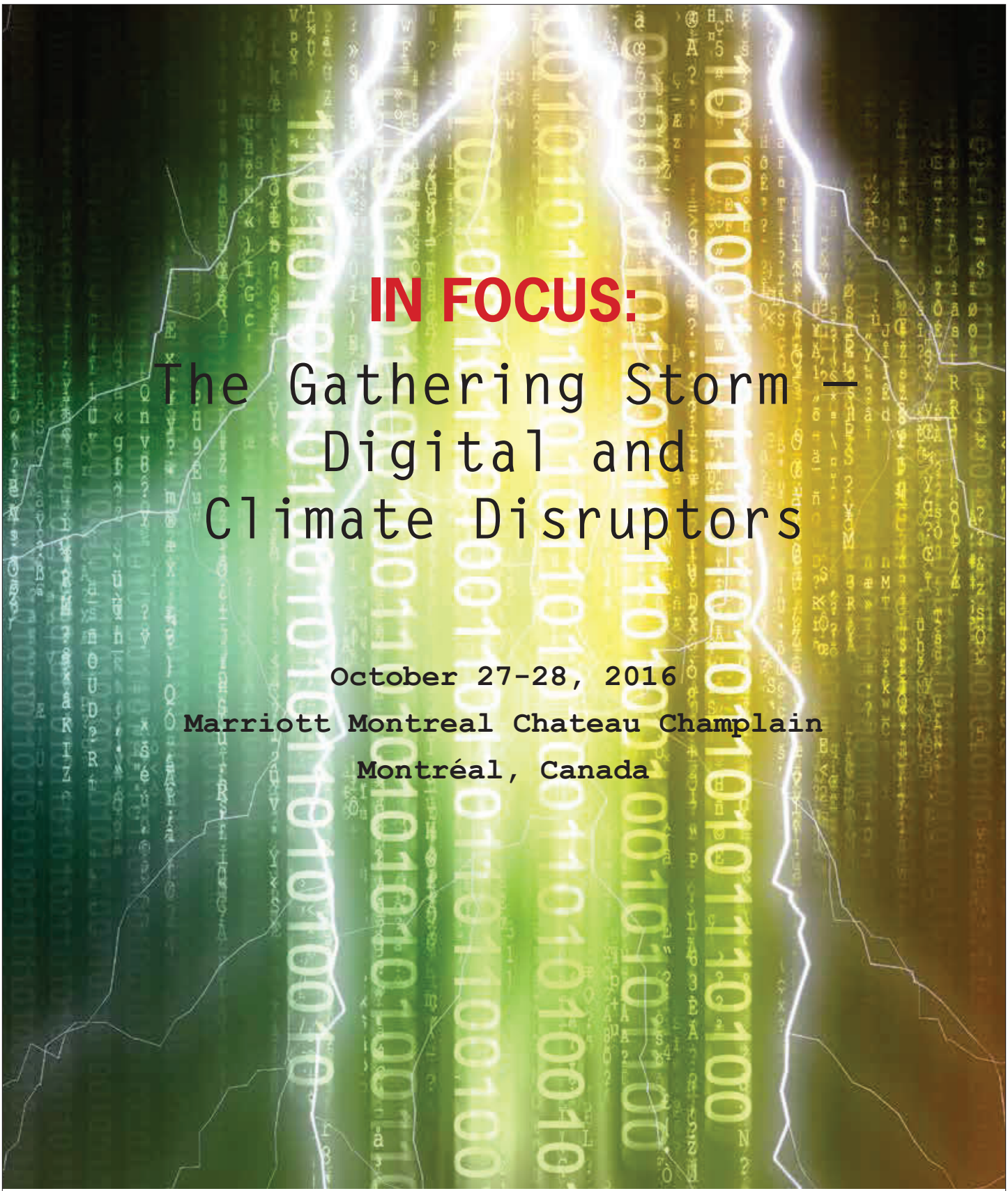

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