SOCIETY OF ACTUARIES

The Actuary

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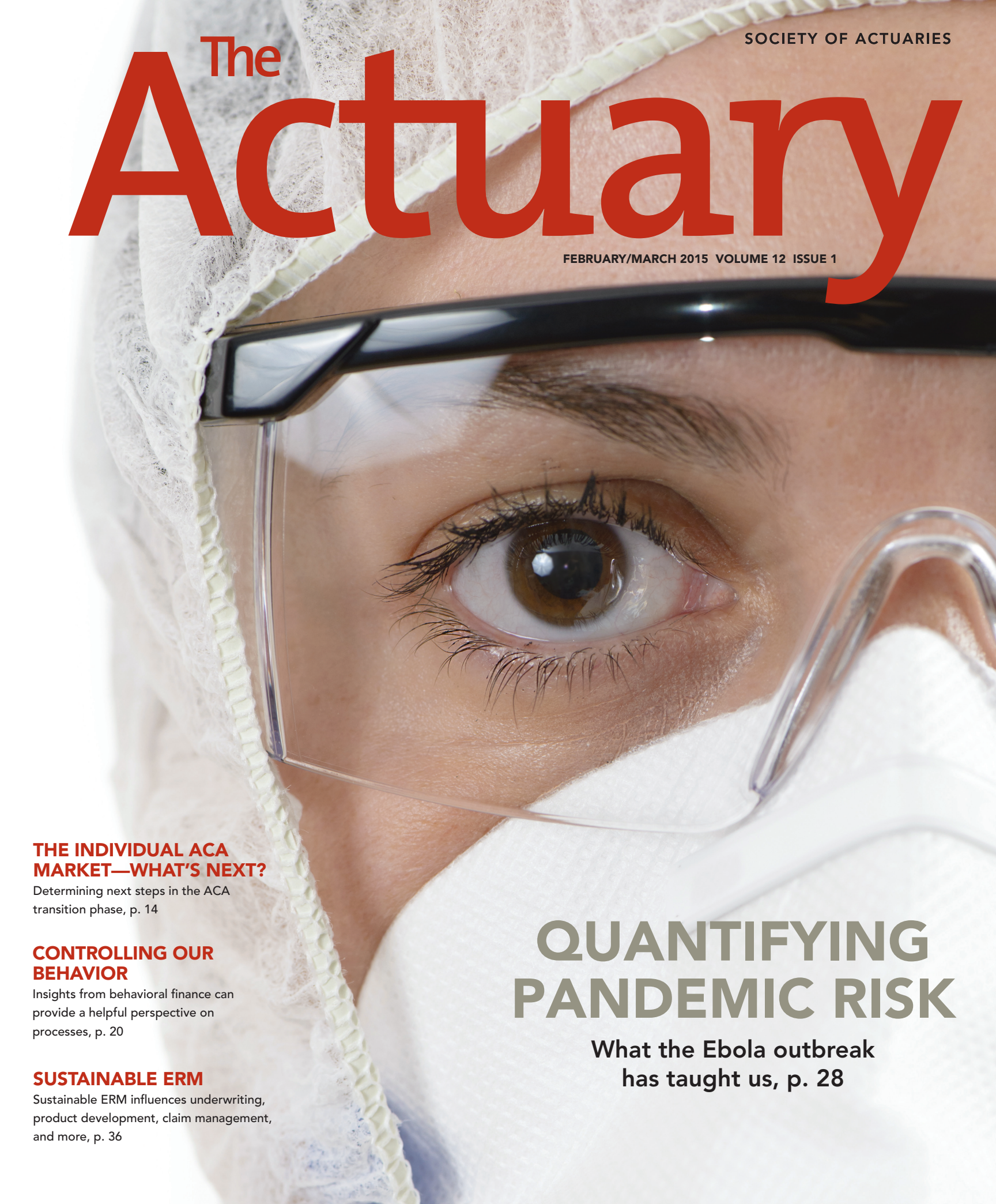

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The Actuary
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Editorial

ACTUARIAL RELEVANCE THROUGH INNOVATION

BY ALBERT MOORE

I OFTEN USE A PARTICULAR UNNAMED COMPANY as an object lesson for the need to accurately assess opportunities and threats. A leader in its industry, in 1988, it employed more than 145,000. In 2012, less than 14,000 were employed. That company failed to take seriously an emerging technology: cell phones. I do not think that company anticipated how cell phones could impact their "unrelated" business. Actuaries must not fall into the same trap.

There are opportunities and threats facing our profession, and the opportunities far exceed the threats. Every year, an actuarial career is ranked as one of the top professions. Actuaries must embrace and foster innovation to meet the growing need for professionals with our unique skills and expertise.

Innovation is needed to answer the following questions facing the actuarial profession:

- What additional disciplines, industries and markets can benefit from actuarial skills and expertise?
- Which additional skills and knowledge must we develop within our members?
- What are the emerging challenges or problems for which we can apply our technical, analytical and management understanding?
- Are there new approaches that actuaries can employ to solve current and future challenges?
- Which products, processes and services are needed to meet current and emerging market needs?
- Are there additional applications of actuarial risk classification?

We must expand our understanding and application of innovative thought processes to answer these questions and take advantage of the opportunities for increased relevance.

There are many schools of thought surrounding the topic of innovation. "Disruptive innovation" is one school of thought that can assist us to embrace our role as innovators and aid in identifying emerging opportunities for our profession.

Disruptive innovation is a phrase coined by Clayton Christensen, the Kim B. Clark professor of business administration at the Harvard Business School. He defines disruptive innovation as a process or innovation that fosters new products or markets that disrupt or overturn the traditional business practices, methods or models and that "takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors."[1]

Christensen takes great pains to narrow disruptive innovation to include ideas or concepts that are not breakthrough or sustaining innovations (improvements to already functioning processes). Disruptive ideas are often not refined, may have limited applicability, have no apparent market and may take many years before growth in market share threatens the status quo. For these reasons, the disruptive innovators require discipline, patience and great (albeit relentless) vision.

Christensen gives several examples that will aid in our understanding of disruptive innovation.

- Cell phones did not make an initial splash but today there are a growing number of households that no longer have land lines. "The number of households with cell phones increased from 36 percent to 71 percent between 1998 and 2005, according to new data released by the U.S. Census Bureau. This corresponded with a decrease in households with telephone landlines, particularly households headed by young adults."[2]
- Personal computers slowly became a fixture on every desk.
- Discount retailers threatened the stand-alone department stores, and both are being threatened by online shopping.

I can think of several examples of disruptive innovation that have impacted actuaries.

The first example that comes to mind is the introduction of the Chartered Enterprise Risk Analyst (CERA) designation to meet the growing need for enterprise risk management (ERM). The CERA designation did not have an immediate demand. However, after the fall of Enron, the introduction of Sarbanes-Oxley Act of 2002 and other regulatory measures, various professions sought to claim the expertise in ERM.

In November 2005, the Society of Actuaries board took measures to position members to explore ERM opportunities and differentiate the CERA designation from "traditional" designations. The CERA name was formally approved in 2007. Those involved foresaw that the CERA designation could extend actuarial risk expertise to banking and the broader financial industry.

The second example of a disruptive innovation is the application of predictive analytics to actuarial and industry problems. Slowly, actuaries are using predictive techniques in creative ways. At the 2014 Life & Annuity Symposium, there were sessions highlighting several uses of predictive models:

- Creation of a mortality score based upon the credit database
- Generation of client profiles to create quality sales leads and matching to advisers
- Application of models for underwriting decisions and savings
- Utilization of models in the assumption review process
- Refinement of experience studies
- Detection of fraud and suspicious transactions.

The final example that I will provide of the innovative process is a historical object lesson in the concepts and promise of disruptive innovation. The introduction of universal life insurance provides a hindsight view of the innovative process at work—the collaborative nature of ultimate adoption, the resistance from the status quo and the ultimate vindication of the visionary.

Albert Moore

In 1962, George R. Dinney, FCIA, and an actuary at the Great-West Life Assurance Co., defined his universal life plan. The concept was far ahead of the thinking of his day. In 1971, Dinney addressed the Canadian Institute of Actuaries and once again made the case for his universal life plan and outlined the growing challenges facing the insurance industry. By the 1980s, universal life products began to gain traction. In 1982, Dinney demonstrated his innovation further by appealing to actuaries to adopt the underlying concepts rather than just the mechanism of the universal plan. By 1985, universal life sales had threatened the viability of traditional products.

This helps me to rationalize why the universal life plan, invented in 1962, took so long to be adopted.

Disruptive ideas require vision but also time:

> This helps me to rationalize why the universal life plan, invented in 1962, took so long to be adopted. Adoption had to await a new generation of flat-earth people, within the life insurance business, who perceived the technology to be an answer to a difficult environmental condition, specifically inflation.[3]

Christensen advances one school of thought of how to promote innovation that

resonates with me. He and his co-authors hypothesize there are techniques that advance innovative thinking.[4] They present five essential methods:

- Associating
- Questioning
- Observing
- Networking
- Experimenting.

Associative thinking would require actuaries to think deeply as to how our skills can be applied to nontraditional disciplines. We should consider how other industries are solving or approaching problems that could have applicability to our work.

As an example, much of the ground in predictive analytics has been broken in the property casualty world. By associating how other industries employ predictive techniques to various problems, similar approaches can be adapted in life and health insurance.

The technique of questioning should be natural for actuaries. Ask a question in a room of actuaries and you are almost guaranteed that even after all have gone separate ways, many will be pondering the query.

Some questions are solved by pure superior brain power and genius. But I would surmise that many challenges are solved by observation, testing and putting pieces together. I do not understand why the insurance industry underutilizes focus groups and surveying of clients.

With the technology of the day, collaboration and networking to share ideas, and posing and answering questions should accelerate innovation within our industry.

Finally, actuaries need to understand the concept of experimentation. I get the sense that most actuaries undervalue the lessons learned by exploration.

Experimentation can be a challenge for very smart people. Experimentation requires the willingness to make mistakes, to look and sound foolish, and to invest time in endeavors that may pay zero tangible return. Experimentation requires someone who understands the value of gaining insight. Another impediment to actuarial experimentation is, in most situations, our mistakes have tangible monetary implications!

In summary, I encourage actuaries to begin to think innovatively in all that we do. Recognize that some of the best ideas and successes require a relentless vision of the possibilities of a proposed solution. Developing simple concepts, slowly introduced, often leads to innovations that have the potential to disrupt the conventional wisdom. Our profession can continue to expand and meet the public needs by fostering an environment where the techniques of innovation are developed throughout our profession. A

END NOTES

1 "Disruptive Innovation," Clayton Christensen's website, accessed Dec. 12, 2014, *www.claytonchristensen.com/key-concepts/#sthash.nYS1qJye.dpuf.*

2 U.S. Census Bureau, "Homes with Cell Phones Nearly Double in First Half of Decade," news release, Nov. 19, 2009, *www.census.gov/newsroom/releases/archives/income_wealth/cb09-174.html.*

3 George R. Dinney, "Life Insurance as a Game," Actuarial Research Clearing House (ARCH), vol. 1982.1 (1982): 215–80.

4 Jeff Dyer, Hal Gregersen and Clayton M. Christensen, *The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators* (Boston: Harvard Business Press, 2011).

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Letter From The President

A DIALOGUE WITH OUR FUTURE MEMBERS

BY ERROL CRAMER

THE CONTINUED VIBRANCY AND VITALITY of our organization depends on our success in recruiting and training the best minds as our future generations of members. In fact, we exist as an organization solely as a collection of professionals highly skilled in our respective areas of practice. We need then to be attuned to the college kids of today—the millennials—to hear their voices and let them know the story of our profession and the opportunities waiting. These will be our support staff in the near future and our successors in retirement.

The traditional route for prospective new members currently is through actuarial science programs and these are often, but not exclusively, through schools that have earned the Society of Actuaries' (SOA's) Center of Actuarial Excellence (CAE) certification. One of my most enjoyable duties as SOA president is to meet and dialogue with members and potential future members, and this includes visits to schools and other college events. One such recent event was a weekend seminar and job fair of the Actuarial Students National Association (ASNA) in Montreal which drew 600 college students from across Canada. The theme was aptly named "*Insuring the Future*." I was heartened by the high quality of attendees who were very knowledgeable, focused and eager to engage in conversation.

From my various meetings with U.S. and Canadian students, three themes typically arise. First, they want to know what employers value most in a job candidate. A key concern is getting that entry level position. My answer is communication skills and business acumen. What distinguishes a professional from a technician is the ability to use judgment in making critical assessments of complex situations. And, to be effective, one needs strong communication skills. At ASNA, the SOA sponsored a case study where teams were presented complex, real-life issues a chief actuary may face, e.g., grow sales of Product X profitability while maintaining risks within established margins, and prepare and make a presentation to the board. Observing the process, I saw team members fully engaged and competing with fierce determination.

Second, they want to know how best to acquire the critical business skills. My answer is that as entry level hires they will be evaluated typically on leadership potential. The lesson I give them for interviews is to demonstrate they are engaged in the profession and industry (e.g., read the business news), are eager to learn, and ask insightful questions. Some learning may occur based on any business courses taken at school—and the SOA syllabus includes some communication and professionalism opportunities—but adequately acquiring these skills is a career long process. I tell my history of getting involved early on in volunteering for professional and industry organizations, and the subsequent leadership positions I have held on many boards and committees.

Third, they want to know what choices to make for their career tracks. Students often express a lot of angst over having to commit to a track (the SOA has six specialty tracks on the way to becoming an FSA), and fear of locking themselves into a particular area of practice early in their career. I let them know of life's twists and turns that will lead them into many different work opportunities, and that's OK. Also, I let them know that exams are only an initial selection process for entry into membership, and career-long work experience and professional development will equip them for moving onto other tracks as needed. I note that tracks are just one distinguisher, that deeper specialization

Errol Cramer

typically occurs with experience—e.g., disability versus long-term care—and that we also have 20 sections for members to share common practice interests.

Another event, the CAE Student Summit, brings together high potential actuarial students who can serve as SOA ambassadors within their schools. Each CAE school worldwide selects two students with demonstrated leadership abilities for a two-day summit in Chicago. The students provide us with a window into how the SOA and the actuarial profession are perceived, and a wealth of ideas on how to better engage students. I presented my own 35-year career story of being an "accidental actuary" from an academia track, crossing from South Africa to the United States, from consulting to the corporate world, from worker to management, and running the gamut of almost every practice area and insurance product line, seizing at each turn opportunities for new endeavors and learning. Feedback was enthusiastically positive—they felt my personal story to be highly engaging and exciting in showing them the profession's possibilities as real life—and they felt the variety and flexibility in choices along the way to be a compelling selling point for becoming an FSA.

Another set of events, the SOA Candidate Connect meetings, provide an opportunity for those who might come from less traditional routes, including those who attended schools without a specific actuarial program and those who are considering a career change. These events, which are very popular and quickly reach maximum capacity, are open to individuals who have passed at least a couple of SOA exams. The most value I derive from these meetings is from the interactions I have during breaks and the social event. The No. 1 question I get asked is how to get an entry level position. Times have changed since I started. Now it is almost expected that hires would be made only from those who served prior internships with the company or firm, which locks out many of these alternate candidates. I tell them to be forthright in their applications, offer to take an internship as a starting point, and indicate they don't expect to get paid based on their exams passed. (Some people I meet are ASAs or are close to achieving their FSA designation, but have zero actuarial experience.)

The students provide us with a window into how the SOA and the actuarial profession are perceived, and a wealth of ideas on how to better engage students.

As a result of the discussions I have had at Candidate Connect events, I have added to my travel agenda visits to some Ivy League and top-tier schools that are not CAE designated and may not have a specific actuarial program, but certainly have many very intelligent students. From personal experience in my hometown of Chicago, some of the smartest actuaries I know were hired from the University of Chicago and Northwestern University, neither known as actuarial schools. The SOA has a rigorous and selective exam process and this leads to an obvious correlation with a wide variety of educational institutions, including highly selective schools.

In summary, I feel heartened at the supply and quality of potential future members we are drawing. My initial pitch to students was, "You will not be the actuary I am, just as I was not the actuary my managers were 35 years ago when I started my career. You have more sophisticated tools from an ever-changing world, and that's progress." My new pitch is, "You are a generation attuned to far more advanced technology and speed of change than mine, but, one thing that is a constant and never goes out of style are the leadership and business skills we need to excel as professionals."

As a final note, discussion of supply is incomplete without consideration of the demand side. The SOA—jointly with the Casualty Actuarial Society (CAS) and the Canadian Institute of Actuaries (CIA)—recently completed the Actuarial Supply/Demand Study for North America, with a wealth of useful information for the actuarial organizations, schools, and most importantly, the students. We will be releasing this information soon, so please look forward to this discussion. A

Errol Cramer, FSA, MAAA, is president of the Society of Actuaries. He can be reached at *errol.cramer@soa.org*.

UPDATE TO THE "LIVING LONGER" ARTICLE BY SAM GUTTERMAN

Period Life Expectancy at Age 65 at Selected Years

YEAR	CANADA			U.K.			U.S.		
	MALES	FEMALES	FEM-MALE	MALES	FEMALES	FEM-MALE	MALES	FEMALES	FEM-MALE
1941	12.8	14.1	1.3	11.4	13.4	2.0	12.2	13.8	1.6
1951	13.4	15.0	1.6	11.7	14.3	2.6	12.8	15.2	2.3
1961	13.6	16.3	2.7	12.0	15.3	3.3	13.1	16.1	3.0
1971	13.9	17.6	3.7	12.2	16.1	3.9	13.1	17.1	4.0
1981	14.7	19.0	4.3	13.0	16.9	3.9	14.2	18.6	4.3
1991	15.6	19.7	4.1	14.1	17.9	3.8	15.2	19.2	4.0
2001	17.0	20.4	3.4	15.9	19.0	3.1	16.1	19.1	3.0
2011	19.0	21.9	2.9	18.2	20.7	2.5	17.2	19.5	2.3

Note: Update to the "Living Longer" article by Sam Gutterman, published in the December 2014/January 2015 issue of The Actuary. *This table replaces the table that originally appeared on page 23.*

LET'S CARRY THE BURDEN TOGETHER

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THE INDIVIDUAL ACA MARKET

WHAT'S NEXT?

BEFORE THE ACA WAS PASSED, INSURERS HAD AN INCENTIVE STRUCTURE THAT INCLUDED THE POTENTIAL FOR PROFIT AND LOSS; IN THE TRANSITIONAL ACA PHASE, THE RISK PROTECTIONS AND THE PROFIT CONSTRAINTS DRAMATICALLY LIMIT THE VARIATION IN FINANCIAL RESULTS FOR AN INSURER. BY KURT WROBEL

With most observers focusing on emerging demographic data and rate increases to define the ultimate outcome of the Affordable Care Act (ACA), at this point, we simply do not have enough data to make a conclusive assessment. In the absence of more quantitative evidence, we can make more definitive assessments regarding the changing risk profile between the transitional ACA period (2014-16) and under the final ACA period (beyond 2017) for the individual market.

As highlighted below, these periods are separately delineated because the policy differences in each period have a dramatically different impact on the degree of risk accepted by health plans. While in the initial transition period, the risk protections and profit limitations inherent in the legislation will ensure that the ultimate financial results will likely not deviate significantly from the original margin assumptions, the final phase will require health plans to accept the full risk associated with this program. As a result, the policy risk in the short term will be the financial costs associated with the risk protection program, while the longer-term result could be lower participation by health plans.

TRANSITIONAL ACA PERIOD IMPACT

Before the ACA was passed, insurers had an incentive structure that included the potential for profit and loss; in the transitional ACA phase, the risk protections and the profit constraints dramatically limit the variation in

financial results for an insurer. These ACA risk protections include reinsurance, risk adjustment and the risk corridor. These provisions provide financial protection if claims exceed a defined threshold (reinsurance), payment or cost to an insurer if the risk is higher or lower than the market level risk (risk adjustment), and additional financial protection or cost if the ultimate claims are different from expectations (risk corridor). In addition to the risk protections, this period also includes the application of a minimum medical loss ratio floor that requires an insurer to pay out a fixed percentage in claims relative to its premium rate.

Because the upside is limited by the minimum medical loss ratio floor and the downside limited by the risk protections, the payment structure more closely resembles a "cost plus" type arrangement where a contractor submits its cost and expected profit to receive an agreed-upon payment—similar to arrangements with a regulated utility or a defense contractor. Consistent with the ACA policy goals, health plans are effectively trading the benefits of greater risk and reward for an arrangement where the financial outcome is much less variable. In return, health plans are allowed a period to better understand the risk and buying behavior of consumers so that this population can be more accurately priced once the risk protections are removed. In addition to allowing a period to collect data and better analyze the ACA population, this funding approach also increases the downside risk associated with overpricing the exchange population—particularly relative to the period before passage of the ACA. Because the potential cost of underpricing the block is limited by the financial protections, the chief risk becomes the loss of market share by overpricing the exchange population relative to other competitors. With this loss in market share, a health plan would have a much smaller membership base to spread its fixed costs and investments associated with its exchange membership and miss an opportunity to better understand the risk profile of this population before 2017. In contrast, in the period before the ACA was in effect, a health plan would have to bear the entire cost of financial losses associated with underpricing along with the potential loss of market share if the block was overpriced.

CONSISTENT WITH THE ACA POLICY GOALS, HEALTH PLANS ARE EFFECTIVELY TRADING THE BENEFITS OF GREATER RISK AND REWARD FOR AN ARRANGEMENT WHERE THE FINANCIAL OUTCOME IS MUCH LESS VARIABLE.

THE RATIONALE FOR THE RISK PROTECTIONS

This risk protection is critical because the structure of the program requires health plans to make assumptions regarding a completely new and potentially volatile population that will no longer be required to undergo the medical underwriting process that health plans have used to ensure the expected costs were appropriate for the premium charged to each individual. As a result, without this historical information and the ability to develop a unique rate for each individual, health actuaries must now develop a rate structure that represents the risk composition for the entire ACA pool. The new rates must now be adequate in total—even if some individuals will have rates that will result in an expected subsidy or an additional cost to the broader pool. In addition to estimating the costs for the entire risk pool, actuaries must also ensure the program provides adequate funding through the ACA's risk protections at the individual health plan level to meet the financial goals outlined in its rate filing. As outlined below, the challenges with rating this population require the additional financial risk protections to ensure broad insurer participation.

- **Estimating the expected health expenses for the ACA exchange risk pool.** In developing the expected expenses for the entire risk pool, along with estimating traditional actuarial variables such as utilization and unit cost trend, actuaries must also estimate who is expected to participate in the ACA pool. Without historical information in the first year of the program and only a limited amount of emerging data in the second year, actuaries must make a determination of how several factors will impact ACA participation, including the health status and age of the individual, the net premium level (premium cost less the subsidy) of the individual, the availability of other insurance options—including the extension plans available in several states where individuals can continue

with their existing plans, and the consumer response to the tax penalty. As one would expect, actuaries can reasonably disagree on the interaction of these various assumptions and the extent individuals will react to the economic incentives to purchase insurance in the most cost-effective insurance pool. Ultimately, this uncertainty has manifested itself in widely varying rates in the exchanges for the initial calendar year with the likelihood of continued volatility in the second year as health plans make decisions with a limited amount of emerging information. In addition to ensuring that some health plans would have either over- or underpriced their exchange business, this rate divergence has the potential to magnify the financial impact of any underpricing as members are disproportionately attracted to the lower-priced plans.

- **Estimating the impact of the risk protections.** After estimating the costs for the entire risk pool, actuaries must then ensure that the total revenue from the program is sufficient to meet the financial requirements identified in their rate filing for their particular organization. While the emerging data will include premium information and initial reinsurance recoveries, actuaries will not be in a position to completely measure the total financial impact of the other risk protections—the risk adjustment and the risk corridor—for their health plan until the middle of the following year. As structured in the legislation, the risk adjustment program requires a final accounting in the middle of the year following the rating period where the relative risk among the health plans is compared and payments are made to the health plans that attracted a population with greater health needs than other health plans. Similar to the challenges in estimating the broader risk pools, this additional uncertainty could increase the potential volatility in estimating the expenses for this population.

In addition to the delay in receiving the risk payment, the ACA subsidy structure could lead to substantial net premium (premium less subsidy) differences among plans in a given year and significant changes in net premium from one year to the next. (See "The Implications of the ACA Subsidy Program on Net Premium Levels" on page 18). This volatility is created by the development of the subsidy, which is dependent on the second-lowest silver plan. To the extent the second-lowest silver plan changes relative to a member's existing plan, a member could see substantial changes from one year to the next. The net effect of this volatility could be substantial migration among the plans and increased difficulty in estimating a health plan's specific risk adjustment as the population changes. This potential volatility also further increases the risk associated with overpricing the exchange population relative to other competitors.

Overall, consistent with the expectations inherent in the risk adjustment program, we can expect to see substantial rate volatility as actuaries make their initial assumptions regarding participation in the ACA exchanges. This volatility will likely continue into 2015 as actuaries continue to estimate the expected ACA participation rate with limited information and without complete visibility to the value of the risk protections at the health plan level. While these costs have the potential to be volatile, if unfavorable results occur, health plans will have sufficient protection from the federal government to continue their participation in the initial transitional phase. This remains the key to the short-

THE IMPLICATIONS OF THE ACA SUBSIDY PROGRAM ON NET PREMIUM LEVELS

The following example from the 2014 Milliman briefing paper "The Proposed Federal Exchange Auto-Enrollment Process: Implications for Consumers and Insurers" by Susan Pantely and Paul Houchens highlights the potential for consumer switching. In the chart below, the authors highlighted the premium and subsidy level offered to an exchange participant at 150 percent of the federal poverty limit. Consistent with ACA policy, the subsidy level in this example is based on the second-lowest silver plan premium—in this case, the maximum expenditure individual is 4 percent of a household's income or $57. The resulting subsidy amount ($268) can then be applied to all the plans to produce a higher or lower net premium.

ACA COMPONENT	PLAN 1	PLAN 2	PLAN 3
Full premium	$300	$325	$350
Subsidy amount (based on the second-lowest silver plan)	$268	$268	$268
Monthly net premium	$32	$57	$82
% of income	2.2%	4.0%	5.7%

As highlighted above, a significant percentage differential in actual net premium levels—$32 compared to $57 and $82—could prompt an individual with an income level slightly above the federal poverty limit to choose the lowest-cost plan.

This switching could be magnified over time as some health plans change premium rates to increase market share. The authors highlighted the following example where Plan 3 purposely reduced its premium and Plan 2 maintained its initial rate in an effort to increase market share.

ACA COMPONENT	PLAN 1	PLAN 2	PLAN 3
Full premium	$320	$325	$350
Percentage change from 2014	7%	0%	−16%
Subsidy amount (based on the second-lowest silver plan)	$263	$263	$263
2015 net premium	$57	$62	$32
2014 monthly net premium	$32	$57	$82
% net premium change from 2014	78%	9.0%	−61%

In this case, a member in Plan 1 where the health plan proposed a modest 7 percent increase would still see a large net premium change caused by two factors—an increase in the premium by 7 percent and a reduction in the subsidy caused by a reduction in the second-lowest silver plan ($325 to $320). Because the member would see the entire burden of the rate increase and the reduced subsidy, the incentive to switch to a lower-cost plan would increase significantly.

term results in the legislation for health plans—any potential mispricing will have financial protection from the federal government.

FINAL ACA PHASE

Beginning in 2017, the ACA market will no longer offer two of the three risk protections—reinsurance and the risk corridor. The risk adjustment program and the existing reconciliation process will continue along with the minimum medical loss ratio floor.

Although one could debate the absolute level of the risk, health plans are clearly taking on more risk relative to the period before the ACA and the current transitional period. The additional risk factors include:

- *Unlimited downside risk combined with limited upside potential.* While before the ACA, health plans bore all the risks and rewards of better- or worse-than-expected results, health plans in the current transitional phase have risk protections that dramatically limit the potential volatility in financial results. Under full implementation of the ACA where two of the three risk protections are eliminated, health plans will face unlimited downside with a financial upside limited by the minimum medical loss ratio floor. With this change, health plans now have a much less attractive arrangement than under both the transitional and pre-ACA periods.

- *Difficulty estimating the total risk pool.* In addition to the challenges already discussed, because the extension policies allowed a number of policyholders to remain outside of the ACA risk pool in some states, insurers would not have gained any information on these members prior to the final ACA period. This lack of information will make the ultimate expense estimate of the risk pool subject to additional variance.

In addition to the above changes, the challenges with having full visibility to the risk adjustment payments and the potential for significant consumer switching among the health plans will continue. These factors will make managing the exchange population more challenging and could reduce participation in 2017.

CONCLUSION

Taken in total, the ACA has introduced new incentives that will have a profound impact in the insurance market for both consumers and health plans. In the short term, the lack of historical information, the selection that could occur as individuals choose the most advantageous risk pool, and the migration among the plans make the potential for inaccurate pricing more likely. The potential downside for health plans, however, will be limited by the financial protections in place through the reinsurance, risk adjustment and risk corridor programs. Any potential profit would also be limited by the minimum medical loss ratio floor.

From a health plan perspective, the real challenge will occur in the longer term as the final ACA rule provisions are put in place. Because the final period increases the risk to insurers and limits any potential upside associated with better-than-expected performance, health plans will need to be able to estimate the expected cost for this population with a greater degree of accuracy than other historical periods. As outlined above, however, this will not be easy. Although the extension plans will presumably be phased out, health plans will still face the potential prospect of attracting a much different population from one year to the next as consumers with dramatically different net premium rates respond by switching from one plan to another. If this migration occurs, the rating process will be made much more volatile because the rated population could change significantly from one year to the next for a given health plan. This challenge is further magnified by the delay in estimating the true financial performance in a year caused by the risk adjustment settlement process. This will ultimately make the consumer participation rate and migration behavior critical in determining a health plan's willingness to participate.

As we make this transition into 2017, our profession is in a unique position to help facilitate the change from the current period to the final ACA period where health plans will have to take on substantially more risk. Relative to most policymakers and observers, we have been on the ground floor managing the technical details associated with the legislation. As a profession, we also have a deep understanding of risk and the financial implications associated with uncertainty. In short, the ball is in our court to help provide policy recommendations and advice as we enter into the most impactful phase of the ACA legislation. A

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Controlling O

ur Behavior

MANY MANAGERS ARE STRUGGLING WITH THE DAUNTING TASK OF DESIGNING A CONTROL ENVIRONMENT FOR THE ACTUARIAL ASPECTS OF AN INSURANCE COMPANY. BY MARK GRIFFIN

Behavioral finance (sometimes referred to as behavioral economics) represents a synthesis between psychology, neurology and anthropology. It demonstrates consistent economic biases and blind spots in the behavior of individuals and groups.

Insurance company managements are in the process of building the "control environment" for financial reporting envisioned by the Sarbanes-Oxley Act of 2002 and the 2013 COSO "Internal Control—Integrated Framework." The risk management, actuarial, compliance and internal audit areas within an insurance company (sometimes referred to as the control functions), together with the finance function, will be critical in building this environment. This article will help the reader understand behavioral finance and its relevance in identifying analytics and processes suitable for a control environment. Three examples are provided. More broadly, the article will help any actuary involved in making and resetting assumptions to understand behavioral finance and thereby avoid some common biases.

THE PITFALLS

In 2002, Daniel Kahneman won a Nobel Prize for his work in behavioral finance. Other authors in this field include Robert Shiller, Hersh Shefrin and Richard Thaler. In 1995, the Association for Investment Management and Research (AIMR) published "Behavioral Finance and Decision Theory in Investment Management."

Their work and that of others has shown that behavioral finance demonstrates a number of decision-making traps:

- Endowment effect: We value the things we have, and the things we have invested time in, more than we should.
- Anchoring: People don't make sufficient adjustments from an initial "anchor," and give disproportionate weight to the first information they receive. In Kahneman's words, this is "one of the most reliable and robust results of experimental psychology."
- Confirmation bias: We tend to look for evidence that confirms our existing view and to disregard findings that contradict it. This is sometimes referred to as the "status quo bias."
- Overconfidence:
  - The more expertise one has, the more overconfident one becomes.
  - We draw unfounded conclusions from small samples.
  - Experts see things in a much more differentiated form, and they may overlook other perspectives.
- Loss aversion: Investors are overly reluctant to sell their loss-making positions because that would force them to admit they had made a mistake. Instead, they hold on to these positions longer than positions with gains.

The confirmation bias suggests that those who have the initial assumption as their "anchor" may not take the new information seriously or apply a disciplined process to its arrival.

ASSUMPTION RESETTING EXAMPLE

Consider the following example. An insurance company enters the simplified issue term insurance market. A mortality table is carefully chosen. A couple of years into the new venture, the quarterly financials of the company contain a poor mortality result for this line of business. In preparing to describe the results to the board of directors and outside investors, the finance department "asks" the actuarial department if this result is merely noise or evidence that the mortality assumption is too aggressive.

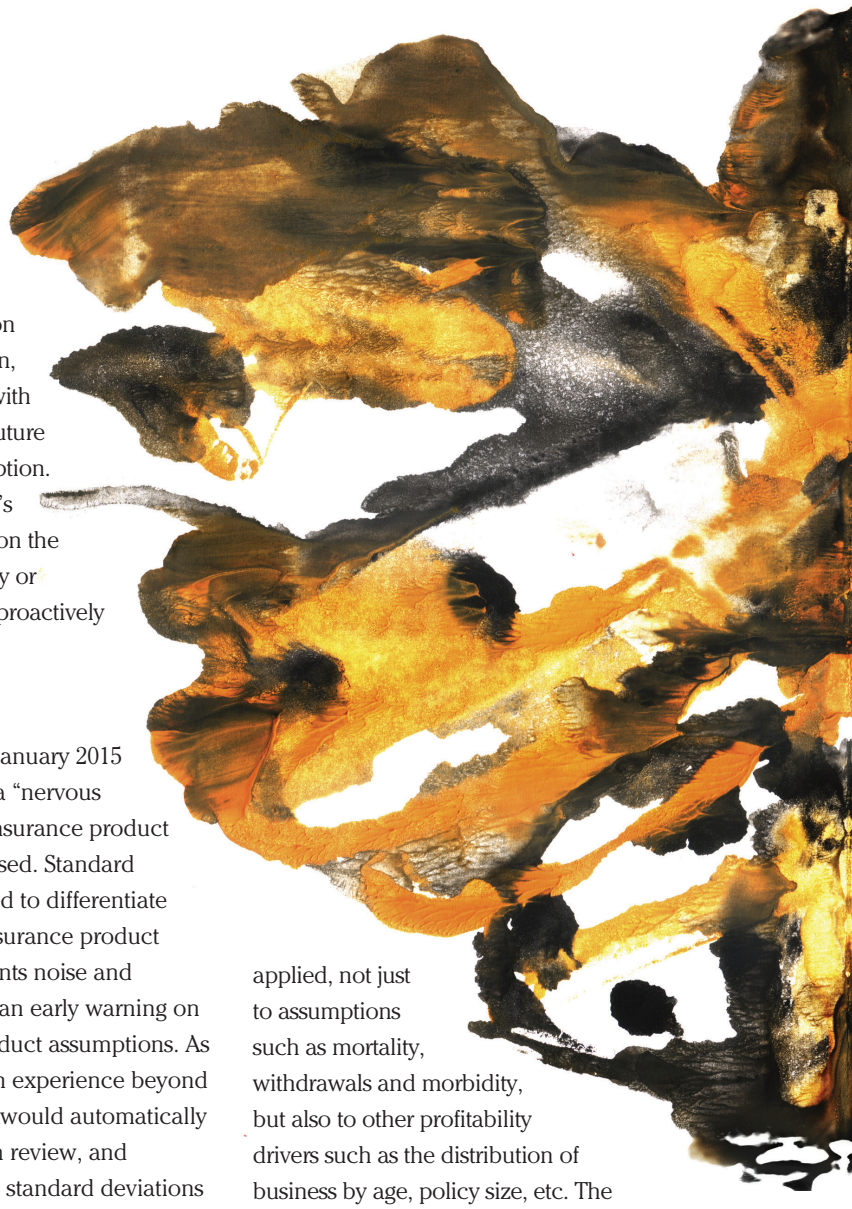
In this case, for the actuaries involved in setting the assumption, the "endowment" is their investment in the actuarial designation, their stature within the organization and the assumption itself. For everyone within the organization who was not involved in setting the assumption, the assumption is the first information they receive and becomes the anchor. The confirmation bias suggests that

those who have the initial assumption as their "anchor" may not take the new information seriously or apply a disciplined process to its arrival. With respect to overconfidence, the simplified issue mortality assumption was probably either made by, or approved by, the ranking mortality "expert" within the company. In this situation, the expert status of the decision-maker(s) may cause the company to be too reliant on the initial data and on the initial assumption drawn from that data. The prospect of changing the mortality assumption may trigger loss aversion within the company, as the resulting reserve increase might be viewed as admitting a mistake. The temptation to hold off on the assumption change and pray silently for future reversion may be too strong.

In the example, there is a possibility that the company will not react promptly to experience that is more than noise. Delayed recognition increases the magnitude of the eventual corrective action and may result in the capital markets losing overall confidence in the company's financials.

In his best-seller, *Emotional Intelligence: Why It Can Matter More Than IQ*, Daniel Goleman describes how initial reactions to unexpected events may be emotional rather than rational. The emergence of negative experience with respect to an insurance product may constitute such an unexpected event. Even apart from "control environment" considerations, the opportunity to replace what may be a rather awkward, emotional situation with a consistent process should be welcomed.

All actuaries must realize that, having made a large personal investment in actuarial training, we consciously or subconsciously feel empowered and entitled to make assumptions. Based on the findings of behavioral finance, we should also recognize that, as soon as we devote time and attention to making an assumption, we lose our objectivity with respect to the possible future need to reset the assumption. Therefore, the company's process should not rely on the assumption-making body or person to raise its hand proactively and identify an issue.



NERVOUS SYSTEM

In the December 2014/January 2015 edition of *The Actuary*, a "nervous system" for managing insurance product assumptions was proposed. Standard deviations are calculated to differentiate between variation in insurance product experience that represents noise and variation that indeed is an early warning on the need to change product assumptions. As an example, variation in experience beyond one standard deviation would automatically mandate an assumption review, and experience beyond two standard deviations would mandate a revision.

The nervous system can be applied consistently within an organization as well as across life, health, property and casualty, and pension assumptions. It should be applied, not just to assumptions such as mortality, withdrawals and morbidity, but also to other profitability drivers such as the distribution of business by age, policy size, etc. The nervous system can form an important part of a model governance policy within a control environment, as described earlier. The analytics can be made available to, and are easily understood by, the actuarial, risk, finance and internal audit teams. While

Reinsurance

THE RENEWAL PROCESS WITHIN A REINSURER is subject to the same challenges listed in the direct simplified issue example. Applying consistent "review and revise" triggers based on the original assumptions at the point of renewal will ensure a disciplined approach and represent an effective control.

the approach is not analytically elegant, it is understandable by those without deep statistical knowledge. Therefore, it will resonate with senior management, industry analysts, investors, auditors, regulators, etc.

THE FED'S PERSPECTIVE

This same need for an objective, transparent process to review and revise assumptions is echoed by the Federal Reserve's "Supervisory Guidance on Model Risk Management,"[1]

> Validation also can reveal deterioration in model performance over time and can set thresholds for acceptable levels of error, through analysis of the distribution of outcomes around expected or predicted values. …
>
> The objective of the [back-testing] analysis is to determine whether differences stem from the omission of material factors from the model … or whether they are purely random and thus consistent with acceptable model performance.

The traps listed earlier obviously all involve behavior. The use of a transparent, consistent process such as the nervous system removes the opportunities to fall into these traps. A company using the nervous system doesn't need to rely on the parties responsible for setting assumptions to raise their hand and identify the need for assumption changes, and there is no need for one party within the insurance company to challenge another party.

AN OUTSIDE VIEW

The example of the nervous system is a specific combination of processes and analytics that helps address the decision-making biases listed earlier. The second example, the outside review, can be thought of as a broad principle. It addresses the same set of decision-making tendencies as the nervous system.

An outsider is not as "endowed with," or "anchored to," the original assumption, and should be able to look more objectively on the assumption and on new evidence. The overconfidence finding suggests that the outside view is necessary and it may be best if it comes from someone who is less of an expert on the topic, and therefore less bound to traditional approaches.

Kahneman devotes a chapter to "The Outside View" in his behavioral finance best-seller, *Thinking Fast and Slow*. The value of an outside perspective is echoed by others.

The Fed makes explicit reference to outside perspectives:[2]

> A guiding principle for managing model risk is "effective challenge" of models, that is, critical analysis by objective, informed parties who can identify model limitations and assumptions and produce appropriate changes. …
>
> Generally, validation should be done by people who are not responsible for development or use and do not have a stake in whether a model is determined to be valid.

One of the International Association of Insurance Supervisor's Insurance Core

Pensions

THE PROCESS OF SETTING PENSION PLAN ASSUMPTIONS is subject to the same behavioral tendencies as those described in the term insurance example. The analytical and process discipline of the nervous system can be applied to assumptions such as early retirement incidence, employment termination and mortality experience. It is important to discern what is noise and what is a genuine trend, and be prepared to change your initial assumptions when warranted.

Principles (ICPs)[3] touches on this as well:

> The control functions (other than internal audit) should be subject to periodic internal or external review by the insurer's internal auditor or an external reviewer.

When a corporate credit analyst first decides to approve a credit, it is similar in many ways to the actuary's choice of a new assumption. For all of the same reasons, the original analyst will find it hard to be objective on the credit if it subsequently starts to weaken. An insurance company's process for identifying and monitoring deteriorating credits should not rely solely on the original decision-maker raising their hand proactively and identifying an issue. Thankfully, views and metrics on corporate credits are available in the capital markets.

A tool known as a tornado chart can be used to rank and communicate a company's top risks, mitigating these behavioral inclinations.

FOCUSING OUR TIME AND TOOLS

While the first two examples were based on the behavioral finance findings around decision-making, the third is based on behavioral finance findings regarding how we allocate our time and attention and how we as individuals, and groups, set priorities. A wide range of studies have shown that we:

- Choose projects for their ease, not their importance.
- Spend too much time on small decisions and not enough on big ones.
- Use the information that is close at hand.
- Are more engaged by things we like than by things we dislike.
- Avoid the problems we cannot easily solve, often by substituting a problem we can solve; this is often referred to as substitution.
- "Choose not to choose." The recent best-seller, *Scarcity: Why Having Too Little Means so Much* by Eldar Shafir and Sendhil Mullainathan, describes how we tend to "tunnel" on the things that will impact us most immediately at the expense of other, more important risks that pose a less immediate threat.

In the January 2014 Health Section newsletter, an article by John Stark addressed insights from behavioral finance with respect to the buying and selling of health insurance. The article referred to substitution, as well as the endowment effect and loss aversion. Also included is prospect theory, which is not addressed here.

These behavioral finance observations on resource allocation strongly suggest the need for a disciplined process to both broadly set the agendas of the various control functions and more narrowly to ensure the modeling agenda is set objectively. The 2014 publication "Model Validation for Insurance Enterprise Risk and Capital Models," sponsored by the Society of Actuaries, Canadian Institute of Actuaries and Casualty Actuarial Society, suggests that the reader "check whether a process is in place to determine which risks need to be modeled."

TORNADO CHARTING

A tool known as a tornado chart can be used to rank and communicate a company's top risks, mitigating these behavioral inclinations. To prepare a tornado chart, all assumptions are shocked in both directions by an arbitrary percentage. For each shock, the severity is calculated (leaving all other assumptions at the best estimate) in the risk "currency" of the institution (such as embedded value, risk-based capital (RBC), GAAP earnings). Most insurance companies have the ability to analyze such shocks, and this type of exercise will almost certainly be familiar for insurers subject to the European Union's Solvency II Directive. These stress test results are ranked in order of their negative impact and might appear as shown on page 26.

Given the behavioral observations listed above, it is important that there be no "view" imparted on the shocks to be applied, just a calculation of the severity of the arbitrary shocks. Hence, a better name may be the Murphy's law tornado chart. Most historical financial surprises have resulted from a misestimation of frequency, not an inability to calculate severity.

If historic data is available for each major risk, the shocks can be calibrated to represent a specific frequency. As an example, the shocks could represent a historical one-in-every-10-year "event." In this "historic" tornado chart, as in the Murphy's law version of the tornado chart, it is critical to ensure there is no "view" involved in the shocks that are used.

The tornado chart can be held up against the risk team's agenda and resources to ensure that economic risks are the prime determinant, and that people's expertise or interest, or the availability of analytic tools

or data, has not had an undue influence. The same biases on resource allocation listed earlier should be considered in setting the agenda for the other control functions, actuarial, internal audit and compliance. As an example, the tornado chart might indicate that the risk team's plan to develop a state-of-the-art elliptical copula formula within the economic capital model should be reconsidered relative to a longevity risk analysis and possible risk transfer. Perhaps some other risk activity can be deferred in favor of a corporate credit deep dive into a sector (for example, energy) that is undergoing structural changes with possible knock-on effects across other sectors.

Behavioral finance reveals a number of consistent biases in both decision-making and resource allocation.

RISK, RETURN AND CAPITAL

The tornado chart can also be an effective framework for presenting risk/return trade-offs. If one can attribute sources of return to various risks and can measure the costs of mitigating the risks symmetrically or asymmetrically as well as measuring the capital (economic or regulatory) of combinations (recognizing that the risks are not necessarily additive), the tool can be used for risk budgeting or strategizing.

As time passes, changes in the impact of shocks are a gauge of the institution's changing exposure. It is also enlightening over time to compare the attribution between actual and expected results of the institution to the elements and magnitudes calculated in tornado charting.

SUMMARY

Behavioral finance reveals a number of consistent biases in both decision-making and resource allocation. Many managers are struggling with the daunting task of designing a control environment for the actuarial aspects of an insurance company (or pension valuations). Insights from behavioral finance can provide a helpful perspective on processes and analytics such as a nervous system, an outside view and tornado charting that help form a control environment. A

END NOTES

[1] Board of Governors of the Federal Reserve System, Office of the Comptroller of the Currency, "Supervisory Guidance on Model Risk Management," OCC 2011-12 (April 4, 2011), *www.occ.treas.gov/news-issuances/bulletins/2011/bulletin-2011-12a.pdf.*

[2] Ibid.

[3] International Association of Insurance Supervisors, "Insurance Core Principles, Standards, Guidance and Assessment Methodology," Oct. 1, 2011, ICP 8.2.6.

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QUANTIFYING PANDEMIC RISK

THE RECENT WEST AFRICA EBOLA OUTBREAK SERVES AS A REMINDER THAT IT IS IMPORTANT FOR ACTUARIES TO ACCOUNT FOR AND QUANTIFY PANDEMIC RISK. BY DOUG FULLAM AND NITA MADHAV

According to the World Health Organization (WHO), as of Nov. 21, 2014, the West Africa Ebola outbreak has resulted in over 15,300 cases and 5,400 deaths. The countries of Guinea, Liberia and Sierra Leone have borne the brunt of the outbreak, with additional cases and deaths reported in Mali, Nigeria, Senegal, Spain and the United States. This is the largest Ebola outbreak on record since the virus was first discovered in 1976, as shown in Figure 1 below.

WHY IS THE WEST AFRICA EBOLA OUTBREAK SO LARGE?

Changes in the Ebola virus itself do not appear to be the major driver behind the unprecedented size of this outbreak. Instead, socioeconomic factors, such as the lack of health care infrastructure in the worst-affected countries, are likely to blame. Guinea, Liberia and Sierra Leone rank low in response capacity, e.g., physicians and hospital beds per capita. In addition, government mistrust in the affected populations—due to decades of civil war—is high, so cooperation between government health workers and the populace, which had been critical for success in previous outbreaks, has not worked to contain the outbreak this time. This outbreak also reached densely populated urban centers, whereas previous ones remained in remote areas. Finally, initial misjudgments about the outbreak, including delays in the initial response to it, false indications that it had been contained, and a hope that it would "burn out" on its own, contributed to its large size.

Despite the initial sluggish response, the international community has contributed significantly to reducing the spread of the outbreak through donations of money, supplies, personnel and capacity building. All these measures have helped tremendously in reducing the rate of disease spread. Drug developers have also begun testing the effectiveness and safety of pharmaceutical interventions such as treatments and vaccines. By the first quarter of 2015, WHO expects that thousands of doses will be available for health care workers in the worst-affected countries, which could also help contain the spread of the disease.

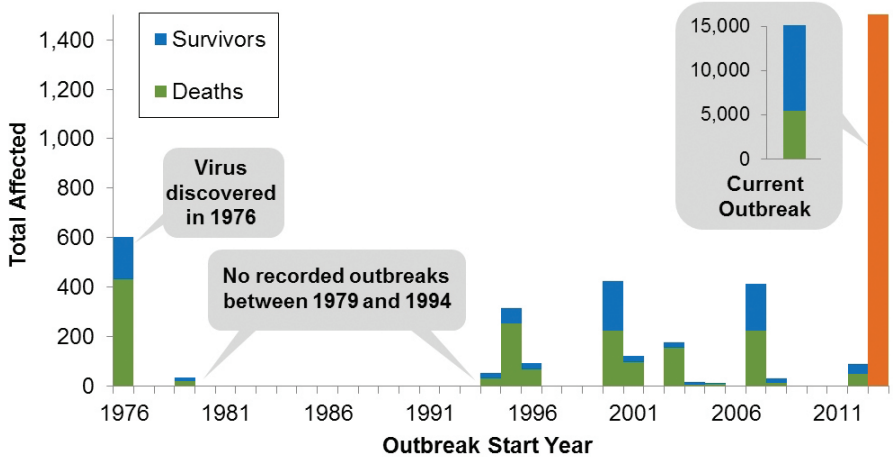
WHAT ARE THE POTENTIAL INSURANCE IMPACTS?

Although the West Africa Ebola outbreak has led to cases and deaths mainly in countries with low insurance coverage, it has far-reaching indirect insurance impacts and it is important for insurance companies and actuaries to have a clear picture of the potential risks.

Large events such as the current outbreak can affect multiple insurance industries, lines and countries simultaneously. The two industries that will likely be hit hardest by an outbreak are health and life insurance, and the severity of the impact is highly correlated to the type of disease and its characteristics. Ebola is spread through direct contact, so it is likely to affect mostly health care workers, first responders, and close family and friends of those already infected. Pandemics that are airborne, however, have the ability to transmit rapidly throughout a community.

Business interruption, travel insurance policies and workers' compensation are

FIGURE 1—CHRONOLOGY OF EBOLA OUTBREAKS, BASED ON DATA FROM WHO AS OF NOV. 21, 2014



lines that could also see claim payouts, although business interruption and travel insurance are unlikely to see large losses because disease is typically not considered a covered loss.

During a severe pandemic, the asset side of the balance sheet may also be adversely affected. People are likely to avoid public places, which will have an adverse effect on businesses. In addition, with people becoming sick and potentially dying, added stress will be placed on workplace labor needs and individuals are likely to take time off, which is likely to hurt their income. Both factors would contribute to an economic slowdown. In October, the World Bank provided stress-testing economic loss scenarios related to the West Africa Ebola outbreak. Their severe scenario resulted in over $30 billion in lost economic output from 2014 to 2015. They noted that this loss is driven by "fear of contagion" rather than being a direct result of the outbreak. Thankfully, in light of the international response, this estimate has been revised down to $3 billion to $4 billion. That said, a survey conducted by the World Bank in November estimates almost half (46 percent) of the working population in Liberia at the start of 2014 are now not working, with the hardest hit being the self-employed.

METHODS FOR ESTIMATING PANDEMIC RISK

Several modeling approaches can be useful for estimating pandemic risk. We will discuss the different modeling approaches and how they can be applied to better understand pandemic risk in the following sections.

Deterministic Methods

To understand the potential impact that

specific types of adverse mortality and morbidity risk—such as a pandemic—may have on a portfolio, stress-testing methodologies are often employed. Some of the most commonly used are the pandemic scenarios from the Department of Health and Human Services (HHS).[1] These scenarios provide both mortality and morbidity estimates that are useful for life and health actuaries. For firms that have exposure to both sets of risk, these scenarios help ensure consistency in modeling approaches. However, they represent only basic assumptions for life and health actuaries and need to be combined with other assumptions to incorporate into stress-testing scenarios.

In his "Potential Impact of Influenza on the U.S. Life Insurance Industry"[2] analysis, Jim Toole took these scenarios and applied them to the insurance market as a whole to estimate the industry loss. He outlines the complementary assumptions required to implement the HHS scenarios into an insurance model. Some additional assumptions applied are as follows: insured vs. population pandemic mortality rates, pandemic age and gender distribution, benefit levels by group, reinsurance credit and tax credits. These assumptions provide a framework for estimating pandemic stresses against a portfolio of risks.

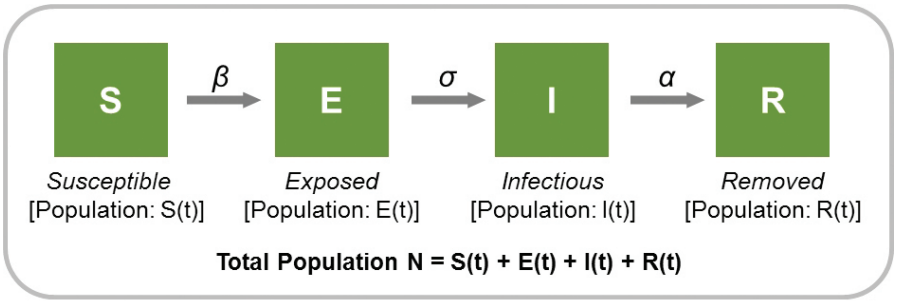
Stochastic Methods

While deterministic methods are useful, the West Africa Ebola outbreak has shown that there is a great degree of uncertainty when an outbreak is unfolding. Stochastic methods can help capture this inherent uncertainty and can provide a method for estimating the probabilities of various outcomes.

Time Series Models

One very useful approach to bringing uncertainty into the equation is through the use of time series models. Autoregressive integrated moving average (ARIMA), generalized autoregressive conditional heteroskedasticity (GARCH) and other time series models allow for fitting an equation to historical data, and for using one or more previous data points as part of the estimation for the current data point. This method is especially useful when there is

FIGURE 2—BASIC FLOW OF EPIDEMIOLOGIC MODEL



a built-in tendency in the system for the current data point to be correlated to the previous data point.

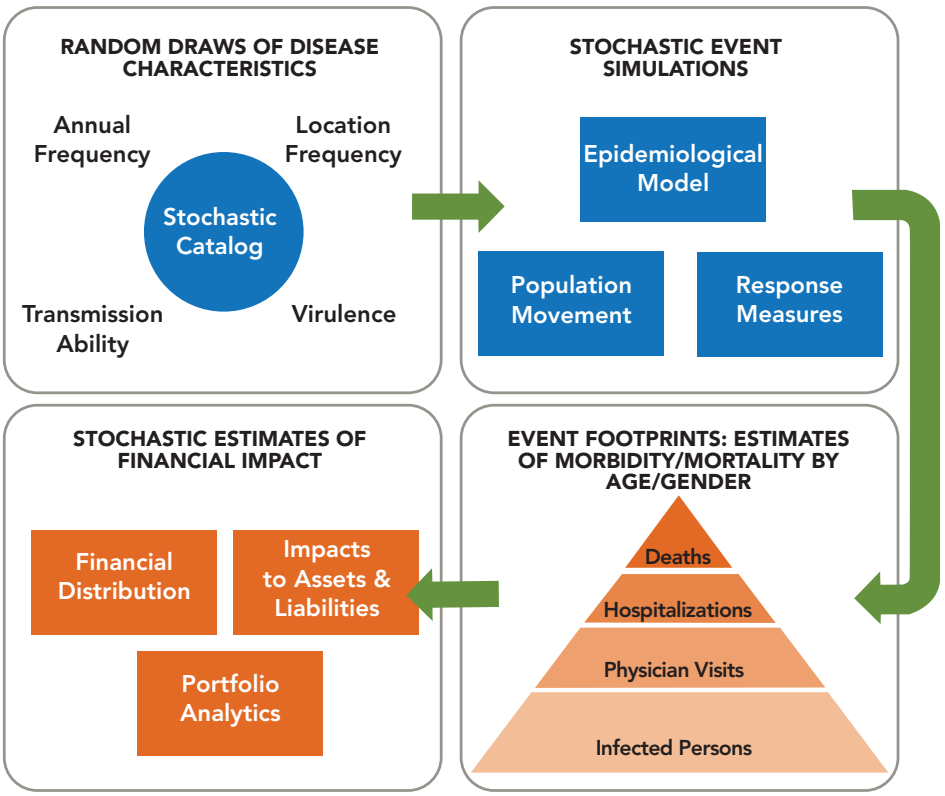
During the early phases of an outbreak, case counts grow exponentially. The rate of infection in the current week will be related to the previous week. Therefore, time series models can be used to model the early stages of outbreaks. With these models, trends, rates of change and variance can be estimated. This information can then be used to forecast future cases and deaths. However, because the outbreak eventually slows down, time series models should be used with caution during an ongoing outbreak. Time series modeling also relies heavily on the assumption that the previously reported data is an accurate representation of reality, which is often not the case during an outbreak.

Epidemiologic Models

Another type of stochastic model is the epidemiologic model, which can be especially useful for simulating the progression of a disease outbreak—even in the early stages. The general technique employed is a compartment model, which divides the population at risk into different "compartments," or disease states. Disease states include categories such as susceptible, exposed, infectious and removed, and represent various stages in disease progression (see Figure 2 above). Once the epidemic begins, anyone who is susceptible is at risk for acquiring the disease. The model then estimates the number of people in each compartment every subsequent day. The disease spreads to more people, until an inflection point is reached, after which the rate of new cases tends to decrease.

Information about the disease, such as how long it takes for someone to develop symptoms or how long someone may be sick, is required to use this type of model. Other important variables include how many people can be infected by one sick person, the percentage of those infected who go to the hospital or die, and the effectiveness of response measures, such as vaccines, during an outbreak. Because there is a great degree of uncertainty in all these parameters, statistical distributions are used for each, and stochastic variation is incorporated during the modeling process. By using this method, the same initial conditions of an outbreak can lead to vastly different final outcomes.

FIGURE 3—EXAMPLE FLOW OF CATASTROPHE MODEL



Catastrophe Models

A third type of stochastic model that actuaries can use is a catastrophe model, which is especially useful for estimating tail risk. Catastrophe models were introduced in the late 1980s to analyze hurricane risk, and now cover a variety of other perils, including pandemics. Catastrophe models use a set of hypothetical, plausible scenarios (called a stochastic catalog) to provide a broad view of risk. Typically, this is done by running many thousands of simulations whose initial conditions are sampled from statistical distributions. These statistical distributions are informed by available data and supplemented with scientific insights. Because it takes a view of an entire range of plausible events, catastrophe modeling allows for estimation of the probability different levels of loss will occur.

Figure 3 on page 32 shows a general pandemic catastrophe modeling framework. First, it is important to simulate the properties of a given pandemic. This includes the type of disease, starting location, rate of transmission from one person to another, and rate of morbidity/mortality, as shown in the upper left quadrant. This is done extensively to build a robust and statistically valid set of simulated events.

These initial parameters are input into an epidemiological model to estimate the total number of infected people, hospitalizations, intensive care patients and deaths, as shown in the upper right quadrant. At this point, the information can be aggregated to create an event footprint. This information allows actuaries to estimate total rates of morbidity and mortality for each event. It can be broken down by region, age and gender. Finally, the appropriate policy conditions

are applied to the number of people insured in each illness outcome category to estimate the financial impact.

COMPARISONS BETWEEN DETERMINISTIC AND STOCHASTIC APPROACHES

Stress testing and stochastic modeling have their advantages and disadvantages and have a proven track record if implemented correctly. Stress testing, which can provide many useful metrics for the life or health actuary, is able to:

- Provide an estimated loss that can be measured against the base assumptions
- Highlight which policies are most at risk and/or will see the largest deviations from base assumptions
- Determine which assumption(s) are the most important
- Help assess mitigation measures.

These four key aspects of stress testing are only important, however, once framed in the context of other analyses—most notably the base analysis. Empowered with this information, the actuary can be proactive about potential issues. Mitigation methods may present themselves in product design, reinsurance programs, asset management methodologies, etc. In addition, the stresses must be reasonable. Using stresses that have little basis in reality can result in inappropriate risk management decisions. Testing assumptions are often based on past experiences to maintain reasonableness. The benefit of using historical information comes from the fact that we know the severity of these events is possible. But the problem is future pandemics will almost certainly not have the same exact characteristics of previous outbreaks. This uncertainty can limit an actuary's ability to determine if the mitigation methods implemented are appropriate for the downside risk.

Stochastic methods have their own set of advantages and disadvantages. The largest advantage comes from the ability to estimate the probability that different outcomes will occur, giving the actuary an enhanced ability to understand the probability of different loss levels and to determine how best to manage reserves.

Stochastic models also allow users to analyze events that may not be similar to historical events. Therefore, stochastic models give the actuary a much better understanding of the risks faced by their firm or client. They also allow the actuary greater flexibility when assessing the risk of an ongoing event like the Ebola outbreak in West Africa. Actuaries who use stochastic pandemic models can look at the simulations from their model and find events that are similar to the one unfolding. These simulations provide a base range of potential losses. And depending on how the model is built, users could run simulations with a fixed set of known parameters similar to the current outbreak. These can be used to create an ensemble of similar events to determine a range of output.

The major drawbacks to stochastic modeling are the time and resources it requires. Building a simulation method is an intensive process, even for the simplest of models. Pandemic modeling isn't simple and requires expertise in epidemiology, statistics, simulation programming, database management and stochastic methods. For proper modeling, it is necessary to:

1. **Analyze each disease class separately.** How disease classes impact populations varies. Some are more concentrated, others are more likely to cause severe morbidity, etc.
2. **Create a large simulation process.** Pandemics are infrequent events, which is problematic for modeling. Convergence issues are likely to arise, and the only way to avoid them is to make sure you simulate enough events. This can put added strain on systems and resources to properly analyze the losses.
3. **Validate many components with limited data.** Over the last 100 years, there have been few pandemic events. Four were caused by influenza viruses and another by HIV. Most of the data used to validate the model will likely come from epidemiology assessments of diseases.

CONCLUSION

Actuaries have already built dynamic systems to account for economic capital models. In some cases, actuaries have also built stochastic longevity and health care models to incorporate probabilistic future rates of change. Therefore, extending these methods to include stochastic mortality and morbidity modeling for pandemic events is possible. In addition, the simulated events can be tied to capital models as a feedback loop, thus creating a dynamic, more useful asset-liability management framework. Both deterministic and stochastic modeling methods are useful for quantifying pandemic risk, and collaboration between actuaries and epidemiologists could help improve modeling methodologies. We encourage the actuarial community to reach out into other fields and incorporate the best modeling methods. A

END NOTES

1 In their "HHS Pandemic Influenza Plan," November 2005 release, the HHS provides two pandemic scenarios: moderate and severe. These scenarios have similar characteristics to the 1957 and 1968 flu pandemics, and the 1918 Spanish Flu pandemic, respectively.

2 Jim Toole, "Potential Impact of Influenza on the U.S. Life Insurance Industry," Society of Actuaries research project, May 2007.

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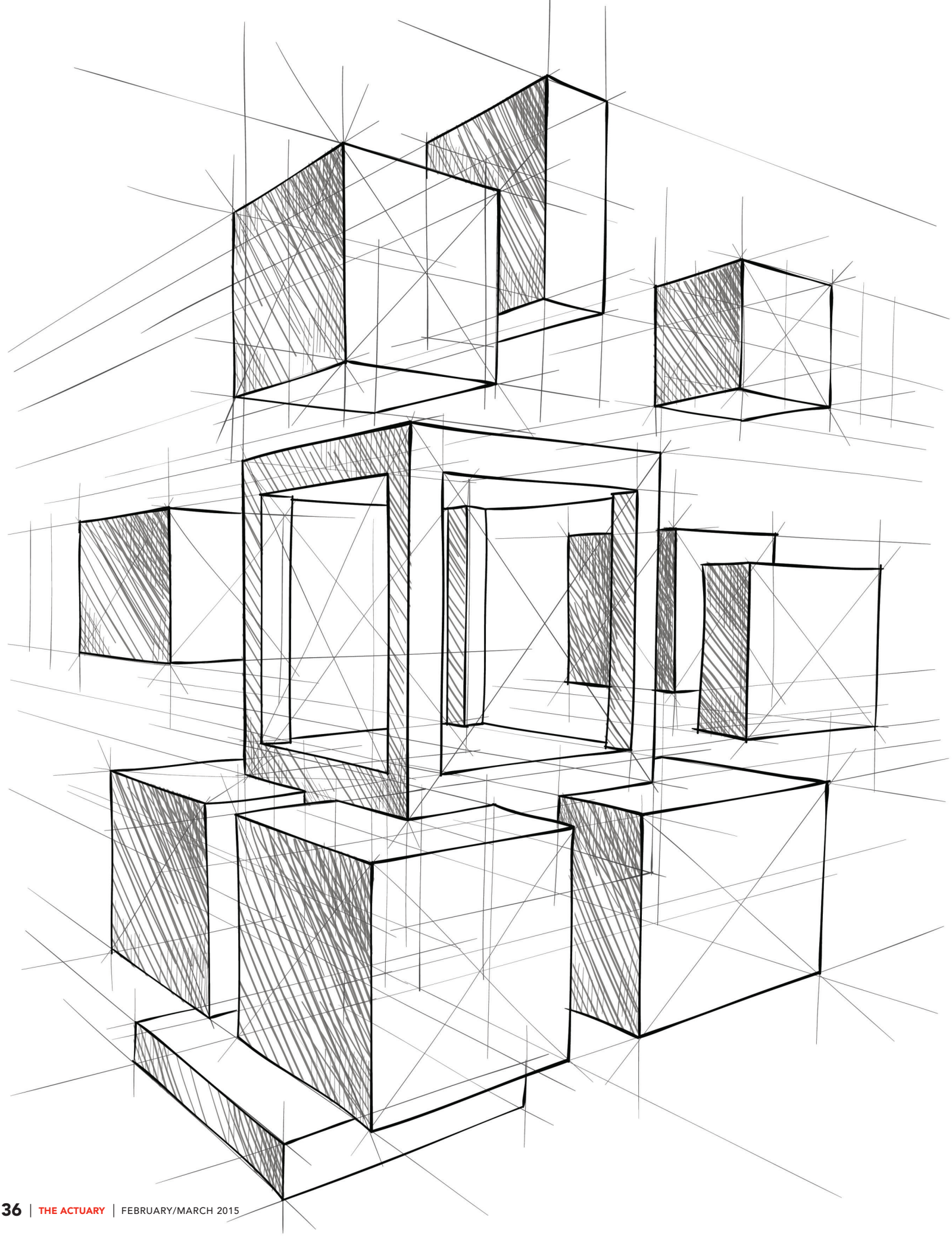


SUSTAINABLE ERM

SUSTAINABLE ERM INFLUENCES EVERYTHING FROM UNDERWRITING, PRODUCT DEVELOPMENT, CLAIM MANAGEMENT, MARKETING AND INVESTMENT TO CORPORATE STRATEGY WITH A FOCUS ON ENVIRONMENT, HUMANITY AND WELL-BEING.

BY FAN YANG

Sustainability encapsulates the concept of resilience, and the ability to maintain continuity and recover when plunged into changing circumstances. Corporate sustainability—the ability to create long-term business value—is dependent on its performance in the financial, environmental, social and governance realms. Insurers provide a unique case in sustainability since they manage not only their own risks from business activities but also the core functions concerned with customers' risks while remaining profitable. The industry bears the financial consequences of internal inefficiency, unsustainable behavior and business practices of clients and partners along the insurance value chain.

At both micro- and macro- levels, sustainability sheds light on environmental, social and governance (ESG) factors that are easily overlooked in decision-making and yet often lie at the root of an entity's rise and fall. Sustainability enables insurers to see the interdependencies of ESG risks and balance sheet risk and more accurately forecast what may occur. If insurers understand sustainability, they can be a step ahead of competitors as it challenges them to make decisions that simultaneously improve the triple bottom line: people, planet and profit.

The purpose of enterprise risk management (ERM) is to increase an

Principles for Sustainable Insurance (PSI)

1. Embed ESG issues in decision-making
2. Collaborate with clients and business partners to raise awareness of ESG issues, manage risk and develop solutions
3. Work with governments, regulators and other stakeholders to promote action on ESG issues
4. Demonstrate accountability and transparency in public disclosures on implementing the principles

Source: United Nations Environment Programme (UNEP) Finance Initiative (2012)

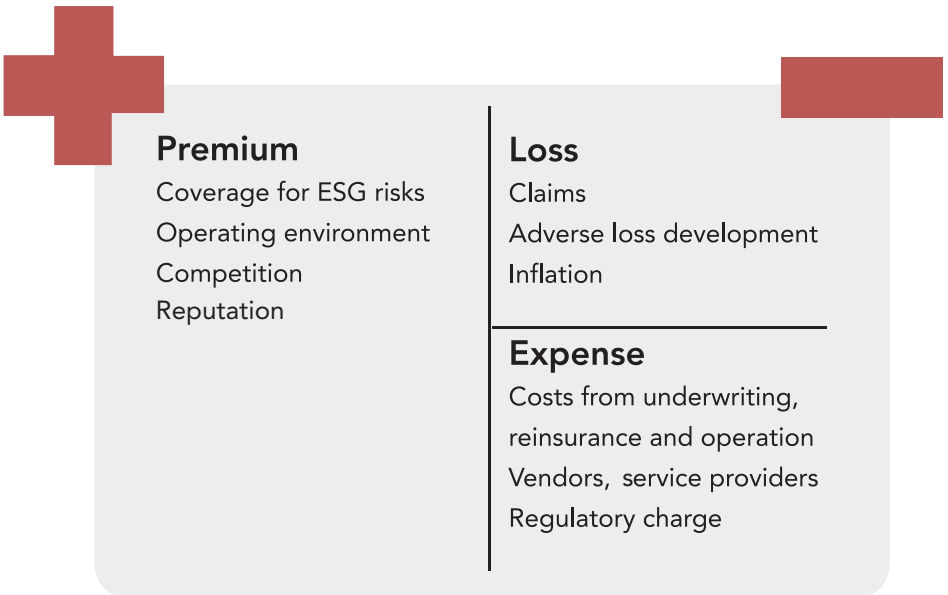
organization's short- and long-term value to its stakeholders. The means of accomplishing this is to assess, control, exploit, finance and monitor risks from all sources.[1] As the actual practice of ERM evolves to align with its fundamental purpose, sustainability will be recognized as a proxy of sound risk management and considered as a key indicator of a firm's health and prosperity.

The aspirational working definition of sustainable ERM (SERM) is the management of ESG issues for the purpose of stakeholders' shared value creation to realize sustainable development of the firm and the society it operates in.

This article will dig deeper into the meaning of this definition and outline characteristics and benefits of SERM. It starts with its relevance to the insurance industry.

THE GLOBAL SUSTAINABILITY TREND AND ITS IMPACT ON THE INSURANCE INDUSTRY

One major sustainability objective is to create balance among competing environmental, social and economic factors. With the growing demand from consumers, investors and regulators in a wide range of sectors such as energy, food, manufacturing and real estate, sustainability has shifted from a moral imperative to a strategic differentiator. In the banking sector, the United Nations-supported Principles for Responsible Investment (PRI) was launched in April 2006 at the New York Stock Exchange to encourage companies to take a wider view of socially and environmentally responsible investing, thus generating long-term sustainable returns.[2] For example, investors assess a company's carbon-related factors, and its relationship with customers, employees, suppliers and wider communities to evaluate its performance and future prospects. Anticipating the needs, Bloomberg started to include ESG information on its terminals in 2009. To meet with the growing interest in "green initiatives," insurers have started to offer green insurance products[3] that include green policy terms or reduced premiums for sustainable products and behaviors. During the last Earth Summit, known as Rio+20 in June 2012, leading insurers collaborating with the United Nations Environment Programme (UNEP) launched the Principles for Sustainable Insurance (PSI),[4] a global framework tailored to the insurance industry to address ESG risks and opportunities. Related practices among the signatory institutions include eco-operation, stronger corporate social responsibility (CSR) functions, and integration of ESG issues in



MAJOR GLOBAL PROBLEMS BY ESG CATEGORY AND CORRESPONDING INSURANCE SOLUTIONS

GLOBAL PROBLEMS		INSURANCE SOLUTIONS
ENVIRONMENTAL	Climate change, environmental degradation, water management, pollution, etc.	Property insurance, weather insurance, environmental indemnity liability, index-based products such as crop insurance, catastrophe pool, alternative risk transfer
SOCIAL	Financial inclusion, demographic change, human rights, emerging health risk such as depression, obesity, etc.	Life insurance, pension, accident and health, worker's compensation, microinsurance, general liability
GOVERNANCE	Regulations, disclosure, business ethics, information management, alignment of interest, etc.	Direct and officer liability and other commercial liability insurance

Source: United Nations Environment Programme (UNEP) Finance Initiative (2009)

product design, research and development, underwriting, investment decisions and emerging risk radar. *(See Principles for Sustainable Insurance (PSI) on page 38.)*

WHY IS SUSTAINABILITY IMPORTANT TO INSURERS?

The sustainability imperative can be illustrated in all the elements of insurer's net profit (premium – loss – expense) *(See chart to the left.)*

Premium income comes from the core business: managing risks for clients through insurance solutions and associated risk management services. The table above contains a list of selected insurance products for managing some pressing global problems. Since insurance creates sustainability value by effectively addressing ESG issues and minimizing uncertainty arising from social economic activities, sustainability lies at the heart of insurance. *(See Major Global Problems by ESG Category and Corresponding Insurance Solutions above.)*

Income outflow could result from any unsustainable activities that impede economic efficiency, fail to protect ecological systems, weaken human well-being or ignore the ethical grounding of sustainability.

Losses due to natural catastrophes possess the biggest challenges to property and casualty insurers. Climate change induced by excessive greenhouse gas emission to power the economy is associated with increasing climate perils, causing deepening economic damages around the world. Product liability and environmental liability loss are usually generated by covering products and operations that breach one or more ESG criteria. On the individual level, unhealthy lifestyle can lead to accident and health claims. Fatigue may trigger medical malpractice and worker's compensation claims. Expenses may arise from operational inefficiency, employee absenteeism, flawed processes and a weak governance structure. Insurers who do not embrace eco-efficiency are likely to forgo the opportunity cost of recycling and "go green" initiatives. Unsustainable practices such as a misaligned reward system, misrepresentation and selling inappropriate policies hold greater operational risk and reputational damage. Likewise, unrealistic return on equity (ROE) promises to the market can result in shady practice and false economies.

Equally important as net profit is the net investment. Perhaps the insurance industry is the only industry where the cost of goods sold is unknown upfront and future payouts need to be estimated. Hence, premium income and part of the shareholder's capital need to be invested in a sustainable manner to fund future obligations and insurance operation. For life insurers, sustainable investment is critical to ensure living benefits and guarantees for policyholders to thrive in the future economic environment.

In conclusion, sustainability focuses on the core business of insurers. It affects the insurers' financial statements, which directly ties to ESG performance of the company and its clients, thus making ESG assessment vital to the success of the firm.

SUSTAINABLE ERM

The purpose of SERM is to create a system where increases in the stakeholders' shared value contributes to sustainable development of the firm and society.

The definition of SERM is grounded in the belief that effective attention to ESG issues in the insurance value chain is the key to corporate sustainability. By embedding sustainability into all aspects of risk management and working in collaboration with all stakeholders, insurers can advance sustainability standards within and without. SERM revolutionizes the concepts of stakeholder, value and capital for a firm's strategic sustainable development.

Stakeholder

The company stakeholder that people think of first is the shareholder. Shareholder value, however, is determined by customer satisfaction, employee happiness, and mutual trust from regulators, rating agencies and the general public. It is the byproduct of taking care of other stakeholders. SERM goes beyond traditional stakeholders by including silent stakeholders such as the natural environment and future generations. From the standpoint of morality and long-term thinking, what this fundamentally means is to negate shortsighted, self-serving practices to gain profits upon the destruction or disregard of other life, including the environment, for ultimately the consequences would return as reputational damage or externality cost. Leadership ethics in SERM ensure no stakeholder is disadvantaged by the actions of others. Traditional shareholder value maximization theory may produce good short-term profits at the expense of reducing long-term growth by overlooking or diminishing other stakeholders' value. Many corporate failures arise from short-term fixation on increasing shareholder value by heavily relying on stock performance. The firm's commitment to foster strong stakeholder relationships is motivated by increasing stakeholder's shared value creation.

Value

SERM expands to consider intangible assets such as happiness, equity, justice and sustainability to improve long-term economic value. The biggest characteristic of SERM is enlightened value creation, which means generating shared value. Shared value focuses companies on "profits that create social benefits rather than diminish them" (Porter and Kramer, 2011). Social benefits include happiness and well-being of SERM stakeholders over the long run.

THE DEFINITION OF SERM IS GROUNDED IN THE BELIEF THAT EFFECTIVE ATTENTION TO ESG ISSUES IN THE INSURANCE VALUE CHAIN IS THE KEY TO CORPORATE SUSTAINABILITY.

Up to now, corporate value has been based on financial indicators using analytics and tools made available to them. Willard (2012) estimates that as much as 80 percent of enterprise value is now dependent on intangible factors that traditional risk management programs fail to address. There are promising developments in green accounting where social and ecological costs and benefits are integrated in traditional economic accounting systems. The participation in the Global Reporting Initiative (GRI), which combines the analyses of financial and nonfinancial performance, is increasing in different industries, including with insurers such as Aegon and Sompo Japan. Many emerging standards led by the Sustainability Accounting Standards Board (SASB) and the International Integrated Reporting Council (IIRC) are driving the needs and facilitating preparation for such sustainability reporting.[5] These new accounting and reporting principles not only support ERM to broaden the scope of value under consideration, but also help produce credible data for holistic decision-making. As sustainability issues pervade every aspect of social ethos, they will be integrated into existing financial reporting[6] and sustainability criteria are

Triple-Capital Regime

Economic capital: Financial capital to cover the economic effects of risk-taking activities

Natural capital: Natural resources and processes needed by organizations to maintain operations, produce products and deliver services

Human capital: Health, knowledge, skills, intellectual outputs and culture of the individual; it also includes human relationships, partnerships and co-operation (social capital)

Source: Porritt (2007)

likely to be adopted for regulatory solvency measurement and credit rating.

Capital

Sustainable insurance recognizes fundamental economic value of natural capital, social capital and good governance. Most analytics and resources are employed in the economic capital calculations of insurers to better estimate financial risk and formulate business strategies. To form decisions that capture the interdependencies of the firm's activities, capital management needs to expand and integrate two other important forms of capital: natural capital and human capital. *(See Triple-Capital Regime, on page 40.)*

The inclusion of nonmonetary measures of well-being in enterprise value calculation necessitates renovation of quantification tools to capture sustainability benefits. The ecological footprint developed by Global Footprint Network[7] utilizes available science to quantify natural capital under human influence. The development of far-sighted risk measures and happiness science in economics, psychology and sociology can be tailored to develop sustainability key performance indicators (KPIs) and proxy data for modeling human capital. The Big Four, which all are GRI-participating firms, now offer consulting services on developing clients' KPIs (e.g., carbon dioxide emission, gender ratio in leadership, employee turnover) and assessing sustainability goals.

Today, corporate and societal value creation is becoming more closely connected. A corporation may win over the competition by employing a sustainability strategy where environmental and social goals are incorporated in a corporate strategy as drivers of financial performance. The triple-capital regime better shapes staffing and funding decisions, which optimizes resource allocation and methodology development. Ecological integrity, social benefits and solid financial performance stem from good management, fueling a virtuous cycle: Actions to increase environmental and social performance create financial capital, which allows for additional investments in natural and human capital, which again improves financial performance.

Sample Definition of Triple Capital

Simple SERM Program

Here is a snapshot of an insurer's SERM program. The goal is to improve business practices and offer excellent ESG coverage for the benefit of stakeholders. This fit-for-future ERM program will be built upon each company's unique ESG profile. *(See chart above).*

Some leading insurers have started to turn their knowledge of ESG risks into operational practice and product features as well as promote a caring/inclusive work culture.[8]

For the environmental aspect, there are growing providers of green insurance to mitigate the impact of climate change. Operational excellence initiatives enable bottom-line cost savings through reducing unnecessary consumption of energy, water and paper from daily operations. Ecological literacy programs can be developed to raise environmental awareness to foster holistic thinking for sustainability stakeholder engagement.

As risk carriers, insurers provide social services through risk solutions. Leading insurers are expanding frontiers of insurability to include low-income families and cancer or HIV patients through external partnerships. Insurance is a human-capital-intensive industry and SERM recognizes employees as the true wealth of the company. Superior customer service and innovation come from great employee care. Under the SERM framework, there would be more focus on building a workplace that cultivates good qualities, inspires growth and realizes each employee's unique potential. Notably, human rights are usually regarded as basic rights to freedom and life; however, fundamentally they also include full human development, including

AXA's Corporate Sustainability

AXA, a French insurance and asset management group, identifies corporate responsibility (C.R.)* that incorporates financial, environmental and social considerations as a key driver of business value. Efforts are put to align all the activities and corporate functions with the corporate mission of "protecting people over the long term." ESG factors are actively managed in insurance business through commitment to Principles for Sustainable Insurance and embedded in investment through Principles for Responsible Investment. Each local entity has a local chief C.R. officer and is accountable for a robust and measurable C.R. approach integrated into local strategic plans. The central C.R. team led by a group chief C.R. officer regularly reports to the group's senior executive management and the board of directors. The company has innovative approaches for all stakeholders, including the environment. A C.R. score and a C.R. index are developed for stakeholder engagement and value creation.

Source: AXA (2014)

*By intention, C.R. is synonymous with sustainability.

human capacities for caring, empathy, consciousness and creativity (Ikeda 2010). Human rights, stakeholders' shared value and sustainability are a single entity. When one disintegrates, they all disintegrate.

On governance, good governance practice instills in the company the essential vision, process and structure to make decisions that ensure long-term sustainability. Establishing a culture of human rights is essential, which is to make human well-being and human happiness a consistent focus and to make business goals that internalize the concept of sustainability. ESG awareness is established at the board level and a business's approach to risks is formed from both strategic and ethical perspectives. Infrastructure and system are created to incorporate sustainability measures and goals into ERM. An ESG advisory group led by the chief sustainability officer can be added to the existing corporate structure. This team consists of people with comprehensive knowledge of environmental, social and economic aspects of the company's operations and impacts. The group examines risk indicators, risk sources and objectives to ensure effective handling of ESG risks and to improve overall company performance and value. *(See AXA's Corporate Sustainability above.)*

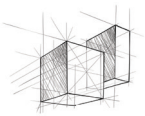
SERM influences everything from underwriting, product development, claim management, marketing and investment to corporate strategy with a focus on environment, humanity and well-being, which in return contributes to long-term financial prosperity. Since a typical company's mission statement already contains commitment to ESG issues, insurers can simply start by revitalizing the original mission statement, transforming culture to reflect ESG values and aligning business models with environmental and social goals. In this way, it shapes a more coherent corporate identity. Talent and investment capital come to the firm because people want to work for and invest in good companies with good earnings prospects. By having SERM, what have traditionally been seen as "softer risks" such as trust, transparency and ethical conduct become a company's core pillars.

CONCLUSION

SERM aims to enhance the triple bottom line: people, planet and profit. It is a win-win-win situation. Companies create sustainable value by aligning business activities with the broader objectives of society: caring for the environment and the people. SERM re-orients the enterprise to function for the happiness and well-being of the people and the society by creating new value from actively considering ESG issues in decision-making.

SERM AIMS TO ENHANCE THE TRIPLE BOTTOM LINE: PEOPLE, PLANET AND PROFIT. IT IS A WIN-WIN-WIN SITUATION.

In the increasingly complicated and interconnected world, actuaries have a valuable skill set to transform knowledge into value. Equipped with risk expertise on



ESG issues, actuaries can serve as a key asset in a company's sustainable development. Collectively as an industry, insurers have the power to improve the risk landscape through managing the ESG profile of the local communities. By being among the world's largest institutional investors, the industry also has the influence to re-channel investment from today's economy to the future's more caring and green economy.

Lastly, the transition to SERM requires culture change. In fact, the biggest challenge and opportunity for having a sustainable mindset is culture. Whether it is covering ESG risks through insurance policies or considering ESG issues in the risk management process, it requires a shift in thinking and prioritization. However, culture—a product of shared values and common behaviors—cannot be forced by strategies. The change has to come from awareness and inner resolve of individuals—with even one person developing the will for cultivating culture within while working to improve the external circumstances. Actuaries, the risk experts with an understanding of the risk state of the world, can become such a cause for effecting genuine change. A

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END NOTES

1 Casualty Actuarial Society's definition of ERM.

2 As of October 2014, over 1,260 signatories representing $45 trillion in assets under management have committed to the principles.

3 For a comprehensive list of sustainable/green insurance products, see Zona, Roll and Law (2014).

4 As of June 2014, 70 organizations had adopted the principles, including insurers representing approximately 15 percent of world premium volume and $8 trillion in assets under management. The principles are part of the insurance industry criteria of the Dow Jones Sustainability Indices and FTSE4Good Index.

5 In 2013, 72 percent of S&P 500 companies published a sustainability report. Of the world's largest 250 companies, 90 percent issued a corporate responsibility report, of which 82 percent refer to the GRI guidelines. (Global Reporting Initiative North America 2014). According to Ernst and Young, currently 33 global stock exchanges require or highly recommend sustainability reporting.

6 In April 2013, the European Commission announced proposals for a directive of the European parliaments and the council of the European Union that would require large companies to disclose economic, environmental and social impacts of their business as part of their annual reporting cycle. Companies are expected to start to report in 2017.

7 For more information, visit *footprintnetwork.org/en/index.php/GFN/page/basics_introduction/*.

8 For a select list of insurers' sustainability practices, see Strandberg (2010). Also, see PSI disclosures from signatory companies in the insurance industry on their ESG practices at *www.unepfi.org/psi/signatory-companies/*.

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Andrea Bykerk Christopherson

Section Highlights

HEALTH SECTION

BY ANDREA BYKERK CHRISTOPHERSON

TRANSFORMATION WITHIN the health care system makes the present such an interesting time to be a health actuary. In addition to the Affordable Care Act, the entire health care system is changing before our eyes.

The Health Section is undertaking a broad, multiyear effort to delve into topics involving these dynamic areas within the health care system. Our Health System Evolution Initiative is an effort both to further our profession's understanding of the topic, and to establish ourselves as thought leaders outside of the profession. We seek to answer questions and acquire outside perspectives regarding risk and opportunity, with respect to both the industry as a whole and the actuarial profession specifically.

The first area of focus is the individual market and exchanges. Highly variant pricing and the politicized nature of this topic present serious reputational risk to our profession if not handled in a proactive manner. The core of this work is to get ahead of the things we, as actuaries, find foreseeable, by presenting information in a way that can be well understood by those outside the profession. Our hope in doing so is to allow for more informed conversation about the challenges and possible solutions. Our initial efforts will be to interpret emerging data and look at how players in the industry are likely to respond to risk protection removals in 2017.

The second area of focus underway is accountable value-based care. There are many professionals in the health care industry working in this space, and it is our challenge as an actuarial profession to determine how we can contribute to developing the next generation of solutions in a way that ensures focus on financial performance. We are building the skill sets and understanding within the actuarial community to accomplish this. Understanding external points of view and the expertise that comes with them is also a key element of this effort. Actuarial and nonactuarial perspectives need to be brought together to further the discussion and develop new solutions.

There is a lot of work and change going on in the health care industry, and these areas are just a few examples. If you are interested in the work we are doing in these areas, please reach out to either me or Kara Clark (*kara.clark@walgreens.com*)! A

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CANDIDATE ENGAGEMENT INITIATIVE

BY BOB SANFORD AND AVI SAPER

REMEMBER WHEN YOU FIRST became aware of the Society of Actuaries (SOA)? For me (Bob), it was while I was in college, and one of my math professors suggested that I look into taking an "actuarial exam"—whatever that was! Actuarial science was identified to me as a profession that I might find of interest. It offered a nice combination of both mathematics and business disciplines. I checked into the exams, and found that I needed to work with an organization in Chicago that administered the exams: the SOA. Sounded like a nice enough group, but I had never heard of them. The subjects covered on the first two exams were calculus and probability. No problem, right? I was a math major who had just completed two year-long courses in advanced calculus and probability & statistics. And all you needed to pass was a 6?

For the next four years, my only interaction with the SOA involved requesting exam application forms, sending in my exam registration fees, taking exams and then waiting patiently to receive the grading slip in the mail each January and July. It wasn't until I attained my associateship that I became aware of all that is done by the SOA in terms of education, research, influence on public policy, assistance to its members, advancement of the profession, etc.

SOA President Errol Cramer (left) discusses career insights with a candidate at a networking event.

The fact that many actuarial candidates have difficulty "getting to know" the SOA, as I had many years ago, has recently captured the attention of SOA leadership. Market research on candidate opinions revealed that there was a need for increased study support resources and networking opportunities. The result is that much has been done, and continues to be done, to enhance the relationship between the SOA and its candidates. This article is provided to educate our membership on the initiatives that are both planned and in place to better connect the SOA with its candidates. After all, today's candidates are the future membership of the SOA and the actuarial profession. And what better way to create such an article than through combining the perspective of a seasoned volunteer from the SOA education system with the perspective of a current candidate who is working his way through that system and is about to embark on an actuarial career?

Let's face it, while information about SOA research, sections and meetings is of some interest to candidates, it's mostly about the exams and the education system when you are a candidate. Thus, based on this fact as well as specific feedback from both candidates and members, many of the new candidate engagement initiatives are education-related. Examples include:

Candidates focus in on a presentation about the different aspects of the actuarial profession.

- *Performance feedback for computer-based preliminary exams:* After an unsuccessful attempt on one of the four computer-based preliminary exams (P, FM, MFE and C), candidates now receive performance feedback in addition to their instant, unofficial result. This feedback includes guidance on the candidate's performance within the various topics covered by the exam so that the candidate can ascertain areas needing further concentration prior to a next attempt. This performance feedback is currently operational, having begun with exam administrations in the second half of 2014.

- *Online sample exams:* New online sample exams are now available for exams P and FM.[1] These sample exams resemble the actual computer-based tests in both time and content, with questions randomly selected to cover all exam learning objectives. Thus, the sample exams are created with a balanced set of questions each time a candidate repeats a sample exam. Detailed solutions are provided for each question. There is no cost associated with these sample exams. It is anticipated that online sample exams will be available for other preliminary exams in 2015.

SOCIETY OF ACTUARIES
CANDIDATE SUPPORT

- *Education seminar on preparation for SOA written-answer exams:* A half-day seminar has been developed as a resource for candidates taking fellowship-level written-answer exams. The seminar was designed to help candidates understand what exam question writers and graders are looking for on SOA written-answer exams. The topics included in the seminar were:
  1. Exam process, including curriculum development and question writing,
  2. Grading and exam performance feedback,
  3. Cognitive levels and verb use,
  4. Question-and-answer examples, including examples of both "model" and poor solutions, and
  5. Study approaches.

The seminars were held in New York City, Toronto and Chicago during August and September 2014. They were also held abroad in Singapore, Hong Kong and Kuala Lumpur in November 2014. The Chicago seminar was recorded and the video is now available on the SOA website at *www.soa.org/Education/General-Info/edu-guide-written-exams-seminar-vids.aspx*.

Bob Sanford

Avi Saper

These initiatives have been well received and the SOA continues to look for ways to support exam candidates.

My (Avi) relationship with the SOA started out similarly to Bob's. As far as I was concerned, I would write this group's exams until they told me to stop and placed some fancy letters after my name. I was a career changer: a 30-year-old newspaper reporter who had decided to go back to school and become an actuary. While I was able to learn all about the profession through the SOA's website, it still seemed as though the only meaningful interaction between pre-ASA candidates and the organization was through the exam process.

That was until the president of my university's actuarial club forwarded an email from the SOA looking for volunteers to join the editorial board of SOA *Candidate Connect*, an e-newsletter that launched in 2014 in an attempt to open the lines of communication between candidates and the SOA.[2] Given my previous career, it seemed like a perfect

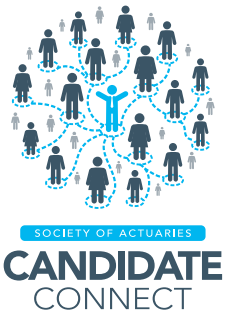
Making the Connection

TO LEARN MORE ABOUT the outreach efforts of Candidate Connect, check out these links:

SOA Candidate Community on Facebook: ***https://www.facebook.com/***

SOA Candidate Connect e-Newsletter: ***http://bit.ly/1tZTOEU***

fit. Our group of 11 runs the full gamut, from FSAs with many years of experience to university students who are still writing the preliminary exams. The biweekly newsletter is emailed to all pre-ASA exam writers, and is intended to support their pathway before they become associates. In addition to keeping candidates up-to-date on news relating to the exams themselves, the newsletter provides insight into the profession for those just starting out. The topics covered will include ways to deal with failing an exam, the various fellowship exam tracks available and the emergence of nontraditional roles for actuaries.



As the planning process progressed, the editorial board morphed into an advisory group for all of the SOA's candidate communication initiatives. Working with SOA staff, the group is helping shape the ways in which candidates are reached. In addition to the newsletter, the SOA is ramping up its social media presence and bolstering its website content. The SOA Explorer—an interactive tool that allows users to locate SOA members on a map—is one example of this.

No amount of newsletters and webinars can replace face-to-face interaction. That's why the SOA began putting on Candidate Connect events. These daylong events aim to enhance candidates' knowledge of the profession and provide networking opportunities with established actuaries. In 2014, two standalone events were held in Hartford, Connecticut and Chicago, where candidates were able to connect with local employers. The SOA also held events in conjunction with four of its largest professional development meetings: Life & Annuity Symposium, Health Meeting, Valuation Actuary Symposium and Annual Meeting & Exhibit. "It is a good opportunity for candidates to hear about the latest and greatest in the actuarial community, get an idea of what being an actuary is really like, and to meet other fellow candidates," said one of the participants at the Valuation Actuary Symposium event.

Finally, the SOA is sponsoring a variety of conventions and conferences in an attempt to reach more future actuaries. The SOA continues to sponsor the Canadian Actuarial Students' National Association Convention, and also sponsored the Gamma Iota Sigma International Conference and the Midwest Actuarial Student Conference in 2014.

Just like it was for us, exams will likely always be at the forefront of any new candidate's relationship with the SOA. But as these new candidate-engagement initiatives take hold, young actuaries will hopefully have a much greater understanding of their chosen profession by the time they earn their professional designations. A

END NOTES

[1] The online exam examples can be found at *www.soa.org/Education/Exam-Req/Syllabus-Study-Materials/edu-exam-p-online-sample.aspx*.

[2] Candidate Connect can be found at *www.soa.org/News-and-Publications/Publications/E-News/soa-candidate-connect/soa-candidate-connect.aspx*.

Robert G. Sanford, FSA, is a consulting actuary with PRM Consulting in Richmond, Va., specializing in the Retirement Benefits practice area. He also is a member of the SOA's Candidate Connect Advisory Group and has been a volunteer within the SOA Education system since the late 1980s. He can be reached at *Bob.Sanford@prmconsulting.com*.

Avi Saper is an actuarial math and statistics major at the University of Manitoba. He will be interning with the Wawanesa Mutual Insurance Company this summer. Saper is a member of the SOA's Candidate Connect Advisory Group and can be reached at *avisaper@gmail.com*.

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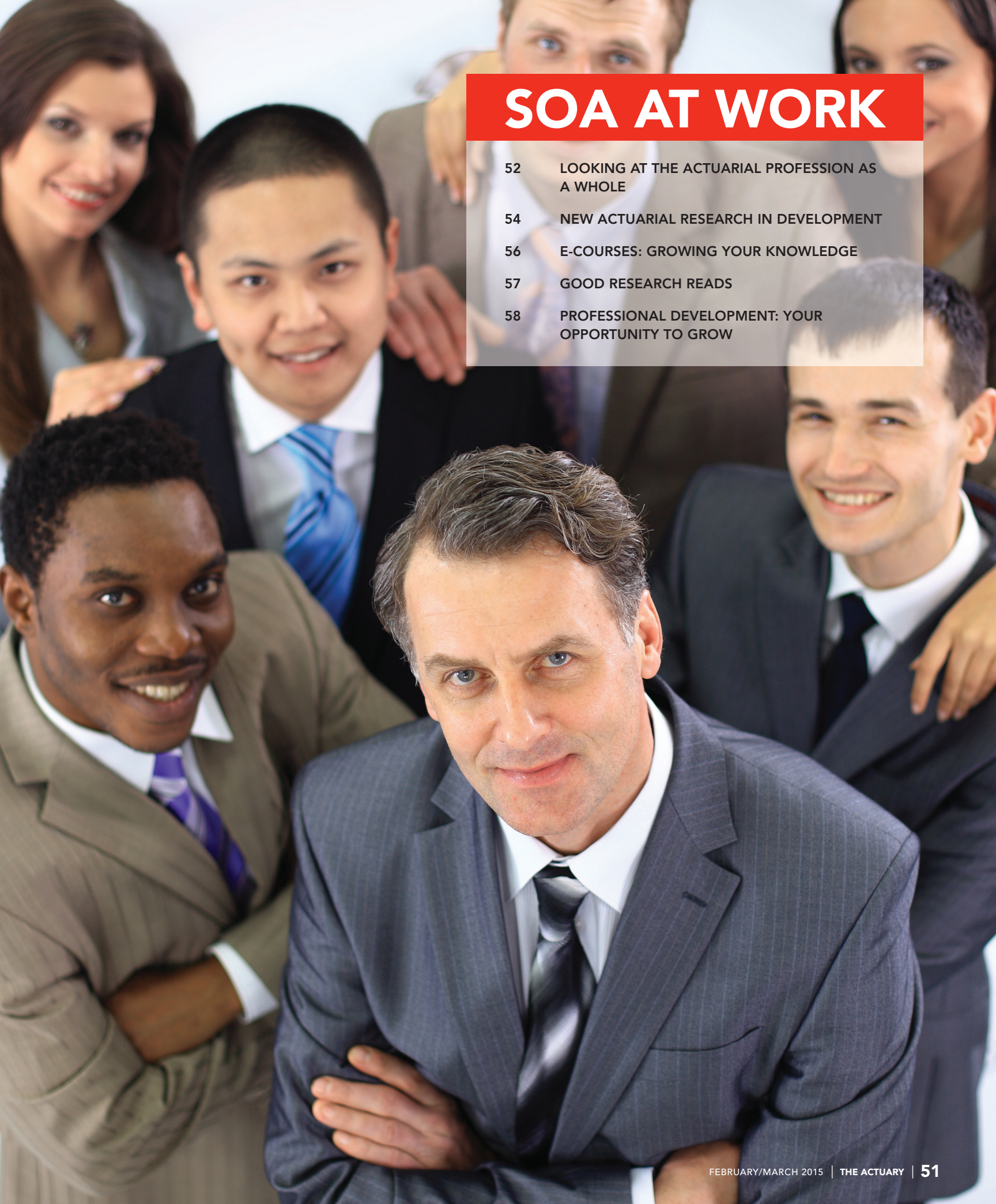

SOA AT WORK

LOOKING AT THE ACTUARIAL PROFESSION AS A WHOLE

BY GREG HEIDRICH

"We all should know that diversity makes for a rich tapestry, and we must understand that all the threads of the tapestry are equal in value no matter what their color."—Maya Angelou

"Diversity: the art of thinking independently together."—Malcolm Stevenson Forbes

"If we are to achieve a richer culture, rich in contrasting values, we must recognize the whole gamut of human potentialities, and so weave a less arbitrary social fabric, one in which each diverse human gift will find a fitting place."—Margaret Mead

We hit the ground running this year, introducing new initiatives and projects, and continuing to build on those that have carried over from 2014. In this article, I want to highlight one of our new efforts, the just-created Actuarial Diversity Task Force. Any profession is stronger—and better—if its membership represents the diverse mix of ethnicities, genders and educational backgrounds present in the community at large. Society of Actuaries (SOA) leaders have recognized this and have created a task force to explore ways the SOA can, along with others, increase diversity within the actuarial profession.

The purpose of this task force can best be described with words taken from the group's official charter:

> *The purpose of the Task Force is to determine what investments the SOA can make, or programs it can undertake, to achieve the greatest impact on diversity in the actuarial profession over the long-term in addition to identifying short-term solutions that could have immediate impact. The Task Force will emphasize building on and enhancing current efforts and collaborating with other organizations inside and outside the actuarial profession. The primary focus of the Task Force's attention should be on diversity within the profession in the United States.*

This group is tasked with examining ethnic diversity in the profession today, developing an understanding of the current state of affairs of the actuarial profession, and identifying ways that we are similar to or different from other technical professions; researching areas where we will have the greatest impact in attracting the best and the brightest; assessing the potential and feasibility for profession-wide diversity programs; and researching ways to develop partnerships with other actuarial organizations interested in pursuing diversity programs. In addition to exploring ways to strengthen ethnic diversity, the task force will also examine what might be done to increase the presence of women in actuarial leadership roles and research avenues to help maintain the profession's "welcome" for students from a variety of educational backgrounds besides just actuarial science.

It goes without saying that achieving a well-rounded profession—in terms of diversity—incorporates ideas from people from all backgrounds, cultures and diverse experiences. Variety brings different perspectives to the table—perspectives that can stimulate new ideas, creative ways to strategize, and a strong sense of camaraderie as issues surface and are discussed together. A U.S. actuarial profession that is more diverse—and that continually reaches out to new communities for its future growth and membership—will be a profession that is more able to develop new ideas, understand and serve new employers and markets, and deliver innovative ways to best serve the needs and interests of an increasingly diverse U.S. population.

To achieve these objectives for the actuarial profession, we need to work to attract new candidates from all segments of the population and from a variety of educational backgrounds—not just actuarial science, but mathematics, statistics, economics, physics, and other disciplines that can prepare students well for an actuarial career.

The work of the Joint CAS/SOA Committee on Career Encouragement and Actuarial Diversity is an example of the importance of a strong focus on diversity. This group is responsible for increasing the awareness of the actuarial career among students, educators and career influencers in high schools, colleges and universities. The committee has focused attention on this issue continuously in a variety of ways. It works with the Casualty Actuarial Society (CAS) and the SOA to promote the profession to aspiring students through *www.BeAnActuary.org*, the joint CAS/SOA actuarial career website. To facilitate the evolution of a diverse profession, this committee helps familiarize students from African-American, Hispanic and Native American communities with important information that will grow their knowledge of and familiarity with topics of an actuarial focus. In addition, they give presentations at various educational institutions, promote the actuarial profession at career fairs and exhibit halls, and develop and maintain solid relationships with other organizations that support diversity in the actuarial profession. We are thankful and proud of the work this committee does to advance the presence and importance of actuaries.

We know, of course, that increasing the diversity of the profession is not just an interest of the SOA. The SOA and CAS have a long-standing partnership to work together on this issue and we know others may want to be involved as well. For that reason, the SOA board has also requested that the task force reach out to other U.S.-based actuarial organizations, asking them to join us in this important effort. We hope they will and are looking forward to realizing the benefits of a strong, broad partnership by working together.

We are confident that the work of the Actuarial Diversity Task Force will expand our reach even further. The actuarial profession is growing and expanding in many important ways. Including diversity programs can help increase our success, have a positive impact on the culture of our organization and profession as a whole, and strengthen the ability of the profession to serve an increasingly diverse public. A

Greg Heidrich is executive director of the Society of Actuaries. He can be reached at *gheidrich@soa.org*.

NEW ACTUARIAL RESEARCH IN DEVELOPMENT

BY R. DALE HALL

In keeping the past year's momentum with new research to support the actuarial profession, there are many Society of Actuaries (SOA) research projects and experience studies in the works, from those in early development to those just released. Here is a glimpse of the practical ideas and innovative concepts from life insurance, pensions and retirement to weather and financial risks.

PREDICTIVE MODELING

We have made available a collection of papers on predictive modeling and analytics, which cover several areas of practice. Also, we are developing a research project to provide a "primer" on predictive modeling for the life insurance industry, looking at a theoretical framework, insights on data, models and results, as well as more information on emerging issues.

PENSIONS

Following the finalization of the private pension RP-2014 Mortality Tables and Mortality Improvement Scale, the SOA's Retirement Plans Experience Committee (RPEC) has provided several new tools for use by actuaries, including "headcount" weighted mortality rates and a new Excel-based tool to construct two-dimensional mortality improvement scales. Visit *www.soa.org/Research/Experience-Study/Pension/research-mort-table-mort-imp-scale.aspx*. Also on the topic of pensions, we will explore a framework for quantitatively evaluating retirement plans for use by plan participants and plan sponsors.

The SOA and Canadian Institute of Actuaries are working together to develop data-driven, in-house research on Canadian pension topics. The projects are in the early stages, though they serve as an example of the collaborative approach in creating research to support Canadian actuaries.

ANNUITIES

We have released a new group annuity study and an individual annuity aggregated database. We are also conducting a thought leadership discussion on longevity risk, in building upon the important topic of living longer. Members will hear more about that discussion soon.

RETIREMENT RISKS

The SOA Committee on Post-Retirement Needs and Risks is hosting focus group research on the spending decisions of long-term retirees. The project will help to study the experiences of people who have been retired 15 to 25 years and to learn what major changes and issues have confronted them along the way. The committee is also continuing its retirement risk research survey series of pre-retirees and retirees, to better understand the risks and challenges in retirement.

WEATHER

On the topic of severe weather, the Actuaries Climate Index is an educational tool designed to help inform the insurance industry and the general public on the extreme climate events over recent decades. This research is a culmination of jointly funded research by the American Academy of Actuaries, the Canadian Institute of Actuaries, the Casualty Actuarial Society and our organization. This February at the National Tornado Summit in Oklahoma City, the SOA will present on Midwest climate research and associated health costs with extreme weather events.

NEW RESEARCH IN DEVELOPMENT

We also are reviewing research proposals to conduct future studies on:

- The financial impact of longevity pooling in retirement, insurance and savings systems
- New developments in economic capital
- Nested stochastic modeling
- Retention management issues for life insurers.

Visit the SOA research page at *www.soa.org/content.aspx?id=3429* for the latest updates on new research opportunities and completed research projects. A

R. Dale Hall, FSA, CERA, MAAA, is managing director of Research at the Society of Actuaries. He can be reached at *dhall@soa.org*.

Already an FSA? CERA with Four Exam Hours More

On July 1, 2013, changes to the Society of Actuaries' fellowship exam structure will allow current Fellows of the Society of Actuaries (FSAs) to obtain the Chartered Enterprise Risk Analyst® (CERA) credential with just four additional exam hours.

As the most comprehensive and rigorous risk management credential available, the CERA offers an enhanced enterprise-risk-based curriculum that better prepares professionals with the in-depth knowledge and expertise they need to play more strategic roles across more industries—including risk managers, chief risk officers and CFOs.

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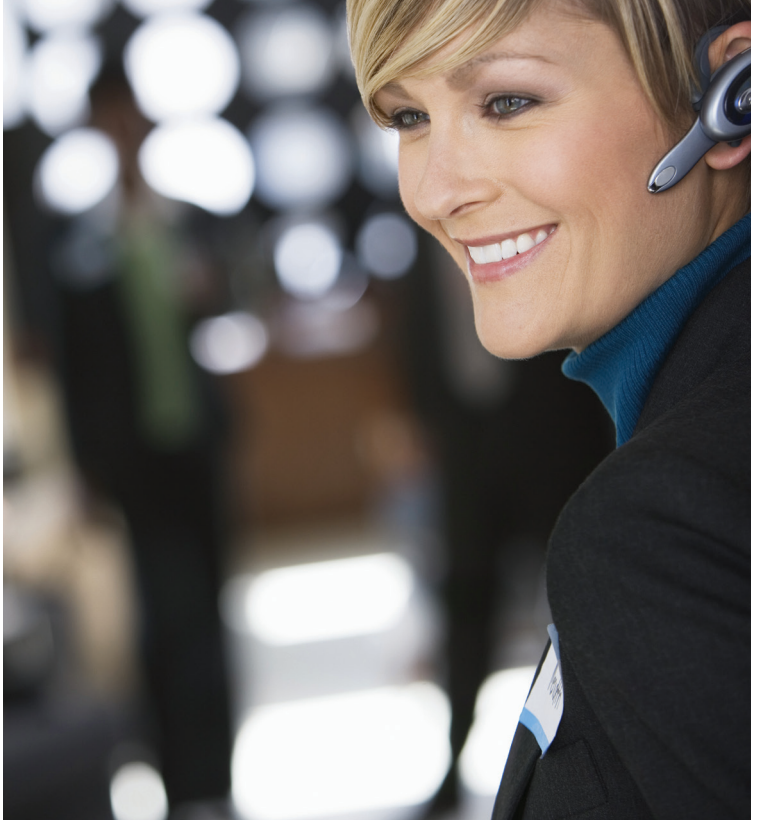
E-COURSES: GROWING YOUR KNOWLEDGE



THE SOA IS PROUD to offer 20 e-courses worth more than a combined 80.00 continuing professional development (CPD) credits. E-course topics range from professionalism and communication to social insurance and enterprise risk management, and can be completed in as little as two hours. Whether you're changing fields, in need of some refreshers or looking to improve your communication skills, get the knowledge you desire by registering for an e-course today. See our full listing at *www.soa.org/ecourses*.

FINANCIAL ECONOMICS: FINANCIAL MATHEMATICS

This e-course focuses on the financial mathematics branch of financial economics. You will learn about derivative securities and options, modeling returns, and option pricing and hedging.

FUNDAMENTALS OF ACTUARIAL PRACTICE (FAP)

This e-course is set in the context of the control cycle. It encompasses real-world applications and uses examples to demonstrate actuarial principles and practices. You will also have opportunities to apply these principles and techniques in traditional and nontraditional actuarial practice areas. With the fundamentals in your toolkit, you will be better prepared to apply your learning to new areas of practice that may emerge during the course of your actuarial career.

HEALTH FOUNDATIONS

The Health Foundations e-course discusses the health care system at a micro level. It begins with an exploration of health care terminology and coding. The module moves on to discuss sources of data with regard to medical treatments and claims experience. The next step is to learn about the administrative systems that bring the data sources together. The module ends with examples illustrating how these elements combine to help provide solutions to actuarial problems.

INTEGRATED DECISION MAKING PROCESS (IDMP)

The Integrated Decision-Making Process (IDMP) provides a foundation for making decisions related to complex business problems that require the involvement of many stakeholders and decision makers. IDMP presents a decision-making process that is specific enough to provide solid guidance when making decisions yet general enough to be applicable in a wide variety of situations.

PRICING, RESERVING AND FORECASTING

This e-course is designed to build upon the information presented in the Design and Pricing (DP) and Company Sponsor Perspective (CSP) examination syllabi and the Health Foundations module in the Group and Health FSA Track. Basic concepts that were presented in the exams will be integrated and expanded upon in this e-course. You will learn practical techniques involved in managing the financial control cycle of a health care company—from trend determination to pricing and reserving to analysis of historical results to forecasting future experience. A

GOOD RESEARCH READS

COMPLETED EXPERIENCE STUDIES

SOA ANNOUNCES FINALIZED PENSION PLAN MORTALITY TABLES AND MORTALITY IMPROVEMENT SCALE

The SOA's Retirement Plans Experience Committee (RPEC) has released the final reports of the RP-2014 Mortality Tables and the Mortality Improvement Scale MP-2014. The SOA also provided responses to comments from both reports. Reblog for more information on the mortality tables and scale. Several media outlets have covered the final reports, including T*he Wall Street Journal* and C-SPAN.

To view a complete listing, visit *SOA.org/Research* and click on Completed Experience Studies.

COMPLETED RESEARCH STUDIES

LTC RESEARCH CENTERS ON UNDERSTANDING THE VOLATILITY OF EXPERIENCE AND PRICING ASSUMPTIONS

The SOA Long Term Care Section is pleased to announce the second of two reports on the volatility of experience and financial results for LTC insurance. Download the full report, which includes mitigation strategies and related approaches.

SOA POSTS UPDATED MODEL ON LONG-TERM HEALTHCARE COST TRENDS

The SOA released an updated resource model on long-term healthcare cost trends. The SOA Pension Section and Health Section research teams originally commissioned this model developed by Thomas E. Getzen. The model can be used as a resource for the estimation of reportable liabilities for retiree healthcare benefits under FAS 106 and GASB 45 accounting statements.

REPORT STUDIES THE IMPACT OF RETIREMENT RISK ON WOMEN

The SOA Committee on Post-Retirement Needs and Risks and the Women's Institute for a Secure Retirement (WISER) partnered on a report that surveys the impact of retirement risk on women. The report includes information to help prepare women of the baby boom generation for the retirement challenges ahead. Download the report to learn more about the findings.

SOA RELEASES RESEARCH ON CASH FLOW RISK MANAGEMENT MODELING

The SOA Committee on Finance Research published a report containing comprehensive analysis of cash-flow modeling and cash-flow risk management in the insurance industry. The research models cash flow risks and analyzes cash flow risk management of insurance firms under a dynamic factor modeling framework.

To view a complete listing, visit *SOA.org/Research* and click on Completed Research Studies. A

PROFESSIONAL DEVELOPMENT: Your Opportunity to Grow

When is the last time you attended a meeting or seminar, or tuned into a webcast? As an SOA member, there are a number of events you can attend, in person or from your computer. Here are just a few of the upcoming meetings and webcasts coming your way that can help you:

- Stay up to date with current trends in your area of practice,
- Continue to make meaningful contributions to your company, your team and the profession, and
- Develop or fine tune new knowledge and skill areas.

MEETINGS AND SEMINARS

2015 INVESTMENT SYMPOSIUM

March 26–27
Philadelphia
Save the date for this important event.

LIFE INSURANCE CONFERENCE

April 13–15
Arlington, Virginia
Learn about the latest life insurance industry developments, marketing strategies and product and technology innovations while networking with industry leaders.

RETIREMENT INDUSTRY CONFERENCE

April 15–17
Arlington, Virginia
This conference covers the latest strategic, sales, product, operations and administration, marketing and distribution trends, as well as regulatory issues that impact the industry.

WEBCASTS

DERISKING OR RISK SHIFTING? PERSPECTIVES OF DIFFERENT STAKEHOLDERS

April 22

CREATING BETTER DC PLANS

June 24

Save the date for these upcoming webcasts. More information will soon be available at ***SOA.org/calendar.***

PODCASTS

GIVING PRESENTATIONS WITH EASE

The Education and Professional Development's series of presentation podcasts covers a variety of topics including presenting with confidence, using visuals effectively, and refining your delivery. Tune in now.

READY TO REGISTER?

Visit ***SOA.org/calendar*** for the full complement of meetings, seminars, virtual sessions, webcasts and more. We look forward to hearing from you!

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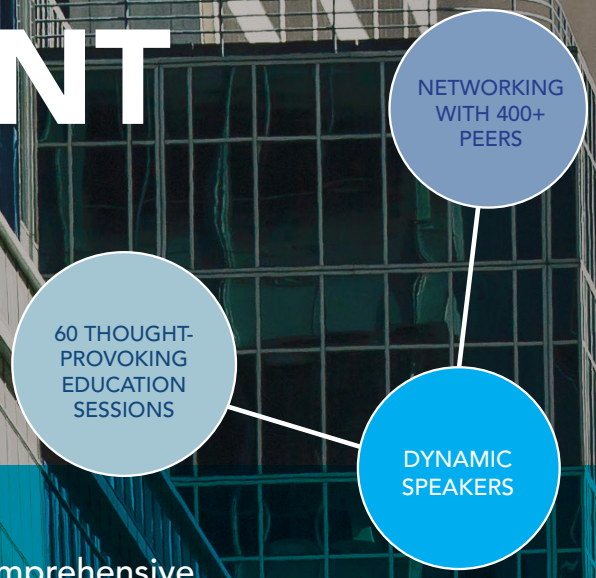

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