

Risk management



ISSUE 22 ■ AUGUST 2011

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Risk management

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ARTICLES NEEDED FOR RISK MANAGEMENT

Your help and participation is needed and welcomed. All articles will include a byline to give you full credit for your effort. If you would like to submit an article, please contact Ross Bowen, editor, at Ross.Bowen@allianzlife.com.

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

PUBLICATION DATES	SUBMISSION DEADLINES
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December 2011	Sept. 3, 2011
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PREFERRED FORMAT

In order to efficiently handle articles, please use the following format when submitting articles:

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- Article length 500-2,000 words
- Author photo (quality must be 300 DPI)
- Name, title, company, city, state and email
- One pull quote (sentence/fragment) for every 500 words
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Letter from the Editor

By Ross Bowen

WELCOME TO THE AUGUST ISSUE OF RISK MANAGEMENT.

We have a variety of articles for this quarter's edition covering a range of topics.

First, Max Rudolph submitted "Evolution of Emerging Risks," a discussion on the evolution of top risks over time. This paper discusses findings from a series of surveys on what practitioners consider to be top risks to their industry. It's interesting to see how the risks we focus most on seem to lag current events.

Next, "Is Predictive Modeling the Answer?" by David Weinsier and Guillaume Briere-Giroux, explores the benefits of using predictive modeling instead of traditional practices to anticipate lapse behavior. Predictive modeling applies techniques developed in the property & casualty (P&C) world to the variable annuity (VA) market. By using more sophisticated modeling techniques, predictive modeling hopes not only to improve forecasting quality, but looks to improve understanding around dynamic lapses.

Peter Nowell, Mattias Eng and Josée Deroy wrote "Longevity Risk Transfer—Europe in Pole Position, Warm-Up in North America?" This paper explores the needs and ways to manage longevity risk through different types of financial tools. The market for these tools is also discussed from both the supply and demand side.

"Solvency II and U.S. Equivalence," by Patricia Matson

and Ronald Sleiman, is a detailed overview of the Solvency II timeline along with context around these changes. In addition to a road map of important deadlines, the implications of these changes are discussed.

Donna Megregian reports to us on a 2010 SOA survey in "Reflecting Risk in Pricing Survey." Profit metrics, risk assessment practices and discount rates used are discussed in this paper.

Finally, Pierre Tournier has reviewed *Extreme Risk Management: Revolutionary Approaches to Evaluating and Measuring Risk*, by Christina Ray. In this risk management book, the author evaluates risk management modeling techniques.

Enjoy this issue. ■



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Do We Intend to Be Technicians or Leaders?

By A. David Cummings

I AM WRITING THIS ARTICLE AS I TRAVEL HOME FROM ATTENDING THE CAS SPRING MEETING. During the meeting, the keynote speaker, Brian Sullivan, asked a penetrating question of the actuaries in the audience. He asked, “Do you intend to be *technicians or leaders*?” He continued with comments showing respect for the deep understanding of the insurance business that we gain through our exam process and through our work experience. He said that knowledge would make us very valuable leaders in the companies we work for, yet few of the highest posts in insurance companies are held by actuaries.

While Sullivan’s comments were intended to apply generally to actuarial practice, I found myself applying them toward our growing role in enterprise risk

management (ERM). I think it is appropriate for us to ask ourselves how we intend this role to develop. Will we become primarily known and respected for our technical expertise in risk modeling? Or

will we instead develop into the leaders that will shape the way our traditional industries manage risk, with influence reaching into other industries as well?

I suppose there are no simple answers to these questions. But it seems that if we predominantly focus on building our technical credentials, we are unlikely to become influential leaders. In contrast, our success in becoming recognized risk management leaders will depend on a strong foundation of technical skills and business acumen. When matched with strong communication and interpersonal skills, our technical foundation will enable us to establish our reputation for leadership. In other words, our profession can best be recognized as both technicians and leaders if we maintain a clear focus on developing our leadership role.

Taking this idea a step further, it seems that if we do not become influential ERM leaders, then ERM will be far less effective than it should be. Because ERM

truly is all about creating effective risk culture, ERM practitioners must be able to translate analyses into action. In partnership with other professionals in our industries, actuaries should be uniquely able to provide these translations and lead the organizational changes that result from them.

The goals of all three of our member organizations (Casualty Actuarial Society, Society of Actuaries and Canadian Institute of Actuaries) clearly set our path toward leadership in ERM. And many of our members are leading the implementation of sound risk management practices within their organizations. With all the developments occurring in the risk management space, now is an ideal time for us to step into various leadership roles using our technical skills.

For example, in the United States, the expanding role of federal regulation is working to ensure more robust risk management practices in the insurance and financial services industries. But these new regulations are just beginning to take shape, and companies are just starting to respond. At the same time, the National Association of Insurance Commissioners (NAIC) is actively pursuing its Solvency Modernization Initiative. The outcome of this work will likely include each company performing its “Own Risk and Solvency Assessment” (ORSA), with reporting of this assessment to regulators. This regulatory evolution in the United States is mirrored by similar changes occurring in Europe, Canada and other parts of the world.

We can help to lead our industries into this new frontier in ways that help companies truly manage risk more effectively. Those of us who serve in government and our profession’s public policy arms can help develop regulations that help to ensure effective risk management practices without creating unnecessary burdens on companies. Our profession can also help companies perform these assessments to gain the benefits of effective risk management. If our companies act only to comply with regulation, then we have missed an opportunity to lead.

Another area that needs leadership at this time is the establishment of professional standards for ERM. A



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working group of the American Academy of Actuaries has recently published a discussion draft of these sorts of standards. By acting to establish these standards, we demonstrate our profession's intent and ability to be respected ERM practitioners. In this exercise, as in others, it will be important that we use our foundation of trusted technical ability to help to establish our leadership influence.

Our leadership role in ERM has been years in the making, and we as a profession are now well positioned to

guide our organizations into better risk management practices. As we continue to build upon our strong foundation of technical and business expertise, and work across our organizations to establish strong risk culture, our leadership role will become even better recognized and better respected. ■

SOA 2011 Elections Let your voice be heard!

The SOA 2011 election is just around the corner! Let SOA.org/elections be your resource for all information pertaining to the 2011 elections. **Online voting** for the election will be open 24 hours a day from August 8 until the polls close on September 2 at noon Central time. **Any elections questions** can be sent to elections@soa.org.

Let your voice be heard! **Please vote!**

*It is important to remember that Section Council elections have different constituencies from the election for Board of Directors. Section members must be current with their 2011 dues by June 30, 2011, in order to vote in this election.



Evolution of Emerging Risks

By Max J. Rudolph

IN 2010 THE WORLD ENDURED ITS USUAL LITANY OF NATURAL DISASTERS:

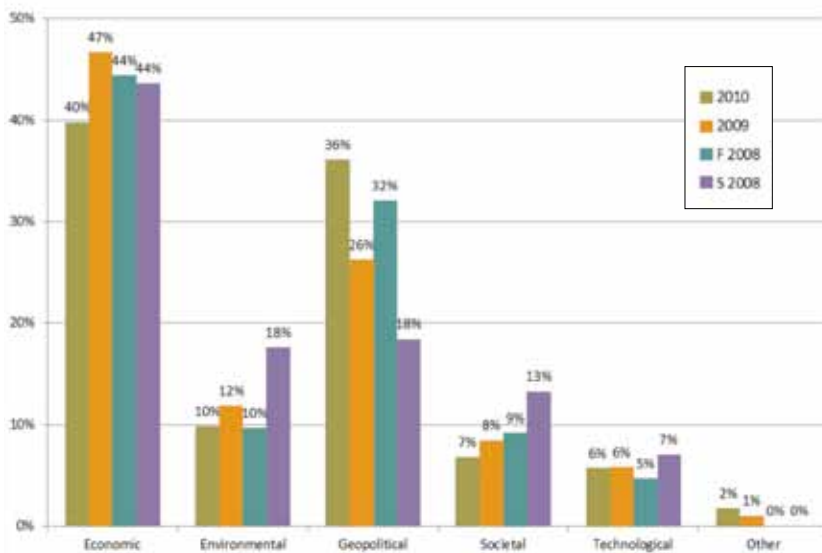
FLOODING, EARTHQUAKES,

volcanic eruptions and wildfires, among others. While some of these caused great grief, such as the Haiti earthquake, or

disruption, like the Icelandic volcano, greater surprises came from man-made crises last year. The European sovereign debt crisis has yet to fully play out, but risk managers now recognize their exposure to the risk that leading nations could default.

The BP oil spill in the Gulf of Mexico was a surprise in its magnitude and brought the impact of various risk combinations to the fore. Tensions on the Korean peninsula had escalated. It was in this context that the Joint Risk Management Section conducted its fourth survey of emerging risks in fall 2010.

CHART 1
Emerging Risk by Category
(up to 5 risks chosen persurvey)



Some risks generate a large volume of historical data that remains stable over time. Other risks are evolving in uncertain ways, have been forgotten in their dormancy, or are new. These latter risks are called emerging risks. While stable risks can usually be represented by statistical distributions, this is not true of emerging risks.

The financial crisis, driven in part by excessive leverage and misaligned incentives, focused risk managers as perhaps never before. Their heads were down, making sure their organizations survived. Not surprisingly, during this period previous surveys showed a heavy concentration of concern about economic risks. As time since the worst of the crisis lengthens, risk managers seem to be taking time to survey other risks that might pose long-term threats and opportunities. This is reflected in lower concentration among the top risks and risk combinations in the current survey.

Nassim Taleb, author of *The Black Swan*, has stated that a black swan is something no one predicts in advance but, after the fact, everyone understands and thinks they could have predicted. Some argue today that the BP oil spill was not a black swan because it could have been predicted. This is a form of hindsight bias. Previous surveys have highlighted a form of anchoring bias, where survey results are influenced by recent events, and that was seen again in this survey.

2010 proved to be a pivotal year for risk managers. There is currently an upsurge in management's willingness to listen to risk managers and fund their activities. Most organizations increased both their risk management activities and staff. Survey results show continued higher enterprise risk management (ERM) activity expected in 2011 (64 percent), but fewer resource increases (41 percent) than in 2010. Could the window of opportunity be closing for risk managers, only to open again after the next disaster or crisis? Prolonged stable environments can lead to excessive risk taking and limited oversight, while high volatility leads to fear and paralysis. Better decision making comes from recognizing that many risks cycle over time. A strong risk culture empowers flexibility, and companies

that embrace it will succeed over long time horizons. Predicting the future was part of their job for 77 percent of the respondents, in terms of identifying potential events and building out the flexibility to address those events if they occur.

There were definite shifts in the 2010 survey results. One can see in Chart 1 that the Economic category of risks is still the top choice ahead of the Environmental, Geopolitical, Societal and Technological general categories. Yet it also shows that as time passes from the financial crisis, its dominance decreases. Finishing a strong number two, Geopolitical risks increased as political tensions rose.

ANCHORING BIAS

As in past reports, the survey results show that current values of the S&P 500, a barrel of oil and the U.S. dollar relative to the Euro seem to anchor perceptions of risk. The survey results have evolved over time, generally lagging recent events.

Table 1

	S&P 500	Oil (per barrel)	USD/Euro
Spring 2008	1,385.59	\$ 113.70	\$ 1.56
Fall 2008	968.75	68.10	1.27
Fall 2009	1,106.41	77.04	1.48
Fall 2010	1,176.19	84.49	1.40

When the initial survey was conducted in April 2008, oil prices were relatively high, the stock markets were at record levels, and the dollar had trended down. At that time the top four emerging risks chosen were:

1. *Oil shock* (57 percent of respondents)
- 2T. *Climate change* (40 percent)
- 2T. *Blowup in asset prices* (40 percent)
4. *Fall in value of U.S. \$* (38 percent).

With oil at historic highs, it was the predominant emerging risk chosen. By the time the second survey was issued in early November 2008, the financial crisis was in full swing. The S&P 500 had dropped 30 percent, the price of a barrel of oil had decreased 40 percent, and

the U.S. dollar had strengthened 23 percent. The top four emerging risks from this second iteration of the survey were:

1. *Blowup in asset prices* (64 percent)
2. *Fall in value of U.S. \$* (48 percent)
3. *Oil price shock* (39 percent)
4. *Regional instability* (34 percent).

Systemic risk was perceived to be very high at that time with stock values in free fall. Oil prices had fallen, U.S. currency was considered a safe harbor, and the U.S. election cycle had just concluded. At the time of the third survey in late 2009, the S&P 500 had increased 14 percent, the price of a barrel of oil had increased 13 percent, and the U.S. dollar had weakened 17 percent. The top four emerging risks at that time were:

1. *Fall in value of U.S. \$* (66 percent)
2. *Blowup in asset prices* (49 percent)
3. *Oil price shock* (45 percent)
4. *Chinese economic hard landing* (33 percent).

In the current survey, opened in mid-October 2010, the indicators had not changed materially from the previous survey. Most of the top five results continue to come from the Economic category, but there is increasing concern about global risks:

1. *Fall in value of U.S. \$* (49 percent)
2. *International terrorism* (43 percent)
3. *Chinese economic hard landing* (41 percent)
4. *Oil price shock* (40 percent)
5. *Failed and failing states* (38 percent).

THE CHINA CARD

Risk managers are increasingly concerned about the situation in China. When asked for their overall top emerging risk, Chinese economic hard landing rose to the number one ranking, increasing from 4 percent in the prior survey to 14 percent this year. A fall in value of the U.S. dollar also remains a top concern as the second leading response:

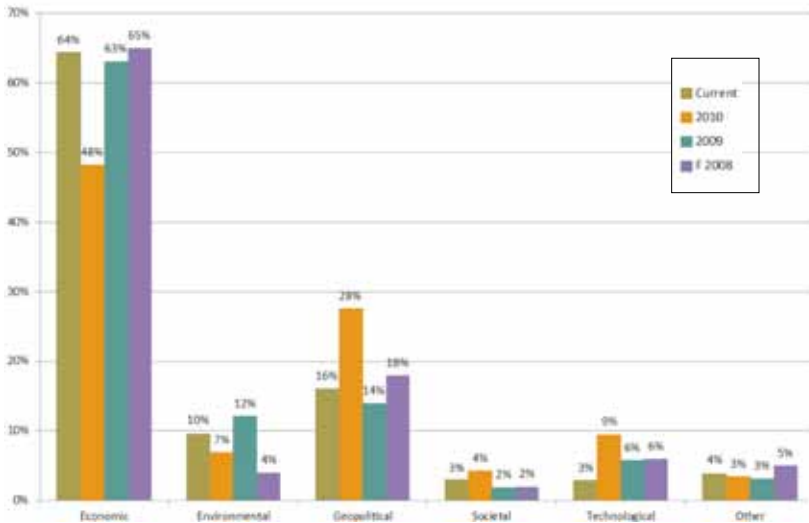
CONTINUED ON **PAGE 8**

Evolution of Emerging Risks | from Page 7

1. Chinese economic hard landing (14 percent)
2. Fall in value of U.S. \$ (11 percent).
3. Blowup in asset prices (10 percent).
- 4T. Breakdown of critical information infrastructure (CII) (9 percent).
- 4T. Oil price shock (9 percent).

It is interesting to consider the ramifications of differences between Charts 1 and 2. In Chart 1, where the survey asked for five emerging risks, the Geopolitical category spiked in the current survey. However, when asked for the overall top emerging risk, the Geopolitical category is much lower than in 2009, while the Economic category remains high.

CHART 2
Emerging Risks by Category
Single Greatest Impact

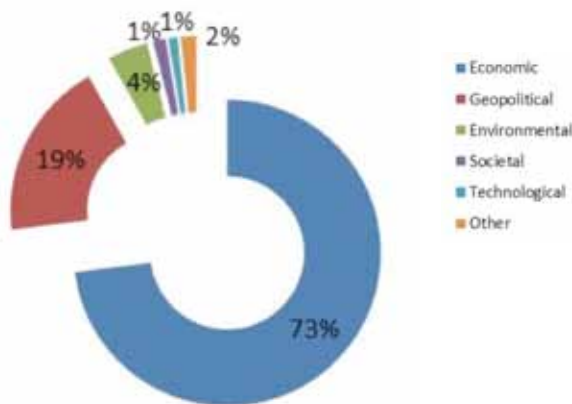


Each year a topical issue is addressed, with respondents asked to choose risk combinations that could impact a potential event. Previous questions have addressed regional food shortages and political instability, and each has since proven timely. In this survey China's financial relationship with the world was explored. Respondents were asked to consider primarily changes in currency, commercial and investment relationships. Respondents were asked to include up to three risks. Results focused on Economic risks, with almost three-quarters of the risks chosen from that category.

1. 73% Economic
2. 19% Geopolitical
3. 4% Environmental
4. 1% Societal
5. 1% Technological

The top two specific risks chosen were almost a dead heat, with fall in value of U.S. \$ (24 percent) and Chinese economic hard landing (23 percent). Rounding out the top five were oil price shock (16 percent), retrenchment from globalization (9 percent) and blowup in asset prices (6 percent).

CHART 3
Combinations Impacting China



LEADING INDICATORS

As companies implement their ERM process, many are creating metrics around key performance indicators. A lagging indicator uses information collected after an event occurs, such as the number of auto policies in force or widgets sold. A leading indicator provides information earlier in the process. Examples would include insurance applications being much higher/lower than expected or a spike in the credit default spread for a supplier. Over half the respondents reported having at least some leading indicators around emerging risks, but efforts continue to evolve and the current status is often "seat of the pants."

“ERM requires a balance of mitigation and opportunity, and between qualitative and quantitative analysis.”

ERM requires a balance of mitigation and opportunity, and between qualitative and quantitative analysis. Risk managers in this survey reported that, in addition to increased model sophistication, they have also incorporated more common sense and imagination into their analysis.

CONCLUSIONS

As this article is being written, countries in North Africa and the Middle East have erupted in a people's revolt against the current regimes and Japan suffered one of the most devastating earthquakes on record, reminding humanity of our fragility. Risk managers are human too, suffering from the flaws of anchoring and hindsight bias, but fulfill an important role as they try to understand risk interactions and the unintended consequences of emerging risks. Which risks will evolve to dominate decision making? The world's Geopolitical

risk is growing, with the eventual outcome unknown. Will overpopulation lead to food shortages, or will disease or global warming become prevalent? By being vigilant and using leading indicators, organizations can better deal with these challenges.

BACKGROUND

This research project was funded by the Joint Risk Management Section of the Society of Actuaries, Canadian Institute of Actuaries and Casualty Actuarial Society. An electronic survey was used to gather the views of risk managers. The research report can be found at:

<http://www.soa.org/research/research-projects/risk-management/research-2010-emerging-risks-survey.aspx>. ■

SOCIETY OF ACTUARIES

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1-2-3

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Is Predictive Modeling the Answer?

By David J. Weinsier and Guillaume Briere-Giroux

LIFE INSURERS THAT WRITE VARIABLE ANNUITY (VA) BUSINESS WITH GUARANTEES FACE A VARIETY OF SIGNIFICANT CHALLENGES.

The recent financial crisis put hedging programs and, in certain cases, the statutory solvency of VA writers to



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the test and demonstrated that future financial success for VA writers will rely on sustainable product pricing, accurate hedging and robust risk management. Each of these actions depends on the insurer's ability to study, forecast and properly manage policyholder behavior risk.

In this Insights article, we explore how important tools used in property & casualty (P&C) insurance—predic-

tive modeling and data mining—can be applied to more effectively model policyholder behavior risks in

VA contracts. Traditional modeling approaches have attempted to reflect VA policyholder behavior patterns based on product design, policy characteristics and policy performance. However, in practice, policyholder behavior is driven by numerous interrelated factors.

Many of these factors are difficult to account for under traditional approaches, which typically consider only a limited number of variables and fail to adequately capture certain correlations and interactions among them.

In this article, a case study is used to demonstrate how a predictive modeling approach can improve upon traditional methods used to model VA lapse behavior.

TRADITIONAL APPROACHES TO MODELING VA LAPSE BEHAVIOR

Figure 1 on page 11 describes the primary factors that drive VA lapse behavior and indicates whether traditional modeling approaches typically reflect each factor.

We have categorized the factors into four groups:

- Product and guarantee design
- Policy characteristics
- Policy performance
- Distribution.

What is Predictive Modeling?

Predictive modeling is the application of certain algorithms and statistical techniques to a data set to better understand the behavior of a target variable based on the co-relationships of several explanatory variables.

Rather than relying on a simple understanding of basic risk elements, predictive modeling enables the user to consider many confounding factors simultaneously by mining across a set of scenarios. This analysis permits more informed decisions and limits the use of subjective judgment.

Predictive modeling techniques have primarily been used in the P&C space to enhance understanding of current and/or future insured risks.

This knowledge has led to improved risk segmentation, underwriting, pricing and marketing decisions. For example, auto insurance premiums reflect the fact that younger drivers are poorer risks than middle-aged and older drivers, and males are poorer risks than females. However, data also show a clear interaction between age and gender (i.e., the difference in relative risk between male and female drivers is much less pronounced at older ages than at younger ages). Traditional pricing techniques typically do not quantify this interaction between risk parameters, but a predictive model will recognize this and other interactions, enabling the insurer to develop premiums that accurately reflect the relative risk characteristics of the pool of underlying policyholders.

Figure 1. Factors that Drive VA Lapse Behavior

Category	Factor	Traditional Industry Modeling Practices
Product and guarantee design	Surrender charge length and strength	Reflected via grading up base rate, shock, shock + 1 and ultimate lapse rates
	Share class (A-share, B, C, L)	Reflected in accordance with specific surrender charge schedule
	Presence and nature of living benefits	Reflected, but approximate and somewhat speculative
Policy characteristics	Policy size	Typically not reflected
	Policyholder age and sex	Typically not reflected
	Life stage (i.e., accumulation vs. income)	Typically not reflected
	Qualified vs. nonqualified	Typically not reflected
Policy performance	Guaranteed benefits in-the-moneyness	Reflected via deterministic formulas applied uniformly to base lapse rates
	Recent fund performance	Typically not reflected
Distribution	Commission structures (heaped vs. trail)	Typically not reflected for in-force modeling (often reflected in pricing, however)
	Distribution channel/target market	Typically not reflected (beyond what is captured in aggregate experience)

Traditional approaches to modeling VA lapse behavior can have the following shortcomings:

- Inability to distinguish between base and dynamic behavior.** Historical data will show a single lapse rate, which is a function of both base behavior and dynamic behavior. However, the use of traditional approaches makes it challenging to identify which component of the single aggregate rate is base and which is dynamic. When attempts are made to separate these impacts, the credibility of the resulting groups decreases. Thus the impact of these separate pieces cannot be precisely validated.
- Suboptimal use of historical experience data.** In a typical experience study, the data are categorized, aggregated and analyzed. By splitting the data into categories, the exposure bases available to analyze a given relationship (e.g., policy year effect for a particular product) become smaller, which results in a loss of credibility. Aggregating the experience for a given variable does not control for the contribution of other variables influencing the experience for that group. This creates “noise” that increases the amount
- of data required to extract a credible relationship when analyzing a single variable at a time.**
- Traditional approaches typically consider a limited number of explanatory variables to account for a complex behavior.** This is often done to maintain the credibility of the results. In fact, many of these variables are readily available (e.g., age, gender, asset allocation, past withdrawals), but others could be categorized as “exotic” variables that could also be collected and analyzed to help predict VA lapse behavior (e.g., indicators of financial sophistication such as credit score, education levels, profession/industry).
- Interactions between variables, where the impact of one variable is affected by a second variable, are typically not captured.** Consequently, these methods fail to consider explanatory variables and their impact on the target variable.
- Correlations between explanatory variables are not fully accounted for,** which can result in double-counting effects or not attributing an effect to the correct variable.

CONTINUED ON PAGE 12

CASE STUDY: APPLICATION OF PREDICTIVE MODELING TECHNIQUES TO VA LAPSE BEHAVIOR

A predictive model can address many of these shortcomings by permitting consideration of all risk factors simultaneously, in addition to reflecting interactions between variables, without significantly reducing the credibility of results. This allows for both a macro view and a focus on the subtle, micro-interactions between risk factors. Specifically, predictive modeling enables management to better understand the factors influencing policyholder behavior, the interaction of such factors and the potential impact on profitability and risk. The results of this case study show how the application of a predictive model to modeling VA lapse rates can improve on traditional approaches. The underlying analysis was performed on a large sample of hypothetical but representative data. The data were developed based on actual industry experience, with certain adjustments, resulting in an exposure base and product mix representative of a typical VA writer. The resulting data set features a typical age, share class, fund allocation, commission type and rider mix by year of issue (and includes more than 10 issue years).

The in-the-moneyness (ITM) for the living benefit riders (e.g., GMWB, GMIB) is representative of actual historical market conditions, including actual experience in the tumultuous years of 2008 and 2009.

The **traditional model** employs a typical industry approach to modeling VA lapse rates, reflecting the following factors:

- Base lapse rate varying by policy year
- Surrender charge length and strength
- Shock lapse at the end of the surrender charge period
- Commission structure
- Presence and nature of living benefits
- ITM of living benefits, defined as: $1 - (\text{account value/benefit base})$.

The **predictive model**, derived as a generalized linear model (GLM), is based on the following variables present in the case study data:

- Base rate varying by policy year
- Surrender charge length and strength
- Proximity to end-of-surrender charge
- Commission structure
- Presence and nature of living benefits
- ITM of living benefits
- Premium (i.e., policy size)
- Fund value
- Portfolio mix (aggressive, balanced, conservative, cash)
- Attained age.

MODEL VALIDATION

The data set was randomly split into two distinct groups in order to facilitate an objective model validation. The first group, made up of 70 percent of the aggregate data set, was used to set the model parameters. The second group, the remaining 30 percent of the aggregate data set, was then used to test how effectively the model predicted actual lapse behavior. That is, the first group of data was used to fit the models. These models then projected an expected set of lapse rates for the policies in the second group (the “E” in an actual-to-expected study). The actual lapse experience in the second group was then designated as the “A” to see how well the models predicted actual results.

CASE STUDY RESULTS

Figure 2 shows actual-to-expected results by policy year, while Figure 3 shows results by ITM bands.

The predictive model shows an appreciably better fit than the traditional model when considering actual-to-expected ratios by policy year and ITM bands. This result is primarily driven by correlations between policy year and ITM that are captured in the predictive model but ignored by the traditional model.

The comparisons of actual-to-expected lapse rates on an aggregate basis shown in Figures 2 and 3 are useful; however, additional comparisons and analysis should be performed to verify this result. Figure 4 on page 14 compares expected lapse rates emerging from the traditional model to the predictive model. This allows for a comparison and validation of the fit of the two models at more granular levels. The x-axis is the ratio of the predictive model expected lapse rate to the traditional model expected lapse rate.

A ratio of 1.0 indicates that the two models produce the same lapse rate for a given policy. A ratio less than 1.0 indicates that the predictive modeling approach produces a lower lapse rate than the traditional model, whereas a ratio greater than 1.0 indicates that the predictive model produces a higher rate.

This comparison tells us that, for a significant proportion of the policies, the two models produce very different expected lapse rates. The absolute difference in the ratio is greater than or equal to 20 percent for 65 percent of the policies and greater than or equal to 60 percent for 23 percent of the policies. As depicted on the far right side of Figure 4, this analysis also shows that for roughly 3 percent of policies, the predictive model produces a rate greater than or equal to 3.0 times the traditional rate, suggesting that the traditional model may have limitations in capturing the tails.

Figure 4 shows that expected lapse rates differ significantly between the models at the policy level, and further analysis is needed to test the viability of the predictive model at a granular level. For this purpose, we developed a typical graph commonly referred to in the P&C space as a “gains chart,” as portrayed in Figure 5 on page 14. A gains chart sorts the policies by expected lapse rate in descending order. The cumulative lapse rate is then recorded as the data are stepped through policy by policy.

Figure 2. Actual Versus Expected Lapse Rates by Policy Year

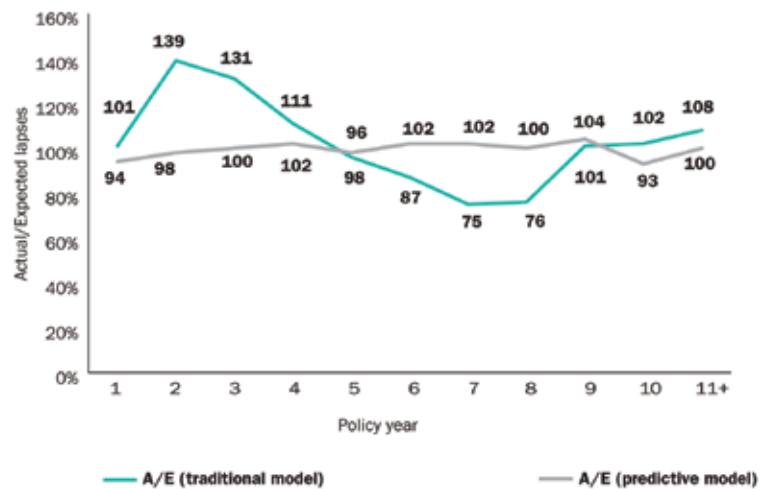
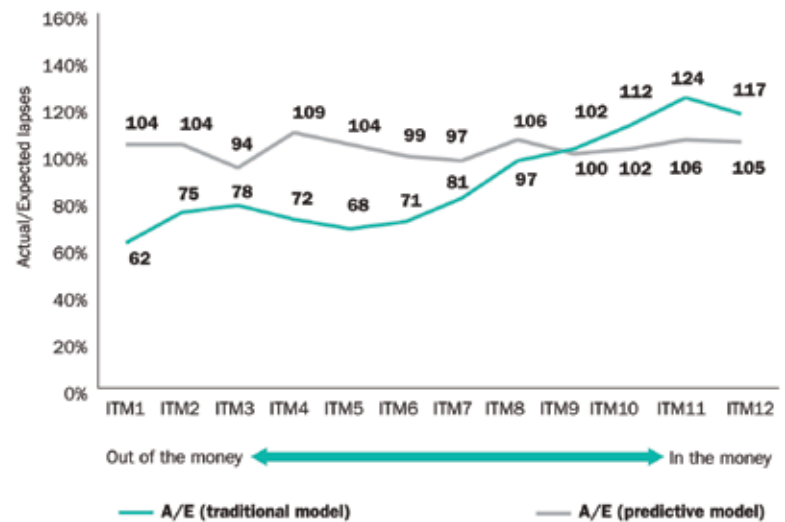


Figure 3. Actual Versus Expected Lapse Rates by ITM Bands



CONTINUED ON PAGE 14

Figure 4. Comparison of Predictive Model to Traditional Model Expected Lapse Rates

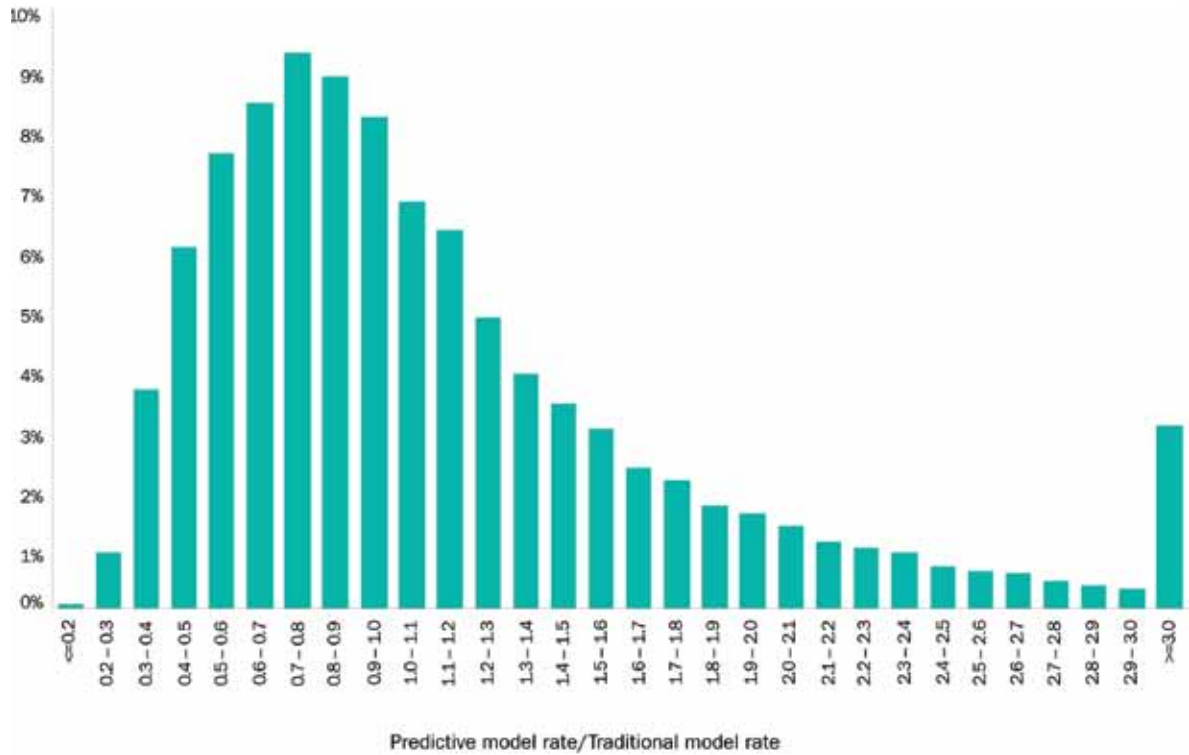
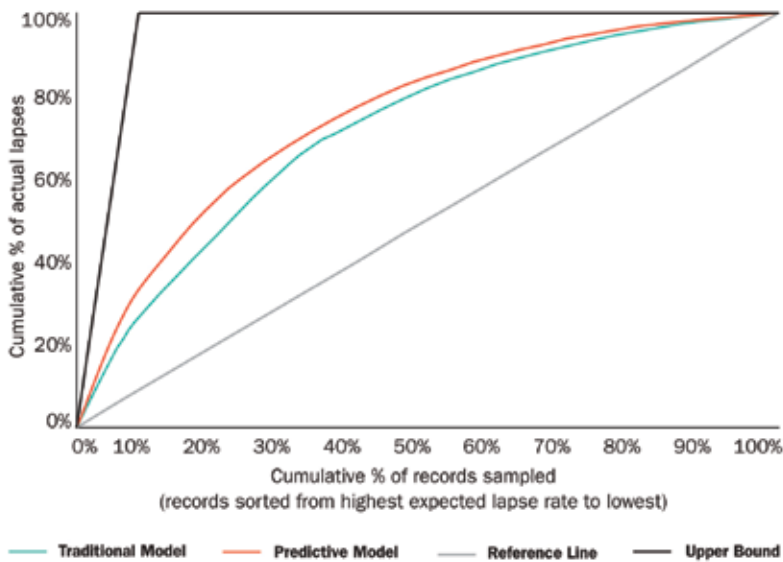


Figure 5. Comparison of Traditional and Predictive Models Using a Gains Chart



By definition, before the first record, the cumulative percentage of the total number of lapses will be 0 percent. At the end of the projection, it will be 100 percent. If the model is no better than a random sort of the data, then we would expect a straight diagonal line that we label the reference line (gray line in Figure 5). In this case, 50 percent of the lapses have been found (y-axis) after sampling 50 percent of the records (x-axis). At the other extreme, a perfect model would have predicted 100 percent of the lapses in roughly the first 8 percent of records (8 percent is the average annual lapse rate). This is labeled as the upper bound (black line).

Since the model is better than a random sort, we expect the cumulative percentage of lapses to increase more quickly than the cumulative percentage of records counted, and the line produced on the graph to be bowed to the left. The greater the area under the model line, the better the model is able to differentiate policies by risk of lapsing. The graph shows, for example, that if the first 20 percent of policies are targeted, the predictive model (red line) would have predicted roughly 55 percent of actual lapses, as compared to 45 percent for the traditional model (blue line), indicating a stronger model.

CONCLUSIONS

Predictive modeling and data-mining techniques commonly used in the P&C space can be applied to effectively measure, analyze and forecast complex VA lapse rate behavior. The results of the case study showed that, as compared to the traditional model, the predictive model achieved an appreciably better fit under a typical actual-to-expected analysis, produced a more granular fit, and better differentiated between policies with a low and high risk of lapsing.

The overall assessment is that, compared to traditional approaches, the predictive model can improve modeling of VA lapse behavior because it can:

- Capture a greater number of risk factors (or variables) that drive VA lapse behavior
- Account for correlations between explanatory variables; in the case study, the predictive model was able to obtain a better fit due to its ability to disentangle the effect of ITM and policy year
- Make optimal use of the data available by avoiding segmenting and grouping, which can result in a loss of credibility; the predictive model uses less data to achieve convergence
- Capture interactions between variables, where the impact of one variable is affected by another.

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Why use Predictive Modeling?

The use of predictive modeling by life insurers can lead to the following business and strategic benefits:

- Identification of more profitable segments, distribution and target markets
- More reliable pricing assumptions, less subjectivity and reduced assumption risk
- Product development based on more accurate estimates of policyholder behavior (e.g., surrender rates, withdrawal/annuitization utilization, asset allocation/rebalancing)
- Improved risk mitigation (e.g., hedging, asset/liability management) by reducing policyholder behavior variances
- More accurate modeling of policyholder behavior in the tail, resulting in more accurate reserve and capital estimates
- More streamlined models and better controlled model implementation by replacing multiple tables and dynamic formulas with a single parameterized predictive model
- Easing compliance with certain regulatory, rating agency and reporting requirements (e.g., Actuarial Guideline 43, Solvency II, MCEV principles).

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ADDITIONAL RESOURCES

Towers Watson Society of Actuaries Research paper Predictive Modeling for Life Insurers—Application of Predictive Modeling Techniques in Measuring Policyholder Behavior in Variable Annuity Contracts.

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Longevity Risk Transfer—Europe in Pole Position, Warm-Up in North America?

By Peter Nowell, Mattias Eng and Josée Derooy

WHAT IS LONGEVITY RISK?

Longevity risk is the financial risk associated with uncertainties around pensioners' and annuitants' life expectancies. Individuals facing longevity risk have traditionally managed this risk through "pooling" within



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life insurance companies and/or pension funds; however, this has resulted in very large accumulations of exposure to longevity risk within these institutions as the risk has not been managed through risk transfer solutions (like reinsurance) the way mortality risk is conventionally managed. The main exposure to this risk lies with the providers of pensions, particularly insurance companies as writers of annuities or guaranteed pensions, and defined-benefit pension schemes. Frequently, this risk is also classified into **macro longevity risk**, where the exposure is to thousands of lives (such as an insurance company's entire portfolio of pen-

sions, or a national population) or **micro longevity risk** where the exposure is concentrated on only a few hundred lives or even fewer (such as a life settlements pool). (This article deals mainly with the former rather than the latter.) The opposite risk is **mortality risk**, the financial exposure from a specific population dying faster than expected. The main exposure here comes from life assurance, where a fixed benefit is paid on the death of the policyholder.

The sources of longevity risk often combine this exposure with other financial risks. For writers of annuities,

as pensioners live longer there are more fixed rate payments to be made in the future. This exposes the annuity writer to interest rate risk and reinvestment risk as a result of the longevity risk. Index-linked pensions give exposure to inflation risk, and any escalation in benefit increases these second-order financial risks.

Defined-benefit pensions have the same risks but may be borne by a pension scheme rather than an insurance company. Here, the fallback if risks exceed initial estimates is to the sponsor of the pension plan, assuming it still exists, rather than to the general resources of an insurer.

Longevity risk is also exacerbated by other benefits granted in a pension scheme, such as pensions to surviving spouses and/or dependents (e.g., children to the age of 18). Whilst such pension payments may be at a reduced rate (typically 50 percent of the first pension), they can continue for a long time. The most extreme example is that of the last pensioner covered from the American Civil War, a widow who passed away in 2004!

WHO ARE THE HOLDERS OF LONGEVITY RISK?

Historically insurance companies have been assumed to have a core competency in taking longevity risk, and focused on managing the other risks through their investment policies (matching assets with expected liabilities) or specific hedging plans (using long-dated conventional assets and derivatives). The only way of managing longevity risk was assumed to be through the natural offsets between longevity and mortality risk—writing both annuities and life policies within the same group for example. However it is very difficult to balance the risks perfectly in this way so this is at best a proxy hedge. Also it is clearly not possible for pension funds to do this, where the only way of limiting risk has been to close schemes to new members and move over to operating defined-contribution pension schemes instead. Whilst this has pushed longevity risk back onto the individuals working currently, it does nothing to manage the huge historic liabilities within defined-benefit schemes, particularly in the United States and United Kingdom. Other countries often had more risk

“The recognition of longevity risk has been spurred on by changing accounting standards and improved, more risk-sensitive, regulation.”

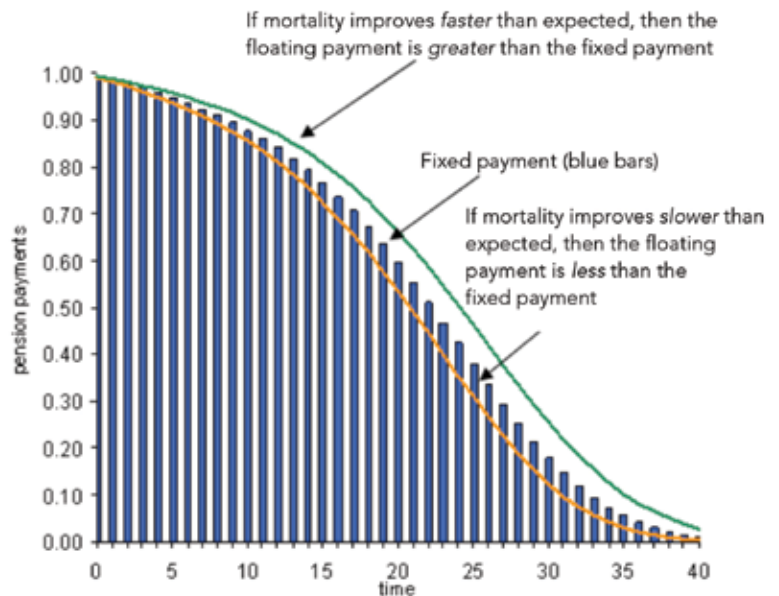
sharing in pension plans, so as pensioners live longer or investment returns decline, all pensioners (current and future) receive reduced benefits or benefits that increase at a reduced rate.

The recognition of longevity risk has been spurred on by changing accounting standards and improved, more risk-sensitive, regulation. Under International Financial Reporting Standards (IFRS), the financial consequences of being a pension plan sponsor have moved from being a note in the accounts to a driver of profit and loss amounts, as future expected liabilities are recognized and provided against. Under Solvency II, a uniform capital charge for both longevity and mortality risks will be applied to insurers across the European Union (and European Economic Area (EEA) countries) from 2013. Proposals to regulate pension funds continue to be made in Europe although these are more controversial, due to significant differences between legal and accounting frameworks for corporate pensions between countries. However, pension scandals and corporate collapses over the last 25 years (Polly Peck, Maxwell Group) have led to an increasing state involvement in the sector, as both regulator and pension insurer of last resort. The Pension Benefit Guaranty Corporation (PBGC) in the United States covers 801,000 active and 669,000 deferred pensioners already; the Pension Protection Fund (PPF) in the United Kingdom now covers nearly 400,000 pensioners and charges an annual risk-based levy on all U.K. pension plans.

WHAT SOLUTIONS HAVE BEEN DEVELOPED TO MANAGE THIS RISK?

Against this background, a market in longevity risk transfer products has started to emerge. Its origins were in the de-risking of U.K. defined-benefit pension schemes. Traditionally this has been achieved through a buy-out or buy-in of the pensions by a bulk annuity provider—which, in the United Kingdom, must be a regulated life assurance company with minimum capital of GBP (50) million. In a **buy-out**, all the individual pension liabilities are transferred to the insurer in return for an up-front payment and the scheme is wound up (the pensioners receive annuities from the buy-out provider in exchange for their pensions). In a **buy-in**, the pension fund buys annuities against the lives covered in

Gross Longevity Swap Payments



the pension plan to remove all financial risks (but these annuities are owned by the pension fund rather than the individuals), and continues to administer the payments to pensioners. A partial buy-in is possible, where annuities are bought against a subset of pensioners (most commonly pensions currently being paid) as a step toward an eventual full buy-in/buy-out. The difficulty with these solutions is costs. Since there is a material transfer of risk, the initial premium paid typically exceeds the accounting value of the liabilities.

For life insurance companies, the corresponding solution to a buy-out/buy-in is through single premium life reinsurance, where an up-front payment is made to a reinsurer, which then makes an ongoing claims payment to the life insurer that exactly matches the payments made under the reinsured pension/annuity policies. However, this also means that the insurer, by paying out all the cash up front, forgoes any benefit from managing assets over the life of the pension (and this is typically the source of the majority of profits from managing these contracts).

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The alternative is to enter into a contract that only transfers the longevity risk to another party, leaving the insurer or pension fund to manage its interest rate and reinvestment risks separately. In a **longevity swap** transaction, an insurer or pension fund pays a fixed schedule of payments equal to its expected future pension payments on a defined block of business, plus a risk premium, to a reinsurer. The reinsurer then has to pay the actual future pension payment. So if the pensioners live longer, then the reinsurer is paying out more in future years than it is receiving from the fixed schedule of payments. It charges a premium to cover this risk. This is effectively the same solution as the single premium life reinsurance structure discussed previously, except that instead of a one-off lump-sum premium up front, the premium is paid over the life of the contract so the life insurer (or pension fund) retains the assets and their returns.

Whilst this transaction type is called a longevity swap, the contract may be structured either as a reinsurance contract or as a derivative. For insurance companies, reinsurance is more likely to offer them solvency capital relief (although Solvency II will allow relief from derivatives for European insurers) and also insurance accounting on an accruals basis rather than mark to market/model (at present). However, the counterparty must be a regulated insurer or reinsurer. Alternatively the longevity swap may be documented as a derivative under an International Swaps and Derivatives Association (ISDA) Master Agreement. This allows the counterparty to be a bank or even a nonfinancial institution such as a hedge fund. Derivatives documentation has the advantages of comprehensive netting provisions on the event of a default of a counterparty, and collateral provisions allowing for the receiving/posting of collateral (cash or securities) on a regular basis to reduce counterparty credit risk (the risk of a party to a deal becoming bankrupt or otherwise unable to pay). Unfortunately, longevity derivatives documentation must still be negotiated for individual deals as there is not yet one “market standard” for such transactions. In the United Kingdom, a trade organization called the Life and Longevity Markets Association (LLMA) has been formed by a consortium of banks, insurance and reinsurance companies to work on improving market

liquidity and promoting longevity risk transfer products. It has published sample term sheets on its website. However, a number of major banks are not part of this association yet, and it lacks the reach of bodies such as ISDA (founded in 1985, counting 800 members from 55 countries on six continents).

HOW CAN MORAL HAZARD ISSUES BE DEALT WITH?

There are a few problems with hedging a defined pension portfolio from an insurer or pension scheme. Firstly, the risk taker is reliant on the existing pension provider for historic and ongoing information about the lives assured. Data quality issues may exist (e.g., lack of information about spouses, health status, even address), and reporting may be subject to delays or revision. Furthermore, any selection of pensions may be subject to moral hazard with the hedging party looking to pass over its riskiest exposures. One solution is for the hedging party to keep part of the risk covered (e.g., 10 percent of all lives) to promote an alignment of interests. Another way is to use an index-based hedge instead.

An **index-based longevity swap** references a third party source of information relating to the wider population of a country, rather than a specific pool of pensions. This is typically a national population (e.g., England and Wales) collected by a national statistical agency. The information is aggregated and an index of longevity (by age and gender) is calculated from the data. Examples include the Lifemetrics family of indices (created by JPMorgan and donated to the LLMA), the XPECT indices (created by Deutsche Borse) and proprietary indices from other investment banks such as Credit Suisse (for the United States this is determined from U.S. government published national death statistics with Milliman as the calculating agent). Banks have been keen to promote derivatives based on such indices. By persuading many clients to use the same index, a liquid market could be created in the product, leading to trading opportunities. Indices also avoid issues of adverse selection and moral hazard. However, hedgers of risk such as pension funds are more reluctant to use them due to the basis risk between their specific population and the national population as a whole.

A **modeled index** may be created to narrow the gap between a broad population index and a defined pool of pensions. This is done by taking a national index but weighting its constituents to match more closely a pension fund's liabilities. For example, those aged 65 to 66 may only be 0.5 percent in England but 5 percent of a pension plan, so the performance of 65- to 66-year-olds is taken and multiplied by 5 percent in constructing this new index. A modeled index could also be scaled by a multiplicative factor if the population is expected to live shorter or longer than the specific pool on average.

HOW IS THE MARKET DEVELOPING?

To date, the majority of deals, whether in reinsurance or derivative format, have been bespoke deals. Here the payout structure is closely linked to a specific pool of people defined just for this trade, although payment mechanics may be simplified compared with the exact cash payment of each pension. Bespoke deals minimize the hedging error or basis risk for the party transferring the risk away. However, reinsurance deals are more likely to match the life span of every pensioner and potentially run out to 80 or 90 years (if pensioners live that long). Derivatives are more likely to have a defined maturity date, be it 10 years to 50 years, depending on the deal and counterparty.

Market participants in the longevity risk transfer market include:

- Reinsurers—usually takers of risk, but potentially some hedgers.
- Insurers—both hedgers and takers of risk depending on their business mix.
- Pension funds—usually hedgers of risk.
- Banks—usually intermediaries—some also own pension insurers.
- Specialist funds and asset managers—takers of risk.

Deals done over the last few years have focused on the United Kingdom, and have included corporate pension schemes for such companies as Babcock, British Airways, BMW U.K. and others. Some insurance companies have also hedged risks including Aviva, Prudential, Friends Provident, Lucida, Pension

Corporation, Canada Life (part of Great West Life) and Standard Life.

WHAT ARE THE CHALLENGES FOR CONTINUED GROWTH IN THE MARKET?

The future challenges for this emerging market are:

- **Standardization**—a common documentation framework would help to speed the execution of deals, which currently can take months due to complexity of negotiating specific clauses.
- **Regulation**—this is both a spur to hedge risks (and free capital) and a hindrance (lack of clarity on treating basis risks at present).
- **Liquidity**—more market participants are expected to become involved as liquidity increases and opportunities to trade out of positions become available.
- **Diversification**—risks from other countries such as the Netherlands, Germany and the Nordic countries will help to build a more diverse pool to invest in.

The next steps are to address these issues with both hedgers and risk takers in this area, and grow the size of the market so it can provide meaningful relief of risks from the pension sector.

WHO ARE THE BUYERS OF LONGEVITY RISK (CURRENT AND FUTURE)?

There are multiple buyers of longevity risk that are currently active in the market:

- Reinsurers (10 current participants) that regard the risk as a natural hedge to their exposure to mortality risk and also, and crucially, as a source of attractive returns.
- Specialist investment funds (25 current participants) that have the ability to independently price and analyze instruments linked to longevity and think that this type of investment represents a low volatility, low correlation, attractive return investment.
- Life insurers (five current participants) that have

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limited exposure to longevity risk due to the products that they offer but have the ability to understand and analyze this risk and regard it as having an attractive risk/return profile.

As can be seen from the above list, the overarching reason that the buyers of longevity risk participate in the longevity risk market is that they regard it as an opportunity to invest in an asset with a low correlation to other risks combined with limited volatility. This is a key distinction that needs to be made: *Investors in the longevity market do not invest in longevity to hedge other exposures; they invest since they regard the investment as an opportunity to earn attractive returns for a risk with limited correlation.* Or put in simpler words, in the same manner that an investor buys stock in, say, Apple, he does this since he considers it an attractive investment and not since he is short on computers(!) The same logic applies to an investment in longevity risk.


In terms of growth of the market, the key impediments at the moment are the need for specialist knowledge in order to analyze these investments, as well as the lack of liquidity and standardization of instruments. As these issues are addressed, we expect to see additional entrants into the buy side of the market, in particular more life insurers and macro strategy hedge funds, as well as private banks.

WHAT ARE THE IMPLICATIONS FOR U.S. AND CANADIAN LIFE ENTITIES?

Longevity risk is seen as less of an issue for U.S. life insurers since NAIC regulation requires zero to limited regulatory capital for this risk. In addition, U.S. mortality rates have improved at a reasonably stable pattern over the past decades whereas mortality rates in Europe have been more volatile, in particular since the mid-1970s. However, a few U.S. life insurers have shown an interest in looking at hedging solutions and are also considering entering the pension fund buy-out/buy-in market to benefit from the strong potential returns that this market has to offer. Canadian life insurers are able to take longevity risk with very little regulatory capital, and we have seen a number of Canadian life insurers (and reinsurers) playing a very active role as buyers of longevity risk from European life insurers (as well as pension funds). Additionally, a number of European life insurers are starting to look into using their Canadian subsidiaries as repositories for the longevity risk they originate from products sold in the United Kingdom and on the Continent.

Therefore, we expect that U.S. and Canadian life insurers will play an active role in the market for longevity risk that is emerging in the United Kingdom and Europe, but that many of them will choose to act as buyers of the risk rather than as sellers of the risk. ■

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Session 69 Open Forum

ERM: Economic Capital Models, "Own Risk Solvency Assessment," Solvency II and You

Rating agencies and regulators are increasing their focus on internal economic capital models and internal company assessments of their own solvency risk. The panel will provide resonating discussions on various related topics including, but not limited to, Solvency II, ORSA and Solvency Modernization Initiatives.

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Solvency II and U.S. Equivalence

By Patricia E. Matson and Ronald Sleiman

ACTIVITY WITH RESPECT TO SOLVENCY II IS INCREASING IN THE UNITED STATES.

The implications vary depending on how directly impacted a given U.S. company is by Solvency II.

- Capital requirements,
- Governance and risk management,
- Group supervision,
- Statutory accounting and financial reporting, and
- Reinsurance.



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In the United States, the companies most interested in the development of Solvency II are U.S.-domiciled subsidiaries with parent companies located in the European Union (EU). In order for the parent company to meet the requirements, its subsidiaries must comply with the various components of Solvency II regarding calculating required capital, demonstrating strong enterprise risk management (ERM) and governance,

and providing required disclosures to the public and the regulators. Responding adequately to these new requirements will mean a major shift in thinking for many organizations.

One unknown with respect to U.S. subsidiaries relates to the “equivalence” rules under Solvency II. These rules lay out required characteristics of local regulatory regimes in order for the capital standards of those regimes to be considered “equivalent” to Solvency II. The National Association of Insurance Commissioners (NAIC) has embarked on a Solvency Modernization Initiative (SMI) to examine current solvency requirements, review international developments, move toward a principle-based approach to solvency regulation, and ultimately improve the U.S. solvency system. The SMI Task Force is planning some significant changes to the U.S. regulatory requirements which will likely increase the chance that the U.S. gains equivalence. While U.S. insurance solvency regulation is updated on a continuous basis, the Task Force will be focusing on five key areas:

SPECIFIC TIMELINES WITH ACTIONS IN KEY AREAS ARE SUMMARIZED BELOW

If equivalence is met in the United States, the U.S. subsidiaries with EU parent companies could base their required capital on U.S. statutory capital requirements, and use that as a basis for local decision making. The U.S. subsidiary would still need to meet certain other requirements with respect to risk management and reporting; however, the level of effort for implementation would be somewhat lower, and more importantly the required capital may be lower for certain types of business. To the extent equivalence is not achieved, competitive issues are likely to result between U.S. domiciled companies and U.S. subsidiaries of EU parents, as the former will price products with a view toward U.S. statutory capital requirements, whereas the latter will be required to consider market-consistent, Solvency II capital requirements in their pricing.

Solvency II is a reality and will impact not only those companies with operations in the EU, but also the broader U.S. industry. Solvency II is likely to raise the bar for risk management practices for all insurers, and potentially disclosures as well. This will be fueled by regulators and rating agencies as they review the detailed analysis and disclosures for those companies that do implement Solvency II. S&P has already provided commentary that those companies that are effectively following Solvency II would likely be considered to have a “strong” ERM rating.

THE BASICS OF EQUIVALENCE

Until recently, the guidance on equivalence appeared to indicate that the United States would not be deemed equivalent in advance of Solvency II implementation.

“ Solvency II is a reality and will impact not only those companies with operations in the EU, but also the broader U.S. industry. ”

NAIC Solvency Modernization Initiative Timeline (based on the latest SMI Roadmap)

Year	2010				2011				2012			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
RBC Capital Requirements												
Identify Calibration/Correlation Policy				December								
Plan to modify formulas and implement missing risk charges				December								
Industry Impact Study												December
Determine change to RBC												December
Governance and Risk Mngmt												
Legal Framework			July									
International Corporate Governance Study			September									
Outline high-level governance principles								December				
Develop ERM/ORSA Type Tool								December				
Develop model law or other implementation tool												December
Group Supervision												
Supervisory college tracking document			August									
Updated Models #440 and #450 adopted				October								
Accreditation Part B Guidelines				December								
Holding Company Best Practices				December								
Study of Holding Company Financial Reporting Requirements								December				
Study Need for Group-Wide Supervision Best Practices												December
Approach to Group-Wide Capital Assessment												December
Stat Accounting & Financial Reporting												
Policy Positioning regarding IFRS: documentation of considerations			August									
Initial Valuation Model (VM-20)				October								
Comments on IFRS Exposure Draft				11/30								
Industry Study								March				
Statistical Agent Policy Decisions								March				
Final Valuation Model (VM-20)								Summer				
IFRS Policy Position Adopted by Subgroup								March				
IFRS Policy Position Adopted by Executive/Plenary												October
Reinsurance												
Task Force Adoption of Recommendations				October								
Task Force Adoption of Amendments to Model #785 and #786												October

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A set of six principles are outlined underlying the regulatory review process that need to be met in order for a jurisdiction to be considered equivalent. They are:

1. Powers and responsibilities of the supervisory authority;
2. Authorization requirements to undertake (re)insurance business;
3. System of governance and its regulatory oversight;
4. Business change assessment;
5. Solvency assessment; and
6. Supervisory cooperation, exchange of information, and professional secrecy.

The U.S. regime does not currently meet all of these principles. We believe items 3, 5 and 6 are of particular challenge.

In general, the published guidance has created a major challenge for U.S. subsidiaries of European parent companies. Without knowing whether the United States might be granted equivalence, these companies cannot do appropriate capital planning nor is there a firm basis of understanding of requirements to allow for a robust Solvency II implementation plan.

POSITIVE EVOLUTION

More recently, the Solvency II Experts Group has been working on a consolidated set of Level 2 implementing measures taking into account the feedback received on the consultation papers, which aim at providing advice on the more detailed technical implementing rules. The current proposal in the consolidated measures is that if a local regime is moving toward solvency regulation that meets the Level 2 criteria, that regime could be granted a transitional period. The Level 2 criteria are the six principles referred to above. However, based on the latest draft, they no longer appear to require a market consistent measurement basis, just an “economic” one. There are three requirements in order to get there:

- Regime is risk-based or measures being taken to get there.
- Supervisors willing to engage in equivalence discussion and exchange information.
- The supervisors in the regime are bound by obligations of professional secrecy.

If granted, the local regime would be treated as if equivalent for the three-year period.

The new guidance appears positive, in that two hurdles have been removed:

- (1) the requirement to use a market consistent basis for the liabilities, which the U.S. regulators are strongly against, and
- (2) the need to be assessed for equivalence before Solvency II adoption in order to use U.S. RBC as the basis for Pillar 1 (which would not have happened for the United States).

In addition to the revisions to the Level 2 measures, a host of Solvency II developments occurred in the first month of the new year. Some of these developments relate to equivalence for the United States:

As of Jan. 1, 2011, the Solvency II landscape was impacted by the introduction of a new regulatory body—the European Insurance and Occupational Pensions Authority (EIOPA). EIOPA is charged with carrying out activities to support policyholder protection (including pension plan participants), financial stability, and transparency of markets and financial products.

EIOPA replaces CEIOPS and will advise the European Parliament and the European Commission (EC) on issues and regulations for the insurance industry and the occupational pension plans. Some of EIOPA's responsibilities include drafting regulation and binding technical standards (BTS) for adoption by the European Commission, and will also have the power to issue guidelines and recommendations on the application of the binding technical standards. EIOPA will assist supervisors with the appropriate application of the rules of the European Union, and also assist in monitoring and reporting on compliance with those rules. The responsibilities of EIOPA and its coordination with EU member countries are in many ways similar to those of the National Association of Insurance Commissioners (NAIC) and its coordination with the states. However, it appears that EIOPA has more authority with respect to the promulgation of regulations and guidelines, as the standards are expected to be adopted by the EC

largely as written and then will be applicable to the EU member countries.

One of the areas of focus for EIOPA will be third country equivalence and establishment of a transitional regime, both for third countries moving toward equivalence as well as for companies adopting the Solvency II requirements directly, to help ease the transition for companies that are struggling to meet the deadlines.

On Jan. 19, the “Directive of the European Parliament and of the Council amending Directives 2003/71/EC and 2009/138/EC in respect of the Powers of the European Insurance and Occupational Pensions Authority and the European Securities and Markets Authority,” also known as Omnibus II, was issued by the European Commission. The proposed directive will now be sent to the Council and the European Parliament for consideration. The primary purpose of Omnibus II is to strengthen the supervision of the financial services industry. A specific component of this is broadening the authority of the key European Supervisory Authorities, including EIOPA. Another key component relates to transitional arrangements, including those related to equivalence.

Omnibus II specifies that the EC may adopt a transitional period, not to exceed five years, for subsidiaries in third countries in which it is unlikely that the third country will meet the requirements for equivalence by the end of 2012. It also specifies that the Commission may adopt requirements specifying conditions that must be met by the third country in order to qualify for the transitional regime. The conditions shall cover “commitments given by the supervisory authorities, their convergence to an equivalent regime over a set period of time, the existing or intended content of the regime, and matters of cooperation, exchange of information, and professional secrecy obligations.”

Omnibus II also specifies that during this transitional period, the group solvency calculation may use, for the subsidiary in the third country, the Solvency Capital Requirement (SCR) and their own funds eligible to cover the SCR as required by that third country. In addition, parent company supervisors may, during the

transitional period, rely on the group supervision of the third country supervisor.

OTHER RECENT ACTIVITIES

In addition to the equivalence impacts mentioned above, there were several additional activities early in 2011 related to the overall Solvency II guidance.

EIOPA ISSUES ITS WORK PLAN

The newly formed EIOPA got to work right away. On Jan. 19, EIOPA issued its Solvency II Medium Term Work Plan. The work plan is focused on activities related to the implementation of Solvency II, versus the historical focus of the European regulators which was on the development of the regulations.

EIOPA has identified the following work streams to carry out its efforts:

- Valuation of Assets and Liabilities including Technical Provisions;
- Solvency Capital Requirements (SCR, MCR);
- Own Funds;
- Governance and ORSA;
- Reporting;
- Disclosure;
- Group Supervision, Supervisory Cooperation, Coordination and Information Exchange, including Colleges of Supervisors;
- Internal Models;
- Supervisory Review Process and Risk Assessment Framework, including Supervisory Transparency and Accountability; and
- Equivalence.

As mentioned above, one of the key responsibilities of EIOPA is in the drafting of binding technical standards (BTS) for adoption by the EC, as well as drafting of non-binding guidance to assist supervisory authorities in their review and analysis of a company’s compliance with the standards. With respect to Solvency II, the work on the BTS is expected to run from April to December of 2011, and the work on the non-binding guidance will run through March of 2012 (drafting of this “Level 3” guidance has already started). The BTS are dependent on the finalization by the EC of the Level 2 implementing measures and the adoption by the

CONTINUED ON **PAGE 26**

European Parliament of the Omnibus II Directive discussed below. Adoption of Omnibus II by the European Parliament is targeted for end of 2011.

With respect to equivalence, which is clearly an area of keen interest for U.S. companies subject to Solvency II, the priority for the work stream will include the development of Level 3 guidance for supervisors to assist them in undertaking equivalence assessments of third countries. In addition, EIOPA is expected to provide the results of its equivalence assessment of the first wave of countries (Switzerland, Bermuda and Japan) by September 2011. The second wave of assessments is planned for 2011–2012, and the third wave for 2013–2015. The timing of these assessments is being carefully coordinated with plans for a transitional regime, which is described in the section on Omnibus II below.

OMNIBUS II IMPLICATIONS

As described above, Omnibus II was issued in January. Omnibus II makes the following general amendments to the existing Directives:

- Definition of the appropriate scope of **technical standards**,
- Inclusion of mechanisms for the authorities to **settle disagreements**, and
- **General amendments** to allow the directives to operate in the context of new authorities created (such as EIOPA).

In addition to these general amendments, several additional amendments were made specific to Solvency II which fall under the following main points:

1. *Transitional Requirements—this is a significant change with implications for the U.S. industry, and is discussed in more detail below;*
2. *Amending Level 2 empowerments—empowering the EC to adopt measures to specify procedures for supervisory approvals in specific areas and also to take into account the new Lisbon Treaty, i.e., to ensure regulatory consistency and appropriate empowerment of the regulatory bodies involved in the Solvency II guidance; and*
3. *Extension of two months to implementation date—this officially extends the implementation date of Solvency II to Jan. 1, 2013.*

The specifics regarding transitional arrangements are covered by new sections inserted into the original Solvency II Directive. These new sections essentially provide for the following:

- Timeframes during which specific requirements of the Solvency II Directive would not apply in the event that the Commission adopts transitional measures instead;
- Authority for the Commission to adopt requirements (“delegated acts”) allowing for a transitional regime for specific components of the Solvency II Directive, up to a specified maximum length of time; and
- Certain limitations apply to the acts that may be adopted, for example with respect to the allowable level of the Solvency Capital Requirement.

Based on the specifics of Omnibus II, below are the proposed maximum transitional periods that the Commission may grant by way of delegated acts for specific requirements of the SII Directive. The delegated acts would provide details of what would be provided in lieu of the requirements of the Directive during the transitional period, and any phasing-in of requirements:

- A three-year maximum transitional period for
 - An effective system of governance
 - Submission to EIOPA information about the level of capital add-ons.
- A five-year maximum transitional period for

Solvency II Framework and Levels				
Level	What is it?	What does it include?	Who develops?	Who decides?
1	Solvency II Directive	Overall Framework Principles	European Commission	European Parliament, European Council
2	Implementing Measures	Detailed Implementation Measures	European Commission	EIOPC
3	Supervisory Standards	Guidelines to Enhance Supervisory Convergence	CEIOPS (now EIOPA)	
4	Evaluation	Monitoring Compliance and Enforcement	European Commission	European Commission

“We believe that the official adoption of Omnibus II has a significant implication for U.S. companies that are subject, through their parent, to the requirements of Solvency II.”

- Companies to provide the supervisor with information to enable an assessment of the system of governance, the business they are carrying on, the valuation principles applied for solvency purposes, the risks faced and the risk management systems, and their capital structure, needs and management.
- A 10-year maximum transitional period for
 - Relief from the supervisor to assess a capital add-on because the risk profile of the insurance or reinsurance undertaking deviates significantly from the assumptions underlying the SCR, as calculated using the standard formula. The transitional provisions to be adopted would instead specify requirements for the transitional SCR standard formula, and capital add-ons could be added based on deviation from those.
 - The establishment of technical provisions. Any transitional requirements adopted with respect to technical provisions must require at a minimum that the insurer meet the regulations in place in their location of domicile as of the end of 2012.
 - Having to specify an approach for calculating technical provisions.
 - Having to specify the tiering requirements for own funds.
 - Having to specify the standard formula approach for the SCR and that eligible own funds exceed the SCR.
 - Having to specify the methodology to be used for calculating the group solvency capital requirement.

WHAT IT ALL MEANS FOR THE U.S. INDUSTRY

We believe that the official adoption of Omnibus II has a significant implication for U.S. companies that are subject, through their parent, to the requirements of Solvency II. To the extent the U.S. companies meet the applicable conditions (which are yet to be specified by the Commission) for a transitional regime, up to five additional years will be added to the timeline for Solvency II adoption, during which the U.S. companies may be assessed for equivalence. It appeared that a positive outcome of an equivalence assessment prior to the planned Solvency II adoption date of Jan. 1, 2013 was near impossible; however, such assessment by Jan. 1, 2018 (in the event the transitional period is set at five

years) appears feasible, assuming positive progress in certain key areas by the U.S. regulatory bodies.

We also believe there are several key implications of the United States obtaining a transitional and ultimate equivalence decision by the European regulators:

- There will be continued pressure on the NAIC and the SMI Task Force to enact solvency regulations for U.S. insurers that contain most of the key principles of the Solvency II requirements. This will require some effort by U.S. companies to comply, in particular:
 - Implementation of a more robust and transparent ERM structure (including an Own Risk and Solvency Assessment process, which is currently being proposed by the SMI Task Force);
 - Significant revisions to determination of required capital in order to better reflect the underlying risks inherent in the business;
 - Greater linkage of risk-based capital results to business decisions; and
 - Increased levels of disclosure regarding governance, risk exposures, risk management and capital position.
- The playing field in the United States and globally will be more “leveled,” in that the key gaps between the capital requirements for U.S.-based companies and those of European based companies will be closed.
- The management of required capital for U.S. companies with non-U.S. affiliates should be easier, as it will be on a more common basis across legal entities (in other words, the current need to manage capital on multiple and very different bases will be eliminated or at least reduced).
- Use of a more robust regulatory capital framework will influence company strategy, and create further incentives for diversification of portfolios and use of a wide range of risk management strategies (such as reinsurance and hedging) that are understood across the organization, to the board level.

In addition to the potentially positive implications on equivalence, the transitional requirements of Omnibus II will likely ease the pain on the global insurance industry, including U.S. subsidiaries, of being able to meet the very significant requirements of Solvency II by Jan. 1, 2013. It appears that Omnibus II, and the

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Reflecting Risk in Pricing Survey

By Donna Megregian

IN SEPTEMBER 2010, THE SOCIETY OF ACTUARIES (SOA) PUBLISHED AN UPDATE TO THE 2005 REFLECTING RISK IN PRICING SURVEY.

This survey is focused on how companies are trying to price for and understand the risks inherent in the products they sell. The survey focused on various product lines—life and annuity, health, and property and casualty (P&C) insurance—and



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showed results for various countries of location and business focus. There were 374 responses that completed some portion or all of the survey: 255 life, 53 health and 66 P&C companies. The survey report can be found at <http://www.soa.org/research/research-projects/risk-management/research-reflecting-risk-pricing.aspx>. The focus of this article is to highlight some of the results from the report. In general, direct writers and reinsurance companies will be lumped together except where noted. The full report breaks out reinsurers and direct writers separately.

PROFIT MEASURE RANKING

The most common profit measures used by companies issuing life and annuity products was internal rate of return (IRR), which was closely followed by premium margin. Health writers indicated expected loss ratio as their leading choice of profit measure, while P&C writers favored return on equity (ROE). Although not necessarily the primary measure, most companies indicated use of premium margin in some way, making it the most popular profit measure in the survey. Outside of North America, embedded value/economic value added (EV/EVA) tends to be the more common profit measure.

The survey asked how risk is assessed under each measure. Assumption stress testing was the most commonly used measure for risk assessment. When using assumption stress testing, most companies used judgment to determine the parameters for testing. Companies that reported using assumption provisions for adverse

deviation (PADs) to assess risk utilize recent experience to determine the PADs. Companies that use stochastic scenario analysis for assessing risk in their profit measure report favoring conditional tail expectation (CTE) to percentiles, especially for reinsurance companies.

COMFORT WITH INCUMBENT PROFIT MEASURE AND RISK ASSESSMENT PRACTICES

Over half of the companies in the survey indicated they feel their profit measure is not substantially different from their competitors. About 22 percent feel that it is different, and the rest are generally unsure if it is substantially different. Over 60 percent of responses were neutral in their assessment of their profit measure relative to other companies as offering an advantage or disadvantage. Of the companies that believed there was a difference, more assumed to be at a disadvantage than at an advantage.

The survey asked if companies had changed their profit measure in recent years. Over 70 percent of respondents indicated they had changed their primary profit measure in the last three years. Life, annuity and health companies that reported a change indicated they moved away from predominantly IRR and premium margin in favor of market-consistent embedded value (MCEV) and EV/EVA. P&C companies indicated a move away from expected loss ratio and combined ratio in favor of EV/EVA and risk-adjusted return on capital.

Almost half of the responses reported no change to risk assessment practices because of the recent economic environment. Larger insurers reported more changes relative to smaller insurers. Sixty-three percent of responses indicated they do employ an enterprise risk management (ERM) actuary or have ERM areas in their company, more so in larger companies than smaller companies. Fewer health companies reported having an ERM actuary or area than life/annuity or P&C.

OTHER AREAS OF INTEREST IN THE SURVEY

All of the P&C companies in the survey reported using a discount rate for their primary profit measure as less than 5 percent. Forty-two percent of health companies

reporting using a discount rate between 3 percent and 7 percent. Life and annuity companies favored the 5 percent to 7 percent range more than the 3 percent to 5 percent range. The discount rate is determined by the earned rate for most life and annuity companies, but P&C, life reinsurers and P&C reinsurers use the risk-free rate as their discount rate.

The survey also asks how companies capture risk associated with:

- Asset default in pricing
- Interest rate changes
- Volatility of equity returns
- Adverse claims deviation/severity
- Short-term fluctuation/frequency
- Modeled customer and agent/broker behavior

- Expenses
- Operational risk
- Mix of business/distribution of policyholders
- Reinsurance.

It is important to note that the results provided herein come from a variety of insurance companies with unique areas of practice, product structures, target markets, distribution methods and regulatory environments. As such, these results should not be deemed directly applicable to any particular company or representative of the insurance industry as a whole. Results shown based on the demographic data include only those respondents who filled out that portion of the survey. These results may vary from aggregate results shown in the various lines of business—life and annuity, health and P&C. ■

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Book Review: *Extreme Risk Management: Revolutionary Approaches to Evaluating and Measuring Risk* By Christina Ray

Review by Pierre Tournier

EXTREME RISK MANAGEMENT: REVOLUTIONARY APPROACHES TO EVALUATING AND MEASURING RISK,

by Christina Ray, is a discussion about financial modeling through risk-management-tinted glasses. This book



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provides a readable discussion of model risk as well as a guideline for how models should be built. The intended audience is the professional in the financial industry who relies on models as sources of

actionable data. Readers looking to learn how to build their own causal models will need more detail than this book provides. Ray assumes the reader is familiar with common financial models and statistical concepts, without being a physicist.

The book begins by reviewing the evolution of current financial models, constantly reminding the reader of the assumptions that go into these models and their strengths and weaknesses. The models that Ray describes are statistical and backward-looking, relying less on economic fundamentals and more on data. Ray argues that these models were developed in response to imperfect, coarse or stale data; as financial products become more complex the shortcomings become more glaring. Although Ray details several value at risk (VaR)-like models, this issue applies to all financial models.

The bulk of the book talks about systems and how we model them. As the system (e.g., the financial market) becomes more complex, the models needed to describe them become more complicated. Ray highlights which elements from a system should be considered, using examples from the financial markets to illustrate her point. The AIG creditworthiness/margin call spiral is clearly presented as an example of both causality and feedback loops. This section advocates for causal models; statistical models are all but ignored here.

At times I got frustrated as Ray described what needed to be considered to correctly specify a financial model. Although I agree with Ray that a correctly specified causal model is preferable to a statistical approximation, I find the task daunting. Creating a worthwhile causal model seems nearly impossible given the complexity involved. It wasn't until I reread Ray's book that I realized she is advocating a mix between the two systems. Ray is really describing a framework for how we should approach modeling problems before blindly applying statistical models. She's also providing a guideline for how model results should be interpreted and formalizing the human judgment piece of the decision-making process.

Throughout this section, Ray reminds the reader to consider that the systems we try to model may evolve over time. Examples of this important concept vary from thought-examples on evolution to demonstrations of volatility clustering. This, along with the discussion on the shortcomings of traditional statistical models, is probably the most important point that Ray drives home about model risk.

The last part of this book makes extensive comparisons between models built by the intelligence and financial communities. In this section it sometimes feels like Ray is in favor of a specialist-based approach where experts gather information, and specify the possible outcomes. This is consistent with the causal theme throughout the book.

Ray also advocates for a Network Centric Organization (NCO) over a centralized system for decision making. Using comparisons between modern warfare and a trading desk, Ray makes the point that decentralized decision-making hierarchy can react faster and more efficiently. It also allows for human intelligence and rational decision making. The financial example provided is a group of trading desks within a bank, each with its own limits. The limits may be mandated by a central group, but each desk is free to manage its limits on its own.

“ I appreciated the theme that systems are fundamentally causal; we use statistical models because we can’t properly specify them. ”

An important omission here is a discussion of human risk as it applies to the delegation of decision making. When describing the advantages of an NCO, Ray does not discuss possible risks such as agency issues. Without comparing the relative risks and rewards, it’s difficult to say that one approach is clearly superior to another.

I enjoyed reading this book and thought it was well worth my time, both as an introduction or refresher to

model risk. I appreciated the theme that systems are fundamentally causal; we use statistical models because we can’t properly specify them. Because Ray assumes the reader is familiar with statistics and risk models (e.g., VaR), the book moves along without getting bogged down in definitions. The discussion thankfully sticks to concepts rather than proofs, which makes for easier reading. In all, it is a very informative and interesting read. ■

Solvency II and U.S. Equivalence | from Page 27

resulting guidance that will be developed by EIOPA, will likely/is expected to bring a welcome sigh of relief from the global insurance industry.

The next several years will be a period of significant regulatory change for the insurance industry globally, with some particular challenges for the U.S. industry depending on the exact outcomes of the NAIC’s proposed changes. Close monitoring of global solvency requirements as well as the specificities of the U.S. regime can be beneficial in the long run to manage the steep learning curve and plan in advance for the sweeping changes to strategy, organization, operations and infrastructure.

LINKS:

SMI Roadmap:

http://www.naic.org/documents/committees_ex_isftf_summer_ntlmtg_meeting_smi_roadmap.pdf

EIOPA’s medium term work plan:

[\[ceiops/WorkInProgress/SolvencyII-Medium-Term-Work-Plan-2011-2014.pdf\]\(http://ceiops/WorkInProgress/SolvencyII-Medium-Term-Work-Plan-2011-2014.pdf\)](https://eiopa.europa.eu/fileadmin/tx_dam/files/about-</p>
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Omnibus II:

http://ec.europa.eu/internal_market/finances/docs/committees/supervision/omnibus2/com2011_en.pdf ■

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