

# Risk Management

ISSUE 42 • AUGUST 2018

JOINT RISK  
MANAGEMENT  
SECTION



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# Risk Management

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## Issue Number 42 • August 2018

Published three times a year by the Joint  
Risk Management  
Section Council of Canadian Institute of  
Actuaries, Casualty Actuarial Society and  
Society of Actuaries.

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This newsletter is free to section  
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### Publication Schedule

Publication Month: December 2018  
Articles Due: August 24, 2018

# Chairperson's Corner

By C. Ian Genno

As you open the pages of this issue of the newsletter, I'd like to take a moment of your reading time to highlight some of the initiatives the Joint Risk Management Section has been pursuing since my last update.

The ERM Symposium is the section's flagship continuing education and networking event each year. This year's symposium offered a wide range of content and perspectives, and a valuable opportunity for risk management professionals to engage in informal networking conversations with a broad cross-section of peers. Over the course of two days, participants had opportunities to hear presentations and participate in discussions in more than 30 sessions, on topics covering risk modelling, risk culture, capital management, case studies illustrating new applications and approaches, and more. In particular, noted ERM innovator and author James Lam delivered a key-note presentation highlighting perspectives on the historical context for today's ERM environment, establishing effective risk governance and feedback loops, and vulnerabilities in how we manage cyber-security risk. If you had the opportunity to attend this year's symposium, I hope you'll join us again next year; and if not, please take a look at the presentation materials that have been posted on [ERMSymposium.org](http://ERMSymposium.org), and watch for next year's line-up of speakers and topics.

We continue to participate in the planning and coordination for risk management related sessions at a number of actuarial conferences each year. To date, we've helped contribute to sessions at the Life and Annuities Symposium, Valuation Actuaries Meeting, Health Meeting, and CIA Annual Meeting; upcoming sessions will be featured at the CAS and SOA annual meetings in the fall. Section council members provide perspective and input on risk management themes, relevant topics and speakers for each of these conferences. And in a number of cases the section also provides sponsorship support to help ensure the financial viability of conferences and reduce the registration costs borne by participants.

Planning work continues for a series of upcoming webcasts, providing members with a quick and cost-effective way to gain access to CPD opportunities on current issues, while eliminating travel time and cost. Upcoming webcast topics include risks arising from climate change; the impact of new EU legislation on data protection and privacy, and how this connects with management of cyber-security risk; investment risk; and emerging risks.

As highlighted in our last issue, if you've missed some of our past webcasts, you can now take advantage of free access to recordings of section-sponsored webcasts that are one year or older, with offerings updated each quarter. Simply log into the Joint Risk Management Section Community which is housed at [engage.soa.org](http://engage.soa.org).

To provide section members with access to relevant in-depth reading material, we maintain an e-book library with links to a curated selection of books and articles. We review and update the library on a regular basis, and several interesting new titles have been added recently. I encourage you to take a look, at [soa.org/sections/joint-risk-mgmt/joint-risk-mgmt-ebSCO-elibrary/](http://soa.org/sections/joint-risk-mgmt/joint-risk-mgmt-ebSCO-elibrary/).

The section collaborates with its three sponsoring organizations (the CAS, CIA and SOA) to help provide ideas as well as financial support for risk management research. While grounded in solid theory, the focus of this research is on practical insights that actuaries and other risk managers can apply in day-to-day work. Current themes include emerging risks, and the impact of climate change on the modeling and pricing of catastrophic risk coverage. You can read more on risk management research at [soa.org/research/topics/risk-mgmt-topic-landing/](http://soa.org/research/topics/risk-mgmt-topic-landing/).

And as always, we continue to focus our time and attention on this newsletter. Once again I would like to acknowledge the significant initiative taken by the editors and staff to source interesting and relevant articles; without their ongoing effort, this newsletter simply wouldn't be possible. I hope you'll enjoy reading it today. You can find back issues of the newsletter and stay up-to-date with JRMS activities at our section webpage, [soa.org/jrm](http://soa.org/jrm).



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# Editor's Note

By Cheryl Baoyan Liu

These days, it is difficult to pick up a newspaper without running into an article about digital technology, FinTech, or artificial intelligence (AI). Over the past years, through digital technologies, predictive analytics is excelling customary statistical techniques in many aspects of insurance business, to deliver more compelling insurance products and services. It not only changes the way actuarial practices work, but also influences the approach to risk strategy.

We discussed the technology interruption on the insurance industry in the March issue. To take a profound dive, in this August issue I'm excited to bring articles to our readers on how predictive analytics reshapes the insurance practice and risk strategy, as well as an assortment of articles offering insights into other risk management spaces.

The first article deliberating predictive analytic is from an inquiry presented at the 2017 Actuarial Research Conference (ARC) on health care fraud detection. In the March issue of *Risk Management*, Dr. Shaun Wang shared his investigation on "Modeling of Optimal Spending and Allocation on Cybersecurity" at the ARC. In this issue, Dr. Lieberthal and his team deliberate their research on a health insurance fraud detection method. This health care fraud study aims to develop a prophetic modeling approach to fraud risk management in health care claims. Understanding the components of health care fraud informs public policymaking, can reduce pressure and the cost of compliance for law abiding providers, facilities, and their patients with potential to spill over into private insurance, and detecting health care fraud has the potential to improve value in health care.

Furthermore, predictive analytics through evolving technological advances also allow life insurers to change the traditional risk management practice. "Proactively Managing Life Insurance Risks" by Feng Sun and Amy Tran, discusses the challenges facing life insurers proactively managing life insurance risk and explores the impending applications of new technologies to the life insurance industry in regard to life insurance policy monitoring and intervention programs for risk management.

Our feature article this issue is "A Review of Root Cause in Insurer Insolvencies and Impairments," by Dave Heppen and



Veronika Cooper. It provides a summary of a study sponsored by CAS, CIA and SOA, to look to causes of insolvency and decisions made by management, regulators and policy holders over the life cycle of the insolvency. It was envisioned to educate insurance professionals on historical insurer impairments and insolvencies, also to explore future prevention indicators that insurance professionals can monitor to mitigate future insolvent situations.

In the second in the "Conversation with a CRO" series, we're pleased to feature Lori Evangel, CRO of Genworth Financial. Lori shares her experiences and perspectives on the biggest issues facing the insurance industry today, the prospects for the LTC industry, cyber risk concerns and management, and the outlook of predictive analytics.

We then turn our focus to global climate change debate, which has evolved over time, and becomes a C-suite topic on corporate governance and risk management. Through a study of interviewing 62 c-level executives of global insurance industry, the Geneva Association provides the reader with awareness into the role of the industry as risk managers and investors in addressing climate change goals, targets, and risks. The study brings focus to key external challenges and opportunities facing the insurance industry in scaling up its contributions.

The fallout from the financial crisis altered variable annuity risk management solutions. Given the rapid embracing of volatility management solutions within VAs and their adoption in the broader marketplace, "Measuring Benefits of Variable Annuity

Volatility Management Techniques” by Raghu Ramachandran and Aaron Sarfatti, compares the three most recognized solutions in the volatility management front. With pros and cons, the authors anticipate continued interest in these controls and a push by insurers for innovative solutions that overcome challenges while providing significant risk management benefits.

Risk Management is at an international level. JRMS has frequent communication and exchanges information with other international risk associations. In this issue, we are pleased to share with our members some recent activities and initiatives in the risk management space from AFIR-ERM, a section of the International Actuarial Association (IAA), with a focus on promoting actuarial research in investment finance and enterprise risk management.

ERM Symposium was held in Miami from April 19–20, 2018. Two days, 31 risk sessions, over 180 attendees, made this a successful professional gathering and sharing event. The symposium

committee chairperson Mike McLaughlin provides highlights of the symposium in this issue.

Last and as usual, we provide a list of recent articles and papers that may be of interest to our members. These pieces can provide further information on a broad range of topics.

I would like to give special thanks to David Schraub and Kathryn Baker for helping me pull together this August *Risk Management* issue. Also, I want to express my sincere appreciation for the wonderful suggestions from our members that I receive over time. With these ideas, feedback, and recommendations, the newsletter is growing stronger. If you have more to share, please feel free to email me at the address below. Enjoy reading!



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# Staff Corner

By David Schraub

Many risk managers were at the ERM Symposium in Miami a few weeks ago. This yearly meeting is always a great opportunity to reconnect with old friends and interact with new people, and to learn many new tricks to perform risk management at a higher level. Allow me to share the beginning of a nice conversation that started at a Wednesday evening dinner meal with some pioneers in the risk management space, past chairs of the JRMS or the ERM symposium. This discussion continues now through email between the few of us, and now with you, reader of the JRMS newsletter: What do you think about the evolution of the role of actuaries in the risk management space?

## HOW TO MEASURE SUCCESS?

Should success be measured by the number of actuaries in CRO positions or by the number of actuaries employed in risk management roles? Or by the role and reach of the CRO position itself? Reading the visions of the CAS: “Actuaries are recognized for their authoritative advice and valued comment wherever there is financial risk and uncertainty,” CIA: “Actuaries are professional business people who are skilled in the application of mathematics to financial problems,” and SOA: “Actuaries are highly sought-after professionals who develop and communicate solutions for complex financial issues,” my definition of success would be number of actuaries employed in risk management roles, as long as quality is not sacrificed for quantity.

## HOW TO FOSTER SUCCESS?

Lobbying for a regulatory protection (e.g., CERA credential needed to sign ORSA, to be CRO at insurance companies) may be unsuccessful due to the low number of CERAs in senior positions, but more importantly could be counter-productive as it may pigeonhole risk managers in compliance and regulatory roles.

Trying to place actuaries at the top should help bring more actuaries into risk management in insurance industries. This means we should teach strategy, which requires synthesis and not analysis. (Note that we need to equip a small fraction of



L-R: David Schraub, Mike McLaughlin, Max Rudolph, Dave Ingram, and Barry Franklin

actuaries that will then pull the rest of the profession.) And we should encourage the CRO being part of the strategic decision making (which may or may not conflict with the three lines of defense model, depending on the exact definition of the CRO role). We are able to see long-term trends, and able to suggest plans that go beyond the myopic short-term horizon dictated by financial reporting and analyst expectations.

And what about outside the insurance and pension sectors? Risk management for industrial companies could be an answer to the current oversupply of actuaries at the entry level.

## WHAT IS OUR COMPETITIVE ADVANTAGE?

Actuaries have long-term future modeling skills. Most other professions look in the rear view mirror, relatively speaking. We are also extremely strong technically and our voice carries respect. This technical skill expertise gives us political capital, and allows us to speak truth to power if need be. But the downside to our deep modeling skills is that we could be viewed as shallow in other skill areas. One other competitive advantage is our code of conduct.

## LET'S WIDEN THE CONVERSATION

What are your thoughts as you are reading this? Do actuaries have a role to play in the risk management space? Please let us know and we will publish some reactions in our next issue. ■



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# Validating a Novel Health Insurance Fraud Detection Method

By Rebecca Elias and Robert Lieberthal

*Editor's Note: The 52nd Actuarial Research Conference (ARC) was held in Atlanta, GA in July 2017, with the theme "Actuarial Research at the Crossroads: Transcending Disciplines." Actuarial educators, practitioners and researchers gathered together to discuss the latest developments and to exchange ideas. In the March issue of Risk Management, Dr. Shaun Wang shared his research on "Modeling of Optimal Spending and Allocation on Cybersecurity." Continued in this issue, we have Dr. Lieberthal and his team to discussing their research on a health insurance fraud detection method.*

In a country where health insurance is the main way to pay for health totaling to \$3.3 trillion dollars, it is important to know how the money is appropriated. It is estimated that over 50 percent of health insurer spending on health care comes from social insurance programs such as Medicaid and Medicare.<sup>1</sup> Coupled with the increasing costs of health care in the United States, lowering health care expenditures and assuring the integrity of these payments is vital. This is what led Dr. Robert Lieberthal, assistant professor in Public Health at The University of Tennessee in Knoxville, along with Dr. Jing Ai of The University of Hawaii at Manoa and Dr. Patrick Brockett of The University of Texas at Austin to their most recent collaboration. The aims of their ongoing study are to devise a theoretical basis for predicting health care fraud and to apply PRIDIT, a method validated in other lines of insurance, to health insurance claims.

The benefits of a predictive modeling approach with health care claims data include cost savings, promptness of claim analysis which could lead to faster payment, and potential to enhance fraud detection techniques. Understanding the components of health care fraud informs public policymaking. Detecting health care fraud has the potential to improve value in health care, especially in social insurance programs such as Medicaid and Medicare. The savings from health care fraud detection can be redirected for expansion of other types of care. Furthermore, detection of fraud can reduce pressure and the cost of compliance for law abiding providers, facilities, and their patients with potential to spill over into private insurance.

This health care fraud study aims to develop a predictive modeling approach to fraud management in Medicare claims. The methodology for this study is to apply PRIDIT to determine suspicious scores for each claim and to determine the most important red flags for fraud. PRIDIT is a fraud detection technique producing a rank-ordered score for the intensity of a latent variable by identifying a relationship between this variable and a set of ranked predictive variables. Redit scoring is a method to relate the value of proxy variables such as claim size, patient characteristics, and provider characteristics to the suspiciousness of a given claim.<sup>2</sup> Then, principal components analysis (PCA) is applied to the Redit score to determine an overall score of claim suspicion based on the underlying variables.<sup>3</sup> This PRIDIT approach has been previously validated in multiple lines of insurance including consumer fraud in automobile claims.<sup>4</sup>

The savings from health care fraud detection can be redirected for expansion of other types of care. Furthermore, detection of fraud can reduce pressure and the cost of compliance for law abiding providers, facilities, and their patients with potential to spill over into private insurance.

Through applying and validating PRIDIT as a predictive method for detecting fraud in insured health care claims, the research team used 2009 calendar year claims from a 5% sample file of Medicare beneficiaries to test this approach. The 2009 calendar year claims data comes from the Medicare 5% sample file, a de-identified data file of a random 5% sample of traditional Medicare beneficiaries and their complete Medicare claims history (Parts A, B, and D). The identified fraud predictors included patient age, diagnosis count, claim payment amount, and total charges. The 5% sample is then split between Medicare-only and dual eligible individuals. The study sample included 453,941 Medicare-only beneficiaries with an average age of 76.8 years and 184,178 dual eligible beneficiaries with an average age of 78.4 years.

The identified fraud predictors included patient age, diagnosis count, claim payment amount, and total charges. The 5% sample



allowed for the research team to study specific populations that may be at risk for fraud. For example, they were able to split the study between Medicare-only and dual eligible individuals who are receiving both Medicare and Medicaid benefits. Potentially important predictor variables included the claim payment amount, total PPS capital amount, claim PPS capital DRG weight number, National Claims History (NCH) claim provider payment amount, and NCH carrier claim allowed charge amount. It is then up to analysts to decide the threshold for identifying suspicious claims for further investigation by human experts such as special investigative units (SIU) or law enforcement personnel. This was a research project, so no claims were forwarded to outside parties for further investigation.

In analyzing the data, a small number of highly suspicious inpatient claims and provider claims were identified, and validation variables and certain predictor variables were found to be more

useful for some diagnoses. While the researchers had access to two validation variables—claim processing time and distance from provider to patient—we are pursuing an independent expert evaluation of claims, comparing a validated sample to the results of any analytic method. This is as close as we can get to the gold standard of comparing adjudicated claims to court decisions on whether claims are truly fraudulent. Currently, this study is in the validation phase, where a medical doctor with clinical experience in the inpatient and outpatient settings with expertise in family medicine is analyzing the claims and determining fraud independently of the PRIDIT method. A forthcoming comparison of the results of the data mining method and the human expert approach is likely to inform both the validity of the PRIDIT methods and future approaches to examining health insurance fraud. ■



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#### ENDNOTES

- 1 National Health Expenditures 2016 Highlights. <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/highlights.pdf>
- 2 Bross, I. D. (1958). How to Use Redit Analysis. *Biometrics*, 18–38.
- 3 Brockett, P. L., Derrig, L. L. Golden, A. Levine, and M. Alpert (2002). Fraud Classification Using Principal Component Analysis of RIDITs. *Journal of Risk and Insurance*, 69(3), 341–371.
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# Proactively Managing Life Insurance Risks

By Feng Sun and Amy Tran

For life insurance companies, investment risks are actively managed; however, insurance risks are usually managed on ex-post basis. Other than scheduled activities such as crediting interests, adjusting certain charge or distributing dividends, life insurers rarely take actions during the lifetime of in-force policies. Strategic decisions such as stopping selling or conducting repricing exercise are made only when evidence have indicated that the experience deviated considerably from the initial pricing assumptions or the existing products are no longer feasible for the company and/or for the market.

The reason that the life insurance risks are passively managed is because life insurance contracts have limited flexibilities in the contract terms, in many cases the insurers are not allowed to make any changes, even when experience has suggested that certain intervention becomes necessary. In addition, implementing and maintaining real-time Dynamic Monitoring and Intervention System (DMIS) over long period of time can be costly.

Today's evolving technological advances could allow life insurers to change the traditional risk management practice. There are high-tech devices such as activity trackers that can be used to monitor fitness related metrics of policyholders. The information obtained through these devices can be further analyzed using data analytics, artificial intelligence (machine learning, deep learning) to assess policyholders' health status and better predict insurance risks on real-time basis with increased efficiency and affordability. Insurers can then use these results to see if certain critical actions need to be addressed sooner.

This paper will discuss the challenges facing life insurers, if proactively managing life insurance risk, and explore the potential applications of new technologies to the life insurance industry in regard to life insurance policy monitoring and intervention program for risk management.

## INSIGHTS FROM PEERS

Research shows that providing timely developmental feedback can help systematically improve individual performance by

recognizing past behaviors and to help influence and reshape their future behavior.

Progressive, one of the largest carriers of auto insurance in the United States, is among the first to leverage the power of new technology. The company allows its customers to use a mileage-based tracking device. For those policyowners who are willing to participate, Progressive offers potential discounts on their premiums based on the past driving records and habits to predict likelihood of future claims using data analytics.

The Vitality program (Vitality) has been successful around the globe in the life/health insurance space. The program allows policyholders to exchange activity data for insurance premium discounts. Upon signing up for the program, Vitality sends those insured wearable activity tracking devices such as Apple Watch or Fitbit to collect fitness activity data. Insured earn points for their activities. The more points they earn, the more they save each year on their life insurance premiums. The points also allow them to enjoy other benefits such as discounts on healthy food.

Today's evolving technological advances make it possible to better manage the insurance risks and ensure the profitability.

While those programs have been proven effective, there are costs associated with providing tracking devices, establishing and maintaining DMIS and researching the latest technology in order to manage the business. How do insurers benefit from this?

## Refine Underwriting and Manage the Risks

During the lifetime of an insurance policy, the risks associated with the policy evolve overtime. The discrepancy between pricing assumptions and emerging experience can grow, either favorably or unfavorably. Worst case scenario, if it turns out to be the case and left unattended, it could cause the company to be insolvent.

By tracking the insured's activities, through use of advance technology, the insurers are able to better predict the future claim occurrences (or timing of occurrence) and the size of the claim on real-time basis. This can lead to better pricing, better risk assessment and more effective risk management at the policyholder level.

Insurers can take certain action based on the real-time analysis. For example, insurers can raise the premium for the risky insured and reduce the premiums (or offer discount) for less risky (or preferred) ones. As the price for preferred insured drops, the product becomes more competitive in the marketplace and attracts more preferred customers. At the same time, the price for risky insured makes the product less competitive; as a result, those risky individuals are expected to shop around and may eventually go to the company's competitors for a better price. This helps the company to become more selective in terms of taking on risks, which is the more effective way to manage the business.

This not only helps the insurers make the price relatively fair across existing customers and ensure the profitability at policy level, but also helps insurers quickly react to any potential financial distress rather than living with outdated underwriting results for years.

### **Prevent Anti-selection and Enhance Transparency**

Treating the customers fairly across the board prevents anti-selection, it is an effective way to make policyholder distribution risk (such as age, gender, smoking status, etc.) for life insurers.

The insurers' price differentiation practice could help customers understand the price they receive and the mechanics behind how that price was calculated. Making the pricing transparent educates customers and drives positive behavior. If policyholders want to have a better price, they need to manage their behavior to reduce the risks. Whether to change their driving habits or to eat healthier or workout more to enjoy the discount or rewards, it ends with naturally building and maintaining stronger relationships between policyholders and insurers.

## **CHALLENGES FOR LIFE INSURANCE**

Vitality sets a good example to pioneer the application of the new technology in the life insurance space. However, the program is limited to enhance policyholders' positive behavior only. In order to effectively manage the risks associated life insurance policies, we need to expand the practice to influence both positive and negative behavior, and cover all products in the life insurance industry. This creates a number of challenges for life insurers.

### **Flexibility in the Life Insurance Contracts is Difficult to Obtain**

As mentioned before, developing products with flexible terms is the prerequisite to allow insurers to build DMIS. However, under the current regulatory regime, the filing is required beforehand when insurers launch a new product or request rate changes. It is a cumbersome and time-consuming process.

The regulators and/or legislators do not like the flexible terms. The regulators or legislators want to insurance terms to be predetermined at outset of a policy so that consumers have a peace of mind. They want to see options and guarantees for policyholders. Besides, they believe that refinement of risk classification diminishes the benefits of the risk pooling mechanism, and could potentially lead to discriminatory pricing, which poses potentially political, regulatory or legal challenges for insurers.

Policyholders do not welcome flexible terms either. Flexibility for insurers means uncertainty for the policyholders; this flexibility is essentially an option for insurers and this type of option has value, which is reason why policyholders do not want to give it away. Therefore, imposing more options make the insurance products less attractive to policyholders, less competitive in the marketplace as well.

### **While Positive Feedback is Easy to Accept, Negative Feedback Faces Resistance**

While policyholders enjoy discounts or rewards, they do not like price hikes or being punished for certain behavior. How about setting the price high enough to cover the loss from the worst case to start with? This leaves insurers enough room for applying the discount later and can avoid a price increase. This could work, but because of the high price, the product is less competitive. As a result, the competitors will take over sales.

### **Some Products Are Suitable, Some Products Are Not**

While providing a premium discount or reward to the healthy lives creates a win-win situation for life (mortality) and health products, it does pose a challenge for annuity (longevity) products.

Using payout annuity as an example, if the real-time tracking and data analytics tells an insurer that the health of an individual is deteriorating or the mortality is higher than expected, the insurer should pay higher annuity benefit by pricing principle. On the other hand, if an individual's health has improved, the insurer should reduce the benefit payments. This appears to contradict the mechanism to enforce the positive behavior and punish the negative behavior. Although the extra payment for an unhealthy individual can be interpreted as wish-you-well gifts from insurers to reinforce the customer relationship, there is no good reason to discourage policyholders from living longer by reducing the benefits.

### **Benefit the Society? Maybe Only to a Certain Extent**

Insurers are for-profit entities just like other financial service firms. Rewarding the positive behavior for life and health products happens to create a win-win situation, but the opposite can



also be true. When charging the high premium for the higher risk individuals, it makes the products less affordable for those who are in need; this could hurt society as a whole because it increases the uninsured or underinsured population. In this situation, the government or regulators have to step in either to force the carriers to take the risks or to create a mandatory/subsidizing program for those individuals. Otherwise, uninsured or underinsured could pose a threat to the public safety or social stability. At the end of day, these aforementioned programs are simply business management tools with both positive and negative societal impacts, but serve the insurers.

## APPLICATION TO LIFE INSURANCE

To ensure the profitability of the business and the solvency of the company, it is necessary to build an integrated DMIS to address some business issues in timely manner. In order to do that, insurers need to consider the following steps:

### Strive to Obtain Flexible Terms In Life Insurance Contracts

Lack of flexibility hurts both insured and insurer. As an example, if the policyholders' health status improved and there is no flexibility, they might have to surrender the policy and get a better deal, which may not be available in the marketplace; or the policyholder may incur a loss by doing the exchange. When the insurers feel a policy is mispriced and there is no flexibility, they have to live with it. If enough losses accumulate, it could potentially make the company insolvent, which ends up hurting the taxpayers and the economy.

To obtain flexible terms is difficult, but not impossible. Insurers should work with regulators and policyholders to demonstrate that the flexible terms are used for good, similar to Yearly

Renewal Term (YRT) or experience rating in the reinsurance treaties; it is used to share the risks and share the profits. Insurers not only need to achieve flexibility in the design of new products, but also need to explore the flexibility within existing policies.

The flexible terms can vary significantly across products. They can be straightforward—such as the future premiums or face amount will be adjusted based on the emerging experience for term insurance—or the future payout benefits will reasonably increase or decrease based on the real-time assessment of longevity factor of the insured for payout annuity products. As long as the adjustment is used to ensure the fairness across policyholders and to benefit the policyholders as a whole, it should be acceptable by both regulators and policyholders.

### Develop an Integrated DMIS

After launching new products with certain flexible terms, insurers may start to explore the feasibility of building ongoing DMIS. If deemed feasible, insurers need to go through a few steps such as the chart in Figure 1.

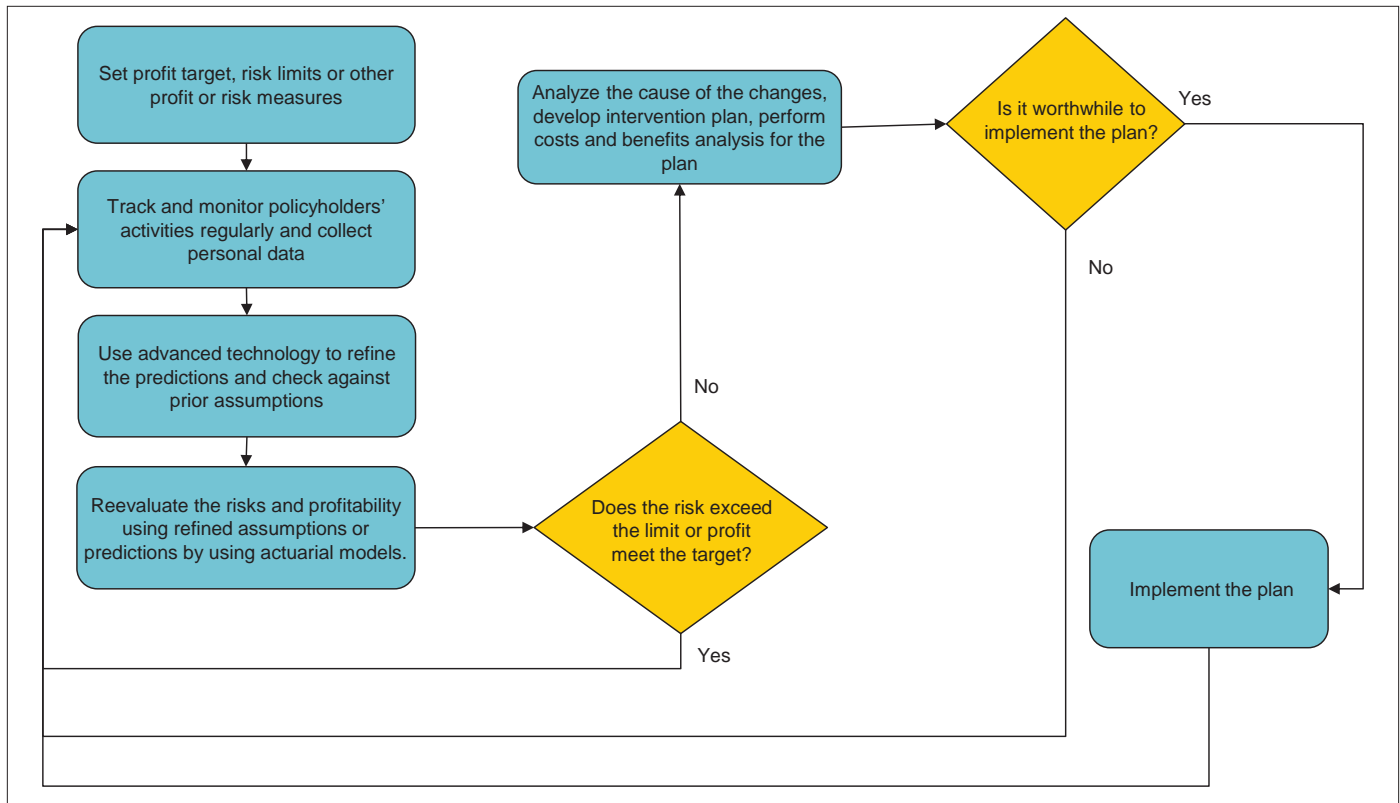
### Use the DMIS to Manage the Profitability and Monitor Risks

Once the DMIS is developed, the insurers can use it regularly to manage the risks. Assuming an insurer has developed the technology that can better predict the mortality and surrender for an in-force policy. Depending upon the updated profitability results by using actuarial models, the company can choose to intervene or not intervene. If they choose to intervene, depending upon the product design, the company can use the flexible feature identified earlier to take certain actions.

For example, for Universal Life (UL) product, if the insurer wants to encourage more premiums, they can offer an extra bonus (as percentage of the premium) to policyholders on the additional premium received. Alternatively, if the morality turns out to be worse than pricing, the company can increase Cost Of Insurance (COI) charges. In reality, there is a limit because the adjustment is subject to the guaranteed COI written in the UL contracts, therefore the full flexibility may not be able to obtain.

Predicting surrender is relatively more difficult than predicting morality because the surrender is usually voluntary. However, if analytics can be developed to better predict which individual is more likely to surrender the policy than others are, and if the test shows that the policy can bring more profits and the effort is worth taking, insurers can intervene and prevent it from happening. To do that, depending upon how much more profits the policy can generate, the insurer can create incentives to make the policyholder stay by providing a persistency bonus. Alternatively, the insurer can offer discount in premium or COI.

Figure 1



The intervention should be considered as a whole for a single policy. For instance, the policyholder has a UL policy, the system told an insurer that this person is healthy, has significantly improved recently and he/she is highly likely to surrender in the next month or two. A major intervention effort to prevent the person from surrendering becomes necessary.

Due to the long-term nature of life insurance contracts, before any action can be taken, long-term and short-term effects of the intervention need to be considered. If the system indicates that a certain change in a policyholders' prediction is temporary, taking no action may be appropriate.

In summary, the DMIS serves as a risk monitoring system, where insurers can use technology to influence policyholders' behavior and achieve the profitability goal as well as take actions to address unfavorable situations in a timely manner to prevent insurers from insolvency.

## CONCLUSION

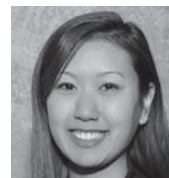
Currently, life insurance risks are managed on the ex-post basis because of challenges facing life insurers. Emerging technology

can help remove some of the obstacles and enable insurers to proactively manage insurance risks by building an integrated DMIS. The life insurance carriers should consider learning from their peers; redesign the products with more flexibility in contract terms, and embrace advanced technology to better manage the risks and profitability. ■

Disclaimer: The views in this paper represent the authors' personal opinions. It does not represent any statements or views of the corporation the authors affiliate with.



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# A Review of Root Cause in Insurer Insolvencies and Impairments

By Dave Heppen and Veronika Cooper

In 2016 and 2017, we conducted a study of root causes in insurer insolvencies and impairments, with the focus on analyzing potential risk factors and prevention measures. The study was sponsored by the Canadian Institute of Actuaries, Casualty Actuarial Society and Society of Actuaries (collectively the sponsoring organizations). It looked at causes of insolvency and decisions made by management, regulators and policyholders over the life cycle of the insolvency. In addition, the study considered ways the actuarial profession can be equipped to help prevent or mitigate future insolvencies. It was also intended to assist other insurance industry practitioners in understanding the complexities of insurance company solvency and the benefits

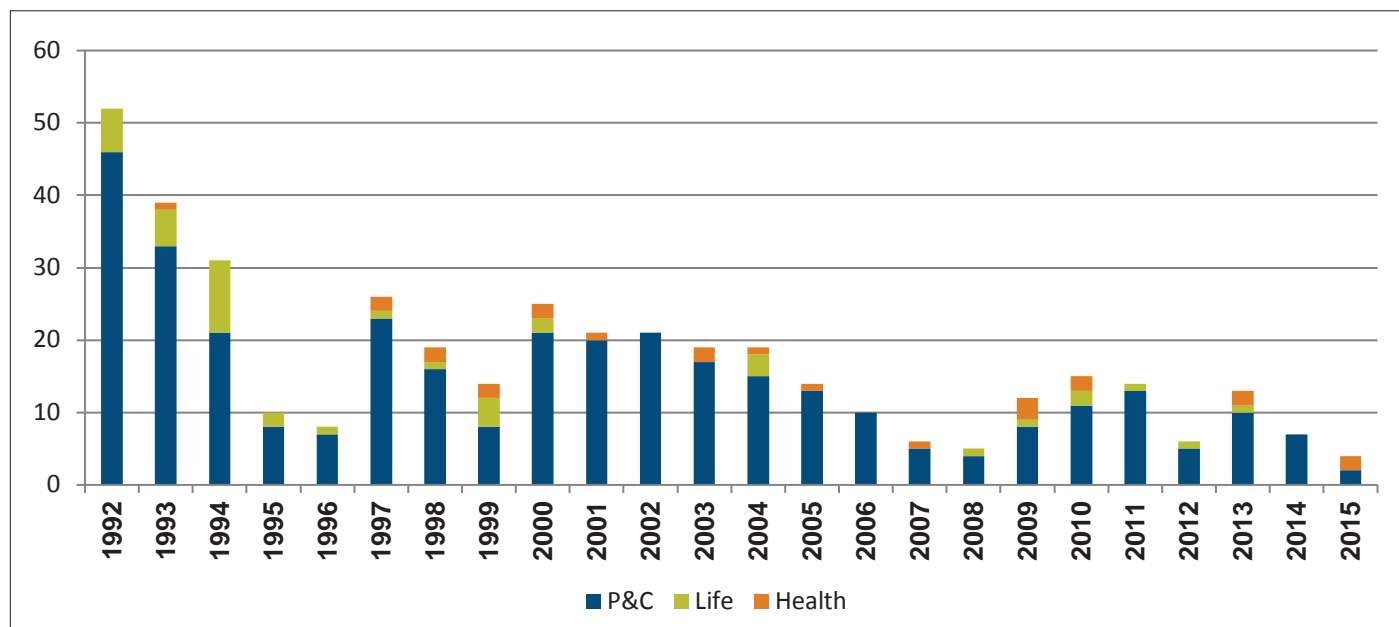
of keeping the actuarial profession in the forefront of company management, operations, and regulatory communication. This article provides a summary of our study. The complete report and case studies can be found on the SOA's website.<sup>1</sup>

The study considered insurer insolvencies in both the United States and Canada. In Canada, the insolvency rates are very low, and detailed studies have previously been conducted on both individual company insolvencies as well as insolvency from an industry-wide perspective. Our analysis used available studies and insights from previous research on Canadian insolvencies to draw comparisons and contrasts to observations on risk drivers in the United States.

Figures 1 and 2 illustrate the historical number of U.S. and Canadian insurer insolvencies by year and by product type. (Please note that there were no health insurer insolvencies in Canada for the period from 1992 to 2015)

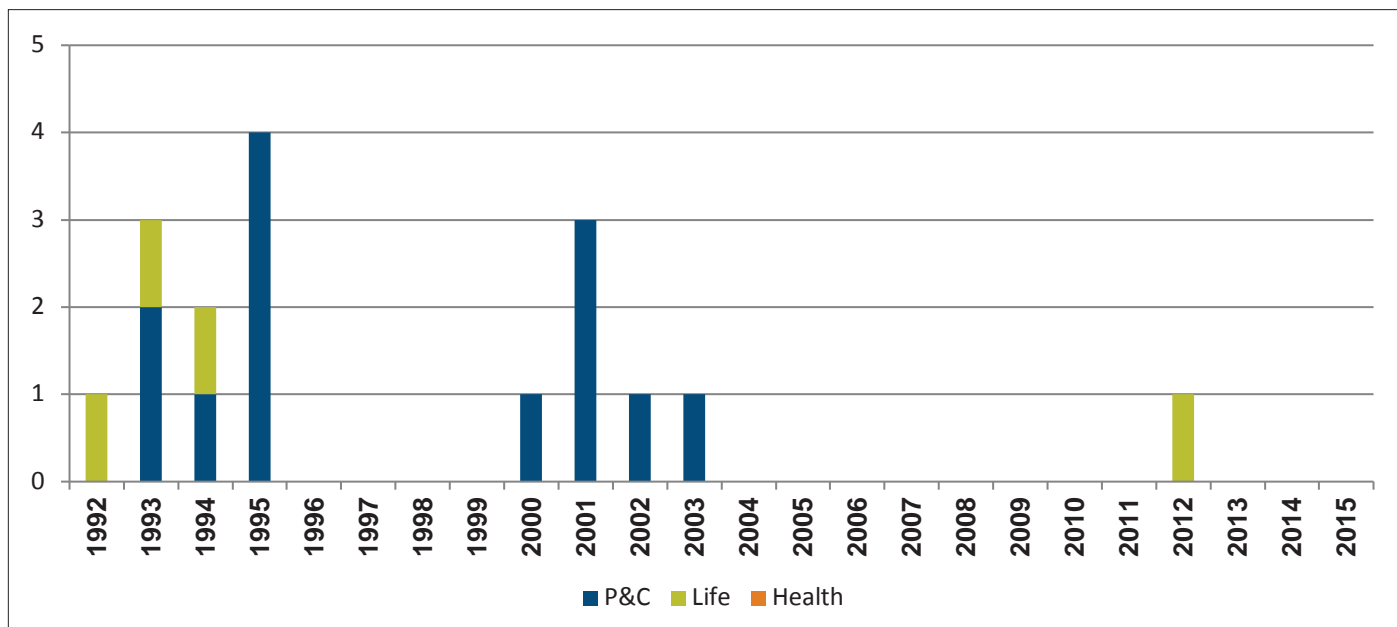
A key aspect of our study was the review of insolvency risk factors by cohort. The use of cohorts allowed us to compare insolvency risk factors across life, health, and P&C companies. The cohorts included P&C personal auto; P&C homeowners; P&C workers' compensation; P&C commercial liability; Life & Annuity, Health, including long-term care (LTC); and Health cooperatives.

Figure 1  
Number Of U.S. Insurer Insolvencies



Sources: National Conference of Insurance Guaranty Funds (NCIGF) and the National Organization of Life & Health Insurance Guaranty Associations (NOLHGA).

Figure 2  
Number of Canadian Insurer Insolvencies



Sources: Assuris and Property and Casualty Insurance Compensation Corporation (PACICC).

## RISK DRIVERS

During the course of the study, we developed two comparative views of risk drivers when performing the analysis of U.S. insolvencies. The first view was based on a review of a sample of U.S. companies' insolvencies by risk factor and cohort. The risk factors considered in the study were grouped into two major categories—financial and demographic. This view allowed for comparisons of the potential importance of particular risk factors for each company and cohort within the study, relative to all insolvent companies and cohorts included in the study.

The financial risk factors were:

- Premium growth
- Profitability
- Liquidity
- Investment
- Leverage
- Risk-based capital

The demographic risk factors were:

- Company size
- Number of years in operation
- Geographic concentration
- Product concentration

The second view was a comparison of the insolvent sample to the corresponding industry sample for each cohort, which allows for perspective on the extent to which the risk factors help distinguish insolvent companies from a broader industry sample with the same product focus. Risk factors are likely to be less useful in identifying potential insolvencies if they manifest the same way for insolvent companies as they do for similar going concern companies. They are more useful if they manifest differently, e.g., displaying higher risk characteristics for companies that ultimately experienced insolvency relative to similar going concern companies.

For example, one of the key risks identified as a potential insolvency driver for the U.S. companies was premium growth, and the charts below represent two main views (described above) for that risk. The first view includes only the insolvent sample of companies by cohort. Based on financial information for the companies in the study, we defined those companies showing low, medium, or high premium growth (and therefore low, medium, or high risk) in the years prior to the insolvency. It can be seen from the first view in Figure 3 that, among the insolvent insurers included in the study, high growth and high risk was present predominately in the P&C cohorts as well as the health cooperatives. In other words, the P&C companies and health cooperatives exhibited more risk associated with premium growth than the life or other health companies. The second view provides an industry overlay, in which the insolvent cohorts are

Figure 3  
View 1: Insolvent Sample

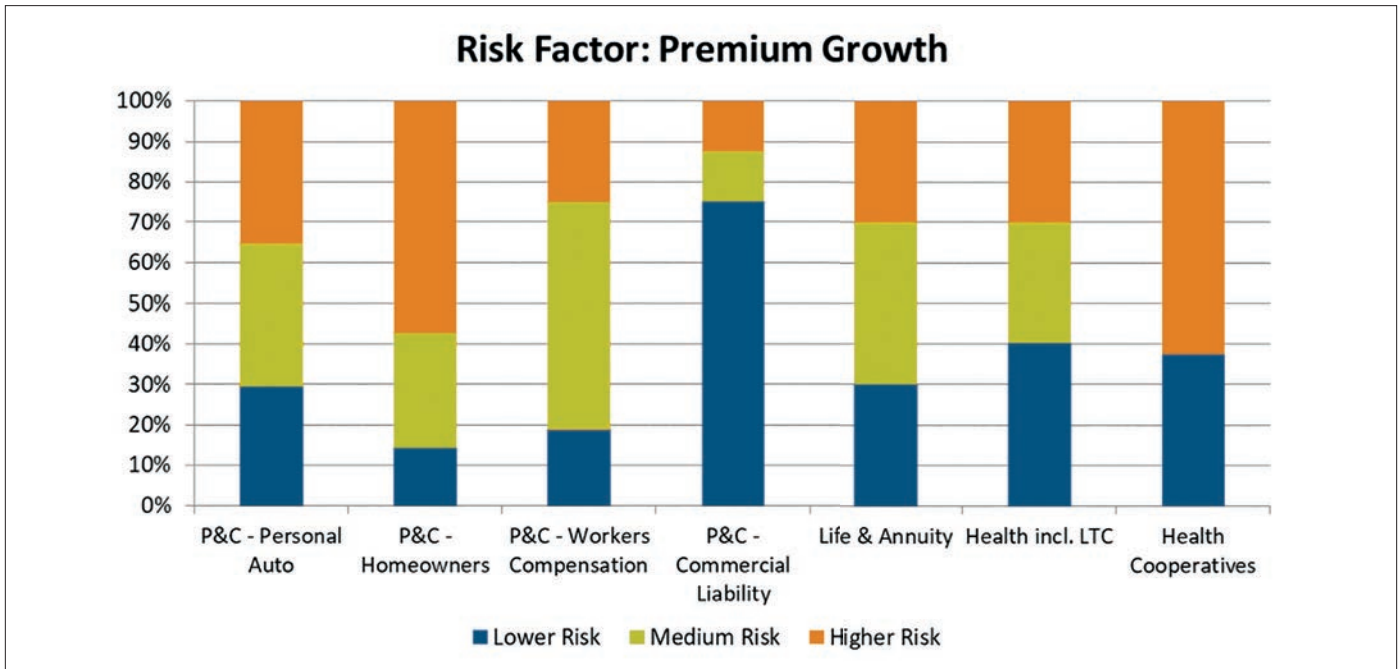
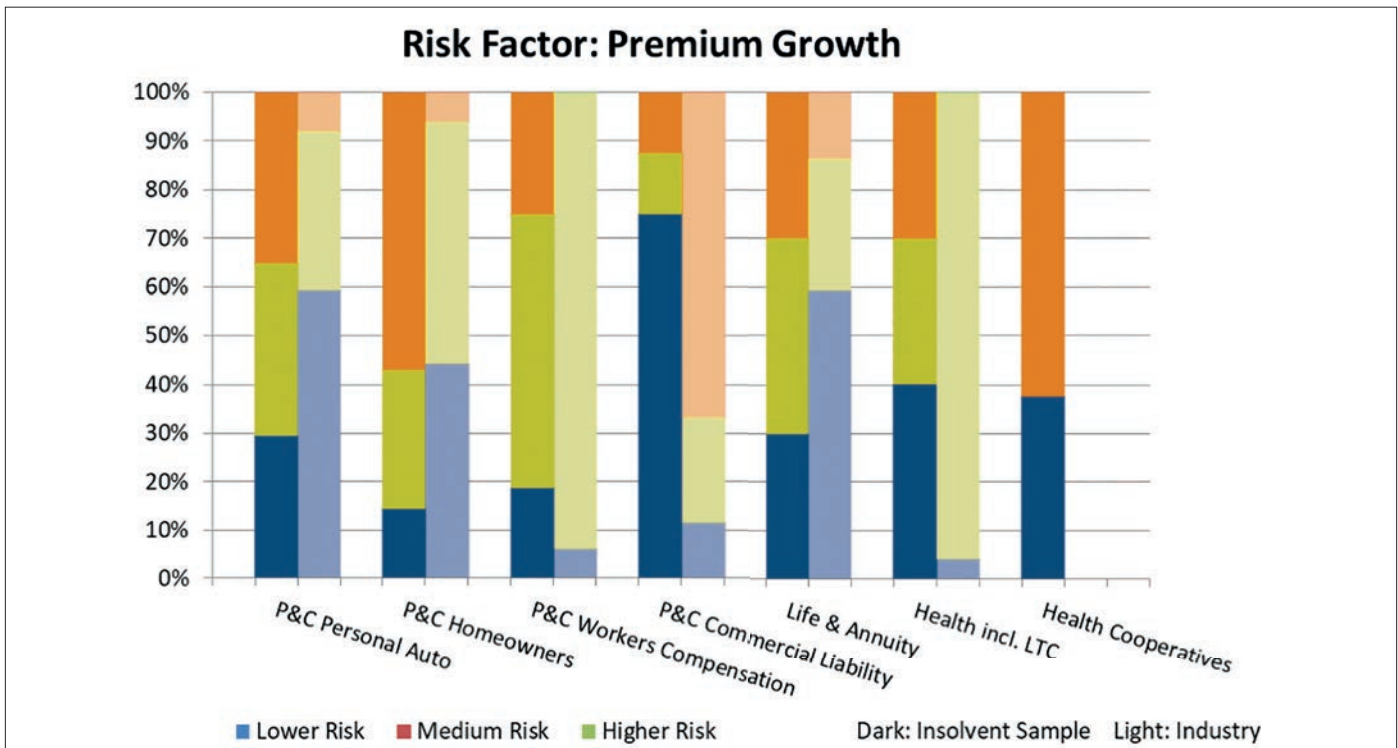


Figure 4  
View 2: Insolvent and Industry Sample





compared to the full industry set of companies in terms of premium growth and risk. This is shown in Figure 4 in which the insolvent sample and the industry sample are compared side by side with the industry shown in a lighter shade. The comparison shows a higher risk associated with premium growth for nearly all cohorts in the insolvent sample, which suggests this risk is a strong indicator of insolvency.

We used data derived from SNL Financial to develop these results for the U.S. companies, both for the insolvent cohorts and their industry counterparts.

## CASE STUDIES

In the earlier phases of the review, the focus was on analyzing the root causes of insurer impairment and insolvency across property and casualty, life and annuity, and health insurance in the United States and Canada with emphasis on potential indicators which may facilitate earlier intervention for companies at risk of becoming impaired or insolvent. In the later phases of the analysis, the focus shifted to specific case studies, where each case study targeted in-depth research on “what went wrong” for a life, health, and P&C insurance company. The goal of the case studies was to provide insight into potential actions that could be taken by actuaries and other insurance industry practitioners to help prevent or mitigate future insolvencies arising from similar circumstances.

Some insurer insolvencies point to one primary causal driver, such as fraud. However, a majority of the insolvencies evolved from multiple risk factors. The most significant of those were identified as financial risk factors. We also identified some of the key regulatory activities that now exist (or are under development) that may help detect issues that were present in some of the case studies under review. The regulatory activities include (but are not limited to) risk-focused examinations, regulatory stance on rate increases, reserve increase requirements, requirements for corporate governance, NAIC filing requirements for LTC on stand-alone basis, changes in opining actuary, and morbidity risk in capital.

## KEY FINDINGS

During the course of the study, we found that financial risk factors were better indicators of insolvency when compared to the industry, while demographic risk factors showed a weaker relationship between the insolvent sample and the industry.

A few examples of our analysis of financial and demographic risk factors are below.

For purposes of this study, we considered negative operating cash flow as indicative of **liquidity risk**. The companies were

ranked by the number of years within the last five during which negative operating cash flow occurred. A review of liquidity in the insolvent sample as compared to the industry sample showed a higher risk mix in the insolvent sample, with the exception of commercial liability insurers. This suggested that liquidity challenges may be a significant indicator of insolvency risk.

Significant **premium growth** in short time frames may be problematic for any insurer. Industry studies from the PACICC found that rapid growth was a primary cause of 17 percent and a contributing cause to 43 percent of P&C insolvencies in Canada. The review of premium growth as a risk factor among cohorts within the insolvent sample shows a varied risk mix. The homeowners and health cooperative cohorts have the largest proportion of high-growth companies within the insolvent companies. A review of premium growth in the insolvent sample relative to the industry sample shows a higher risk mix in the insolvent sample, with the exception of commercial liability insurers. This suggests that growth is a strong indicator of insolvency risk.

**Company size** was based on the largest net written premium amount observed in the last five full years of company operations for the insolvent sample. The study *did not* categorize small companies as indicative of higher risk from an insolvency perspective. The analysis also indicated that when comparing to the broader industry results, company size did not appear to clearly indicate relative insolvency risk as there was no observable pattern of small or large companies predominating the insolvent cohorts relative to the industry counterparts. Company size may, therefore, be less predictive of future insolvency as compared to other financial risk factors.

Figure 5 provides a summary of the risk factors for which we observed noticeable differences in the insolvent cohorts relative to their industry counterparts.

Consistent with the U.S. review, Canadian studies by the PACICC showed growth and profitability (pricing) as leading factors in insolvency. They also highlighted foreign parent as a significant factor, which was less evident in the review of the U.S. companies.

As a result of the study, including the case studies, we observed key areas in which increased actuarial involvement may support earlier identification of some of the challenges that lead to insurer insolvencies:

- Increased involvement of actuaries in the surveillance process, which includes (but is not limited to) identifying issues such as underpricing and aggressive rate increase assumptions used in reserve adequacy analysis.

Figure 5  
Risk factors noticeable in insolvencies

|                              | P&C Personal Auto | P&C Homeowners | P&C Workers Compensation | P&C Commercial Liability | Life & Annuity | Health incl. LTC | Health Cooperatives |
|------------------------------|-------------------|----------------|--------------------------|--------------------------|----------------|------------------|---------------------|
| Premium Growth               | X                 | X              | X                        | X                        | X              | X                | X                   |
| Profitability                |                   | X              | X                        | X                        |                | X                | X                   |
| Liquidity                    | X                 | X              | X                        |                          | X              | X                | X                   |
| Investment                   | X                 | X              | X                        | X                        | X              |                  |                     |
| Leverage                     |                   |                | X                        |                          | X              | X                |                     |
| Risk-Based Capital           | X                 | X              |                          | X                        | X              | X                | X                   |
| Company Size (S/M/L)         | X                 |                |                          |                          | X              |                  |                     |
| Number Of Years In Operation |                   | X              |                          |                          |                |                  | X                   |
| Geographic Concentration     |                   |                | X                        |                          |                |                  | X                   |
| Product Concentration        |                   | X              | X                        | X                        |                |                  |                     |

- Improved practices and disclosures regarding the assumptions used in assessing reserve adequacy, which includes providing enhancements to Actuarial Standards of Practice, developing educational materials and updating practice notes.
- Increased coordination and consistency of actuarial requirements across states, including items such as additional disclosures to consumers, additional requirements for rate filings, experience tracking, and additional requirements for testing adequacy of LTC reserves<sup>2</sup>

### CONCLUSION

The study was intended to educate insurance professionals on historical insurer impairments and insolvencies and possible future prevention indicators. It explored potential risk factors insurance professionals can monitor to mitigate future insolvent situations.

Overall, the analysis suggested that the financial risk factors (premium growth, profitability, liquidity, investment, leverage, and risk-based capital) were useful indicators for insolvency. The financial risk factors in the insolvent sample analyzed generally showed a greater proportion in higher risk brackets when compared to the industry. The demographic risk factors analyzed (company size, number of years in operation, geographic concentration and product concentration) showed a less

significant relationship between risk levels within the insolvent sample and the industry.

We would like to thank the sponsoring organizations and the Project Oversight Group for their contributions and support throughout this research process. ■



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### ENDNOTES

- 1 <https://www.soa.org/resources/research-reports/2018/actuarial-review-insurer-insolvencies/>
- 2 The NAIC recently adopted Actuarial Guideline 51 *The Application of Asset Adequacy Testing To Long-Term Care Insurance Reserves*, effective with December 31, 2017 annual statements.

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## Conversation with a CRO: An Interview with Lori Evangel

In this, the second in our new series, “Conversation with a CRO,” in which we engage in open and candid Q&A with top practitioners in the insurance industry, *Risk Management* is honored to have been given the opportunity to interview Lori Evangel, CRO of Genworth Financial.

*Lori was interviewed over the phone on May 1, 2018 by Tony Dardis, of Milliman, Inc. and Awa Koné, of Swiss Re.*

Lori Evangel describes herself as someone who gravitates toward opportunities where she can build or fix key risk organizations, based on the ever emerging best market practices occurring in the field.

Lori is the CRO, and part of the senior leadership team, of Genworth, a writer of both mortgage insurance (primarily in the U.S., Canada and Australia) and Long-Term Care (in the U.S.), and a company that has as its mission providing products for key moments in life such as first home ownership and to assist in the challenges of aging.

Lori has been very honored by the opportunities given to her. Prior to joining Genworth in January 2014, Lori held the position of CRO of AFLAC’s Global Investment Division, and prior to that served as the Enterprise Risk Officer at MetLife. She was tasked with building an integrated global risk function after the acquisition of ALICO from AIG, which transformed MetLife into a major worldwide player spanning many countries. This was a huge challenge in itself, but was further complicated by the fact that it was happening at the height of the financial crisis.

Lori also served in key risk management and other positions at MBIA Insurance and Moody’s Investor Services.

Not surprisingly, our discussion with Lori proved to be a whirlwind trip—fasten your safety belts.



Lori Evangel, CRO of Genworth Financial

**Q: What would you view as the biggest issues facing the insurance industry today?**

A: The insurance industry in general is trying to figure out how to stay relevant. By that I mean we’ve had a very significant change from yesterday’s generation to today’s generation in terms of how customers view insurance: the products that they feel they need; what they are willing to pay for these products; and finally the channels through which they want to buy these products.

For generations, people bought the same type of products in a similar fashion. They tended to think about insurance in terms of catastrophe, and getting protection against catastrophes, and insurance was sold to them via a broker. Today’s generation does not think in this way—we are witnessing a generational shift. This generation tends to think of insurance as to how it fits within their overall wealth accumulation strategy, and their spending habits; they also want to be able to use the internet to not only compare different products but also to make purchases.

They are not necessarily thinking about what they need long term. Additionally, macroeconomic events such as the financial crisis have delayed events such as marriages and having children, which are key times when people start to seriously consider insurance. As a result, the industry needs to determine what consumers want and how we can design and distribute affordable products which would be of interest to these consumers.

Then to supplement this fundamental generational shift, we have two other huge paradigm shifts taking place.

The first paradigm shift concerns the granularity and nature of data we are starting to collect on the insured population. This is a double-edged sword, in that on the one hand, an insurer having access to more detailed data on an individual gives us the scope to more effectively underwrite that individual. But on the other side of the coin, developments such as DNA testing may enable customers to get greater insights into their health status than the insurance companies do; and this can potentially lead to their self-selecting when it comes to certain insurance products, which ultimately creates the potential for adverse selection against the insurer. We must ask ourselves, is there a danger that we are starting to move away from the concept of risk pooling that is at the very core of insurance? That we may no longer be able to rely on the law of large numbers; with a truly universally representative population, can we still expect that group to act in a similar fashion?

The second paradigm shift is the uncertainty around future mortality and morbidity. We have had long periods of mortality improvements, fueled by medical advances, which allowed people to live longer lives. There have also been tremendous advances in medicines for cardiovascular disease. And there may yet be important advances in the diagnosis and treatment of Alzheimer's. However, we are now faced with ailments such as diabetes and obesity that are affecting a younger portion of the population much earlier than previously and spreading across the globe. This is a challenging situation because these diseases actually require lifestyle changes (as opposed to medications). These issues will have a big impact on claims for the insurance industry associated with mortality and morbidity, the age at which people die, and the severity of LTC claims.

The generational shift, along with these two paradigm shifts, in combination, create both challenges and opportunities for product design, underwriting and pricing. I am not an actuary, but actuaries usually assume that the wealth of historical data will help predict the future. What I worry about is how these paradigm shifts are going to change the future predictability of historical-based assumptions.

**Q: What are things that can be done to ensure a successful “risk culture” in an insurance organization? What can CROs do to make risk management part of their company’s strategic decision making?**

A: Having a risk culture is extremely important.

The centralized risk unit, or second-line-of-defense, can’t legislate how risk is managed. As a CRO I cannot do this by myself. Risk management needs to flow throughout the organization. This can only be achieved by having a risk culture. By the way, it is very hard to change a bad risk culture, if you let that manifest itself.

In my view, there are four hallmarks of a good risk culture:

- Every employee understands the mission of the company, what is acceptable and what is not. This message is something that needs to run through the DNA of the company. If you have a firm of say 30,000 employees, you can’t legislate their every behavior, but you can communicate a mission to them. I have seen some CEOs and boards do this brilliantly. It is essentially important.
- There needs to be a clear alignment between what the company is trying to achieve, and the risks it is willing to take in order to meet these objectives.
- The right “tone from the top” needs to be set. This means that the CEO and board have to be risk-focused. And people have to feel empowered to come forward when there is a problem—that it is ok for people to communicate to senior management that something is going wrong.
- The Three Lines of Defense model is important, however it is essential that the role of the first line is emphasized. The business lines are the closest to their operations and therefore have the deepest understanding and the resources; so if there is a risk issue they are the ones that have to be comfortable with the remedial action and should be the ones to act. They should be accountable and responsible. Then the role of the second line can focus on setting risk policies and guidelines, and reviewing that procedures followed by the first line are in accordance with those policies and guidelines. The third line can then undertake assurance and advisory activities to check that all is working properly and controls are functioning as designed.

As the CRO, I view my primary job as making sure that the policyholders get paid for as long as we are contractually obliged.

Therefore I take a long-term view of the business and risk. Managing the two sides of meeting shorter-term shareholder expectations versus providing long-term security for our policyholders is not always easy, but it is critical to ensure that the latter is never compromised.

**Q: How do you think the insurance industry should be responding to the LTC coverage needs of the North American population? What are the prospects for the LTC industry?**

A: I think LTC insurance is an important tool in helping people manage their assets and wealth in older age. I believe in the product intensely. The product is needed by consumers even though they may not know they need it. And if we don't find private solutions to providing LTC needs, it will end up becoming a huge strain on local governments. People will look to the public sector for assistance, and the taxpayers will be picking up the tab.

Unfortunately, in the past the product was not appropriately understood in terms of the risk and the size of claims relative to the size of premiums. The industry charged fixed premiums, as if LTC was similar to term insurance, and did not have the expectation of a changing premium over time that would provide profitable business as experience on morbidity, mortality and interest rates emerged. This is a very different model from health insurance, or auto insurance, where there is a recognition that premiums will change over time to better coincide with the changing environment and emerging claims experience. The biggest mistake made by the industry was not realizing the importance of having a product that could be re-rated over time, to recognize the many uncertainties around future events that is inherent in LTC. The industry did not totally appreciate the dynamics of how long people would live, what would cause people to go on claims, for how long and what kind of care facility they would go to. Everyone in the industry made the same mistake.

The industry is now seeking to design and develop products that will both be affordable to and meet the objectives of the consumer, and provide a reasonable risk/reward and profit proposition for the insurer. We need to design products that are simple to understand, and represent a good value-for-money proposition to consumers.

If we can get there, the industry will be viable again—and I strongly believe we will get there.

**Q: Notwithstanding some element of relief recently, “lower for longer” interest rates continues to be an issue for all long-dated liabilities, including life insurance and LTC. What are some of the things that companies can be doing to help better manage this particular risk?**

A: This situation has been the bane of the insurance industry for the better part of the last decade plus. There is a school of thought that interest rates will revert back to a higher mean. However, there is also strong evidence over this cycle that interest rates are not completely solely subject to market forces, but that government actions have kept interest rates low. In fact, due to many forces, we have had a long period of declining interest rates.

We may need to start thinking about this in terms of maybe another paradigm shift. Perhaps interest rates might not fully revert to their historical mean; that the shorter end of the curve may increase, but the longer end not as much (flattening). We might, in our models, have to assume lower interest rates for longer, and continue to determine the impacts on our companies.

LTC of course poses particular problems as the liabilities are such long duration, therefore we face a very considerable long-term exposure when realized interest rates are persistently below what we have assumed in our pricing. So, it gets back to the need to have flexibility in the product design, such as having the ability to increase premiums or reduce benefits during the course of the policy.

Of course, hedging is also an important mitigant and utilized by all insurance companies. For hedging to work effectively, you need to have a well-developed derivatives playbook and be constantly in the market.

All insurers with long-term liabilities are now addressing the issue head-on and looking at ways to create additional yield without taking undue risk, whether that be by going longer on their asset durations, or by adding alternative or equity-based asset classes.

**Q: What role can economic capital (or internal capital) have? What are potential barriers to a successful economic capital program and how can insurers overcome them?**

A: I am a big fan of economic capital—I believe in it. However, while I think it is extremely important, it needs to be married with stress testing. Presenting, for example, a 1-in-200 event to management, which can be considered just a theoretical number, makes it hard for management to pay much attention to EC. But if you can link that to what you're doing for stress testing, it helps to bring economic capital to life and can be very valuable.

Economic capital lets you see the changes in the value of the company if a very bad event occurs. It thus gives an early warning signal, and essentially enables you to take advance action. The key is to make economic capital actionable. Companies can do this, first by marrying it with stress testing, and then linking it to mitigating strategies. This is what will get the attention of the board. Going to the board and saying “our economic capital

analysis tells us that we need to take certain mitigating actions” is something that is going to get a lot of attention. It gets economic capital away from the theoretical and makes it real.

**Q: Cyber risk has gained increasing focus in recent years. What would you view as some of the biggest issues around cyber risk and how to best manage these issues?**

A: Most insurance companies have a very significant amount of personally identifiable information (PII). We know a lot about our customers, so every insurance company in the world should be worried about someone hacking their data and the potential actions they might take with that data.

I worry a lot about cyber risk. Unfortunately, it is impossible to set up mechanisms within your company to perfectly protect against a breach of your systems and data. Despite all your efforts, it is important to recognize that there will always be players ahead of your defense mechanisms. So, it is important to also focus on your business continuity mechanism, and how quickly you can respond to a cyberattack—the question of “velocity.” This matters just as much as the cybersecurity defenses. So, just as a hacker can get into your systems unexpectedly and suddenly, your response also needs to be rapid. In short, while I cannot perfectly protect the company against a cyberattack, I can put things in place to ensure we have a very effective response in case of an attack.

**Q: Much attention has been given by the industry in recent years to building out their model risk management capabilities. What would you view as the key to a successful model risk management program?**

A: Model risk is everywhere. Everything we do in this industry has a model associated with it. It’s an area that has created both challenges and opportunities for enhancements.

A critical aspect of model risk management is ensuring that you have the right model for a given application—that the model is fit-for-purpose. As a risk manager, I also want to know that our models have been properly documented—not always something the teams do with rigor at insurance companies—and finally that the models have been peer reviewed (which means challenged and validated).

It is essential that you develop a rigorous program of model validations to assure the models are operating as you intend, that all is properly documented, that appropriate peer review occurs and that your overall model risk governance program is operating effectively.

**Q: How do you see the role of actuaries in the risk management space?**

A: Actuaries are a wonderful asset for any insurance company. We can’t live without actuaries. They have a deep understanding of insurance and the long-term risks to which we are exposed.

My advice to the actuarial profession is twofold. First, start thinking very hard about the paradigm shifts I mentioned earlier. Are there things that are fundamentally changing in the world around us that could lead to data from the past becoming considerably less useful in thinking about what may transpire in the future? Second, recognize that none of this is a perfect science. Data can help and should be looked at, but don’t get caught up in looking at numbers to the nearest decimal point and thinking analytics alone will give you all your answers. Judgement is a critical component to all of this, the decisions we make and future outcomes.

**Q: The use of big data and predictive analytics are changing the industry, and look to offer potential to help insurers in a number of areas. What is your view?**

A: Big data and predictive analytics offer a great opportunity to help solve the concern I raised earlier about the industry trying to stay relevant and getting a better understanding of consumers’ habits and purchasing patterns, and importantly policyholder behavior. Predictive analytics have been used effectively by the banking industry for many years, but it is still early days on how the insurance industry will decide to use it.

I am part of a few risk and CRO forums, and we talk about this topic a lot. The general sentiment is that we do not know whether or not these tools will provide us with solutions to the industry’s current challenges, however, we need to keep abreast of the developments. We need these tools as one part of our arsenal to inform the judgement calls we have to make. It can be viewed as another lens for us to look at. A good CRO uses all the tools at their disposal (whether it be economic capital, stress testing, predictive analytics, etc.) to make informed judgements and recommendations. And let’s not forget the value of experience. I am absolutely informed by my experience of over 30 years. ■



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# Addressing Climate Change Belongs in Insurance Companies' Boardrooms

By Maryam Golnaraghi

In its latest report,<sup>1</sup> The Geneva Association offers new insights into the role of the industry as risk managers and investors in addressing climate change goals, targets and risks.<sup>2</sup> The study, which includes interviews with (and written responses from) 62 c-level executives of the global insurance industry, highlights how companies are considering climate change within their governance and strategy as well as measures being taken by the industry on liability and investment sides. The study brings focus to key external challenges and opportunities facing the insurance industry in scaling up its contributions. This article highlights some of the key findings and recommendations of the report.

## RECENT DEVELOPMENTS AND TRENDS GLOBALLY

**In recent years, globally, the focus of the climate change debate has evolved from being mainly a scientific, environmental, social responsibility, and humanitarian issue to becoming one of the core drivers of socio-economic development and risk management.**

On the climate adaptation side, with rising socio-economic costs associated with extreme weather events, there is increasing evidence of a paradigm shift in governments' approaches, from "inaction" or "post-disaster reaction" towards a more comprehensive and integrated risk management framework, spanning the different sectors and layers of government. Importance of risk quantification and pricing, as well as ex-ante investments in disaster risk reduction and preventive measures is coming into focus. Empirical studies indicate that countries with a widespread market-based insurance coverage recover faster from the financial impacts of extreme events; it is the uninsured part of losses that drives macroeconomic costs. Governments are recognizing the role and benefits of a market-based insurance industry in carrying and transferring risk with a number of initiatives underway to expand insurance in existing and new markets (Geneva Association 2016, 2017). Yet, there is a large

and in some places widening protection gap, indicating that the benefits of risk transfer measures are not being harnessed to their full potential.<sup>3</sup>

Following the adoption of the Paris Agreement in 2015,<sup>4</sup> there has also been a burst of initiatives and activities across a wide range of stakeholders to support the transition to a low carbon economy (mitigation side) (see Figure 1).<sup>5</sup> Latest developments include, (i) growing wave of climate policy and regulations at national to local levels and across regions, although highly fragmented and in some cases conflicting subsidies and incentives;<sup>6</sup> (ii) innovation in clean and green technologies, with some gaining noticeable market share; (iii) rising interest in green financing, efforts on the part of shareholders, asset managers, standard-setting bodies and rating agencies to reduce barriers to green investing; (iv) growing demand for low carbon commodities; and, (v) efforts to collect and avail reliable and consistent information as part of annual reporting to investors, lenders, insurers and other stakeholders.

In September 2015, Mark Carney, chairman of the G20 Financial Stability Board (FSB), in his historical speech at the Lloyd's of London, linked global financial stability and economic resilience to three types of climate change-related risks: physical risks, liability risks and transition risks (Carney, 2015).<sup>7</sup> Subsequently, the FSB Task Force on Climate-Related Financial Disclosure (FSB-TCFD) was established to develop





Figure 1  
Recent Developments Related to Transitioning to a Low-Carbon Economy

| Policy and regulation  | Technology  | Financing and markets  | Reporting and compliance   |
|--|---|--|--|
| <p><b>The Paris Agreement</b></p> <ul style="list-style-type: none"> <li>Common but differentiated responsibilities result in policy fragmentation across countries and regions</li> <li>2050:Net-zero emission target</li> <li>Different regional, national, local policies</li> </ul> <p><b>National decarbonisation targets</b> being submitted, but pathways and implementation not clear</p> <p><b>Pricing carbon and carbon emission caps being considered/discussed in many jurisdictions</b></p> <ul style="list-style-type: none"> <li>Carbon tax vs. ETSs</li> </ul> <p><b>Subsidies and tax incentives</b></p> <ul style="list-style-type: none"> <li>Fossil fuels vs. green investments</li> </ul> | <p><b>Green/clean technologies gaining market share</b></p> <ul style="list-style-type: none"> <li>LED, solar, onshore wind, hybrid/electric cars</li> </ul> <p><b>New investments growing steadily</b>, e.g. renewable energy</p> <p><b>Energy-smart technologies rising targets</b>, e.g. energy efficiency</p> | <p><b>Shareholder sentiment</b> favouring more climate action</p> <p><b>Increasing interest in green investment</b></p> <ul style="list-style-type: none"> <li>Green investing coalitions: Blackrock, Goldman Sachs, Deutsche Bank</li> </ul> <p><b>Rise in green bond markets</b>, although lacking proper monitoring</p> <p><b>Efforts to lower barriers to green investing</b></p> <ul style="list-style-type: none"> <li>G20, EU-HLTF</li> <li>Global Green Finance Committee (ICMA/GFMA)</li> </ul> <p><b>Rising trades</b> of low-carbon commodities</p> <p><b>Rating agencies linking climate risk to credit ratings</b> (companies, sovereign, municipalities)</p> | <p><b>Emergence of wide range of mandatory and voluntary frameworks</b></p> <ul style="list-style-type: none"> <li>Environmental and sustainability driven</li> <li>Highly fragmented depending on stakeholder</li> <li>Increased reporting not leading to enhanced transparency</li> </ul> <p><b>FSB-TCFD</b></p> <ul style="list-style-type: none"> <li>Effort of convergence towards coherent and consistent annual reporting of climate risks</li> </ul> |
| <p>➤</p> <ul style="list-style-type: none"> <li><b>Growing wave of climate policy and regulatory measures, but fragmented, with sketchy implementation pathways</b></li> <li><b>Fragmented sectoral approaches dominating</b></li> </ul>   | <p>➤</p> <ul style="list-style-type: none"> <li><b>Growing opportunities in green and clean technology, although still risky and volatile</b></li> </ul>  | <p>➤</p> <ul style="list-style-type: none"> <li><b>Need for pipeline of investable grade opportunities, asset classification, standardization, methodologies and expertise</b></li> </ul>  | <p>➤</p> <ul style="list-style-type: none"> <li><b>Standard climate risk reporting—a potential game changer</b></li> </ul>   |

recommendations for voluntary and consistent climate-related financial risk disclosures for use by companies to avail information to investors, lenders, insurers, and other stakeholders. Following the release of its recommendations in 2017, The G20 extended FSB-TCFD's work on the implementation of its recommendations.<sup>8</sup> This could potentially be a game changer in the way publicly-traded companies report their climate risks and opportunities in their annual reporting.

Finally, emphasis on climate resilience and decarbonization of critical infrastructure is also rising as a top priority of some governments, not only to address climate change targets at scale but also in relation to their national security, economic development and trade agenda, (for example Canada and the European Union).

### IMPLICATIONS FOR THE INSURANCE INDUSTRY

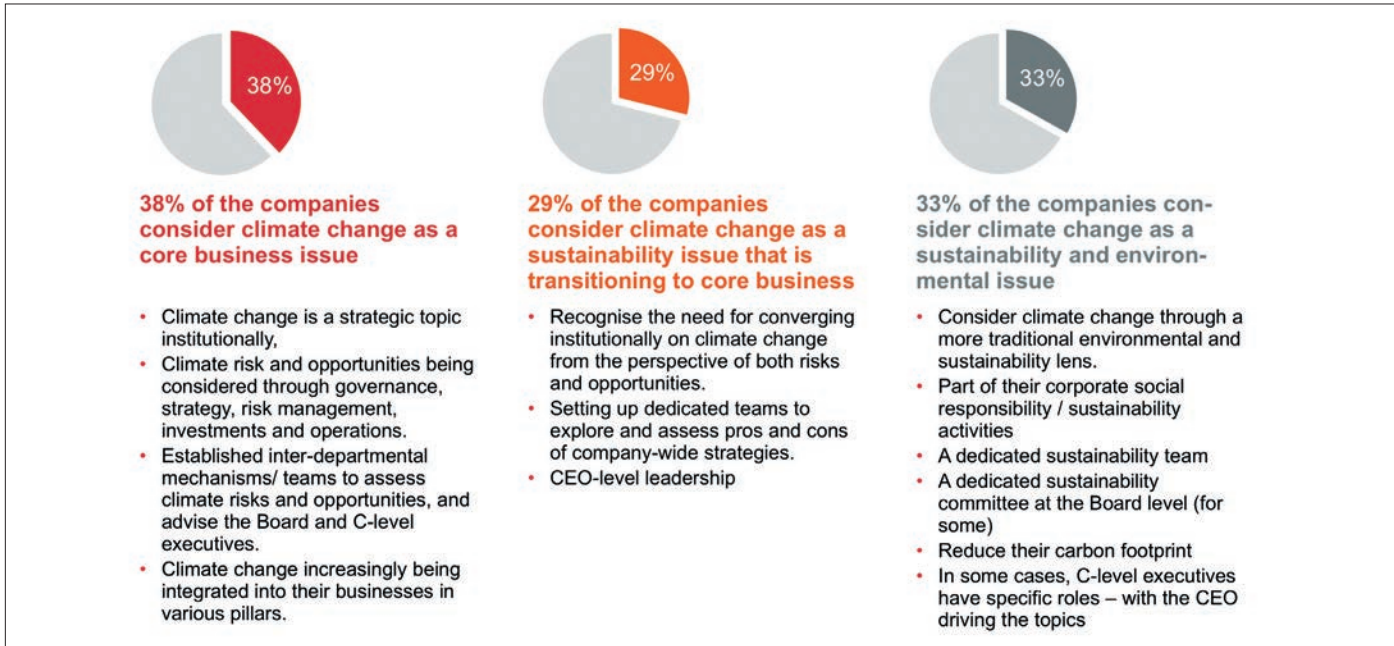
The interviews have revealed that addressing climate change is a priority of the majority of C-level executives. Climate change is making its way into companies' boardrooms as a core business issue with implications for governance and

**institutional structures and processes, strategy, business development, risk management, investments, operations, and reporting.**

Companies are increasingly considering the implications climate change (not only physical risks but also liability and transition risks), not just from an environmental and social responsibility lens, but as a core business issue. Currently there are three ways climate change is considered by companies' boards and C-level executives: (i) a core business issue with implications for governance, strategy, risk management, operations, and asset management processes; (ii) a sustainability issue but transitioning into core business; and, (iii) a sustainability and environmental issue. Figure 2 highlights some of the key actions companies are taking.

The insurance industry is part of the solution and plays a critical role in enabling economic resilience and fostering entrepreneurial pathways for addressing climate change goals and targets.

Figure 2  
Climate Risk is Being Considered by Majority of the Board and C-Level Executives of the Participating Insurance Companies, in Three Ways



In summary,

- On the **liability** side, insurers are offering risk modeling and pricing expertise, as well as a variety of innovative and specialized risk transfer solutions to: (i) build financial resilience to impacts of extreme events; (ii) incentivize reduction of greenhouse gas (GHG) emissions; (iii) enable entrepreneurial pathways for green and clean technology from start-up to commercialization. The industry is providing regional risk pools and other specialized products and services to protect governments' budgets against the financial impact of major disasters. The industry is working to improve its products and services in areas such as business interruption, contingent business interruption and other risks associated with supply chain failures linked to climate and extreme events risks.
- On the **investment** side, the insurance industry is increasingly integrating climate change considerations in their investment strategies and processes. Various policies and approaches to investment strategies are being adopted. Environmental, Social and Governance (ESG) is emerging as the predominant methodology, but being implemented using a variety of different approaches.
- On the **operational** side, insurers are actively working toward reducing their carbon footprint.

The insurance industry wants to do more. However, the study has identified a number of external challenges, outside the scope of the insurance industry, that need to be addressed by various stakeholders, to enable the industry to expand its contributions on both the adaptation and mitigation sides.

The study has revealed that eight primary factors hinder the expansion of market-based insurance in high-, middle- and low-income countries:

- Limited access to risk information and related risk pricing difficulties;
- Public policy, regulatory and legislative issues;
- Need for increased awareness about socio-economic benefits of insurance;
- Need for stakeholder-relevant products and services;
- Limited take-up of disaster insurance linked to post-disaster government hand-outs;
- Weakness of domestic insurance market particularly in the rural areas and most vulnerable nations,
- Regulatory barriers in some countries, which may hinder access to global reinsurance capacity; and

8. Scalability and sustainability of insurance programs and need for stronger public-private engagement and partnerships.

**Interviews and our research has revealed that the scaling-up of green investments is inhibited by many factors linked to five key areas:**

1. financing and market-related factors, such as lack of clear taxonomy and investable-grade green investment opportunities and,
2. need for financial and insurance regulations that encourage long-term investments,
3. fragmentation and in some cases contradictory climate change and sectoral-related policies and regulatory frameworks,
4. volatility in the green and clean technology markets and that in general, technology-related investment opportunities do not meet their investment criteria technology and
5. Data and transparency for informed investing—for example, factors such as a limited capacity of relevant markets to accommodate large-scale portfolio allocations, a need for well-defined asset classifications, fragmented climate policy and regulatory frameworks, and lack of data to support informed investing.

**In general, insurers consider critical infrastructure as fundamental to scaling up socio-economic resilience to physical risks and transitioning to a low-carbon economy. They are underwriting critical infrastructure and willing to invest and expand coverage, but a number of challenges remain on both liability and investment sides.**

The insurance industry is already underwriting critical infrastructure, and there is willingness to expand coverage, but a number of challenges remain. However, the extent to which insurers have been underwriting infrastructure risks varies from country to country. Some challenges identified are:

- limited consideration has been given in many countries to assessing impacts of natural hazards throughout the entire life cycle of critical infrastructure projects;
- limited incentives, especially for private operators, to increase resilience; and
- lack of access to high quality data to assess various risks associated with all phases of the project.



On the other hand, for insurers to invest in critical infrastructure, they require a stable, predictable regulatory and political framework, a pipeline of projects, and an efficient and liquid market.

## SUMMARY AND RECOMMENDATIONS FOR THE WAY FORWARD

**Building socio-economic resilience to the increasing impact of extreme weather requires preventive risk management and adaptive strategies. Transitioning to a low-carbon economy has profound socio-economic implications for many sectors, requiring investments in areas such as technology, critical infrastructure, labor training, trade, and public education.**

Transitioning to a low carbon economy needs to be well-planned and it must follow a predictable path with strategic alignment across all layers of government as well as active engagement with the private sector and investors. Implementation will take time and may take even longer in some countries and regions, depending on existing policies and political frameworks. A complex network of stakeholders (e.g., governments, policy makers, regulators, standard-setting bodies and the private sector) are working through the growing number of adaptation and mitigation initiatives, but these efforts also remain fragmented. To achieve scale, the key barriers, opportunities and solutions need to be identified through more coordinated dialogue, engagement, and action among key stakeholders.

**The insurance industry is neither the polluter, nor the climate policy setter, but is a critical part of the solution.**

As a global leader in risk management, the insurance industry is already contributing significantly to building socio-economic resilience to extreme events and climate risks. It is also supporting transitioning to a low-carbon economy through its underwriting business, investment strategies and active reduction of its carbon footprint. But, it wants to do more.

Addressing climate change at scale also provides opportunities for expansion of risk transfer solutions for building socio-economic resilience to physical risks, incentivizing GHG emission reductions and paving the pathways for green and clean technology development, from start-up to roll out. Building strong public-private partnerships is central to the success.

As institutional investors, insurers' investment strategy is liability-driven, constrained by regulations and driven by a number of internal and external factors (Asset-Liability Management, ALM). Insurers invest conservatively as they need to ensure that they remain solvent and can make their pay-outs to the policyholders with the highest probability at any time. Scaling-up of their green investments is inhibited by factors

such as a limited capacity of markets to accommodate large-scale portfolio allocations, availability of pipeline of investable-grade opportunities that meet their criteria, a need for well-defined asset classifications and fragmented climate policy and regulatory frameworks.

Finally, the industry needs to manage its own climate risks (not only physical risks but also liability and transition risks) and develop capacities to integrate these considerations into its core business, through its governance, strategy, risk management, business development, underwriting, investments, operations as well as compliance and reporting activities.

The Geneva Association offers three recommendations for the way forward detailed in Figures (3a-c). Specifically:

*Recommendation 1: Third-party stakeholders such as governments, policymakers, standard-setting bodies and regulators across sectors should work in a more coordinated fashion to address key barriers that hinder insurers from scaling up their contribution to climate adaptation and mitigation.*

*Recommendation 2: The insurance industry should continue to institutionalise climate change as a core business issue, expand its*

Figure 3a  
Recommendation 1

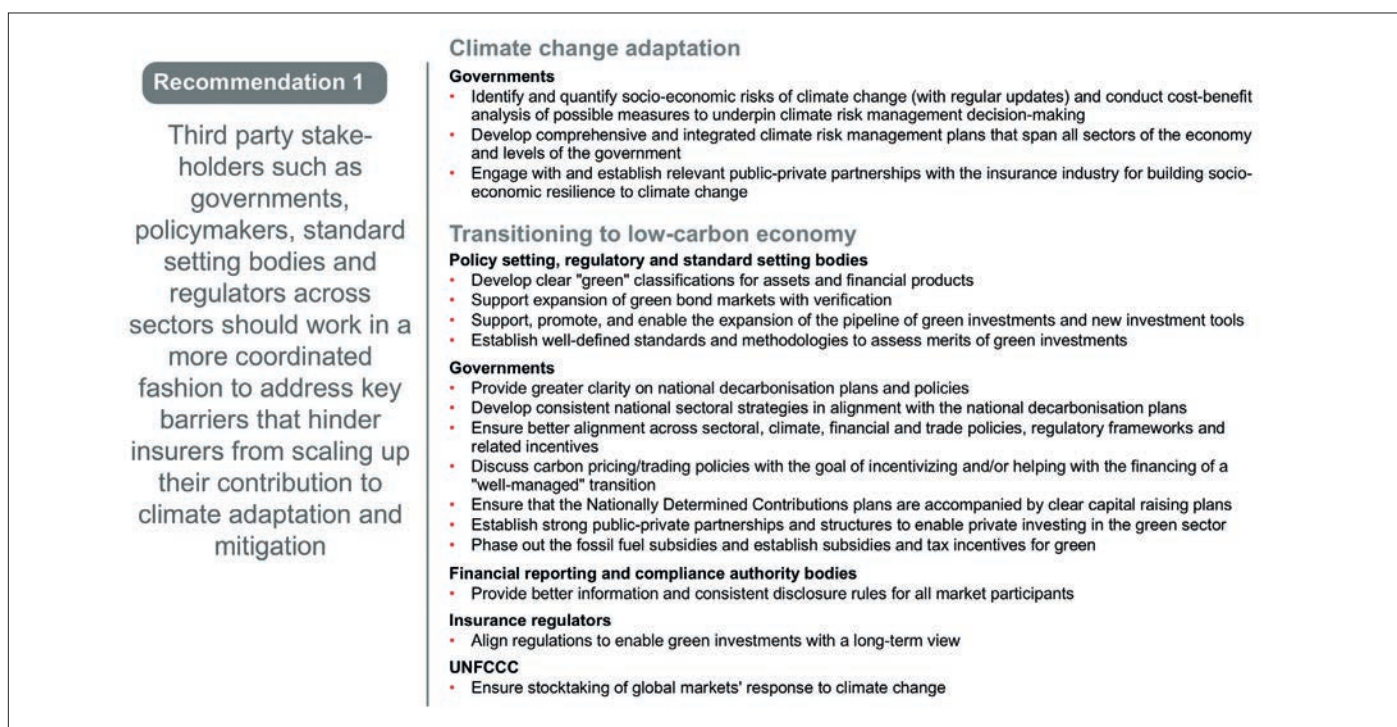


Figure 3b  
Recommendation 2

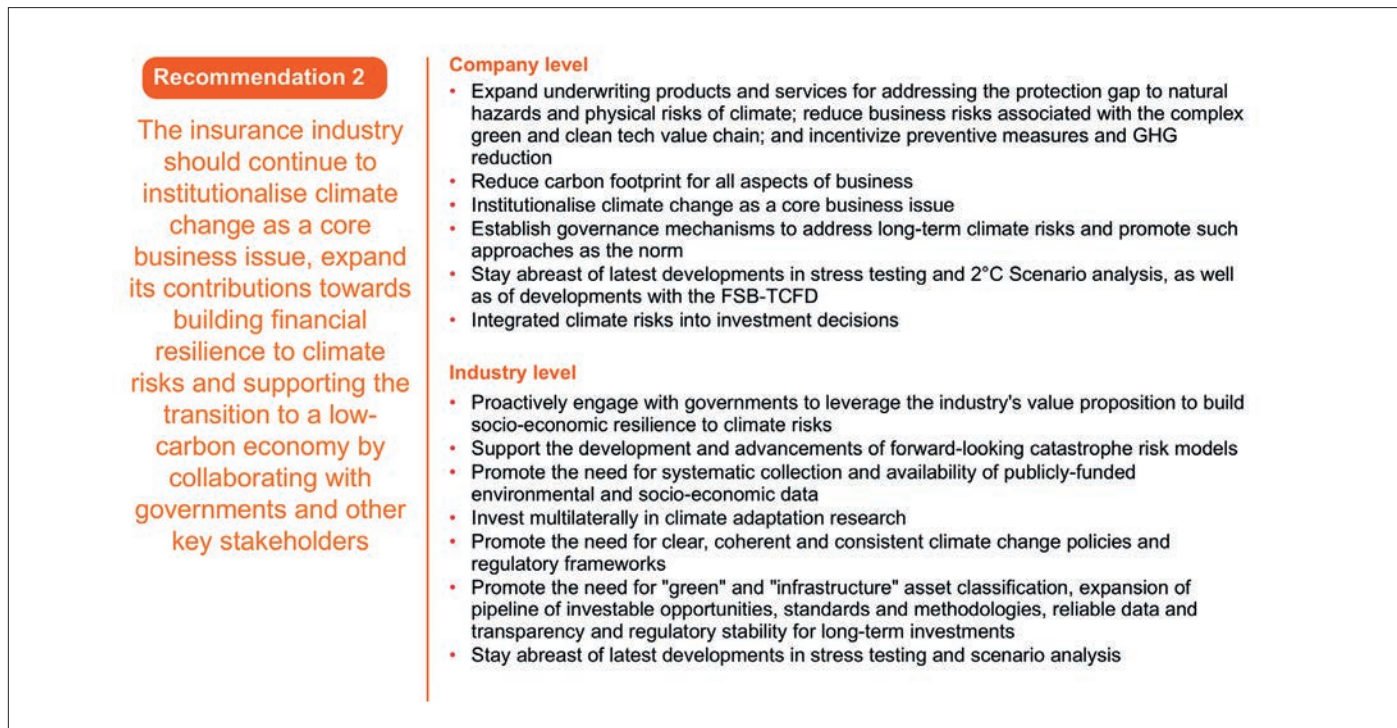
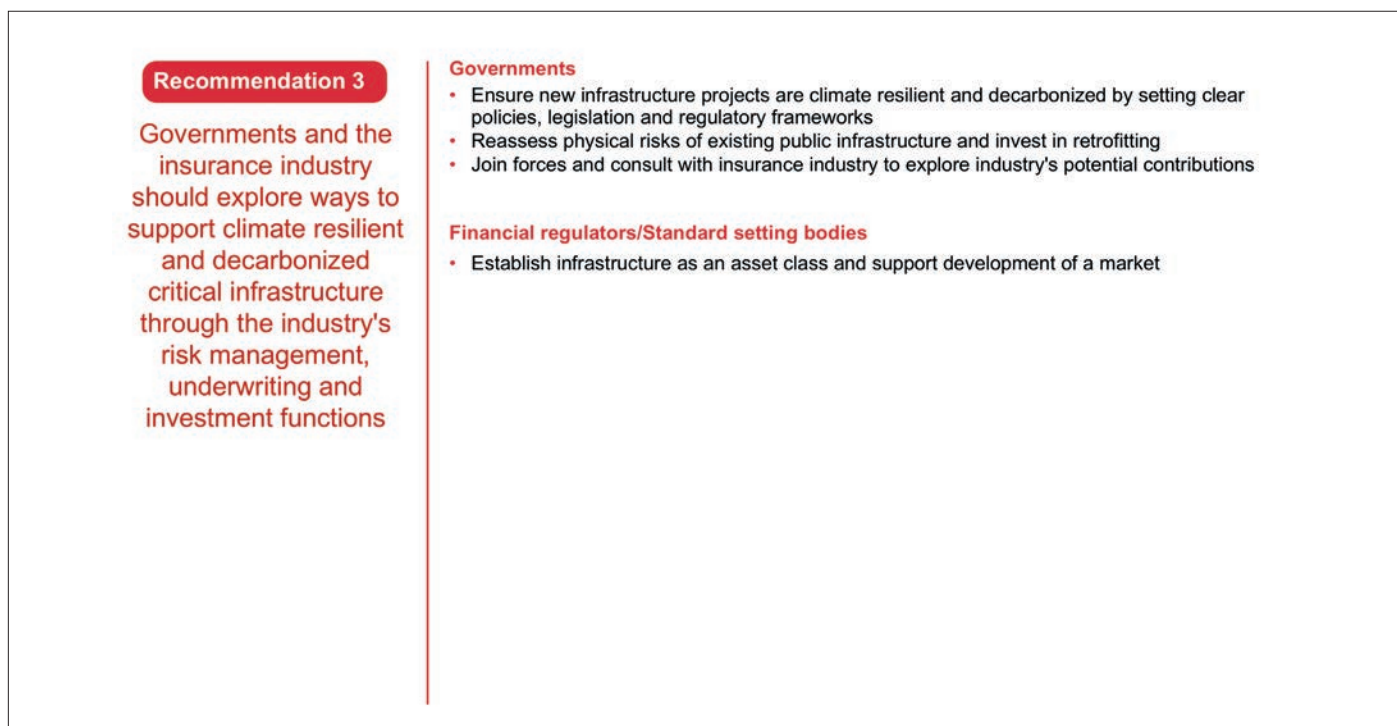


Figure 3c  
Recommendation 3



*contributions towards building financial resilience to climate risks and supporting the transition to a low-carbon economy by collaborating with governments and other key stakeholders.*

**Recommendation 3:** Governments and the insurance industry should explore ways to support climate-resilient and decarbonised critical infrastructure, through the industry's risk management, underwriting and investment functions.

For more information and to access the full report, please go to: <https://www.genevaassociation.org/> ■



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- (2) The Geneva Association (2017) "The Stakeholder Landscape in Extreme Events and Climate Risk", By: Golnaraghi, M., Khalil, P. Available at: [https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf\\_public/stakeholder-landscape-in-eecr.pdf](https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf_public/stakeholder-landscape-in-eecr.pdf)
- (3) The Geneva Association (2018) "Climate Change and the Insurance Industry: Taking Action as Risk Managers and Investors." By: Golnaraghi, M., Available at: <https://www.genevaassociation.org/>.

## ENDNOTES

- 1 The Geneva Association (2018) "Climate Change and the Insurance Industry: Taking Action as Risk Managers and Investors." By: Golnaraghi, M., Available at: <https://www.genevaassociation.org/>.
- 2 We interviewed (and obtained written responses from) 62 CEOs, CROs, CUOs and CIOs of 21 primary insurance and reinsurance companies around the world. These included twelve primary insurers underwriting life and non-life (or both) policies and nine reinsurance companies. Of these 48% are headquartered in Europe, 28% in North America and the Caribbean, 19% in Asia and the Pacific and 5% in Central and South America. With respect to assets under management, 57% are under USD 100 bn, 19% between USD100 bn-200bn and 24% over USD200bn. As for premium volume, 53% with less than USD25b, 33% between USD25-50bn, and 14% over USD50bn.
- 3 According to AON Benfield only 36% of economic damages sustained from hurricanes Harvey, Irma and Maria were covered by insurance.
- 4 The Paris Agreement: <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>
- 5 For a list of stakeholders see Annexes 2 and 3 of the Geneva Association Report.
- 6 In the United States President Trump decided to pull the Federal government out of the climate change Paris Agreement, rolling back many of the programs and regulations established by President Barack Obama to reduce greenhouse gas emissions. However, this action has galvanized business leaders, investors, corporations, the state and local governments and top business leaders to come together under "America's Pledge" to find the pathway for America's transition to a low carbon economy. California governor Jerry Brown and the former New York City Mayor Michael Bloomberg founded "America's Pledge" following Trump's decision to pull the U.S. federal government out of the Paris Agreement.
- 7 In September 2015, Mark Carney, Chairman of FSB in his speech "Breaking the Tragedy of the Horizons", highlighted climate risks as (i) **Physical risks:** economic risks that could arise from direct and indirect impacts due to: (i) increasing severity and frequency of extreme weather events; and (ii) long-term shifts in climate; (ii) **Liability risks:** the impacts that could arise tomorrow if parties who have suffered loss or damage from the effects of climate change seek compensation from those they hold responsible; (iii) **Transition risks:** financial risks which could result from the process of transition towards a lower-carbon economy.
- 8 This is an industry-led initiative, chaired by Michael Bloomberg., for more information see: <https://www.fsb-tcfd.org/>

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# Measuring Benefits of Variable Annuity Volatility Management Techniques

By Raghu Ramachandran and Aaron Sarfatti

The fallout from the global financial crisis significantly altered both the perception of investment risks faced by policyholders approaching retirement and the management of balance sheet risks arising from equity-based guarantees written by insurers. In the wake of the crisis, insurers launched three broad solutions to manage their balance sheet exposures without upending the client proposition for investing in such products. These solutions include:

|  |  |
|--|--|
| <b>Asset transfer programs</b>               | Insurer-driven programs that reallocate client discretionary funds to bond funds based on the in-the-moneyness of contracts.       |
| <b>Volatility-managed/risk-control funds</b> | Fund features that dynamically rebalance allocation to equities depending on a target or trigger level of realized volatility.     |
| <b>Market-linked rider fees</b>              | Fee feature that adjusts the level of rider fees tied to a prevailing market index, e.g., volatility index or U.S. treasury rates. |

What remained uncertain is the benefits and risks of these solutions to both policyholders and insurance companies. In a recent white paper we developed metrics to gauge the benefits of these solutions to both groups.

Insurers introduced an array of volatility risk management solutions to address the above objectives. Solutions broadly fell into three categories: asset-transfer programs (ATP), risk-control or volatility-managed funds, and market-linked fees and benefits.

ATPs manage risk by reallocating client discretionary funds based on contract in-the-moneyness. Risk-control funds, which encompass a broad range of fund strategies, adjust positions in response to market signals of risk.

Capped volatility programs engage when market volatility exceeds a pre-defined volatility “cap.” In such instances, the equity allocation of the fund is maximized under the constraint of maintaining the capped level of fund volatility. If market volatility falls below the volatility cap, the original fund’s equity allocation is restored. The goal of this fund is to leave the traditional static allocations intact except during periods of crisis or other times of elevated uncertainty.

Similarly, a target volatility strategy sets a pre-defined fund volatility target that remains constant in the fund’s investment lifetime. The equity allocation of the fund is routinely adjusted to ensure the fund is performing at or near its desired volatility level. When market volatility is low, the fund increases equity allocations beyond long-term target allocations, and when market volatility is high, the fund reduces equity allocations below these target allocations.





The capital preservation strategy (also known as self-hedging) extends the target volatility mechanics. It uses futures and other derivatives to mitigate the risk of the fund following market declines—in this case by simulating the return impact of a put option holding. Because the mitigation of the fund occurs after a decline in market returns, the changes in asset allocation trail changes in market returns.

Market-linked fees, a more recent product innovation, seek to provide risk management by linking rider fees to movements in key market drivers. Most common market-linked fee structures include VIX-indexed features that link rider fees to the VIX, a market index reflecting implied volatility, and U.S. treasury (UST)-indexed features that link roll-up or payout rates to UST yields.

## ANALYSIS OF SOLUTIONS

The rapid adoption of volatility management solutions left insurers with little time to assess implementation and communication challenges, which were important to the product proposition for clients and their advisors. Insurers experienced

three broad categories of challenges: performance benchmarking, loss of “upside potential,” and lack of clarity of investment thesis.

**Performance benchmarking**—insurers were unable to define suitable benchmarks for funds that had a risk-control overlay and often assigned improper benchmarks—including the use of the S&P 500 for funds with equity allocations closer to 60 percent. Clients who were “oversold” on the benefits of volatility management held false expectations of the level of risk-and-return potential, resulting in dissatisfaction during the bull market equity returns. The lack of transparency caused investors to blame “underperformance” of any type on risk-control features.

**Loss of “upside potential”**—in the recent bull-market, the risk control overlays in certain cases resulted in lower equity ratios and allocations, which in turn caused under-performance. This phenomenon is applicable mostly to risk-control funds, but similar issues are observed to varying extents with asset-transfer programs and market-linked fees. Regardless, as risk-control features lost money, they also started falling out of favor.

| Objective                                    | Metric                        | Description and evaluation   | Insurer concerns   |
|--|-------------------------------|--|--|
| <b>Write profitable business</b>             | Guarantee cost (GC)           | <ul style="list-style-type: none"> <li>Definition: risk-neutral GC at issue, defined as PV of rider fees less PV of guarantee claims</li> <li>Evaluation standard: percent reduction in “volatility cost” (difference in GC between static 60/40 and 100 percent cash fund); higher percent reduction better</li> </ul>  | <ul style="list-style-type: none"> <li>Do the risk controls reduce the hedge cost (risk neutral value) of the guarantees?</li> </ul>         |
| <b>Stabilize ALM and hedging performance</b> | Hedge ratio                   | <ul style="list-style-type: none"> <li>Definition: efficiency with which the position is hedged</li> <li>Evaluation standard; percent change in PC of total cash flows given 1 percent decrease in volatility; lower hedge ratio percent reflect improved efficiency</li> </ul>  | <ul style="list-style-type: none"> <li>Do the volatility management strategies improve key hedge ratios (in particular Vega)?</li> </ul>     |
|  | Hedge-ability                 | <ul style="list-style-type: none"> <li>Definition: dispersion in liability value changes due to equity movements</li> <li>Evaluation standard: cumulative hedge P&amp;L losses over 2008 and 2008; lower losses are better</li> </ul>  | <ul style="list-style-type: none"> <li>How well do the risk-control strategies minimize hedge P&amp;L Losses in crises?</li> </ul>           |
|  | “Basis Risk”                  | <ul style="list-style-type: none"> <li>Definition: realized effect of tracking error produced by imperfect knowledge of investment positions</li> <li>Evaluation standard: proportion of time that weekly equity allocation changes are non-zero (illustrated for risk-control funds only); lower proportion of non-zero changes reflects less tracking error</li> </ul> | <ul style="list-style-type: none"> <li>Can our risk management and hedging groups effectively mirror the changing fund positions?</li> </ul> |
| <b>Optimize capital requirements</b>         | Reserve impact and volatility | <ul style="list-style-type: none"> <li>Definition: portfolio values in “tail” of distribution</li> <li>Evaluation standard: real-world conditional ail expectation at the 70th, 90th and 98th percentiles; lower losses reflect better “tail” performance</li> </ul>   | <ul style="list-style-type: none"> <li>Do the funds reduce statutory reserve requirements (and volatility of reserves)?</li> </ul>           |

In the wake of the crisis, insurers launched three broad solutions to manage their balance sheet exposures, but we note that several challenges emerged with these solutions that no single risk control solution adequately could address completely.

**Clarity of investment thesis**—clients and advisors have been providing feedback that indicates a growing skepticism and concern over investing savings in “black box” solutions. Clients are unable to distinguish risk-control features that are balanced in terms of client/insurer interest from highly insurer-centric strategies that do not provide credible standalone investment theses.

An insurance company has three principal objectives in the manufacturing of equity-based guarantee products:

We can broadly express the performance and risk trade-offs that clients consider in purchasing equity-based guarantee products through two principal objectives:



| Objective                            | Metric  | Description and evaluation   | Client and advisor concerns  |
|--------------------------------------|---|--|--|
| Maintain investment upside potential | Return and volatility characteristics                             | Definition: historical fund returns net of fees and historical realized volatility<br>Evaluation standard: returns relative to realized volatility over certain periods                                    | Do the solutions materially alter the overall investment proposition?<br>Do the solutions provide compelling back-testing? |
|                                      | Long-term equity allocation                                       | Definition: equity allocation over time<br>Evaluation standard: average allocation to equity historically; higher allocations maximize return performance  | Do the funds produce permit sufficient “upside potential”?<br>Can the funds be adequately benchmarked?                     |
|                                      | Cumulative fees paid (applies to VIX-indexed fee strategies only) | Definition: cumulative fees paid relative to a traditional static fund<br>Evaluation standard: fees assessed historically, and prospectively (PV of fees as percent of PV of benefit base)                 | How much additional fees are required for the risk-control features?   |
| Minimize impact to guarantee value   | Guaranteed income levels  | Definition: guaranteed withdrawals for a policyholder age 70 with issue age of 55<br>Evaluation standard: assessed historically (\$000’s) and prospectively (percent) relative to a \$100K initial premium | Do the funds maximize guaranteed income in retirement?   |

|                     | Objective                             | Metric                                | Measure  | Static 60/40 | ATP   | Capped volatility | Target volatility | Capital preservation | VIX-indexed fees |
|---------------------|---------------------------------------|---------------------------------------|--|--------------|-------|-------------------|-------------------|----------------------|------------------|
| Insurer perspective | Write profitable business             | Guarantee cost                        | Reduction in “volatility cost” of guarantee  | N/A          | 62%   | 15%               | 61%               | 94%                  | 26%              |
|                     | Stabilize ALM and hedging performance | Hedge ratio                           | Vega—impact of a 1% reduction in volatility (% premium)  | 0.53%        | 0.25% | 0.40%             | 0.12%             | 0.03%                | 0.36%            |
|                     |                                       | Hedge-ability                         | Stability of hedge P&L (2008 hedge gain/loss)  | 4.2%         | -1.3% | -1.5%             | ~0.0%             | +0.6%                | -3.0%            |
|                     |                                       | “Basis risk”                          | % of weeks that have a non-zero equity allocation change   | N/A          | N/A   | 4%                | 48%               | 99%                  | N/A              |
| Client perspective  | Maintain investment upside potential  | Return and volatility characteristics | <ul style="list-style-type: none"> <li>• 2000–2009: <ul style="list-style-type: none"> <li>– Returns -0.37%</li> <li>– Volatility 12.92%</li> </ul> </li> <li>• 2010–2017: <ul style="list-style-type: none"> <li>– Returns 6.19%</li> <li>– Volatility 8.65%</li> </ul> </li> </ul> | -0.37%       | N/A   | -0.25%            | -0.55%            | -0.06%               | -0.73%           |
|                     |                                       | Long-term equity allocation           | <ul style="list-style-type: none"> <li>• Average allocation to real investments <ul style="list-style-type: none"> <li>– 2000–2017 60%</li> <li>– 1970–2017 60%</li> </ul> </li> </ul>   | 60%          | N/A   | 59%               | 55%               | 33%                  | 60%              |
|                     |                                       | Cumulative fees paid                  | <ul style="list-style-type: none"> <li>• (Historical) Average fees (1970–2017)</li> <li>• (Prospective) Fees paid <ul style="list-style-type: none"> <li>– Average 100</li> <li>– 75th %-ile 100</li> <li>– 25th %-ile 100</li> </ul> </li> </ul>                                    | 100          | N/A   | 100               | 100               | 100                  | 101              |
|                     | Minimize impact to guarantee value    | Guaranteed income levels              | <ul style="list-style-type: none"> <li>• (Prospective) Initial withdrawal rate of <ul style="list-style-type: none"> <li>– 5% 8.8%</li> <li>– 5.5% N/A</li> </ul> </li> </ul>  | 8.8%         | 8.7%  | 8.8%              | 8.4%              | 8.1%                 | 8.8%             |

## CONCLUSIONS

We summarize the results of the table on page 35, but we note that several challenges emerged with these solutions that no single risk control solution adequately could address completely.

Analysis of five common volatility management solutions in the marketplace highlight considerations relevant for insurers contemplating the introduction, augmentation, or removal of risk-controls in their products. These key considerations are as follows:

- Risk-control features provide material risk management benefits, albeit to varied extents, and their removal must be considered strongly.
- The type of market environment affects the effectiveness of risk solutions. All risk-control features are effective in the “body” to an extent, but risk-control funds and asset-transfer programs are the most effective in “tail” scenarios. VIX-indexing solutions provide insufficient protection in volatility “spikes.”
- More invasive risk-control overlays—such as capital preservation and target volatility—have historically experienced

the greatest challenges due to lack of performance transparency and persistent benchmark deviation. VIX-indexed and capped volatility funds historically have minimally affected investment performance.

Given the rapid adoption of volatility management solutions within VAs and their adoption in the broader marketplace, we anticipate continued interest in these controls and a push by insurers for innovative solutions that overcome challenges while providing significant risk management benefits. ■



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# The AFIR-ERM Section of the International Actuarial Association (IAA)

By Michael Sherris



*Editor's note: Risk Management is at an international level. JRMS has frequent communications and exchanges information with other international risk associations. AFIR-ERM is a section of the International Actuarial Association (IAA) with a focus on promoting actuarial research in investment finance and enterprise risk management.*

*In this issue, we're pleased to share with our members some recent nice activities and initiatives of AFIR-ERM on the risk management space. Please find useful information in the article below from Michael Sherris, Chairman of AFIR-ERM Section.*

The AFIR-ERM Section was founded in 1986 to develop, promote and disseminate actuarial research in investment finance and enterprise risk management, at the international level.

AFIR-ERM is focused on pushing the boundaries of actuarial knowledge and facilitating an international exchange of views, research and practical approaches among actuaries and other professionals via the following:

- Annual **colloquia**, sometimes jointly with other sections, and so with other actuarial approaches and perspectives;
- periodical **webinars** on research, delivered by expert professionals in finance and risks;
- access to the *ASTIN Bulletin*, the journal of the IAA, published three times per year;
- on-line resources including a **virtual library**;
- monthly **reference lists**, with links to interesting finance and risk-related topics;
- and **international networking**.

Annual colloquia are hosted by actuarial associations around the world. They provide a valuable international networking forum for academics and practitioners to discover and discuss the rapid

changes occurring in the disciplines of financial economics, financial risk management and enterprise risk management.

Recent AIFR-ERM colloquia were held in Edinburgh, Sydney, Lyon and Mexico City and their presented papers are available to section members on the website.<sup>1</sup> Our more recent colloquium in Panama included educational workshops covering enterprise risk management, longevity risk, term structure models, and derivatives pricing master classes. Future colloquia will be held in Florence, Italy, in 2019 and Paris, France in 2020 and a US venue for 2021.

One of our 2017 innovations and member benefit is free access to more than 150 hours of live streams and videos through the Virtual ICA (VICA).<sup>2</sup> The Virtual ICA is a new offering as part of the 31st International Congress of Actuaries in Berlin this June, and will include sessions from the Congress as well as additional content not available on site.

In 2002, the AFIR-ERM Section established The Bob Alting von Geusau Memorial Prize in honour of its late and long-serving treasurer. The prize is awarded annually for the best paper on an AFIR-ERM topic published in the *ASTIN Bulletin*.

AFIR-ERM Section members have exclusive access to our virtual library and monthly reference lists, published on the AFIR-ERM Section website. AFIR-ERM Section members also have free access to scheduled webinars that present research from recent Colloquia.

As part of its international outreach, the AFIR-ERM Section offers financial support to young researchers from actuarially developing countries to attend AFIR-ERM colloquia and the International Congress of Actuaries, encouraging them to develop a broader perspective and valuable networking opportunities. Section membership is open to interested individuals for \$50.00 CDN annually.

To become an AFIR-ERM member and start enjoying the benefits, visit [https://www.actuaries.org/iaa/IAA/Sections/Join\\_Section/IAA/Member\\_Join/Individual\\_Sections/0\\_Section\\_Join\\_Landing.aspx](https://www.actuaries.org/iaa/IAA/Sections/Join_Section/IAA/Member_Join/Individual_Sections/0_Section_Join_Landing.aspx). ■



Michael Sherris, FSA, FIA, FIAA, is chairman of the AFIR-ERM Section of the IAA.

## ENDNOTES

- 1 [https://www.actuaries.org/iaa/IAA/Sections/AFIR\\_ERM/IAA/Sections/afirerm/00Home.aspx?hkey=29af2381-e7f4-45eb-ba35-2c6052cd85af](https://www.actuaries.org/iaa/IAA/Sections/AFIR_ERM/IAA/Sections/afirerm/00Home.aspx?hkey=29af2381-e7f4-45eb-ba35-2c6052cd85af)
- 2 <http://ica2018.com/program/virtual-ica/>

# ERM Symposium in Miami April 19–20, 2018

By S Michael McLaughlin

**E**nterprise Risk Management is an established discipline. It's been around, for actuaries anyway, since at least 2001. ERM is already recognized as vital for all businesses, especially financial services businesses. So. What's new!? Aren't we all experts already?

Well, no. New risks are emerging all the time, quantification of many risks is still problematic, and there's still plenty of thinking in silos. The ERM Symposium, now in its 15th year, has helped to establish and advance the science—but is still needed to advance our risk preparedness.

197 attendees this time around would agree. They traveled to the Marriott Miami Biscayne Bay for two days of continuing education. They weren't disappointed.

For 2018, the symposium sponsors included the Casualty Actuarial Society, as well as the Canadian Institute of Actuaries and of course the Society of Actuaries. The organizing committee, composed of members from the sponsoring associations but also non-actuaries providing a different perspective, worked hard to present a fresh look and to appeal to a wide audience. They developed tracks for participants with backgrounds in life, health, finance, and property-casualty areas. They ensured sessions were available for very experienced practitioners as well as those getting immersed in the technical details of modeling risks. They encouraged the speakers to bring fresh, new content.

Perhaps most importantly, the sessions were organized to permit much more audience participation than usual. The increased interaction helped to develop wider perspectives than any one expert might present.

There were 31 sessions in the two days, including three general sessions for all attendees. Our featured keynote speaker was James Lam, who is considered by many to have been the first dedicated Chief Risk Officer (at Fidelity Investments). He led off the symposium with several provocative thoughts. For example, what level of precision should be sought? 99th percentile? 99.5? 99.96? The precision may be illusory—better perhaps to concentrate on providing usable information. Sometimes less

detail is more useful. And how best is ERM integrated with operations on a continuing basis. James has recently published a new book, *Implementing Enterprise Risk Management*, which he discussed briefly.

Our second keynote speaker was Chandu Patel, FCAS. He presented a case study followed by a lively audience discussion period. His example was a property-casualty reinsurance writer expanding rapidly in a risky new area. What is the correct role for the chief risk officer in staving off undue business concentration risk? Many attendees will likely claim professionalism continuing education credit for the session.

A real highlight of the symposium was the Chief Risk Officer panel discussion, which led off the second day. Thanks go to CROs Nick Silitch, Prudential, Tom Wilson, Allianz, and Dave Brentlinger, OneAmerica, for candidly sharing their perspectives, experience and advice. One interesting topic was how best to serve the needs of the Board of Directors. How much detail should be provided? How should the CRO prepare for board members' unpredictable questions? And how does the ERM function add value to the organization. There was also plenty of time in this session for audience members to ask questions and make comments from their own experience.

The concurrent sessions received generally excellent reviews. One, on Cyber Risk, was a little scary, in terms of how easily one's personal information stored electronically could be hacked. A major casino in Las Vegas lost information when a hacker gained access to their systems through a device controlling the fish tank! Operational risk continues to be a challenge to quantify. The regulatory framework continues to be helpful but is growing in complexity.

Thanks go out to several people who helped to make this symposium a success. The organizing committee of 19 people, led by Mike McLaughlin, along with David Schraub and Ryan Smith of the SOA staff, worked for many months in advance. All the speakers came well prepared and gave interesting new information. The commercial sponsors helped to finance the symposium and provided solid information to attendees. The hotel and staff were fully cooperative and there were few if any logistical hitches.

And of course your suggestions for improvement for next year will be welcomed! ■



S Michael McLaughlin, FSA, CERA, FIA, MAAA, is principal at McLaughlin Actuarial Consulting. He can be reached at [mike2567@aol.com](mailto:mike2567@aol.com).

## Recent Publications in Risk Management

**A**s an ongoing feature in *Risk Management*, we will provide recent publications we find noteworthy to our readers. Please send suggestions for other publications you find worth reading to [dscbraub@soa.org](mailto:dscbraub@soa.org), or [cheryl.by.liu@FWD.com](mailto:cheryl.by.liu@FWD.com).

National Risk Management: A Practical ERM Approach for Federal Governments

**Joint Risk Management Section**

<https://www.soa.org/Files/resources/research-report/2018/national-risk-management.pdf>

Policyholder Behavior in the Tail Joint Risk Management Section Working Group Variable Annuity Guaranteed Benefits 2017 Survey Results

**Society of Actuaries**

<https://www.soa.org/Files/resources/research-report/2018/variable-annuity-benefits-survey.pdf>

Effective ERM Stakeholder Engagement

**Joint Risk Management Section (CAS, CIA and SOA)**

<https://www.soa.org/Files/resources/research-report/2018/effective-erm-stakeholder.pdf>

11th Annual Survey of Emerging Risks

**Joint Risk Management Section (CAS, CIA and SOA)**

<https://www.soa.org/Files/resources/research-report/2018/11th-emerging-risk-survey.pdf>

Major Trends and Emerging Risk Radar: April 2018 Update

**The CRO Forum**

[https://www.thecroforum.org/wp-content/uploads/2018/05/CRO-ERI\\_Emerging-Risk-RadarTrends\\_Apr2018\\_FINAL.pdf](https://www.thecroforum.org/wp-content/uploads/2018/05/CRO-ERI_Emerging-Risk-RadarTrends_Apr2018_FINAL.pdf)

Supporting On-Going Capture and Sharing of Digital Event Data

**The CRO Forum**

[https://www.thecroforum.org/wp-content/uploads/2018/02/201802\\_CROF\\_Capture\\_and\\_sharing\\_of\\_digital\\_event\\_data.pdf](https://www.thecroforum.org/wp-content/uploads/2018/02/201802_CROF_Capture_and_sharing_of_digital_event_data.pdf)

Political Risk Insurance: A Primer

**Milliman**

<http://us.milliman.com/insight/2017/Political-risk-insurance-A-primer/>

The Global Risks Report 2018

**Oliver Wyman**

<http://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2018/January/Global-Risks-Report-2018.pdf> ■

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## JRMS e-Library

**A**bout five years ago the Joint Risk Management Section established an e-library for its members. Over the last three years, it has added a number of books from the Skills and Knowledge Inventory (SKI) for Risk Management. It can now be said that the library contains all the available books for the ERM SKI.

For those of you who are not familiar with the SKIs, each practice council in Canada establishes a list of books, papers and articles with which a practitioner in that area should be familiar. While some of the papers and articles are Canadian specific, the texts are of interest to anyone interested in risk management.

Joint Risk Management Section members can download the books from the Society of Actuaries website for free. At the end of two weeks the books disappear, but can be immediately downloaded again if one is not finished reading the book. ■



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